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194 Ganja Strain Listings (Alphabetical Order)
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BC Hash Plant
Beatrix Choice
Big Mac
Big Sur Holy Weed
Blue Mountain Jamaican
Bolivian
Champagne
Chemo
Cream Sodica
Early Bud
Early Girl
Early Pearl
Early Skunk
G-13
Kali Mist (a.k.a. Western Winds)
Kong
Matanuska Tundra
Oakland Indica
Romulan
Strawberry Blonde
Sweet Tooth
Texada Timewarp
Western Winds
Williams Wonder
Yumbolt
BC Big Bud is a stabilized 65% indica/35% sativa, the Dutch Big Bud (Sensi) is all indica. BC Big Bud has tremendous resin, its the crystally bud on the cover of the Cannabis Culture #18 (Steve Kubby header), and a citrusy scent. Usually only available in clone, (hence the crosses, its usually the female in those Romulan x BC Big Bud or Mikado x BC Big Bud), it is now available in seed (pure) at $50 CN/$40 US for 10 seeds. Giant seeds,

Region: New World Strains - The Americas, Hawaii and Caribbean

Family: Big Bud Strains

Strain: BC Big Bud
Strain Type: Mostly Indica  Origin: Oregon/British Columbia  Breeder: Undetermined
Images:
Description:

“BC Big Bud is a stabilized 65% indica/35% sativa, the Dutch Big Bud (Sensi) is all indica. BC Big Bud has tremendous resin, its the crystally bud on the cover of the Cannabis Culture #18 (Steve Kubby header), and a citrusy scent. Usually only available in clone, (hence the crosses, its usually the female in those Romulan x BC Big Bud or Mikado x BC Big Bud), it is now available in seed (pure) at $50 CN/$40 US for 10 seeds. Giant seeds,”
largest I have (not that that information has meaning, seed size has no relevance despite what mythology persists about them). Very nice smoke, the Dutch Big Bud can be a good yielder like BC Big Bud but the high is superior in the BC Big Bud version. The leaves in the BC Big Bud variety are

**Specifications:**
none

**Growers Comments:**
none

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**Strain:** Big Bud

**Strain Type:** Mostly Indica  **Origin:** Oregon, USA  **Breeder:** Sensi Seed Bank

**Images:** 1 2 3

**Description:**

“Winner of the Cannabis Cup in 1989. Mostly Indica. All plants have guaranteed high yields, 25% has something special to it. Usually the lower branches collapse under the weight delight.

**Specifications:** ~ Flower: 7.5-8.5 weeks ~ Sensi Seed Bank catalog

**Growers Comments:**

“Ed Rosenthal says Big Bud came from Portland, Oregon.”

“The Big Bud was the same as usual. The buds are large for sure, but this strain just doesn’t do it for me. They reached about 15 inches in height and yielded at least an ounce each. I've grown this strain 2 times before and to be honest I thought it came out poorly originally because they were not in this batch, which was grown and dried as perfect as I have ever done, still palest the last time I take up space with this strain.” – James Hetfield

“While I'm not going to say that Big Bud isn't a good strain, it's not as magical as many people seem to think. The main problem is the name, Big Bud, everyone expects massive buds. They are larger than many other top strains. The potency is good but not knock you over. Variations from plant to plant, some are killer and deserving of some of the legends (typical of high quality strains). Overall, a good plant as long as you don't expect miracles. I just finished a bowl of it myself.”

“Friend has been growing supposed BB for a while now, and let me say that I selected a perfect mother (maybe just great luck?), but mine sure is different. Much greener, tastier, more potent, amazing. 8-10 in my opinion. But even Sensi says that 25% are “Special” so germ the whole batch (pack) of seed so to give yourself a better shot at a primo Mom! If you never grew any exotics before, try an easier strain. You really kind of need to know what your doing (selection wise).” – Bdubs

“Piece of crap - hard to clone. I grew a few seeds from a seedbank selling Sensi waste time and space with any more than 2 females. Maybe I was unlucky and large producer. Dunno. the plants were grown indoors under plenty of light. The spread out bud yield. I was expecting fatty kolas, but nope. It looked more like Holland/Canada Big Treat than
BB is supposed to be. Anyway, that's my two cents.” – dak

“Afoaf has a Posi Big Bud Mom that is 70% pistils ripe, with cloudy heads in about 43-45 days and it yields real nice. Its a real tough strain, eats ferts big time, not the strongest most devastating buzz, however it has a long duration 4 hours, but a repeat for sure, the strain has really "grown on me." Its just an all-around good strain, now if it took 55-60 days it would be history, its speed to harvest is a big consideration.” –Budm

Strain: **Big Bud x Skunk #1**
Strain Type: Sativa/Indica mix  
**Origin:** Oregon/British Columbia  
**Breeder:** Undetermined

Description:

 Specifications:

Growers Comments:

"(Big Bud x Skunk #1) 23.25 oz. Cured, VERY well manicured. Also made 2 lb of butter, that turned out way too strong) and 10 grams of hash. There were 8 1/2 plants grown from clone(one was a complete runt, I don't know why I even let her live). Plants were vegged in an aeroponic/NFT system with an AgroSun bulb. They were about 18-20 inches tall when switched. Each plant was topped twice. Flowering was in an NFT system. The first 2 weeks a single 1000MH w/ AgroSun was used. A second identical light was added at the third week. Flowering took about 70 days. These were the most crystallized plants of this variety that I've ever grown. Slow cured over 1 1/2 months. First on newspaper, then into paper bags, then into mason jars. Smell is incredible. High is incredible. Normally I find BB a little less potent that I'd like. This crop just floors me. High starts out mellow, upbeat, then when you start the second round of hits it just hits you like a wave. Immediate couch melt. Cancel your plans, you're not going anywhere. But it lets your mind stay somewhat sharp, which is the best thing about it. Overall I was pretty pleased with this harvest. I had a couple problems in the early weeks of flowering with mites, and then nearer the end the cold started to set in a bit. So considering that I was pleased with the yield. Although it did suffer the typical Big Bud problem of slightly looser buds. I had one plant that was a monster! A good 8 inches taller than all the other plants, I ended up having to tie her down. 4 huge colas each around 4x11. That plant probably yielded almost 4 ounces alone.” –

Strain: **Green Spirit**
Strain Type: Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank

Images: 1 2 3

Description:

“Green Spirit is a hybrid of Big Bud and Skunk #1. Was developed because Big Bud itself is not a very consistent strain, with very big differences among individual plants. By crossing Big Bud and Skunk #1, Green Spirit became quite homogeneous. Good results under artificial lights. Clearly an explosive flowering trait and are extremely resinous. Very high yield.

Specifications:
**Specifications:** ~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.” - Dutch Passion seedbank catalog

**Growers Comments:**

"Green Spirit is a short resiny 8 week strain that crystals up nicely and has a real bomb taste. The only drawback I see is the mold susceptibility trait inherited from its Skunk#1 forefathers." - Mcgee

**Family: Blueberry Strains**

**Strain:** Blue Moonshine  
**Strain Type:** Indica **Origin:** Oregon, USA  
**Breeder:** D.J. Short

**Images:**

**Description:**

“A super potent Blueberry Indica, coated with a strong concentration of tall standing trichomes. This produces a long lasting very narcotic experience ~ body high blueberry. Short (80 cm) stout kush plants that produce dense, tight, rock hard nuggets of trichome coated bud. A true “hash-plant.”

**Specifications:**

**Specifications:** ~ Flower: 9-10 weeks ~ Harvest: mid Nov.” – Heaven’s Stairway catalog

**Growers Comments:**

“Blue Moonshine IS NOT a White Widow cross. It is similar to the "Whites" only in its glandular resin coating. Blue Moonshine is a cousin to Blueberry, and is derived entirely from within my personal gene pool collection.” - D.J. Short

“I liked it a lot. It's mellow, weird, trippy yet down to earth. I crossed it with my best NL female and so far, NL-BM smells like heaven. I'd say it smells like Bubblegum, but I know there's a strain out there with that name. But that's just what it smells like (right now.)

So anyway, I found B.M. a lot like the description; strong but don't get it if you want your ass kicked (it isn't that way.) However, if you like mellow, different stones, I highly recommend it. I grow it strong and hard if such a thing exists, quick: takes about two months or so; sorry I'm too busy to get terribly scientific about it. (and as I grow in about 12 CUBIC feet, you don't want my numbers.) And these are only my experiences and current opinion. I reserve the right to change my mind, which I may.

Oddly, I'm just not sure about the Blue Moonshine, which is weird because I have an opinion on all others. Going to start all B.M. beans soon (Moving to bigger local and I swear I'm starting every bean in my possession when I get there (and I'm going totally organic!)) and I'll know my opinion better then.

Blue moonshine wouldn't be my choice if I could only grow one strain. But I'm...
**Strain: Blue Velvet**
**Strain Type:** Mostly Sativa  **Origin:** Oregon, USA  **Breeder:** D.J. Short
**Images:** 1 2 3
**Description:**

“An Oregon-Thai cross with blue hues and elevating energetic high. This is our most pure and oldest sativa strain. She is truly a queen of the cannabis court and a favorite for 70's sativa lovers. Wrap these velvety buds on a stick and create your own royal scepter.

**Specifications:**

**Specifications ~** Type: mostly Sativa, indoor. Start vegetate: 1 week after roots show. Flowering time: 65-70 days. Average height: 1-1.5 m. Yield: 250-300 grams / m2 (dried)” – Sagarmatha seedbank catalog

**Growers Comments:**

“I like it ok as an outdoor plant. The flavor is very good, the high is not bad. The buds, and yield are a bit low. I crossed it with a WW and WOW. Will try and get some photos of it up. I would say it does MUCH better outside than indoors." - ncga

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**Strain: Blue Widow**
**Strain Type:** Mostly Indica  **Origin:** California  **Breeder:** NCGA
**Images:** 1 2 3
**Description:**

“Blueberry (female from British Columbia) x White Widow (Aloha male) APPEARANCE: Very short plant -up to 80 cm- with short to medium internodes, no central stalk but rather many stems forming a bush almost as wide as tall. Fat indica dark green leaves turn more slender when flowering. Very consistent -height, nodes and density are all very uniform. BUDS: Budding is slow at first, then it explodes with orange clusters covered in abundant shiny glands, all possessing an unmistakable blue hue to the tops. Good side branching will form dense solid buds with much resin everywhere in-between. TASTE / SMELL: Smelling like a strong house cleaner that tingles the nose, it is extremely tasty, with a sweet hashy berry flavor that explodes in the lungs. HIGH: Very strong, nice up, clear high -exhilarating, floaty, very visual buzz. It is more powerful, and has a much better high than either blueberry or white widow. YIELD: It is high, being an easy to grow plant. Budding is slow at first, but then explodes with orange hairs and a very high calyx-to-leaf ratio. The AK-47 is a good yielding plant indoors but the Blue Widow will out yield it (NCGA).

**Specifications:**

Very short plant -up to 80 cm- with short to medium internodes, no central stalk forming a bush almost as wide as tall. Fat indica dark green leaves turn more...
consistent -height, nodes and density are all very uniform.

Growers Comments:

Top 3 NCGA´s strains in potency according to Marcel (NCGA assistant): BlueWidow (so far); G13 crosses; any NC5 series cross.” – NCGA

Growers Comments:

“When looking at the BlueWidow it does best indoors. It does well outdoors but start it indoors under natural day length, clone it then place it outdoors. I found when it was grown outdoors it produces a single 6 ft bud. Not the best use of space. When cloned though it reaches the same height but yields more than triple the times as much. Harvest date outdoors California is 2nd week in October. If you can wait to the 3rd or 4th it just wonderful and did well in the SF can cup.” -ncga

“I have grown out a Blueberry x White Widow cross, BlueWidow. It is a definite winner with a strong berry taste(very strong) and a kickass buzz, more than just blueberry. It has a moderate yield, but yielded more than my NL strain. I will do a new grow with the two awesome strains. you wont find BW but a F2 is out there called TwoBlue. Taste and buzz are the most important things IMO.” -HJ

“Here's a great tip for you people just starting out. Don't get caught in the hype about how great Sensi, Serious, Sagarmatha and Greenhouse are. They are very good but they are just very good commercial pot. The strains have been around in some form or other for 5 to 10 years and lots of people have tried them. However... some of the new ones by NCGA tip the scales at excellent. Blue Widow is much better high than Sags Blueberry and Greenhouse white widow. Stoneblue absolutely destroys the original Stonehedge and Blueberry that it was made from. Stronger, sweeter with big buds. The reason NCGA´s strains are so much better is because of hybrid vigor. Not to mention their price is much much better.” -Merry Gary.

"Supposed to be rock hard nuggets, very crystal-covered with a strong smell. The originator of this cross said it lost some of the funky sweetness when crossed with the Widow-- that the smell is more pungent and harsh. Potency is supposed to be sky high... Most of us are just starting to flower it so the first results are from those who crossed the strain. (Some of us here have know each other for a while and have some of the same hybrids.)"

"I have the blue/widow at 43 days 12/12. I began flowering when nodes stagger. I don't think it will be more than a fair yielder, but I think this is going to be a very potent strain. The leaves are as strong as our area commercial buds. This is one NC strain that could become INFAMOUS!"

"Well I can tell you about BlueWidow or (BW) I'm the one that had the idea for this strain to cross with a very nice blueberry mother...BW grows short to medium nodes fat fan leaves that will go more sativa as it enters flowering...the budding is slow at first then explodes.... She produces nice buds with orange hairs very high calyx/to leaf ratio.... Smell like a strong house cleaner that tingles the nose and strong hashy berry taste...high is very strong nice up not very heavy high. Hope this helps."

"BW is very nice STRONG body high but if your looking for something quite clear and focused...I would go with Kali Mist its VERY up and super clear great sativa energy, although BW is very nice. I have yields quite good and is quite dense def. not what I've heard or it described to be. It's spicy with incense tones taste...I love it I got 9 clones ready to go with 9 AK. AK is heavy slammin high but very nice. So if you want a clear focused high then go for Kali. If your want a slam..."
AK...and if you want an EASY high yielding plant BW would be your choice. Happy hunting."

"My mcw's and BW's, as most of the ncga strains so far, have shown pre-flowers after 4-6 weeks of continuous
light, it probably is the WW in them. By contrast, I am growing a few NL x Afghan and they show their sex so quickly. As the BlueWidow enters flowering the leaves go from indica to sativa the side branching starts to fill out more. Should be some big colas and a very good high exhilarating floaty very visual buzz. Another shrub! Looks like the WW is still drying too so... Early samples were EXTREMELY tasty! My growing partner lost his sense of smell and taste in a freak deal and even he prefers this 1 for flavor. He says he can taste a sample thought that said something for it. It’s a good buzz too, but didn’t seem to last as long as the others (keep in mind I only have 2 goin’). J VERY CLEAR high taste spicy sweet height nodes density are all the same with BlueWidow."

"Those of you that are growing the BlueWidow are growing a very good strain short nodes thick dark green leaves in fact its very short I have a mother that’s 31 and hasn't got much taller than that when u flower her its a bombshell thick dense ROCK SOLID buds covered in so much glands it almost hurts the eyes to look at it and a strong smell that hurts the nose a bit its sweet hashy berry taste that IMO better than pure blueberry. You will fall in love with this hybrid very short side branch form in thick rock solid clusters and have sooo much resin everywhere in between the leaves smell that tingles the nose a sweet berry taste that goes BOOM in your lungs VERY STRONG. IMO better than pure blueberry. You will fall in love with this hybrid very short side branch form in thick rock solid clusters and have sooo much resin everywhere in between the leaves smell that tingles the nose a sweet berry taste that goes BOOM in your lungs VER..."

"I took 6 clones off one and the growth pattern is unusual. Instead of growing a main stem like most plants, this seems to have many smaller stems like a bush. I am only about 10 days into flowering, so I am curious as to what kind of bud formation to expect. Leaf is usually a good indicator and this leaf “kicks ass”! Vic, I can see your concern about colchicine but you are in luck. Ncga has taken blueberry and crossed it with other killer strains to get crosses that are even BETTER than the blueberry. StoneBlue which is a cross of Stonehedge and Blueberry has got to be one of the best ever strains. Blue widow is almost as good sacrificing a LITTLE bit of potency for flavor and quality of high." -NCGA

"I have 2 sets of Blue Widows, the first set is two clones at the end of their 5th week of 12/12, both stand about 32” (80 cm) and are almost identical, glistening with a thick coating of resin. They are also kinda bushy since I took the clones when the mother plant was almost done flowering, so since I took the clones when the mother plant was almost done flowering, so second set is of 3 seedlings; they are also quite uniform. They are all on their 7th node, still parallel branching. One does have a thicker trunk than the other two, but I attribute that to having more room root growth, they have all since been transplanted to larger pots." -Japedo

"I'm currently growing his StoneBlue, MCW, nc5 and BW but unfortunately have yet to sample any... but I can say ALL germinated (in soil) and all are now knee to waist high after a mid-march planting. They are all very healthy, bushy, nice color and of the other strains now growing, his seem to have just a bit slow but they are coming). The BW is the most impressive of the entire garden. It looks, it’s a winner! Wish I could give a critique on the potency/taste... ask me..."
“My two from-seed BW's look close to done, but I'm trying to restrain myself a week earlier than I should. The upper leaves on the smaller one have now turned a robust purple, kind of like Japanese maple leaves. Very exotic looking and very resinous, but alas really coming around though and looks about a week and a half from harvest. The upper leaves on the smaller one have now turned a robust purple, kind of like Japanese maple leaves. Very exotic looking and very resinous, but alas such a low yeilder. Her big sister is really coming around though and looks about a week and a half from harvest Harv....

Larger plant was a better yeilder, 46g 24" topped plant with 4 dominant colas. 6 clones with 3 weeks left. Smaller, more resinous, very-purple girl was a low yeilder (31g from a manicured 18" plant w/ 4 colas). Smooth and fragrant with a very up high. Such a clear, functional high, in fact, that one wonders if they are still high after only half an hour or so. Larger plant was a better yeilder, 46g 24" topped plant with 4 dominant colas. For all the difference in looks, the high is very similar. Energized, not wiped out. All in all it was a fun project and I've got 6 more clones coming along with a mother under floros. May keep a bit of the BW around for a while.” – D.

“Early flowering will also tend to produce hermies. It is best to wait for the plant to develop sexually before flowering it. My BlueBell is a great example of an OUTDOOR plant. I have grown it and several of my patients do also. But they use my natural day length method or grow it outdoors. The results have been zero hermies. Yet when it hit the market I got several email complaining about it being a hermy. Now that it is only recommended for outdoors this problem have been reduced to zero.” –ncga

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Strain: BlueBell
Strain Type: Sativa/Indica mix Origin: California Breeder: NCGA

Images:

Description:

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Specifications:
none

Growers Comments:

“This is by far the best plant I've ever had. I grew her to about 2 feet under flouros (24/7) then cut back to 12/12 for a couple of weeks before transferring her to the HID bud room. Plant really stretched at that point for the first few days and then I noticed that my HPS light was coming on, then powering off and back on over and over again. Bought a new bulb and the plant quit stretching. At about golf ball size the top calyxes turned dark, bright pink and the small leaves around the buds frosted themselves with THC glands. This happened very fast. I had a male that looked a lot like the female BlueBell so I grew him long enough to get pollen and seeded one of the branches. This seemed to make the plant respond with additional calyxes on all the buds (maybe just a timing thing?). Seeds are getting very large. Plant is extremely easy to clone. It had approximately 20 nodes and I took the small side bud with a 1/2" of stem rooted ok. They seemed to have a hard time breaking out of bud mode back into veg mode but are growing very fast now. After a week out of town and my plant only being fed once a day, most of the plant just went. The frosting of THC is at ridiculous levels. Fan that was blowing on the course a little and looks like the plant tried to save itself from the heat by coating its top buds (all that's left thanks to over active pre harvest testing) with THC. Smoke now tastes more like hashish and is losing the berry like aroma. Probably could grow the buds another 2 weeks but have a bunch of clones out.
“I harvested my first “full garden” of BlueBells. Growing 12 clones in a 10 sq. feet room. Seems like you can harvest this beauty a little early for the berry tasting high or wait for them to finish to get the hashish tasting smoke that about knocks me out on 2 hits. Smoking the small frosted bud leaves gives me a strong rush that lasts for a minute or so." – tokertoo

“I think all the seedbank versions of blueberry originate with DJ Short, but he think he improved upon it though. Also, I think blueberry is predominately a fruity Kush. And I think I remember reading in an earlier CC issue that DJ incorporated Thai into it to give that uplifting high.” -Vic High

"The name "Afghan" (indica) was assigned to the original P1 Afghan stock that was removed from its region of origin via the northwest growing community (and to the plants grown from this stock). The name "Hindu Kush" was assigned to the “Kush” looking varieties." - Sagarmatha seedbank catalog

**Strain: Blueberry**

**Strain Type:** Mostly Indica  
**Origin:** Oregon, USA  
**Breeder:** D.J. Short

**Images:** 1 2 3 4

**Description:**

Blueberry is a mostly Indica (80% Indica, 20% Sativa) strain, that dates to the late 1970's. A large producer under optimum conditions. A dense and stout plant with red, purple and finally blue hues that usually cure to a lavender blue. The finished product has a very fruity aroma and taste of blueberry. It produces a notable and pleasantly euphoric high of the highest quality and is very long lasting. Medium to large calyxes.

**Specifications:**

Flower: 6-7 weeks (45-55 days); Harvest: 2nd to 3rd week of Oct.; Height: 0.7-1 metres (2-3 feet); Yield: 300-325 grams per sq. metre.” – Dutch Passion seed catalog

**Specifications ~ Type:** Indica-Sativa, indoor and outdoor. Start vegetate: 1-2 weeks after roots show. Clip center cola. Flowering time: 45-55 days. Average height: 0.7-1 m. Yield: 300-325 grams per sq. metre.” – Sagarmatha seedbank catalog

**Growers Comments:**

"Blueberry is a mostly Indica (80% Indica, 20% Sativa) strain, that dates to the late 1970's. A large producer under optimum conditions. A dense and stout plant with red, purple and finally blue hues that usually cure to a lavender blue. The finished product has a very fruity aroma and taste of blueberry. It produces a notably and pleasantly euphoric high of the highest quality and is very long lasting. Medium to large calyxes. Blueberry has a long shelf life and stores well over a long period of time."

"Another mostly Indica plant of superior quality. This fast maturing girl produces large, crystallized buds with natural occurring bluish hues. The berry taste is unmistakable and very pleasurable on the palate. A favored treat for all connoisseurs' Cannabis menu. Pick some Blueberry and have a happy, healthy harvest.” – Sagarmatha seedbank catalog
beyond) crosses of the P1 Highland Thai (sativa)/P1 Afghan (indica), and, P1 Chocolate Thai-Oaxacaan (sativa)/P1 Afghan (indica) crosses. The resulting F1’s of the P1 cross were uniform hybrids. The f2’s, f3’s and beyond were universally diverse. Among the variance developed what came to be known as “Hindu Kush”, “Sweet Kush”, “Berry Kush”, “Blueberry Kush” (among others).

To help clarify, allow me to describe the subtle differences that I observed between the two. Both grew short and stout with wide leaves and both matured early. The leaves of the Afghan were therefore closer to the main stem giving the Afghan a leafier look. The Afghan also tended to point more upward as they developed. The Afghan had more side branching, especially from the bottom of the plant. The Afghan also had a very distinct "skunky-musky-earthen" odor and a lighter green color compared to the Kush.

The Kush is the least leafy with long stemmed fan leaves that tended to droop downward, exposing the dense, tight-to-the-stems buds (very little if any side branching) to more light during later maturity. The fan leaves of the Kush were slightly wider (at the leaflet center) and "rounder" than the Afghan. The Kush became notorious as the easiest plant to manicure and trim due to the long-stemmed leaves that fell off at maturity, and the trichome-drenched, fat, dense bud structure (with large swollen bracts and flowers). The Kush was also more colourful and sported a "sweet-musky-earthen" aroma, some with aroma like sweet-ripe berries. The name "Hindu Kush" was reinforced (and partially borrowed) from Robert Connell Clarke's Marijuana Botany as it seemed best to fit the description.

Therefore, "Blueberry" (et al) was selected not only from "Hindu Kush" (sweet, berry, or otherwise from my own f2 and beyond crosses) but inevitably derived from Afghan ancestry as well (the original P1 stock). Technically, the Hindu Kush region (Northeastern Himalayas) is associated with Afghanistan/Northwest Frontier north of Pakistan, but this has little to do with the specific names assigned to these strains to clarify somewhat.

The line in the strain description of Blueberry that states “we developed Blueberry from new genetics” was added (edited in) by Dutch Passion, my European distributor, for the European market. I simply authorized the Dutch Passion description for Marc's catalogue. Perhaps, at some point, I should re-do these descriptions. No genetic stock outside my own material is used in the production of any of my own varieties. I am only interested in using pure, land-race varieties acclimated in their particular region of origin. Until more of these become available, I have plenty of my own stock (much still untested) to work with. Look for new varieties in the not too-distant future.” - DJ Short

"1) DJ Short is the original breeder to introduce blueberry to the commercial market. 2) there are basically two phenotypes released to the public, the first Sagarmatha release, and all subsequent. The first phenotype had thinner leaves and more blueberry flavour. The second phenotype is more vigorous, and although sweet and fruity, not quite as blueberry tasting. 3) I've found the first phenotype twice, from a direct purchase with Emery, and then from seeds from a friend who bought the first batch direct from Sag. 4) Sag and DJ had a falling out, and Sag now sells DJ knockoffs. These are now of the second (wider leaf) phenotype. 5) Dutch Passion is now the European source for DJ Short genetics. These are also of the second (wider leaf) phenotype. 6) And yes you got it; BCGA version is a knockoff like the Sag version. But the difference is that it is a knockoff of the first (thinner leafed) phenotype." - Vic High

"I used Blueberry from DP with great results, albeit in soil mix. Very consistent and as expected. Yield was less than White Widow (which I grew along with BB) was. Re-vegging now and will use clones in hydro. I topped twice, but am planning..."
hydro. Stems appear a bit woody for cloning but I think this is a strain-specific trait. I used 'feminized' seeds with 4x4 results but I've seen posts where other growers didn't seem so enthused. For me, the cost of power and the hassle of sexing made the choice a no-brainer. <

"From 8 female blueberries grown from seed 4 were boring lowdown indica stone 1 quite zippy and 3 quite up and they put a smile on your face I like the last three and will save them for breeding."

"Buds from the two blueberry keepers are my most popular, although not most potent. The smoke is very clean and sweet. It's like it actually clears your sinuses but with a sweet berry flavor. They don't attract as much attention as my other main strains."

"I would not recommend blueberry unless you want to become an experienced grower quickly. Blueberry, although a quality plant, will test a beginner's ability. It's usually the first plant I'm doing something wrong. If you're a beginner, why not go with a proven such as NL5?"

"I would have to say to give Blueberry a shot. I received mine from BC Seeds. No more. Blueberry in 65 days budding time produced 1.8 Oz per s.f., with 55 watts per s.f., vented highly. The strength and the taste were a 10 on 1-10 with skunk #1 being a 5."

BCGA: Blueberry and It's Yields

"Blueberry - 10 seeds purchased from Marc Emery at Hemp BC. Reportedly supplied by Sagarmatha Seeds. Reported to be mostly indica plant 2-3’ high that matures in 45-55 days. Reportedly produce large crystalized buds with natural occurring blueish hues and an unmistakable berry taste and aroma."

Of the ten seeds, I got 5 males and 5 females. They all started out looking very deformed and variegation. At first I thought it was due to excessive inbreeding but later found out that the strain was treated with cholicicine. Two males and one female were precocious and wouldn't stop flowering regardless of light cycle. These were discarded. Of the remaining 3 males, two would not shed pollen (they would flower but the pollen would not drop). These were also discarded. The fifth male (BL-9) fortunately did shed pollen. It was used to pollinate select mothers. Two of the females that didn't smell like blueberry so seeds were collected (BL-9 was father) and the other females were what I was looking for (BL-8 & BL-10). Very robust and they produce sweet smoke. Clones of both were kept as mothers and seeds produced with BL-9 at 5. These clones mature at about 3 feet tall, with a few side branches. All deformities have disappeared in mature plants and successive clones. They have very thick stems. The main colas are crystalline oval buds. They appear to be well suited to sea of green application. Buds are bluish and purplish and smell like such sweet blueberries. They are not my most potent but are my favorite. The smoke is very sweet and good tasting and the high is uplifting and pleasant.

Yield Trials

To date, the blueberries have been grown to 18 to 24 inches, placed into bud and finished at about 36 inches, yielding about 1 to 1 * ounces per plant. They have been grown in 5 gal grow bags containing the super soil mix. To try to figure the best pruning method, the following trial was conducted.

Started with 35 clones (18 BL-8 and 17 BL-10) that were placed into 5 gal grow bags containing the super soil mix. When they reached 20 inches, 13 were placed into flower (Group A) while the remaining 22 were pruned back to 12 inches. When these 22 clones reached about twenty inches, 10 were placed into flower (Group B). The remaining 12 (Group C) were pruned back to 18” and placed into flower. These clones were grown amongst other clones in a 12 by 12 area lit by 2 1000w HPS and 1 1000w MH on a fast moving suncircle. One HPS was in a horizontal reflector, one in a vertical reflector and the MH was in a parabolic reflector. This worked out to about 20w per sq ft.
All weights are dry weights unless otherwise specified.

Group A harvest:
Harvested main colas and then let the rest of the plant continue for a week so that the lower buds would fill out. tops = 8.52oz rest = 3.55 total = 12.07oz mean = .92oz per plant
Each plant took up 1.5 sq ft for a total of 19.5 sq ft. This means that I yielded the plants in their natural form (no pruning).

Group B harvest:
Harvested main colas and then let the rest of the plant continue for a week so that the lower buds would fill out. tops = 10.02oz rest = 9.15oz total = 19.17oz mean = 1.9oz per plant
Each plant took up 1.5 sq ft for a total of 15 sq ft. This means that by pinching I yielded 1.28 oz per sq ft. This is a 109% increase at a cost of 2 weeks veg time.

If the entire 12 by 12 area was filled in this way, a total of 1.28 * 144 = 184.32oz (11.5 lbs) would be produced by just 3 lights. This works out to be about 3.8 lbs per light over a 7 week flower period. Pretty efficient for a low yielding stain such as blueberry!!! Didn't even use CO2!

In order to get an idea what wet bud yields I weighed some colas after they were manicured but wet and still on the stalk (just prior to hanging to dry). They weighed 46.2 oz. After drying and removing the stalks they weighed 10.02oz. This means that dry weight = 22% of wet weight.

Group C Harvest:
I harvested these all at once as there were no big main colas. I got a total of 7.75 oz and an average of .64 oz per plant.
Each plant took up 1.5 sq ft for a total of 18 sq ft. This means that by pinching twice, I yielded .43 oz per sq ft. This is definately NOT the way to go.” –BCGA

“Bank- Dutch Passion
Supplier- Jock
Started with 5 seeds. A cracked seed, the only damage on delivery of batch 1 and 2, still germinated but kicked it about 4 days after sprouting. Of the 4 remaining 3 were female. The sprouts started a little on the twisted side but grew out of the awkward looking chit pretty quick.

All 4 plants were very similar in both growth and appearance prior to flowering. One plant had more oval shaped leaves than the others. The rest were typical indica shaped leaves, wider and rounded on the leaf blade serrations. Once the plants went to flower differences were seen. Oh yeah. These plants had a mutually shared stink while vegging too.

Note: The male developed leaf mold and since it was the only plant of many with this history. Of the three females two were keepers, for now, while the other was weak.

1- The most prolific grower during flower with decent branching when trained. Having the most bud of these 3 isn’t much of an accomplishment for any respectable plant though. Plant was harvested at approximately 50 days. Buzz was slightly higher than average for this age.

For a bud description see 2.

Note: For a reference point a typical commercial weed is considered below average in buzz.

2- Was the most compact grower of the bunch with little branching. Again yield wasn’t impressive but... the buzz was. Buzz was better than average and was different and very promising. That’s the best that can be done since it was only smoked a couple of times from seed. This plant finished very early, approx. 38 days. The short flowering time was likely due to the size of the plant, very small. It was more indicative of getting more light, it was on the edge and shaded somewhat this go round. Buds on this and 1 look the same. White pistils and a heavy covering of resin. The buds were tighter than average considering they lived on the edge of the grow. More veg time under white light would help this plant to pick it up in the yield department I suspect. As far as all the colors DP advertises on the web page.

Maybe its colorblindness or something but all that’s seen is deep, dark and flat green right now. But if you look at the buds when the light is at a certain angle they do look like they have a...
reflection of the resin glands and the deep green color. Maybe as it gets older it will show its psychedelic side. For now if you really want blue weed: You could make believe whenever that lighting angle is achieved and maybe take a picture. Note I suspect like many plants this plant will show colors outdoors if it does produce resin. Slack isn't even the word it's more like failed. It almost literally had zero resin. Because the other 2 were nice plants this one was given a second chance before meeting its maker. Make the grade when grown from clone it didn't. Meet its maker it did, good riddance. No. They didn't smell like blueberries to me but did have something added to the grow with these. Except of course for 3 which doesn’t smell like anything. This plant would present a packaging challenge if you need to move it for some reason. Aroma: These babies stink. They smell when they're young seedlings, vegging, rooting and flowering. The smell from just 2 vegging plants, 1 and 2 caused more noticeable odor than half the same grow filled with flowering NL x Shiva's. The smell was a mild, skunky odor that has a berry quality to it. It is becoming stinkier as it ages too. For those of you that are impressed with smell this would be a winner. Max security calls for paying big time attention to odor control in the grow with these. Except of course for 3 which doesn’t smell like anything. Buzz: As stated the two remaining plants had better than average potency for indica types buzzing with 2 being somewhat unique with a heady floaty type buzz. Taste: Distorted by feeding. Not bad not memorable but there is something there that catches the nose. There is some kind of berry taste about in the mix but we'll see. Yield: Below average at best. Comments: Both 1 and 2 will be kept until older and decisions will be made on who stays and who goes then. This decision will be made on buzz and as far as 2 goes how long it takes to mature. If it shows an early harvest when grown from clone it may be kept for a cross or two in a search for surprises. “I hadn't planned to use Blueberry as my outside crop this year, it just sort of happened. I ended up using clones from two different females, but the plants were not distinguishable. The plants were relatively slow growing, and formed tall, loose, open bushes (until height restrictions forced cut backs). The stems were red-purple, a nice addition to the camouflage, as the eye reads the color as bark from a distance. The fan leaves were a medium green, thinner than an indica, but not sativa thin. They stood out straight from the plant on thick purple stems, drooping gracefully. The plant was normal in its resistance to mites, that is, not very. I did use a fogger a couple of times, not for the poison, but for the reproductive chemicals, and that was fairly successful. On the other hand, the plant was as mold resistant as anything I've grown. It did get mold spots in the middle of October, and I pulled the plug about two weeks before full maturity. Good thing, as the weather turned impossible (50's, constant wet), before nature laughed at us with a late Indian summer this week. The flowering period was amazing! The buds were purple from the get-go, with the older the plant got, the more it became purple, all the way down to the fan leaves. The smell was not sweet, rather it was skunky; mild, and not noticeable from a distance. Now, there were some problems. First, of course, it did not mature when it was suppose to in September. There may be many reasons why (I'm working on it), so it's too soon to tell if it was nature or me. In Seattle, if this plant performs as it did this year, it wouldn't work most years. But I call it stalwart, because it was undaunted by several rainy periods in late September and early October that would have melted other contenders, and was mold free almost to the end. Second, the production. Blueberry isn't known for production, and I only cleared 9 dry ounces (very closely
manicured) from four 5 1/2 ft. tall plants, each with 10-15 main flower spikes (after being cut back a couple of times), and a couple of much smaller plants with three flower spikes. That's piss poor in anyone's book. Another two weeks probably would have added 2-3 ounces, maybe (a guess), another 3-4 ounces (gland covered only, I didn't screw around with partially coated leaves).

Finally the high, or lack thereof. Oh, it's strong, not quite as potent as others I've smoked, but it gets the job done. But jeez Louise, the stuff is absolutely the stupidest pot I've ever smoked. About two hours, and it doesn't have a nice mild letdown, like my sweet indica pot. I don't sleep on the letdown, but I wouldn't call it sleepy pot at all, just, duh!, stupid. I've had different genetics, I don't know, as I haven't seen this pot described as a downer before. It has an initial head rush, but after that, try to remember your Mom's maiden name and deliver it to your vocal cords in any kind of reasonable order.

So, what is this stuff good for? Gland hash, I'm thinking (varietal differences are greatly washed out in gland hash). I couldn't see smoking the pot that much. I don't like the high as much as any of my other pots. It definitely isn't daytime or driving pot, no way, and it's not narcotic enough to be a sleep pot. It doesn't last very long, about two hours, and it doesn't have a nice mild letdown, like my sweet indica pot. I don't sleep on the letdown, but I wouldn't call it sleepy pot at all, just, duh!, stupid. I've had different genetics, I don't know, as I haven't seen this pot described as a downer before. It has an initial head rush, but after that, try to remember your Mom's maiden name and deliver it to your vocal cords in any kind of reasonable order.

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Strain: Flo  
Strain Type: Sativa/Indica mix  
Origin: Oregon, USA  
Breeder: D.J. Short  
Images: 1  
Description:

“Original Flo is a Sativa/Indica cross (60% Sativa, 40% Indica) with very Sativa phenotypic characteristics that also matures very early. The large, tight, spear shaped buds are made up of small, densely packed purple calyxes. The plants are taller and like to branch out. Indoors the buds are fully mature by the end of their sixth week. Outdoors the plant is a super producer when multi-harvested over a period of time. The first buds are ripe around the third week of September. About every ten days after that, new buds form and can be harvested through the end of November, if the plant can be kept alive that long. Therefore, “Flo” is ideal for greenhouse production. The motivational “high” produced by the “Flo” is quite unique, the flavor is like Nepalese Temple Hash. A most pleasant and enjoyable experience.

Specifications:

Specifications: ~ Flower: 6-7 weeks ~ Harvest: 3rd or 4th week of Sept.” – Sagarmatha seedbank catalog

Growers Comments:

“I've had Flo for a while now (grown a couple crops w/ her)...As for the potency/ high: Not much “body stone” at all, the high is pretty clear (meaning it's not confusing or stupefying like some you want to go and do things (not like my NL cross, that's couch-lock stuff). It's not the longest lasting stone (but certainly respectable - maybe stoned for ~3 hours), but definitely worthwhile. Really unique, but not *the* most powerful stuff. I'd recommend this variety IF it isn't the only strain you'll be growing. I say that because the small calyxes in small spear-shaped buds. This is definitely my lowest-yielding strain. But also the most unique. It really does taste like Nepalese hash. Also, the plant is beautiful to look at, dark maroon-colored stems w/ dark green leaves. Nice smell, too, not skunky or stinky at all, it's a sweet floral scent. One of the big advantages to this strain is its primarily sativa heritage (I've h
7/8 sativa, I don't know which is accurate). Nice high, really good morning weed. I like to smoke first thing in the morning with this stuff without losing the whole day. I like to smoke first thing in the morning with this stuff is positively energizing. It's weird, the first time I smoked Flo, I almost thought I wasn't high -- the stone is VERY clear, not confusing or buzzy, no real 'body-stone' to it, just trippy, slightly visual, cerebral stimulation.

Another nice quality Flo has is her dwarf stature. She's mostly sativa, yet she's not very tall. Very unusual for a sativa. I haven't grown Blueberry, so I can't compare. I highly recommend Flo, as long as you're not counting on her to produce a big yield (just a guess, and I say this just 'cuz I bet you're wondering) she yields ~1/4 oz/2'.

"I planted Flo one time. It is very slow germination strain, so you better to wait about 7-10 days for the germination. Flo was one of my favorite strain, especially taste, it really taste like Royal Nepal. High was like medium up-lifting high, very relaxing weed. Don't expect big yield from this strain. I grew both Blueberry and Flo. I think still Flo has better quality than Blueberry."

"I read somewhere (so who knows what its worth) that most, if not all, of that breeder's strains came from crossing Thai indica with a Thai sativa... The Blueberry, Flo, B.Velvet, are all supposed to be related--probably distant cousins from the same original crosses. Sorry no real facts..."

"I'm on my second Blueberry crop and first Flo crop. I'm one of the few people that do not like Blueberry. Its strong, and has a unique taste. the plant yields pretty well, and the buds are quite leafy. The Flo's have thinner, more sativa like leaves. The buds turn purple like Blueberry. Flo finishes very fast and have pretty big yields with the growing performance. Now the high... Flo is very strong, lots of resin. One toke is enough to tell you that this plant is 50% blueberry. Same taste but more potent taste in addition. Flo is the better high and plant of the two, and finishes a week or two earlier than Blueberry. If you like the taste of purple indicas like blueberry you will love Flo. I am partial to the oranges, and sweet hash tastes." – Abbie Hoffman

"Flo looks sativa like grows very well with big, long buds. The genetic makeup must be that it is 50% blueberry. The buds turn purple like Blueberry. Flo finishes very strong, but has a bit of pepper taste too. I like it , its a winner and will stay in my garden. I’m not crazy about the blueberry taste but I’m getting resin on the first puff! its a winner! Not a clear high, it kind of puts you in a daze, a dreamy kind of state where you’re in deep thought and contemplation. Good for reading. I like Cinderella in the morning, Flo is more of an afternoon high."

"Flo is very strong and clones very easily....from 10 seeds I got two good mothers. One was an indica dominate one a sativa.. as for the high... It is a very fun high...not paranoid at all...very good... after the first joint you are high...real high...go ahead and roll another joint for about 30 minutes then you will come down quietly... but you don’t want to have another trip again...it never makes me sleepy until I stop smoking...the end of the buds can get a bit sticky and sleep...but shit man...we usually just keep rolling...3:00 am still got a big grin on my face...the high is warped...it is by far my favorite morning...day...evening...all time smoke...and socialize with friends. so I say it is exactly how it is described...there are much better strains that I haven't found a more fun."- Eric

"For me Flo is couch lock weed. despite the literature, I would rate it at 90% body high. I smoke it very fast, like 45 days, has tons of resin, almost no odor, tends to be purplish in color, has a nute overdose leaf curl down when others don't. not a strain to continue. The finish is a very physically relaxing and emotionally amotivational." - Splif Lipsit
“I’ve grown 4 crops of Flo. It is very difficult to clone and not very hardy. I lose 2 plants when my hydro system was shut off accidentally. All the other strains except the Flo dried out beyond recovery. This is not an easy strain to work with. The reason is because of its fragrance and taste. I love the hashy fragrance and taste. It is truly an exceptional strain in this regard. The seedlings I grew were not very uniform in this regard, which might explain why yours does not have much odor. Revegging this strain takes a very long time.” - potattic

“Yes it was ok but not great. The buds were pretty leafy and I didn’t get very high on it. something that is a lot like it but better is Romulan strawberry blonde surprise. Both are 50% blueberry. Your mileage may vary.” - BeenThereDoneThat

"Why is it so hard to get her to turn back to vegetative growth after 12/12? I sexed her for maybe 2 weeks and then the lights were turned back to 18 hours and she is growing new growth but calyxes are growing with the new growth. Eric"

"I have grown it and didn’t like it. Yours may be different but on mine the buds never got very frosty and the high was weak. I let it go for 70 days and it still wasn’t finished so I cut anyway. The yield was about the same as princess but out of a small circle of friends the Flo got a thumbs down.” - nobodyz

**Strain: Northern Berry**
**Strain Type:** Indica  **Origin:** British Columbia  **Breeder:** Undetermined
**Images:**
**Description:**

“Blueberry crossed with Northern Lights #5. A combination only a stoned mind could think of. A mix of NL power with Blueberry Kush high. Good yields. Squat, muscular vigor. My only disappointment is that they don’t exhibit Blueberry coloration.” - gilman

**Specifications:**

~ Flower: 55-65 days ~ Height: 100-120 cm ~ Yield: 250-300 gr/sqM

**Growers Comments:**

“NL5 x Blueberry. Got them from Emery. Potent, resinous. Under 60 days. A true Kush high. Good yields. Squat, muscular vigor. My only disappointment is the lack of coloration.” - gilman

**Strain: Romberry**
**Strain Type:** Indica  **Origin:** British Columbia  **Breeder:** Vic High, BCGA
**Images:** 1
**Description:**
"Is a very vigorous F1 hybrid of the pure Romulan female and a select Blueberry male. The hybrid retained the large sticky and stinky buds of the Romulan. It gained stronger stems and fruity aroma and taste from the Blueberry. Colas should become larger and more frosty than the Romulan buds seen in Aug. 98 High Times. This one is also very easy to clone.

Specifications:

**Specifications:** ~ Flowering: 55-60 days ~ Height: 90-140 cm" – BCGA catalog

Growers Comments:

"Romberry has become a fav of mine in the last few grows (Thanks BCGA!) The high leaves me with a warm happy glow and a stupid grin on my face. High-- 8- 8.5 Taste--9 or higher! This one is also very easy to clone. It really keeps me coming back, the Romulan taste, well, exotically sweet is the best way I know how to describe it, with the Blueberry giving a full, rich sensation to the smoke. Romberry likes organic ferts, lots of light (20 w psf. min 30 w and up is best) and at least 8 weeks 12-12 to finish. Believe me the extra time is worth it!" - greenbear

"I grew out BCGA's Blueberry (f2) and it is a good indoor choice. Nice yeild, nice taste but I would still pick Romberry." – Greenie

“Well it started with six beans via HS (Excellent Service:-)) 3 females, Veg to pots BCGA "Super Soil" recipe "Bio-Blend" organic two part ferts for "Soil applications." 50 days 12/12, and after 50 days of 12/12, today 2 Rom ladies 404grams un-cured buds. Lots of resin heads cloudy under 30x mag. The height was about 23-31” tall. About 30% of the bud material was left on plant in hopes of continued ripening. So each one should finish with over a pound. This says volumes about the strain, Romberry is outstandingly vigorous, and is able to achieve a solid top cola 11' and 3" in diameter and as dense as any dank, 1000watt lamp. But this was accomplished with a 400hps. And early quick try samples withstood a couple of abuses of rookiness, and really came through with big colas that really lend credence to the fact that this strain does not need vast amount of light to produce impressive colas. I guess that my extreme-joy is in the fact that I read "Don’t Expect Centerfold Colas on Your First grow" and I took it to heart, and the Roms surprised me (Thanks to a lot of help from the great people here and at BCGA's board) cause I have four main colas between 46-79grams that I think are worthy of a photograph, they are really impressive.” – Budm

“For me it was a great grow. I think I did well, all things considered. I did not have the best conditions and I think this affected the yield. But I was satisfied with the results. I think this strain has a lot of potential and I would definitely grow it again. Thanks for a great board and for all the help and advice I received from everyone here!” – Budm

“Well if I had to use flouros, Id go with Romberry, it produces very dense tight colas per sq. ft. The breeder Vic High, in trying to make a guess on Romulan’s heritage and objectives, has posted that he feels that it had its roots in California back when flouros were popular, and guesses its a Blue Indica, and was breed to do well under flouros, and it still does well under low light situations.” – Budm

“Ended up with 1 Sage, 2 GWS, 2 Cinder, 1 blueberry, and 2 Roms. Actually, I had "sexual problems". No big deal. Watch your Roms--and look for females to keep in mind that I like to veg for a long time--2 months min. This time I let the plants go 72 days. Actually, I wouldn't have done it if I didn't have those pH/slow growing problems--but each plant yielded 1-2 oz. each. Not bad for a tiny closet. Hell, that's enough for a year! Comments: Romberry's a peach. What a nice high--ya can't get that grin off your face as the cure progresses.” - shaggy
**Strain:** Shishkeberry  
**Strain Type:** Indica  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:** 1

**Description:**

“The heavy early. Large production mother (mostly Afghani) crossed with a glistening Blueberry Male, for added flavor. Frosty leaves produce exceptional screening dreams. F1 to Shiske mother backcross.

**Specifications:**

Flowering Period: 6 Weeks Outdoors: Early Oct. Yield: Huge (up to 3lb per light)

**Growers Comments:**

"I've grown the shishke topped and cola style on two occasions and would say that shishke is a better yielder with tighter spacing and no topping. When I topped shishke at the 5th-6th node it got bigger than I wanted it. The best yields I've seen with that plant were in a friends garden at 4 per sq/ft with almost all extraneous branches pruned, it produced very solid foot long colas in a 2 foot garden. Pruning the lower branches in my experience gives better growth to everything above them wait a few weeks after you start 12/12 and you'll have a good idea of which ones to clip." – Shiva

"I was impressed with the quality and the amount of resin. Yield was pretty good (could have been better but my stupid girl partner killed my best shisk mother). Flowering time was 40 days. How did yours compare. My high was of the deep hit you with a hammer burn me out indica stone. Not too much blueberry influence though." -The Chronic

"I just harvested 3 HUGE Shiskeberries grown outdoors (ask sly about them). Had 3 sizes but all eventually put out approx. the same amount of finished product. The biggest one had the highest leaf-calyx ratio while the smallest one's ratio was reversed and the 3 made up 1.9 lbs. total of dry, manicured bud (still 5.5' tall) having the biggest colas (2 14-18" beer can size colas from a once pinched plant) and the biggest (just under 11'tall w/o pinching) having a large assortment of "branch buds" along with a nice main cola...and of course the middle one fell in between (also unpinched). Good buzz and taste but there's better out there imho. Too much waste overall in my experience with it compared to other strains and lots of trim-work to make them look nice. But it is a pretty plant that's fun to watch last winter indoors (finished outdoors) that never got to the size/quantity/quality that I hoped for. I only got 1 f out of 5 with the indoor and 3 f's out of 5 with the outdoor grow but all 10 did germinate in just the simple “finger poke in the soil" method. Btw, I purchased mine last winter from HBC in person." -m.g.

"I received an order of Shiskeberry from Laughing Moon some time ago. The buds are fat and sticky with a very hashy almost mocha smell. So far no purple, but two of them have a very blueberry upon pictures of Blueberry I have seen, but with a definite Afghani influence. Shiskeberry is the smell. It is very strong and although not entirely distinguishable, it make me paranoid about someone catching a whiff of it outside." Duke of Herb

"On Shishkeberry: I just finished up the Shiskaberry and I have a few notes on it, if anyone is interested. A friend made my seeds; parents were Breeder Steve’s seeds. The notes below..."
Shiskaberrys that I have tested. With further testing I will find the definitive Shiska mum.

Aroma - The smell put a smile on a friends face tonight when I pulled out da' sample. But kaka has yet to smell a thing. Allergies are a killin' and ka ain't a smellin'. A bunch of Shisks are drying and I can't smell them.

Buzz - The first time I smoked some Shiskaberry yesterday it really didn't stone me. :) A few hits on the way to school were a few too many, it hit and I became unmotivated. This evening a friend and I finished off two bowls and it was quite the experience. Fair amount of visual distortion, which lead to tears and falling on floor. Totally a fun indica. I place it a little below the NL x shiva level, but still above average. I'd put the Shisk in the social indica category, with the unsociable side. I did have to pull myself from the couch also.

Taste - Taste is mostly hashy. Expando in the lung is nice, exhale is smooth and leave with a sweetness/berry aftertaste. Taste is good, this sample I would put taste on the mild side. I'll have to see what kind of differences there are in the mums.

Yield - While there were some runts in the group, most of the plants ended up heavy yielders. Plants were started tight but eventually spaced at 1/ft2. Two or three a sq. ft would have been killer. 3 mothers had the fattest buds with the top yielder being a topped Shisk. Yield would be well above average considering flowering time, which ran me 49 days. For comparison the Shiskaberry sample next to it.

Bud appearance - Buds look silver because they are so covered in crystals. Hairs are orange and few leaves that remain are dark. Buds look great, in this reviewer's humble opinion. Bud density is definitely above average.

General notes - Shiskaberry is freaking leafy and takes tons of time to manicure, not that I'm complaining. There is so much resin on leaves including fan leaves that screening is a possibility. Lots of sticky fingers. The Shisks were around 80 days old from seed and were done quickly in search of a good mother. As soon as drying has finished I'll offer up some weight numbers. Plants sizes were from 2' (runts) to 3' (fatties)."

"I'm on my 4th crop of Shishkeberry. I've grown topped and untopped. I would say top after the 5th or 6th internode. Depending on how much room (height) you have. Clip lowest 2 side branches so it will have from 8 to 12 colas per plant. The plant will finish between 2.5 and 3 feet tall. My current grow I tried growing 2 plants per container and its too crowded. Because Shishke is so bushy big leaf I would try to grow no more than 1 plant per sq. foot." - Shishke

“Shishkeberry did great in the desert. very stony, stupor inducing indica with a large "beer-can-cola" buds on main stem with all branches producing...so I’d say above avg. yield too. IOW, I would never kick her out of the bed... btw, I'm at 36 degrees latitude +/- with long, hot season but Shishke finished around end of Sept to mid-Oct, if I recall correctly. it did finish before the majority, at any rate.” – m.g.

**Strain:** StoneBlue
More information on StoneBlue: Day 37 of 12/12- Very uniform hybrid, indica dominant expressed in two sub-phenotypes. More resin at this point than nc5a or blueberry; the individual glands are smaller but more profuse. The smell is very similar to blueberry and nc5a. Appears that the aroma gene has been fixed quite well in blueberry. Sample tokes at this time produce quite a strong physical effect (on me at least) with typical strong indica stone. I expect flowering to be in the 60-day range. Some fan leaves will turn yellow - this appears normal as all other parameters are in order. Yield estimated from visual comparison to bb and nc5a looks much better than the other two strains. StoneBlue has very good lateral branching. 5 seeds were germinated, of 5 seedlings I ended up with 4 females. This plant will need more than 6 weeks veg for full sexual maturity, at week six of veg the nodes had just begun to alternate.” - Lady J

Strain: Two Blue
Strain Type: Mostly Indica  Origin: California  Breeder: NCGA
Images: none
Description: none
Specifications: none
Growers Comments:

“Two Blue (F2 Blue Widow) from HS - Have 3 females in day 23 of flowering. Flowers look similar but plants very different in shape (1 is tall and lanky - me no like, 1 is short and stout but not bushy enough - ehhh, 1 is short, stout, bushy and bud crazy - mmmm, me likey. Hope to pollinate 1 branch of the latter to cop some seeds. Will let you know in about 30 to 45 days re: buzz and taste. Two Blue, as an F2 hybrid, has lots of variables.” – Air Cooled

Family: Central and South American

Strain: Colombian Widow
Strain Type: Mostly Sativa  Origin:  Breeder:
Images: none
Description:
Colombian x White Widow

**Specifications:**

8-10 weeks bloom period

**Growers Comments:**

"Colombian Widow is a cross of Greenhouse's WW and a skunky two hit Colombian. The Colombian female was chosen for its robust growth, relatively short flowering time for a tropical, dense buds and stickiness. It is a two hit lady with a piney aftertaste. She is crossed with a WW male with good branching, sticky Colombian with an intense mind bending high. The plants branch and bud extensively and are ideal for scrog. In fact have several under the screen now and I would say it's long branches through the screen. Expect buds to really begin putting on the bulk at about week 6. 8-10 for finishing. It can get big so I flower at 12-15" no more. If you are not scrogging then train the plants and you should easily get multiple colas." - Santa Marta

**Family: Durban Strains**

**Strain:** Durban Thai x Cinderella 99  
**Strain Type:** Sativa  
**Origin:** Holland/USA  
**Breeder:** Mr. Soul, Brothers Grimm Seeds

**Description:**

"The Super Sativa Seed Club (SSSC) bred a Thai strain for four generations to stabilize its traits favoring indoor cultivation. SSSC's famous Durban Poison male was used to pollinate a particularly sweet Thai female from this fourth generation. The hybrid was called "Durban Thai Highflier" by SSSC is has quite a reputation among Cannabis "Old-timers". They exhibited the best genes from both sides of their heritage, maturing early and remaining reasonably compact due to the Durban's influence. True Thai weed is sickly sweet, but when crossed with the Durban, the hybrid took on a taste distinctly like black licorice. Bros. Grimm decided to cross a particularly early-maturing female SSSC Durban Thai with a Cinderella 99 male. A limited quantity of seeds is now available. Expect a hybrid that is heavily Sativa-dominant, yet suited to indoor cultivation."

**Specifications:**

Flowering: 60 days.  
Outdoor Harvest: Late September  
Height: Indoors, under 4 feet. Outdoors, up to 10 ft.  
Yield: Indoors, 2 ounce/plant. Outdoors, 1/2+ lb./plant.

**Growers Comments:**

none
Family: Hawaiian Strains

Strain: **Black Hawaiian**
Strain Type: not listed  Origin: not listed  Breeder: Undetermined
Images: Description:

“These buds are very compressed with many seed husks. They are a deep army green colored that seem brown from a distance and are sparsely covered with brown hairs. The scent is a little chemical and a very little green. Since the Hawaiian comes from a long distance, its appearance could be greatly altered from its travels. It seems to have had many crystals, and its compactness is certainly a result of its shipping. When smoked this bud tastes very full, almost meaty (BBQ) with both green and brown flavors. The smoke is not particularly expansive but is very harsh because the buds have been overly dried in transit. The high comes on very quickly and is very stony and will leave you dazed. If it were nicer aesthetically it may have received an even higher mark. ****1/4“ – Homepage Amsterdam

Specifications: none
Growers Comments: none

Strain: **Cotton Candy**
Strain Type: Sativa/Indica mix  Origin: Hawaii/Canada  Breeder: Federation
Images: Description:

An old Island strain that comes out of Afghani and Blueberry seedlines. Long and fluffy to start but thick and sweet with a pinkish hue after 8 weeks. Odiferous flowers with intense resin production, deep green colour on upper leaf surfaces, but the underside of the leaves are almost white with crystal at maturity. Recommended by my carny friend “Resin Rene”.

Specifications: Height 7 feet  Flowering time 8 wks.
Veg 1 wk for sea of green. Yield 9oz full size. 1oz in a 2 gal. pot. Harvest outdoor.

Growers Comments: none
**Strain:** Hawaiian Indica
**Strain Type:** Sativa/Indica mix  
**Origin:** Hawaii/Holland  
**Breeder:** Sensi Seed Bank

**Images:**

**Description:**

**Specifications:**

**Growers Comments:**

Medical: Spasticity and pain

“The Hawaiian Indica by Sensi (and that is the Hawaiian used in the excellent Hawaiian, as well as the Classics Hawaiian Indica, Hawaiian/Kush) is like a summer day, dreamy. The big buds, that I can identify more readily that any other strain of the fat cola bud type, rose, pink, (usually white), are wide round buds, offering great dreamy high and large potential yields. Hawaiians indicas, somewhat like Thai indicas/ especially sativas, don't handle stress well, so an already proven environment of conscientious grow room care should be the phase you feel you have evolved to in grow experience. A Hawaiian Indica really adds flesh to small yielding indicas (I would like to see White Widow crossed Hawaiian Indica, I think that might have profound benefits and influences). Hawaiian indicas, in my experience, are good medicine for the spasticity and pain ailments also.

Hawaiian Indica used to be more popular 10 years ago, when there was more Hawaiian outdoor shipped off outside of Hawaii. With the severity of the Marijuana Extermination Program of the USDEA, Hawaiian outdoor is simply not found outside of the former Sandwich Islands these days.

“Lighting was a 50/50 mix of 1000w MH and HPS. The plants were grown in soil before planting. The plants started out under 40w fluorescent light in 16 oz. cups for approximately 4 weeks, then transplanted to 2 gallon pots under the MH and HPS. Plants were vegged for another 4 weeks, then the lights were turned back to 12/12. After the females were identified, most were transplanted into 5 gallon pots. No CO2 was used. The seeds were Sensi Seeds products purchased through Ubino.

Two packs of seeds were also used for the Hawaiian. The germination rate for this strain was a perfect 40/40. The branching for this strain was quite a bit more "vertical" with much less branching than the Californian. Some were mostly a dominant main cola. I think this strain may be well suited for a SOG set up. Several of these plants were also subject to mold. Of the 12 best, finished heights are 42 inches for the smallest, 64 inches for the tallest, with the average at 52 1/4. Dry, manicured weights are as follows: min. 36g, max. 65g, average 48.6g. The flavor of this strain is a bit citrus. Some of the bud has a definite "lemon pledge" flavor to the smoke. A good high, but I have to smoke a little more of it than most other to get the effect that I like. Many of these showed some hermie traits, like growing anthers on stalks among the female pistils, but there were no seeds from these hermies, so no harm, no foul.” – High Dog

**Strain:** Hawaiian Indica x Skunk #1
**Strain Type:** Mostly Indica  
**Origin:** Hawaii/Holland  
**Breeder:** Positronics

**Images:**

**Description:**

F-1 hybrid Sativa/Indica: mostly Indica Appearance: very wide and resinous leaves Smell/taste: musky hash smell Type high/strength: strong, physical Height: 1.5m Yield: medium plus Harvest date (Netherlands natural photoperiod): end Oct 12hr day exposure harvest
“Mostly Indica (F1 hybrid) with exceptionally broad leaves. Lots of resin on leaves as well as flowers, with a musky hash like aroma. Strong physical high. Yields are above average. Short rounded plants.

**Specifications:**

Height: 1.5m  Yield: medium plus  Harvest date (Netherlands natural photoperiod): end Oct  12hr day exposure  harvest (# of weeks): 9-12 indoor / greenhouse – Positronics catalog

**Growers Comments:**

none

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**Strain:** Hawaiian/Skunk  
**Strain Type:** Mostly Indica  
**Origin:** Hawaii/Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“Mostly Indica (F1 hybrid) with exceptionally broad leaves. Lots of resin on leaves as well as flowers, with a musky hash like aroma. Strong physical high. Yields are above average. Short rounded plants.

**Specifications:**


**Growers Comments:**

none

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**Strain:** NL#5 X Hawaiian  
**Strain Type:** Sativa/Indica mix  
**Origin:** British Columbia  
**Breeder:** Undetermined

**Images:**

**Description:**

none

**Specifications:**

none

**Growers Comments:**

“I am about 10 days from harvesting NL#5 and NL#5xHawaiian right now. This could be a good ScrOG strain. It is very vigorous, very bushy, and has branches that are not rigid. I was thinking of doing this myself.

I got these from Richies but noticed that they started cracking open after being in my sock drawer for about 2 weeks. 5 out of 12 cracked open and had to send these to my sister (she had room to start them). Also noticed that there were a high percentage of mutants. These seem to have all new growth coming out of the same node. Looks like a cabbage. I got one mutant of the 4 seeds I started but killed it. My sister is flowering a mutant now (she got all mutants - the cracked open seeds?).

Of the 3 normal females, 2 are average and one is outstanding. The outstanding female (mother) was topped and has 4 colas about 18" long each. These are really packing on the weight now. The secondary budding is amazing. I pruned all the lower branches and leaves before flowering but this..."
Everywhere you look is bud. Even the lower buds that don't get much light are frosted with crystal (not as dense as the upper bud but I'm sure it will be tasty).

I noticed what seemed to be a male flower on one of the "normal" females and pulled it at 5 weeks. I thought it was a male flower because it had a stem. I noticed the same thing on the outstanding female but left it. It turned out to be a female flower "with a stem!".

I hung the pulled plant to dry for about a week and started smoking it (had nothing else). It was some of the best tasting bud I've smoked in my 25 years of smoking herb. It is very fruity and tropical. Even the leaves had the sweet fruity flavour. The buzz was really nice, fairly strong, but only lasted for about an hour (5 weeks and no cure). Really looking forward to trying the finished (and cured) product.

"Completely covered in brick-red hairs, this dark green bud has a nice thick layer of tannish resin crystals. It smells candy-sweet and lightly fruity. It looks and smells like a Sativa, but glistens like its Northern Lights forefathers. When smoked, the bud tastes fruity and sweet too, but smells very brown, like a Colombian. ***1/2" – Homepage Amsterdam

Family: Haze Strains

Strain: Haze #1
Strain Type: Mostly Sativa  Origin: California/Holland  Breeder: Undetermined
Images: none
Description: none
Specifications: none
Growers Comments:

*** 3/4- These buds are made up of nug clusters that are entirely coated in white crystals. The cannabis leaves within the bud are a much darker green. There are long red hairs evenly spread throughout the bud and has a perfumy-organic scent and is tacky when broken up. The stems also take on a different spicy and tangy taste. The high is quick, very stony and visual but doesn't cloud your head, allowing you to concentrate when/if necessary. (from reviewers in Adam)

Strain: Haze #19
Strain Type: Mostly Sativa  Origin: California/Holland  Breeder: Positronics
Images: none
Description: none
Specifications: none
Growers Comments:
“Haze seeds were bought from Martijn, the heir apparent to Wernerd´s genetics of Positronics fame. "haze" was said to be a descendant of the legendary cutting "rescued" by Neville at the Seed Bank, so I decided to take a chance.

Germination on Haze was poor (6 out of 10), not surprising as seeds looked almost lettuce green, three showed female, no hermaphroditic tendencies detected.

Phenotype was a surprise (even when Martijn said that this "haze" was of the #19 lineage "lightly" crossed with a short node, short flowering indica for manageability), quite indica dominant: small leaves, up to five medium-width short fingers, very light green, overall kind of "tender" looking variations in nutrient availability, short plant with sparse foliage.

The female that was selected for cloning was VERY short, very OILY and with an unusual smell... in between cellophane and grapes (imagine simultaneously smelling the clear plastic covering a new audio CD and Welch's concord grape juice, and you'll have a close idea). High was intense, UP, heart-racing, but not overwhelming (never over indulged it though, to avoid possible paranoia).

Not a tremendous yield, averaging 1 oz for each 2.5 feet finished clone (clones easily), buds very oily, not dense but not fluffy either, under two 400 MHs., in a soil recipe closely resembling BCGA "supersoil" mix. Miracle Grow (vegetative) and Peters (flowering) in the fertilizer dept.

The reference to #19 in this case is just the number this particular Haze seedling is known under, its "Haze #19", no connection to Peak #19. The original Haze cutting (according to Martijn) was super-strong but in order to develop a seedline it had to be crossed with some male and reportedly today has 13% indica in it. This "Haze #19" plant is definitely NOT what you would expect phenotype-wise (looks indica), but on the other hand the high is trippy and has almost NO body, the color of the leaves is pale green, has no skunk odor at all (fruity when growing, spicy "Vicks vapo rub" when cured), it is finicky about its feeding regimen (it immediately goes yellow)... all traits that one does not associate with Indica.

Not a "wonder" plant, I would rate it 7.5 overall, but its a compact plant, short and flowering time, with a respectable high.” – Adam Tripper

**Strain:** Haze Skunk  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“Winner of the fifth annual "High Times" Cannabis Cup by Dutch Passion. Originally Haze is a pure Sativa strain. It is crossed with Skunk#1 to get a bigger yield, a softer taste and a shorter flowering period. Truly superior sweet taste. The high is incredibly clear and up energy. A very favorite strain from our collection. Very high yield for an almost 100% Sativa variety. Flowering period: 10-12 weeks Harvest time under natural light: end of Dec. Really tasty strong plant, indoor, 8 weeks.” – Dutch Passion catalog

**Specifications:**

Flowering period: 10-12 weeks Harvest time under natural light: end of Dec.
“I’m not sure how close the genetics are (to Positronics), but I recently did some HazexSkunk from Dutch Passion. What I had was lots of hermies, only one true male out of 10 seeds, 4 real females, from sativa type to mainly indica -yield low, taste sweet, sweet, sweet. High up, very potent. small cola tops 3.5 ft plant with 2 weeks veg, 8 weeks to mature. I had one of the females that was impressive, producing more resin than white widow growing with it but the high from this wasnt too intense tho. I probably wont keep this strain long but I’m not sorry I grew it either.” - Stix

“I tried Haze skunk from clones. when flowered at 6-10 inches they ended up about 2-3 feet. They would work. A pure thai i had ended up at about 5 feet when flowered from clones and could be problematic.” - Chemo

I just finished a couple of crops of this strain from Dutch Passion. Its a very sweet smoking (lots like Skunk1 but sweeter) and if you get a good mother it can be pretty potent. Out of ten seeds had 1 male, 4 hermies and 5 females with one keeper (makes me wonder about the breeding). Its pretty rough on the lungs but I enjoy it if I have to keep moving while stoned. It is a very clear energetic high. Fairly low yield. I wouldn't recommend it very highly (I like more body in the high) although I enjoy smoking it.” - Stix

“The NL5 x Haze has an unusual leathery or sandalwood taste, a VERY expanding smoke (that is, when you inhale it, it just keeps expanding in the lungs). The high from some peoples report is supposed to be “up” but I get so stoned on it I cant get up and move, dont know if it is difference in mothers or us smokers. I've had friends who are heavy duty smokers who cant take more than a few hits of NL5 x Haze. The Haze x Skunk on the other hand is not an extremely potent smoke in the same way -its plenty potent but not debilitating like the NL5xHaze is. The taste is much sweeter, but like most skunk strains, it burns my lungs after smoking lots of it. Another curious thing about the NL5 x Haze, the high lasts for me about four hours, the Haze x Skunk about the normal two. If you choose the NL5 x Haze, grow a less potent variety along with it for “daytime” smoking, the NL5 x Haze is so potent it bums me out if I smoke it all day.” - Stix

“The skunk x haze is a relative compact plant that looks really great. Its about 1 m high, 1,25 in diameter and very nicely branched conically like a Christmas tree. The flowers seem to be compact and plentiful (every internode) and the odor is very nice. Less pungent than skunk, but I doubt if it seems to be a lot of skunk in it. It reacts relatively fast to a change in light regime. After 4 days of 12 hrs the first flowers appeared.” - Smurf
**Strain: Haze Strains**

**Strain Type:** Sativa  **Origin:** California, USA  **Breeder:** Nevil

**Images:** 1 2

**Description:**

"Haze is a late sativa from America, widely agreed by experts to be the best sativa in the world. In the 70's, it nearly became extinct in recent years as growers switched to easier varieties. We managed to salvage a few viable seeds from the last crop grown in America and we have used them to produce some remarkable hybrids. Haze is known for an extreme, almost psychedelic spaciness. The fragrance is complex and deep with a dry flowery perfume over a base of dark leathery animal tones. When used in a hybrid it adds fascinating notes of depth and complexity to the taste, as well as a unique addition to the high. While not for everyone, the most jaded connoisseur will often find haze irresistible". –The Seed Bank catalog, 1988

**Specifications:**

none

**Growers Comments:**

"Regarding ...Haze, Ed Rosenthal says he knows (it was) developed by Cultivators' Choice in California in the 70's"

"Haze is the most difficult and challenging of any strain, perhaps Thai sativas also. Haze takes a long time, in a recent interview Ben Dronkers said a true Haze takes 8 months to flower! Yow! In fact, Haze seeds are very pale, never dark. A seeded Haze takes upwards of 16 - 20 weeks for good seeds. The high is pulse racing, I would say even paranoid. In fact, I have reservations about recommending Haze, because it plays to deep emotions is what I have observed. That said, it also often a cross with Haze imparts the Haze flowering time and modest yield but not the high. Ideal crosses would see the Haze stone with a quicker delivery, but in my experience indicas well, its better suited to a sativa, whether that be a Skunk (as in Super Silver Haze or the sativa high of a Durban, Hawaiian Sativa, Sensi Skunk, Joker's Haze/Skunk hybrid strain). I must say Willy Jack is busy trying to find the perfect Haze cross, as he has crossed Haze with Black Domina, Big Bud, Jack Herer, Early Girl, Hindu Kush, William's Wonder, and not to find the perfect cross, maybe take the 'edge' off the Haze as well as the development of the plant."

- Marc Emery

"Good luck finding pure haze, I sure didn't get it. My success was planting 6 seeds from Positronics through Jock, kept them in the fridge until germ, and got a 50% germination rate. Of the three, one turned to be a beautiful male, with a sativa/indica profile, but nice internode lengths, medium green medium wide leaves, heavily serrated. Collected the pollen... The other two turned out hermie-like, one very hermie which unloaded its pollen on some others, the other which a few days before harvest started showing weird misshapen male parts in the midst of the female flowers. The calyxes were very purple as well - very indica looking. No pollen released on this one.

Am I disappointed? You bet. Had visions of pollinating a real, pure, sativa haze with some of my babes. From everything I've read, haze has been bastardized by the Dutch, it's no longer getting until you've "groaned" it out.

Being a little cynical, I don't think I'm going to order from overseas anymore.

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another grower got from Homegrown Fantaseeds was very afghan like. Hear Passion and Homegrown are all affiliated, so, if I were ordering from of these "same" strain, I would go with the best price. Homegrown is able to up its price some of its stock at the Cup. This kind of crap will eventually hurt the Dutch herms, a big negative as far as I'm concerned. Think their interest lies in prof rotten genotypes. If I am paying $4 to $25 a seed, I want a first class product some flowery ads. Unfortunately we can't turn to the BBB to claim.

Be sure to ask your distributor if he will guarantee his stock as the real deal.

“I know which one not to buy. I grew Homegrown Fantaseed's Haze and it had looks to be a Haze/indica F1 with the indica being very dominant in the high. that may or may not be worth growing out. In closing, don't bother with this

“I have tried HGF's Haze. It most certainly is not the real deal. There is a lot if there is any real original Haze in it at all or if they just called it Haze for sales easily and even had a great pineapple smell. The potency on the other hand or otherwise. Don't do it.” -RedDevil

Strain: **Haze X Northern Lights**  
Strain Type: Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Nevil  
Images: 1  
**Description:**

"1988 Catalog the Seed Bank introduced a Haze X NL #1 hybrid. In 1989 the the Sensi Seed Bank offers NL#5 X Haze. I do not know if the listing of Haze the listing today of NL#5 first in the "Name" has any real bearing on the form that the 88 version and the 89 version were indeed different.

**Specifications:**
none

**Growers Comments:**

88 version (Haze X NL#1 ) states ‘Haze X Northern lights has been the most our favorite smoke. It is a bit stretchy and difficult to grow but well worth it”.

1989 version: “Due to tremendous customer demand, we have spent years an Indica hybrid that is suited for indoor growing but still retains the unique sativa X NL#5 hybrid is the result of this search. A note of warning: Adverse effects inexperienced smokers, particularly when combined with alcohol. Side effects fainting and loss of bowel and bladder control. Extreme introspective behavior

“One item that may be of interest is that in the 1988 Catalog the Seed Bank In 1989 they introduced Haze X NL #5. Today the Sensi Seed Bank offers NL listing of Haze first in the "Name" as opposed to the listing today of NL#5 first bearing on the formulation of this cross. I do know that the 88 version and the
"I grew that strain in '89 and your right, one of the wildest highs I have ever had was from it. The pistils must have been almost an inch long when they were fresh. It took 4 months for them to come but I never regretted it after the first stone." -Lady J

"Your main problem will be getting any real original haze I don't think it's available in Holland the last people to sell it were positronics there stock went to Dutch passion and I think they modified it as they state a finish time of 9 to 10 weeks to suit the hurry up boys. Original haze takes at least 14 weeks and the best ones 16 to 18 weeks." -Oldtimer1

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**Strain:** Haze#19 x Skunk#1  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Positronics  

**Images:** none  
**Description:** none  
**Specifications:** none  
**Growers Comments:**

“I would strongly suspect that this hybrid, despite it being carried by Dutch Passion and Positronics, originates in a single breeding operation (same exact genes) for all three seed companies have been consolidated under one owner. Which helps explains why all three seed companies claim the hybrid has won a Cannabis Cup prize ‘for them’.”

“Hehe... sounds like a strong sativa. I have a Haze19Xskunk#1 (positronics) that kicks out bud with a distinct 'heart racing' feeling. This bud keeps me wide awake. Zero to LSD in two tokes. This may be of interest to those wishing to grow killer sativa outside and have it mature. I grew Haze #19 X skunk plants start flowering after 3 months regardless of day length. I have no explanation for this but I talked to Mike at TAC and he said that this is common with Haze #19 which is very variable. We are still getting 14 hours of daylight and my Haze has been flowering for two months. It is typical Haze potency but you need to be fairly experienced to grow it properly unless you have a good location. The reason is that it grows very tall and spindly and it also grows very fast." - Dynamite

"I grew a haze19 X skunk#1 strain I got from jock, and enjoyed growing this hybrid. The buds are delicious in odor ... sugary & citrus. The high from the buds is strong! The plants are very good. I grew the scissor hash was incredible. With the 2 out of 10 ten females I grew I gave them all the strain corral. The yields weren't too good with this plant. I'm very happy I had some totally meditative smoking sessions with the shishkeberry ... details later. Relaxing, ahh! that's my kinda' weed. Good luck with the haze X skunk... if you can find a good yielder, it'd be a great strain. I let my haze X skunk plant go, but I crossed it with a shishk male to try and make a worthy hybrid ..." - Shiva

“Bank: Positronics  
**Supplier:** Jock  
**Started with 10 seeds, all 10 germinated and sprouted. Had 6 females and 4 males. All the females practically identical. They grew and looked like clones from the same Ma and Pa."
kept after indicating sex, probably a mistake. This variety was a pleasant surprise.

buzz, what a buzz. Of the 6 females 5 of them were just about identical in growth both during veg and flowering. They had leaves somewhere between the indica dark and sativa light green with midsize width blades. The one loner plant showed its differences during flowering. While the majority had bud covering most of the stem this one grew nuggets at the nodes, thick tight ones.

Because they were so similar in growth just three were kept to be grown from mothers though. As a matter of fact if you had to or wanted to do a seed crop now these would be a better choice than even my favorite the NL x Shiva because also from Posi.

5- This one was the highest of the yielders and came in third in buzz with the plants that were killed off. Not a distant third just third. The plant matured in approximately 8 weeks. This might be based on what has been seen so far.

6- This baby was the lowest of the yielders but came in a strong second in buzz. It also finished in approximately 8 weeks.

10- This was the rebel of the bunch. Difference in growth weren’t that noticeable during veg but this plant showed its colors during flowering. The others had bud formation up and down the stem but this one grew chunky buds at every node. This made for a longer manicure but it was worth it. The buzz at this time by a noticeable margin. It’s probably the best weed in the stable as of now these would be a better choice than even my favorite the NL x Shiva because also from Posi.

Aroma: Kind of a slight skunky smell on the sweet side. Nothing offensive nothing overpowering, but fairly strong. Double bag when carrying stink without doubt.

Buzz Well above average. Ah what the heck. This chit is nice.

Semi couch-lock with a kick is the best I can do. Not couch lock but could be. You get an edge plus it creeps up on ya. You get a buzz and feel like that’s it, next thing you’re smiling 61514 At this early age the buzz is in the same class as the older plants and NL x Shiva. Imagination knows how the buzz will be when the plants are older.

The oddball - 10 û with the superior buzz has more of an edge and leans towards a sativa side more than the other two. The weed already has a nickname- Sunshine Weed; the buzz is better even though you’d think it’s because the edge is taken off some with the sun beating on ya bean and it all works out to a good thing. Can’t be explained you’ll have to do it.

One last note. This weed rings some bells from days gone by?

Taste: Distorted by feeding- nothing to write about nothing to bitch about. Good.

Yield 5 has production potential and was kept for that reason. The yield from the others was at least average. As a whole taking all plants into consideration yield was better than average getting much better with time and choice of method used to grow em. Good.

Comments: The day this is puffed when it’s older will be a great day I’m sure. It compares to the rest of the stable. If it gets just a tad bit better in the buzz department it could be already NL x Shiva is dusting off the belt for transfer.

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**Strain:** Neville’s Haze  
**Strain Type:** Mostly Sativa  
**Origin:** California/Holland  
**Breeder:** Nevil Schoenbottom, Green House Seed Co.

**Images:**

**Description:**
“Pedigree: Almost pure Haze with just a hint of Indica (Northern Lights). Strongest variety of its kind on or off the market. Not recommended for inexperienced smokers - too trippy - too profound.

Flowering Times: Indoors: should be started under 12 hours of lights. The earliest will finish in 14 weeks (25%). Those that take much longer than this are usually discarded as not practical. Outdoors: should be grown in the Tropics + started just before the on set of autumn. Yields are surprisingly good - the longer flowering time is usually compensated with extra large yields, both in and outdoors. Not for the novice grower.” –Greenhouse Seeds catalog

Growers Comments:

“The plants are still in early flowering. They were started Feb 23 under a 400W HPS on a 14 hour light/10 hour dark schedule. After that, light period was slowly decreased for two weeks, and then switched to a 12/12 and flowered(about March 10). Sometime in late March or early April (I forget) the damned old hps bulb went dead! Fortunately, the weather had warmed up so that I could take them outside and inside under a bank of florescents for some hours after that. Now, it's warm enough for 11 hours each day. I selected two females and one male which had the pure haze phenotype, and discarded(gave away)all the rest. From the first, these seedlings had extremely long, slender leaves to boot. It was my intention to let the male fully pollinate the females for seeds. Well, they've been in flowering about 6 weeks now, but stretching is just now slowing down. I'm expecting another 8 or more weeks till finish. It was a mistake to flower them too soon as the tallest is only 2 ft., but I did take clones from the females which I'll veg to 7 in., and those should stretch. I've seen them they're flowered. As I said, the ones I selected appear to be pure haze with no NL, and the others I let go were about a third NL, but these are pure! At least, for outward traits as well. Leaves are the longest and most slender that I've ever seen! The top bud site looks like a small marble on top of a two foot pole. I don't know, it's hard to judge what the final yield would be on an unseeded, sinsemilla plant. I'm pretty sure that a five foot plant would have a fair yield. Grown in the tropics, this strain would easily get to 20 ft., and have an enormous yield. Definitely not suitable for SOG. But, if you're like me, you'd rather have a little of the best there is, than a lot of some other.”

Strain: **Northern Lights #5 X Haze**

**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Nevil Schoenbottom

**Images:** 1

**Description:**

“This hybrid is the pinnacle of achievement in Cannabis breeding today. The result: an extremely potent plant with a great Sativa high. In the 1994 harvest festival this variety was miles ahead of its competitors. The high yields compensate for the slightly longer flowering period. Hybrid vigour provides for lush growth, heavy bud formation and abundant resin. A true champion!

**Specifications:**

Flowering: 65-75 days / 11 weeks Height: 150-180 cm. Yield: up to 150 gr.” –Sensi Seed Bank catalog
Growers Comments:

“Big plant with big leaves. Light green. It will grow to 15 feet tall outdoors. Will produce 4-6 ounces per plant. An extremely sweet smell. A unique and high quality stone. Flowering: 9-10 weeks Yield: up to 100 grams” – Richie’s catalog description

“It is the “ultimate”. Can do a wake-and-bake without turning into a couch potato. Stretchs like a sativa. But gets plenty of crystals. Hash made from those crystals in your own network marketing friends, drink lots of water and you'll be prepared. Your brain cells are going to be going on a rocket trip ... they need lots of fuel!! But be careful ... if you go shopping under the influence of this stuff you'll spend too much money. I suggest the NL5xHaze. Heavy yielder, great sativa buzz however it does take just the wait if its for your head.” – Root

“A-1 I got some of those seed from Nevil in 88 and I've seen it make many experienced smokers do strange things-throw up, anxiety attacks-honest to goodness. I just received an order of the Sensi Seeds version of it and can't wait to compare it. I think Nevils seeds from the old Seed Bank days were something completely different from most sativas. When Nevil released the pure NL5 AND pure Haze both of which he found in the States.” – Lady J.

“Was it you that had experience with NLxHaze? I now have two from Sensi that are growing like wildfire in my flowering closet. They have almost taken over. My question is are these girls going to be worth the trouble they are causing. If not I am thinking of ripping them out now. It is really running on me. Has to be the Haze. Here’s to hoping it is all you say. I will tough it out. I had a similar problem with my Auto NL5. These did not preflower. They full on began to flower at about 6-7 weeks. When it became apparent they would continue, I moved them into the flowering area. After a decent harvest, I moved them into the auto area. After a decent harvest, I moved them into the auto area. Again. I have bred these plants just begun to break soil. I’ll just go with the flow and play jr. scientist trying to figure out if it was environmental or genetic. It was great and worth the money but still not the best I ever had... been a little better. The buzz was powerful and very up heady, a little disorientating and a good laster. Taste was unique kind of a lime flavor with a fruity-tooty hint. mellow burn. excellent stuff but I have had stronger in Jamaica. slow-slow-slow grower and quite pricey for the seed bank seeds. I may have gotten better results had I waited longer and dryed longer. I still have 5 seeds left and 4 clones so I am going to refine my growing technique. I would recommend it yes but maybe not on limited funds or for the impatient grower. I love the taste though and the buzz... awesome!” – Turbo

“Remember how my NL5xHaze budded on auto? Well the harvest was somewhat small as a result, but the bud was damned stoney. At about 6 weeks reveg the plants went on autobud again. Larger this time.” – sb

“Being a big fan of this original cross by Nevil of The Seed Bank, I’ve been waiting to grow out Sensi’s version of it. The original was the most potent, devasting high I’ve ever
The best plants leaned to the indica side in her traits, finish was longish but worth it, with tight, large, crystally buds. Sensi's version today, however, doesn't come close to the original in any way. Its mostly sativa, LOOSE buds, potency at best average, and I've honestly lost track how long they've been budding, and 90% of females not finished yet. I don't really think any of the females(9) I got from the order will be worth keeping, to say the least I'm very disappointed, since I have recommended this strain to so many people. Perhaps the successful grows of this strain use a mega amount of light since mine is only 40 watts/sq. or else it was my turn to be unlucky with the females in my order, but I'd never recommend this to anyone again. I know time makes the memories better, but I swear the strains from 85-90 from SSSC and The Seed Bank were much more vigorous than crosses today." -stix

“This hydro is light green with scarce long, red hairs and very crystally buds. It breaks up very easily and emits a sweet green scent, characteristic to Northern Lights. The buds are surprisingly much denser than they seem. Smoked, the buds are smooth but very expansive in the lungs and will certainly leave you coughing. The taste has a mild overall bouquet if not a bit bland. The high comes on quickly but is a bit spaced. *** 1/4″ – Homepage Amsterdam

“As for the nl5xhaze, I tried it both on e f table with 40+ watts/s.f. and in e-f trays with much less light, about 30 watts/s.f. Using GH nutes with fox farm and EJ Catalyst in both systems. Most plants were moved to trays but a couple stayed short enough and bloomed properly loose as could be. Ones in trays were more sativa and finished bout 6 feet and had much better-looking buds, though still loose. They are covered with resin. More light would have been a big plus and perhaps the sole reason my results weren’t as good as your own. Air turnover every minute in both grows. I'm not as disappointed since I've sampled them since they've matured, the early samples weren't too potent at all - I think they were worth the effort cause they do express the haze pretty well – a treat.” - stix

“I have a few NL#5 Haze that I have just harvested, I was really happy with the product produced. Fat tight buds, minimal stretching, and mine was from Mike, straight from Sensi. Mine gained height of around 5 and a half-foot, they yielded pretty well as well. I bent them over and it increased the yield. - Mirage

“I've just finished growing out ten NL#5 x Haze females. Firstly the seeds were bought in Sensi for USD 150. You get 16 seeds to a pack. Germination saw 15 seeds pop, out of which 5 were males. I let the plants vegetate until 2 feet in height - mistake. On going to 12/12 the plants took off towards the ceiling. They eventually reached 6 feet and were a regular pain in the ass to look after; buds running buds etc.... (I'm using 600W HPS in a 5 x 5 grow room). The plants were mature after 75-80 days.

I'm now in the process of drying and curing with the intention of selecting the best mother afterwards for regen. and cloning.

I must say that I'm disappointed in the quality at this point. The buds I've smoked so far have had a really nice taste and are very smooth to smoke. The high, however, leaves something to be desired. Although I haven't sampled the best bits on each plant I have yet to come across a NLH bud which flattens me. Sensi say this is 'extremely potent' grass. What does this mean? Extremely potent for whom exactly? I'm a joint-a-day man for years and my intention in buying these expensive seeds was to grow a really potent strain to have for my 'experienced' buddies.

There seems to be a high variability in potency among the ten plants. My experience tells me that I'm not going to find a killer here. Manicuring a cola from a plant always gives me a clue to its potency. I use a scissors and if it gets clogged up by resin I know I have a good smoke. Only time will tell. However, I'm reserving final judgement until the plants are fully dry and mostly cured (about another 3 weeks) before I start ranting and raving.
Tips for growers of this strain:
Put on 12/12 when plant is under 12 inches.
Maturity will take 75-85 days.
You need LOTS of light.
Yield is o.k.
Cloning is easy - I've tried it.
The buds will be fluffy, not tight.
No major smell problems with this strain.” -Harry H.

**Strain:** Original Haze
**Strain Type:** Mostly Sativa  **Origin:** California/Holland  **Breeder:** Positronics
**Images:** 1

**Description:**

“Strong compact plant, very high. This homogenous Sativa type weed originates from Nepal and contains a high level of THC. Grow it from fertile soil and add nursery supplements to the water. This strain grows up to 1.75 meter and is especially loved by musicians around the world due to its easy to grow but famous for its special qualities. A classic Sativa high, and good results are obtained after waiting a little longer. Strong, compact plant, mellow. Original lambsbreath from BC Seeds. The buds have a Skunk crossing. Flowering time 10 or 12 weeks. (1st two weeks 14 hours of light, last 2 weeks 10 hours of light). Has Narrow leaves, a Plant with yellow-whitish Skunk odour.

**Specifications:**

Type : Stabilized F1-Hybrid, 88% Sativa  
Flowering time : 8 - 12 weeks  
Cultivation : Inside, outside and greenhouse  
Appearance : Slender leaves  
Aroma : Spicy odour  
Height : 1.50 - 1.75 m  
Yield : 400 - 500 grams

-- Positronics seedbank catalog

**Growers Comments:**

"Haze (Katsu coffee shop) This place came highly recommended to me from Tony at Sagarmatha. They are said to have "the best Haze in all of Holland". Trippy buzz with a similar taste to the Kali but not quite the same. Very, very cerebral in nature. Like the onset of LSD right before it really kicks in. Some what apprehensive feeling with heart racing aspects. This bud is for experienced smokers only. It could really freak out a newbi consumer."-Prince Caspian

"The most mind-blowing weed BY FAR, that I've ever smoked (in 25 years of steady smoking) is Haze. It's like taking LSD. I can't even rate a second or third because NOTHING ELSE COMES CLOSE TO HAZE."

"Cleaner, cerebral buzz from the pure sativa. Haze is a super sativa of four sativas; Colombian, Mexican, Thai, and South Indian. Haze is one of the few genuine, pure sativas in existence (as far as I know). It has very long, slim fan leaves. The plants and their fans make the tops droop over kinda like a sunflower. it's definately a pure sativa. I have some original haze barely budding and its already a killer. Leaves and limpy plants? haven't got to try any mature bud yet, but the 2 weeks into flowering time gave me a better buzz than mature durban bud. unfortunately i just had to put them outside into a longer light cycle so maturity will probably be delayed. i do believe it will be some of the best..."
"The original Haze from Positronics, which is a stabilized hybrid is said to produce 75% female. Out of 5 mother plants, there is one that is a little different from the bit wider and the plant is definitely showing more vigor than its sisters." - Toker2

"That's what I thought, Wernard at Positronics got one of the original clones. I got a handle on the general growing characteristics, how's the high? Is the Posi. Haze as potent as the Haze reputation?" - Uncle Ben

"In the seventies we tried several times to grow original haze in the UK all to no avail we were using cool white and grolux and didn’t know about hid’s. In the eighties we tried again using 100w per sq ft the selected ladies took 15 to 18 weeks on 12h and the start of amber glands. Some of these we probably need less hrs to stop them. I don’t think the so called hazes offered anything some quote 8 weeks some 9. Over the years we made a number of crosses last two were the best [see post 24]. The high was very high, not at all paranoia coloured edges to their vision unfortunately not me. We found it just too expensive and has left us with some high yielding hybrids with a touch of the haze high as a time down to was with super skunk m x o~haze f = 10w and o~haze m x ss f = 8w.

“I just finished some Positronics original haze for the most part under 44w/sq'. the clones were taken from outdoor mothers. The outdoor buds at 7 weeks had far better potency and taste than the indoors had at 12 weeks. It did make some righteous size buds indoors and a nice yield, approx 2 oz/plant. Unfortunately, it just didn't have the kick of its outdoor mother. I really believe haze needs far more light." – Toker2

“Haze is a sativa hybrid. If I remember right, they mentioned Mexican, Colombian and Thai in varying degrees. This would explain some of the variation I saw in the hybrids Nevil sent me. Some of the extreme sativa characteristics included one plant with a 6" sport in 24hrs. That happened right after the induction of flowering. Outdoors they would have been giants.” - Lady J

“Posi haze is mostly Colombian x Mexican with small amounts of Thai and some Haze brothers" in California 20 years ago.”

“Our Haze is indeed from Posi’s genetics, the flowering times do differ. Hydro we find can take 1 - 2 weeks longer. 10 - 13 weeks would be most likely on a some variation from grow room to grow room, even though it's the same strain popular strains and is well worth the wait. A real up high of cosmic proportions." - Homegrown Fantasy seedbank

“This sounds close to my strain, except the very best go to between 16 and 18 weeks. Homegrown Fantasy must have done what they call improving the strain to reduce the hrs to 10 to 13 because that's not what Positronics started with. In fact it is very close to what you get with an F1 cross of original skunk No 1 which is probably closer to the truth. The other thing is to light levels in excess of 100 w per s.f. are needed its not an economical crop."

**Strain: Pure Haze**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Homegrown Fantaseeds  
**Images:**
Description:

“100% Sativa, it’s a hard plant to grow, but famous for it’s special qualities. A classic Sativa high. Good results for those who do not mind to wait a little longer. The plant that sets the standard for all Sativa’s. Was one of the prize winning selection for Homegrown Fantaseeds in the Cannabis Cup ’97.

Specifications:

Specifications: ~ Flower: 10-13 weeks” - Homegrown Fantaseeds catalog

Growers Comments:

none

Strain: Silver Haze
Strain Type: Mostly Sativa  
Origin: Holland  
Breeder: Sensi Seed Bank
Images: 1

Description:

“Although the cerebral high of the Sativa is preferred by many, indoor growers aren’t too fond of this type: Sativas get very tall, take a long time to finish off and produce skimpy yields. We have spent years searching for a superb Indica/Sativa hybrid suited for indoor growing. By crossing the Haze, the most powerful Sativa in the World, to a non-dominant Indica we managed to get the height and flowering times down to an acceptable level and still retain the unique Sativa qualities of the high. The result: the Silver Haze, winner of the ’89 High Times Harvest Festival. Don't expect top yields but top quality that will excite the true connoisseur. –Sensi Seed Bank catalog

Specifications:

Flowering: 65-75 days. Height: 150-180 cm. Yield: up to 100 gr.” - Sensi Seed Bank catalog

Growers Comments:

“This bud is so crystalline that it looks silver, as its name portends, but underneath the crystal layering are actually dark-green buds with flame-orange hairs in clusters all around the bud. The buds are very difficult to break up due to their density and leave a tacky (but tasty) film on your fingers. The stems taste like flower nectar. The smoke is sweet and pleasant and tastes mild but a bit piney. This is an intense, stony, vegetative high that could leave you wandering around Dam Square wondering which way your hotel is. ****” – Homepage Amsterdam

“I have both silver haze and skunk x haze in early bloom outside right now. I planted them around half may.
The skunk x haze is a relative compact plant that looks really great. It's about 1 meter high with very nicely branched conically like a Christmas tree. The flowers seem to be very dense (every internode) and the odor is very nice. Less pungent then skunk, but I doubt if it will have a lot of skunk in it. It reacts relatively fast to a change in light regime. After 4 days of 12 hrs the first flowers appeared.
The silver haze looks much more like a sativa with longer internodes and sparser leaves. I topping it when it was very small so it wouldn't get too tall and this has turned out nicely. The plant is about 1.5 m in diameter. The appearance of flowers was fast (also +- 4 days)
concentrated on the tops of the branches. The smell is much softer then the skunk x haze and much "hazier" (If you have smoked real haze you know what I mean, there is nothing like it!) -Smurf

“This variety made Dutch Passion the “High Times Cannabis Cup” winner in 1992. Formerly this strain was called “Haze Skunk”. Still one of the best for the Dutch Passion team. Original Haze is crossed with Skunk #1 to get a bigger yield, a softer taste and a shorter flowering period. Truly superior sweet taste. The high is incredibly clear and energetic. A very favorite strain for an almost 100% Sativa variety.

~ Flower: 10-12 weeks ~ Harvest: end of Dec.” –Dutch Passion seed catalog

“I had the opportunity to acquire some Super Haze from Henk in late September. They got through customs just fine. I germed in soil of a fine mixture in early October. Of 12, 11 germed and unfortunately 5 turned out to be herms with largely male characteristics. 2 true males, 4 females. Fairly broad, medium degree leaf serrations, and max 7 blade leaf structure. These babies grow fairly quickly in veg under my 250w HPS with 320w supplemental fluorescent. Problem was though in flowering as this strain took too long to finish. Took about 6 months total. Very deceptive in that the buds will look beefy, but the hairs take more time to turn than any other stain I have encountered. My guess is that this strain will perform much better in high light -temperature situations. I am going to try outdoors now and compare. Under my lights some nice 6 - 8 inch colas but they were not as tight as a big light setup would pollinated more bud than I had intended to when my pollen collection cup hit the fan...whoops...oh well, now I have enough seed to grow a small forest. And believe me when I say they ought to rename it Redwood bud. Next time I think I'll try something more suited to my setup like NL.” -Patient Grower

“In the new Dutch Passion catalog, Henk the owner insists on calling his HAZE/SKUNK cross which won the Cannabis Cup in 1993 now called ‘SUPER SILVER HAZE’. The Super Silver Haze is by Greenhouse Seeds. Henk is fairly proprietary about names, he has registered many of his own, so he must be fairly convinced the Super Silver Haze is an identical Haze Skunk cross.” – Marc Emery

"Isn't Dutch Passion's variety Haze/Skunk called Super Haze? The Super Silver Haze is just at the Greenhouse and they have the genetic backgrounds of most of the menu." - Sensi Claus

Strain: **Super Haze**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1

**Description:**

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Strain: **Super Silver Haze**
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Green House Seed Co.

**Images:**

**Description:**

“Pedigree: Composed of the most commercial strains, known to the civilized world - Skunk, Northern Lights + Haze. Royally bred from 3 precious High Times Cup winners. Awards: 1st place High Times Grand Cup '97, '98. Strength: Overpowering combination of Indica + Sativa Highs. It leaves you gasping for reality. Flowering Times: Indoors: 8-10 weeks, with top yields, heavy resin production.

Outdoors: Finishes by end of Oct. in northern hemisphere, or end of May/June in the southern Hemisphere. This complex hybrid is the cutting edge in practical Haze hybrids designed to astound both the grower and smoker alike. Highly Recommended.” –Green House Seed Co. catalog

**Specifications:**

Flower period: Indoors, 8-10 weeks.

**Growers Comments:**

“Close sources say Arjan bred the SSH (nl x haze x skunk )in the Sensi Seed breeding rooms (Cannabis Castle) with royally bred Sensi strains. It's basically the same exact thing as Jack Herer, but with one difference. Arjan had some reputed misunderstandings with Sensi Seeds, and accidentally leaving behind his notes (woops!). The key difference is that Neville donated his special pure isolated “Haze” strain to the SuperSilverHaze which made it slightly better than Sensi's version. Neville went on to screw Arjan in much the same way Arjan screwed over Sensi.” -Tobes

“I bought Super Silver Haze in Amsterdam directly from Greenhouse. Out of about 20 different strains (including all kinds of hash), I smoked Super Silver Haze about 40% of the time as the nicest tasting smoke in Amsterdam. Most Amsterdam smoke has little taste in my opinion. But the Super Silver Haze from Greenhouse had a spicy taste, that everyone I shared it with commented on.

Most of the plants I grew with seeds bought in November are about 45" tall, so they are only about 26" high not including the rockwool. I get lots of various size buds that are pointy on top when fully mature, with a long top branch of buds about a 18" long that you could call a spread-out cola. One plant I pruned in veg. Topped at the 4th node than again a week later. It created 4 main colas with only 4 or 5 side branches. It is just about ready. It will be less than 30" mature (not bent at all) and very compact not as wide compared to the other Super Silver Hazes (and much easier to manage). For SOG, you would need to be a master at controlling the growth patterns. But if you know how, you could get (4) four cola Super Silver Hazes per Sq. foot, or at least 3 that could yield at least 22 grams of dry manicured bud.

I have not had pure Haze so I can’t comment on the existence of the Haze component. It is supposed to be crossed with Nevil’s Haze, one of the world best Sativas. The high is complex, slightly up. I need to study it more but it is up there with the best, per say. But most people will like this strain. Every one likes different things. I can tell you it was a relative bitch to manicure compared to Great White Shark and other strains that have more compact buds before curing. It manicured like White Widow, the buds were fully formed after 7.5 weeks like WW would be after 10 weeks. You have to go in deep with cutting shears and get out a lot of little leaves that are best removed. It takes time. I’ll always grow Super Silver Haze, but probably one plant every other grow. I’ll keep a mother of the best and continue my search for the plant of my dreams.” - Ananda

“(To breed SSH you need to start with a) NL5 Male x Haze female. The main
from the Northern Lights #5 is the short height and, if possible, the trichome characteristics you seek from the Haze are the high and flavour.

Once you have a stable version of those two, cross a NL#5 x Haze male with making it "Super". The main reason Greenhouse Seed Co. created SSH was because a little while back quite a few people were upset with the consistency and potency of the NL#5xHaze. They crossed it with a Super Skunk to give it more stability and up the ante on potency. Plus, I'm sure they needed something "new" to enter in the Cup.

The difference between Jack Herer and Super Silver Haze is the NL#5 is the male in the original cross of SSH, while Haze is the male in Jack's original cross. From what I can recall reading Jack has a tendency to show a bit of favoritism towards it's tall, lanky Haze father. The SSH leans more towards the Indica growth pattern due to the NL#5 daddy.” -Geronimo

“I just harvested the second SSH female. and am impressed it has a strong SK#1 taste and stone, lots of resin sticky as g13 ....and good yielder mine went 70-80 days.” –la.bud

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**Family: Mighty Mite Strains**

**Strain:** Kush X Mighty Mite  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Undetermined

**Images:**

**Description:**

“Heavy budding and lots of crystals makes up this plant, larger colas than Kush, excellent high. Easy to grow, and great for both indoors and outdoors.

**Specifications:**

~ Flower: 8-10 weeks ~ Height: 4-5’’

“MCW is a very nice strain to grow and smoke. Matures around 55-63 days. I'm resistant because 2 other strains I had developed a white "cottony" looking mold even though she had really phat buds. The buds are nice and tight. I have stony, one has more flavor than the other does. The flavor is excellent in taste occasionally puts out a few sterile male pollen anthers, which has never pollini
2 mcw's going for quite a while now and I prefer the one with the occasional anther, even though the other mcw has phatter buds.” – ncga

**Specifications:**
none

**Growers Comments:**

"Ncga's Chemo cross (MCW) would do any garden proud! It's my personal favorite although it's a low yielder, the flavor/buzz more than makes up for it..."-Mohave Green

"And, for what it's worth, IMHO, that MCW was the best of the bunch! Without a doubt, try to keep that strain going! The others were fine, but MCW just gave you (or me, anyway) that energy rush that is truly incredible! If you EVER have any extra of that let me know.... I'd drive across 3 states for it..."

"Planted my last 6 MCW (I think it also had a '?' behind it, or maybe an 'x') for 1 extra large female (#1). 2 avg. ones (#2 & #3) along with exact same for the males. kept the tallest male and a bushy one and bred with #2. not much to say about #2 other than it has pods on a 30" tall, bushy plant. #3 is also unremarkable in its growth and both were grown outdoors last summer from same batch of seed (btw, 3rd week of Oct, however, is a monster! 4' tall, easily 2' diameter and solid with bud (looks very candelabra style" with one pony tail bud and an outstanding yield from this one in particular... all are a lighter shade of green... trichomes. And super-sweet aroma. It's a very long lasting, semi-heavy high that I share it with. It's always been what they ask for anyway and works well for me too (failed back from 6 surgeries and 2 fusions).

All were grown in 5 gal. black plastic, nursery buckets filled with "Whitney farms premium potting soil" cut by a third with "Whitney farms cactus mix". Vegged under 1 1000W Sunmaster MH conversion and 2 1000W HPS...after sexing, reduced to 1 HPS and the Sunmaster in a 4 x 8 x 7 space.

Tried Mylar this year for the 1st time. I don't notice much difference between it and plain flat white walls. Mylar is a real pain to keep clean and it will be gone as soon as the room is cleared.” - del

**Strain:** Mighty Mite  
**Strain Type:** Indica/Ruderalis mix  
**Origin:** British Columbia  
**Breeder:** Undetermined

**Images:**

**Description:**

“Mighty Mite is a famous BC indica strain from the Himalayas cultivated for 12 - 15 years here. It is uniquely suitable for indoor or outdoor cultivation. All Mighty Mite varieties and hybrids feature a dominant main cola that explodes in the 6th to 8th week of flowering.

**Specifications:**

Flowering Period : 7-8 weeks. Height : 2.5’-3.5” ~ Marc Emery Direct seedbank catalog

**Specifications:** ~ Plant: Jun. 1st ~ Finish: Oct. 1st ~ Height: 4-6’ ~ Yield: 3-4 oz” ~ Bonhomme’s seedbank catalog
Growers Comments:

“From Lesquiti Island in B.C. Seeds take up to 14 days to germinate. Huge cola! Indoor/Outdoor. From a population of 3000, 50 of the best females were selected to produce a definitive 90 day strain. This generation will show a much higher consistency of commercial grade bud development. Yield: 3-4 oz to oz. for the experienced grower. For a smaller window of profile outdoors, the strain can be started as early as February indoors, and then placed outdoors in May. Mighty Mites can even be started as late as August and finished outdoors in October. For indoor/outdoor germination to harvest is 90 days. They can be grown indoors for 24 hours under continuous light. Not recommended for cloning.

Family: Niagara Strains

Strain: Huron (Niagara X White Widow) 
Strain Type: Mostly Indica with Ruderalis  Origin: Ontario, Canada Breeder: Images: 1
Description:


Specifications:

Indoor Growth Outdoor Growth
Cutting height 36"-48" Plant Height 4'-6'
Yield (/m2) 300-400 g Yield (/plant) 125-150 g
Flowering 60-75 Days Finish Approx. Sept. 15-30
Frost Resistance - Spring Very Good, Fall Good.” – Dr. Greenthumb seedbank

Growers Comments:
none

Strain: Niagara 
Strain Type: Mostly Sativa with Ruderalis  Origin: Ontario, Canada Breeder: Images: 1 2
Description:

“A mostly sativa strain, early finish, sweet taste, mold resistant, high flower to leaf ratio, soaring high and heavy.

**Specifications:**

**Indoor Growth Outdoor Growth**
- Cutting height: 36"-48"
- Plant Height: 6'-12'
- Yield (/m²): 400-500 g
- Yield (/plant): 400-500 g
- Flowering: 60 Days
- Finish Approx. Sept. 15
- Frost Resistance: Spring Very Good, Fall Good.

**Growers Comments:**

“Out of 18 Niagara seeds I got 17 sprouts. Out of the 18 Niagara x shiva seeds 18 sprouts. Out of the Niagara, 9 were female. Out of the Niagara x shiva 11 were female. Clones were taken and put into my hydro system. Growth was better than I've ever seen; in fact both types threatened to outgrow my space heightwise, so had to bend them a bit. I harvested last weekend. The plants have no actual weight as both are still drying. I would say in the area of 400g. They look fat and dense. The Niagara buds have almost no leaf, just pure flowers I have not seen a less leafy plant before. The Niagara x shiva has more leaf as it is more indica. I have no idea why. Niagara I have been smoking is far more potent than anything I have ever grown before; some of my friends say it's too potent or accused me of spraying it with something. The Niagara x shiva is less potent than the Niagara, and more physical but I would say it also is more potent than any of the strains I have grown before. for those who like a very potent weed Niagara is the bomb, but some may not like getting that high. Overall I like both and plan to grow more in the future.”

“I have some 5 week old Niagara plants that were ordered from Doc Greenthumb. The plants look good 12-15 inches tall and appear to be very healthy. I germinated 10 seeds all but one sprouted. Plants have been under 18/6 light cycle and all have been preflowering and revealed they sex 5 females and 4 males. One of the males started flowering at 3 weeks and had to be moved out of room so it won't pollinate the females. The staminate pollen sack looked like it would release the pollen anytime. Have never had this happen before in the vegetative stage. Have heard that some Ruderalis strains flower regardless the photoperiod. Has anyone heard from Doctor Greenthumb?” – edhassle

“I am down to 8 Females only out of a 30 seed order. And not the first PINK HAIR. All normal color. :( Finishing out the budding of them to sample the quality. Since they did not produce the pink hair the strain I paid for? 3 of the males fully showed & produced pollen while under 24 hrs light. I saved the pollen from those 3 males. There were a lot of hermaphrodites, at least 8. Some of the females showed under 24 hour also. I have dropped the females all down to 10 hours a day to finish them out. All males & hermies are dead. I hope they did not send me industrial hemp or straight Ruderalis? But they finish at different rates so I wonder was it stable at all? Or maybe I was sent different types of seed? I thought that F1 hybrid seeds would produce even traits? I thought that the traits would not segregate unless I seeded the F1's? ” – Country Boy

“This is my first attempt at growing it and it's about 5 weeks into flowering. It's a little tall and grew like a regular sativa. This would be an ideal plant for ScrOG method. However, it does flower fast. Faster then one would expect from a sativa. I tried some of the immature flowers and it was pretty potent, especially for immature buds. The buds are starting to get a little big and strange because the pot that I have grown, buds don't fill out till really late in the flowering stage. I used organic ferts like Shultz bloom plus (10 60 10) and miracle grow etc. I have also put a lot of light for sure and all my other plants fill out really well. Niagara loves lots of light; it does really well under good lighting,
start flowering this variety at about the 4-5th node or you'll have a rather large plant. I made that mistake and ended up with a mother plant to provide me with clones instead of buds.” - Hvac Man

“11 days into 12/12 My Niagara X Shiva went Hermy. Arrggg! Too bad 'cause it was a really good-looking plant. Very wide leaves. Fairly compact.”

“They are two weeks into 12/12. All system go for flowering. Soil. Niagara X Shiva goes hermy. 6 other of same strain. I guess you get what pay for.”

“Niagara is Sativa and is kinda fluffy. Its drying so can’t say about potency. Some variation in crystal formation. Yield...nothing to scream about. Niagara x shiva- a lot of variation between others. Tight nugs. Some tendency to herm in all examples.” – Flashman

“I got 10 seeds, 6 were female, all were very tall and showed sex under 18 hrs of light within three weeks. Only 2 had somewhat of a good yield and the other 4 should have been killed. Only 2 were potent, but nothing special, all the rest including the 2 yielders were average or below. What I grew did not look like the pictures I saw. This is no match for the Niagara which I've grown out as far as yield, potency, TASTE, and growth pattern. This plant does not seem to be a very unstable strain. Compared to everything else I have grown which has been very good, this seems to be the one that doesn't live up to its reputation. I simply cannot understand what all this hoopla is about Niagara. It might be ok for someone who is just starting, but not for those of us who are striving for the ultimate kindest bud!” – angelface

“Niagara from HS. Promix/perlite/worm castings. Start & veg under floros. Flower under 430W HPS. One female out of 6.Looked definitely indica, but were supposed to be mostly sativa. Trashed males. Started flower at 14 weeks preflowered and was very easy to distinguish. Fan leaves were wide fingers. Topped once. Very few leaves. Buds production was not much to speak of (thought should be great with 1 plant under 430W). Bud leaves had purple cast to them. High was average. Overall opinion - not as advertised in type, production, or high. As far as production/high could have been me, but type was not as advertised.” – Al Phadog

“The good doctor used two kinds of weed to make Niagara; a Oaxacan plant, and an early Afghanistan, both of which, he got from the original countries. The Oaxacan was late, and wouldn't finish in Canada, but he crossed it with the Afghanistan, then selected for two generations to come up with a hybrid that flowered early like it's Afghan ancestor. So this is the origin of Niagara if anyone wants to know.” – 67ed

“Started 7 Niagara. So far three have shown male under 18/6 photoperiod. Two definite sativa dominance. Leggy and long internode spacing One is 18" this is the tallest but is not very dense. The other 2 are runts sativa dominant but very slow growing about 10"-12" tall. One is totally different very indica influenced much more bushy and vigorous looks much like an indica/sativa mix 14” this plant...” – germinator

“Started (with) clones from a 2 month Niagara female. The plants were grown under Sunmaster 1k cool deluxe mh and 1k hps on light movers. Plants were grown in organic mix of worm castings. I had no problem until flowering. Then the Niagara grew too long and spindly and the tops never filled out. The Niagara was a disaster for me in terms of wasted time and space. The plants were fed with Foxfarm big bloom during flowering. At 5 weeks into 18/6 veggie the plants went wild with uncontrolled spindly lateral growth...”
The plants were ok smoke but I really can't say because they were never finished. – edhassle

“My understanding of this strain WAS that it was a cross between Afghanistan and Oaxacan strains. There was no mention of Ruderalis in it's genes, but 3/12 of these little $#@&er's are flowering under 24/0 after 8 weeks from seed, so what's the scoop?

These plants showed preflowers at the 6 & 7 nodes at 6 weeks, which I thought was odd but I really could start weeding some of these out as things were getting crowded. They're one approx. 10+ nodes and flowering! Also, the description of Niagara indoors and out, which led me to think that this would do ok indoors.” – Unhappy Camper

“I haven't grown any of doc's strains to harvest yet, but, I have Niagara, and NiagaraVE growing indoors right now, which will be thrown outside sometime in may. I have read that the Niagara is an indoor/outdoor plant, but I fail to see how this strain could possibly be grown successfully indoors. I'm really like to reach for the light with quite a bit of side branching. I'm sure these plants will be enormous when grown outdoors, but I wouldn't chance then indoors.” – S_Ont

“My experience (one grow) is this: out of 8 plants, two were bushy runts--one female, one male. Both were late to show sex and develop flowers. I axed the male because it produced a very sparse spike of flowers, each flower node greatly separated (4-5 mm) from the others. The runty female is who looks like the pictures and descriptions of Niagara. The runty girl also has sparse flowers distributed like the male--definitely a lot of stem and few flowers. To top it off, I discovered a few male flowers on a couple of branches of the runty girl this morning. I didn't plan to save any seeds from these runts anyway, but it was a great disappointment to see how variable (with undesirable Ruderalis-like runts) this variety is :-(

I don't have anything against some Ruderalis genes; the Doc has created a line that will grow outdoors in higher latitudes. He's a breeder, not a magician. I'm disappointed mainly because I had planned to produce my own seeds to avoid the paranoia ordering out-of-country causes me. If his seeds stock is so variable, it suggests that Niagara is closer to an F1 or F2 hybrid than a stable variety--something like a F1 of one type, though perhaps a stabilized hybrid, and an F1 of another, such as Ruderalis indica.

On the plus side, the other female is big, producing a good yield, has a moderate covering of trichomes on the distal parts of the bigger bud leaves; has a very pleasant, aromatic odor (none of the plants were stinky, though the grow-room smell was evident during the last few weeks of vegetative and flowering phase). I smoked some quick-dried buds of each at day 56 of 12/12. It tasted like quick-dried pot--not as harsh as some; I just crushed up the bud leaves and buds and rolled a fat one of each (different days). Both gave better than average highs that seemed to last at least a couple of hours. It was a type of power, but it was good :-))

I started with tap water (pH ~8) to clear nutes at day 53. I plan to harvest on day 63. Can't wait to cure and smoke this mother though I don't think the taste is going to be anything to brag about.

“What strikes me most at this point is the variation in the plants. There is no one plant outgrowing the rest of the garden markedly, which has that characteristic Afghan look to their leaves. Another three have three with that characteristic Afghan look to their leaves. Another three have one with that characteristic Afghan look to their leaves. Another three have one with an indica look I have not seen before, very short and stocky. This mutt strain that has not been stabilized.

I use a 400 MH in a small 4'x2' space, so my wattage and lumen intensity is growing well. No problems there. And, the side branching has already begun...
the Afghani-like plants. Since I will clip their tops once, at the fifth internode, it will be better.

All in all, it is an interesting crop to observe. I don't care about the variability much; I can simply choose the best to breed and create my own unique strain. I am crossing my fingers that the Kush-like plant that is growing so fast is good and potent."

“I have 3 Niagara females in late bloom now. There seems to be a bit of variation in them. One is looking like a good yielder, but the other 2 are very skimpy indeed.

Another thing is they are prone to going hermy when you switch from 24 or 18/6 straight to 12/12. They don't do this outdoors with the gradual decline in daylength (so I hear). All 4 females turned too herm and got the chop. As for the good female growing now it has lots of resin and looks well. I can't wait to try the buzz for size. It's probably best grown outdoors at this point.

“Started 10, 9 sprouts, 4 females, 4 males and 1 hermy. I kept 1 Niagara that was robust. The mother plant was OK but not great. After a couple of clonings, however, the bud size, potency all rose quite a bit. Clones well, great branching and flowers fast (7-8 weeks). It slowly creeps up on you and builds into a fun laughter inducing high. No immediate impact or couch lock of some of my other strains which makes it good for the daily consumer. Good one Greenthumb.

I have a feeling they will do well outdoors. I've only grown them under lights (47W/sf in a flood/drain table). The buds filled out pretty good for a sativa. Still a little bit loose and fluffy though. Outdoors, one was worth keeping. The other 3 were very low yielding and poor in the THC department.” - Red Devil

“Finished my Niagara grow, starting with 8 seedlings. Bought my seeds not from the Doc, but from Heaven's Stairway. Six were male (one a slow-growing runt with very sparse flowers); two were female--one was robust with fairly tight buds, good amount of trichomes, glossy leaves on buds. The other was a runt, with very few flowers per cm or inch, (individual flowers separated by a few to several mm), few trichomes, and no gloss to bud leaves. Leaf characters were the same (I described all this in earlier posts). The robust female was the runt, i.e. compact floral spikes. Both get me high, but I prefer the other.

One of the biggest males, who tested about the same in potency. I don't plan to grow more Niagara from seeds for more than a year, and then I still have 9 from my original purchase.

Wait until a few weeks into flowering (2-4) and you should be able to tell if any of the short, bushy ones are going to be worth keeping.

Apparently like you, I was disappointed because I thought this was a “stable” variety, as I have seen from other and with Niagara. Now, I believe I would have been better served by my Durban Poison, or one of Doc's Heritage varieties instead of Niagara. But hey, this is the most potent weed I've smoked in a long while--if it is, it definitely is a subtle, up kind of high. I crossed my best female about 1 week into 12/12, and have 4 Northern Lights about 2 weeks away from the same time. My plan, assuming I've got a NL male among the 4 is to cross these two, as well as produce some more NL seeds for the future.” - T. Aich See

“So far I've grown Niagara (a disappointment, though I haven't given up on it), and am 2.5 weeks from harvesting Northern Lights (recent sample of green bud tells me I'm going to like this plant)…. Niagara is good, but I like more body to my high--something to make me laugh and get me hard--not cerebral for kicking back.” - T. Aich See
“I've grown it from seeds and clones indoors. I only had 2 females out of 8 seedlings; both males and females were quite variable in stature and flower production. One female was a worthless runt with very little potency and production. The more potent female produced a subtle high (little body) that was not especially long-lasting. Personally, I don't like it as much as varieties with more "body" (I'm not talking couch-lock high, but something with some "feel" to the high). It isn't a great "airy" side, though they plump up some at about 8-9 weeks of 12/12. It clones easily (I've only cloned after 4 and 5 weeks of 12/12 and it took 2 & 3 weeks for the cuttings to root and start growing). It seems to be somewhat resistant to fungi (I had a fungus attack that wiped out my last grow - California Orange seedlings and Northern Lights clones were wiped out first). I'm glad I tried it, and I plan to grow some more to breed and blend (the buds - but only until I am able to find varieties that are more to my liking and which I might smoke pure Niagara is when I'm going to be around people who high or when I have some serious thinking to do.’ -T. Aich See

“I had some trouble with Niagara in the early seedling stage...I believe it must have been the soil because I know that the problem was coming from the roots of the seedlings...I never really found out what my problem was but even still I ended up with some healthy plants...they are nearing their harvest time and I wanted to ask you a question or two to help me determine the proper time to harvest your strain.

At this time I have one with a more indica influence and one more sativa. Both have lost all large leaves and only have some small single bladed leaves left. flowers are very aromatic. I would say that 50% of the pistils have turned brown and I can clearly see a percentage of white newly developed pistils...they have large and thick colas. If you look closely at the resin glands on the small bud leaves you can clearly see the amber color of the resin inside the globular resin glands....you can see that there is a higher percentage of lighter colored resin. I noticed a definite stretch of the internode growth about 8 days ago. The temperature is very high and so is humidity here...sunrise is at about 6:00 am and sunset is about 7:30. Bud sample: We sampled some buds 8 days ago and only received a small buzz...we sampled a bud last night and noticed DEFINITE psychoactive highs... I love the strain and find the plants that survived MY environment to be VERY strong and dense with buds... My end thoughts on Niagara is that it is worth every penny.” - Eric

“Harvest time for me, would begin when the majority of the trichomes were amber or brown, including, when the bracts begin to swell....They'll noticeably put on weight and put on weight and put on weight. I sometimes in fact take 2 harvests, as it were, by taking the best colas, at a given time; then allowing the smaller lower branches, and what's left of the main, cola-bearing branches to further develop and pile on the trichomes.

I don't encourage people to harvest Niagara in the clear globular trichome stage...it's a waste of time in my opinion. Harvested at the right time though; it's a beautiful thing.” - greenthumb

Strain: Niagara VE
Strain Type: Mostly Indica with Ruderalis
Origin: Ontario, Canada
Breeder:
Images: 1
Description:

Mostly indica. Mold resistant. Medium flower to leaf ratio. Potent. Medium to difficult areas (short season; cool spring & fall) Potency: 3 out of 5. Bouquet:
**Specifications:**

Indoor Growth Outdoor Growth  
Cutting height N/A* Plant Height 4'-8'  
Yield (/m²) N/A* Yield (/plant) 200-300 g  
Flowering N/A* Finish Mid-Late August  
*Indoor growth of Niagara VE is not recommended.  
Frost Resistance - Spring Very Good, Fall Good. “ – Dr. Greenthumb seedbank catalog

**Growers Comments:**

“Already grew out Greenthumbs Niagara and X Shiva. Not "da bomb" I was led to believe. I have grown out better Dutch varieties. Please remember that this is strictly my opinion I have been very happy with what they grew! Different strokes for different folks." - Indica Queen

“My Niagaras are starting to flower! They were planted outside a month ago. I was I surprised When I went out to water them today and some of them had flowers just in time. The others were just starting to show white hairs. I wasn’t expecting them to show sex for another month. My guess is that Niagara and Niagara x shiva auto-flower automatically at sixty days.” –Robin

“If this is true, it would stand to reason that Niagara is just a Ruderalis that has a little (recessive) amount of Sativa in it. I've grown Niagara X Shiva before and found it too wily to have indoors in a small area, but if I were to grow outdoors I'd consider it I think.”

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**Strain:** Niagara X Shiva  
**Strain Type:** Sativa/Indica/Ruderalis mix  
**Origin:** Ontario, Canada  
**Breeder:**  
**Images:** 1  
**Description:**


**Specifications:**

Indoor Growth Outdoor Growth  
Cutting height 24"-36" Plant Height 4'-6'  
Yield (/m²) 350-450g Yield (/plant) 100-125 g  
Flowering 50 Days Finish Approx. Sept. 1  
Frost Resistance - Spring Excellent, Fall Good.” – Dr. Greenthumb seedbank catalog

**Growers Comments:**
Family: Northern Lights Strains

Strain: **Aurora Borealis**
**Strain Type:** Mostly Indica  **Origin:** California  **Breeder:** Super Sativa Seed Club
**Images:**
**Description:**

"Yes it's The Brothers Grimm version of Northern Lights! Truly outstanding individuals were selected to breed our own UNIQUE true-breeding version of the classic NL#5." - Brothers Grimm

**Specifications:**

~ Flowering: 55-60 days ~ Height: 100 - 120 cm ~ Yield: 300 gm/m2

**Growers Comments:**

“This is my first crop with a 1K light. All 8 plants were grown in 2.5 gal containers, organic super soil. Seven Aurora B females from a ten seed pack. Vegged for 50 days and all finished flowering within 50 days. The Aurora B came on strong in the last two weeks. I didn't really expect what I ended up with, but they really bulked up well during the last two weeks of flowering. I topped the three tallest ones and they produced slightly more than the untopped, but the ones that I didn't top turned out to have some really nice colas. One ended up being around 18 inches long and 3 inches in diameter, plus a cluster of smaller flowers around the main shoot. Their scents ranged from pungent,(the big cola) to the lemon scents that these plants produced, and all of them were very frosty. The smaller plants were like lemons. Overall, I ended up with just over 13.5 oz's, including 11 oz's of Aurora B, from 8 plants. A happy camper. The AB kind of creeps on ya. It starts out as a light feeling in your forehead right after lighting up, and a couple minutes later you're feeling pretty damn good. After about an hour on the couch and I found myself in a daze, trying to watch Rocketman on the Disney channel. I'm no big time grower, and this is the first time I've grown a strain of NL, but I'd rate the Aurora B an 8 out of 10. It's a more complex buzz than Sensi's Hindu Kush and a much better producer. - Pauly

"AB potency doesn't get much better, if you're looking for an indica that is. It puts you in a daze till I fall asleep after a few bowls. It's my favorite, but it's making me fat!" - madam in Adam

**Strain: M39**
**Strain Type:** Mostly Indica  **Origin:** Holland  **Breeder:** Super Sativa Seed Club
**Images:**
**Description:**

none
"We have been working from a m39 mother plant that is from 1987. This is absolutely the most powerful strain that I have ever come across. I have purchased & grown many of the newer bragged on strains and still am looking for something that will even come close to this strain. I'm not saying that this variety is the most potent, just that in my over 15 yr. search this is what I've found to be the strongest so far.

"M39 by SSSC was "Basic#5"/Sk#1, but I BELIEVE "Basic#5" was actually NL#5, but SSSC weren't allowed to say so. You're actually looking for NL#5/Sk#1 which is available from Sensi Seed Bank, they call it "ShivaSkunk".

-MrSoul

Strain: Northern Lights
Strain Type: Indica  Origin: Pacific Northwest, USA  Breeder: Undetermined
Images:  1  2  3
Description:

Medical: Multiple Sclerosis “A pure Indica, won the Cannabis Cup in ’88, ‘89, ‘90. Much used for cross breeding for it’s strong and big buds. Famous throughout the world, everyone has heard of N.L. Sweet taste and very potent stone.

Specifications:

~ Flower: 7-8 weeks” – Dutch Passion seedbank catalog

Growers Comments:

Northern Lights
"pure Indica 88/89/90
An absolute must for the indoor grower! For the last couple of years the Northern Lights has dominated various Harvest Festivals. Through selective breeding we have succeeded in producing one of the most powerful plants in the world. On top of that, we have developed a strain highly adapted for indoor growing: compact, powerful with a good yield and exceptional resin production. The most lucrative plant for the indoor grower.

Flowering: 45-50 days.
Height: 100-125 cm.
Yield: up to 125 gr.” – Sensi Seed Bank catalog

"IMHO a Northern Lights would be best, easiest, and have the best high. This variety has been around for years; it has great name recognition. It is disease free, and easy to grow. They may not perhaps quite as great as some of the Big Bud hybrids. It can be grown using SOG, SCROG, or bushy. An all around great strain." -Kohala

“Bank: Positronics
Supplier: Jock
Started with 10 seeds all germinated. One sprout was lagging far behind the
misery. Ended up with 1 female, 5 males, and 3 herms. Again, like the rest of the Positronic stock grown out so far, these plants were close to identical in appearance. They looked very much like the NL x Shiva that also came from Posi. To bad it didn’t take after the NL x Shiva in all respects. The one female was not very impressive grown from seed and turned herm. It grew like chit. Very airy bud with little resin and a lot of leaf. The buzz made one clone one time to see if it could redeem itself. Because the buzz got better it though it still showed male flowers, not a lot but too many. The second time it showed flowers again and didn’t improve much in quality or growth. So now it’s dead. To be fair it could be that this plant just couldn’t handle being flowered so early possible.” - flick

**Strain: Northern Lights #1**  
**Strain Type:** Mostly Indica  
**Origin:** California  
**Breeder:** Dutch Passion Seeds  
**Images:**  
**Description:**
“Developed in Seattle, perfected in Holland, Northern Lights has become the “State of the Art” indoor plant. A must!”

**Specifications:**
~ Flower: 45-50 days ~ Height: 100-125 cm ~Yield: 300-325 gr/sqM” – Dutch Passion Seeds catalog

**Growers Comments:**
“Northern Lights #1 = Described as a true breeding strain (Stable) of Afghani origins.

Northern Lights #135A = Available commercially for just a short while (87-88) from the original Seed Bank. Described as "a fast finishing hybrid of Northern lights and an Afghani". This sounds a lot like the forerunner of Slyder/Chronic.”

**Strain: Northern Lights #2 a.k.a Oasis**  
**Strain Type:** Mostly Indica  
**Origin:** California/Holland  
**Breeder:** Dutch Passion Seeds  
**Images:** 1 2  
**Description:**
“One of the most popular varieties, Oasis is our Northern Lights #2 selection. A very strong plant, almost spider mite resistant. Good yield, excellent taste and excellent high.

**Specifications:**
~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.” – Dutch Passion Seeds catalog
Growers Comments:

“Northern lights #2 = originally a Hindu Kush X Thai cross. It was selectively inbred and developed into a stable almost all Kush type cross that is mostly indica.”

“I haven't done #5, but # 2 (Oasis) was great. Most people say that the NL strains have little or no taste or smell, but my experience with #2 was that it had an oniony, garlicky smell and Couch-lock, but surprisingly psychoactive, given indica's reputation. I don't think you can go wrong with a strain that highly touted.” - Skunkman

Strain: Northern Lights #5  
Strain Type: Mostly Indica  
Origin: Holland  
Breeder: Sensi Seed Bank  
Images: 1 2  
Description:

Medical: multiple sclerosis “This state of the art Indica is the result of over 20 years of select inbreeding. Bred for vigorous growth, high yield, and superb high. A must for growers who prefer short bushy plants. The buds have an extremely frosted, resinous appearance and the yield is high.

Specifications:

~ Flower: 55-65 days ~ Height: 2-3’’ – Sensi Seed Bank catalog

Growers Comments:

"NL#5 is NL with another plant crossbred. Part indica, part sativa. Grows great, a pretty good yield. I know a few that have grown it. Call it the "Christmas tree" bud, the plant looks like one. Thumbs up to it, it is a great strain." -V

"I got NL#5 never had any problems with cloning, also if its real NL#5 (which at all which is great if ya grow indoors. The ones I've seen really fill out at the sometimes looks like the yield will be marginal and then in the last couple of weeks with most indica strains, usually they do not fill out till the last 2-3 weeks of flowering. This strain, one of my fav's too." -Unknown

"I grew Sensi Seeds NL#5 and it was one of the best plants I had ever seen. I agree with Skunkman, its like a psychedelic couchlock, the buzz goes for long after inducing bloom, excellent flower/leaf ratio. I had good 400 gr./sq. I had good 400 gr./sq. drawback I noticed was you better watch the air humidity, they have a tendency to get too fat and sticky so the air won't go into. But when you keep moisture down to max. 50% rh. you should do well. To my experience they are true-breeding, but on the other hand inbreeding out of a small number of species might cause some problems and you may not want to have. I heard of NL#5 F2 that smelled and tasted like shit. -Shuzzit

"(For multiple sclerosis) my friend is currently using a pure indica (NL#5) wit
Strain: Northern Lights #9  
Strain Type: Mostly Indica  
Origin: Holland  
Breeder: Sagarmatha Seeds

Images:

Description:

“After years of heartfelt requests for a Northern Lights strain, Sagarmatha has engineered a superior version of the NL legend. NL#9 delivers the finest qualities expected from that variety: a short plant with a voracious stone and minimal smell. The flowering time is acceptable and fat chunky nugs can be expected. Fantastic for gardens where smell is an unfavorable factor. Also fine for persons who desire a heavy, lethargic stone.

Specifications:

~ Type: Indica-Sativa, indoor. Start vegetate: 1 - 2 weeks. Flower for: 50 - 55 days. Height: 0.75 meters. Yield: 300 - 325 g/m² (dried, indoor).” – Sagarmatha seedbank

Growers Comments:

“My 3 NL#9 girls were harvested last week, dried and are curing now. Plant #1 flowered for 52 days, 2 and 3, 56 days. I have to say that this is some of the best smoke of all time for me! Looks white in the bag slow clean burn, great taste, kick-ass high. I yielded about 5oz. off 3 plants. NL#9 is a Sag product. Info I've gotten says its NLxWhite WidowxJack Herer. Pretty intense stone." - KGB

“I chatted with Rosa from Sag some months ago, she said it was WW, NL#5 and Durban.... I've grown it too and it is quite nice...2 thumbs up from all that have tried it...its an up high for sure and lasts a solid 2 hours...but man does this shit stink when its in the baggie.... 2 layers of plastic can't contain its hashy smell...I saw a friend of mine smoke 2 joints and was he fucked...he turned down the third j and he is a REAL hardcore.... The next day he looked all hungover.... I've never seen him that high on grass in 18 years...this is some good shit" - Naughty

“Try NL#9 from Sagarmatha. This strain is NL#5, WW and Durban Poison. I've heard great reports about this plant.” - SK1

“I have been growing Northern Lights #9 from Sagarmatha for about 8 months and the yield is pretty good. My yield in hydro is a little over 2 oz's dry per 3 1/2 ft plant. The buds are HUGE, very fluffy, and very visible crystals. When growing the smell is very minimal but once the buds dry after an 1/8th will stink up your whole house even in Tupperware. Another great thing is that the plant is ready to harvest in 45 days, 50 days tops. I also had a few problems since I have corrected it I am expecting to get 2 1/2 or better my next harvest. I also have been growing this strain organically yields a little under 2 oz's using a 400 watt hps.” - KB

Strain: Northern Lights X Shiva  
Strain Type: Mostly Indica  
Origin: Holland  
Breeder: Amsterdam Aloha
Images
Description:

“Strong sweet weed, much THC, with big buds and few leaves. Improvement on, and has a stronger taste than pure Northern Light. This is the #1 in its kind. Best for inside cultivation.”

Specifications:
one

Growers Comments:

“The one I know is the NL X Shiva cross from Aloha which I like and have grown for years. It is very potent, wonderfully aromatic and complex. It is also pretty easy to grow and that it yields well! An all-around winner, IMO.”- Moose

Family: Orange Strains

Strain: California Indica
Strain Type: Sativa/Indica mix  Origin: California/Holland  Breeder: Sensi Seed Bank
Images:  1  2
Description:

“A fine blend of sweet orange flavoured Californian strains, combined with a versatile plant which performs well under all conditions. The more heavily branched specimens tend to be the big yielders.

Specifications:

Flowering: 45-50 days. Height: 100-130 cm. Yield: up to 125 gr. Flowering in the greenhouse: up to 500 gr.”- Sensi Seed Bank

Growers Comments:

“Lighting was a 50/50 mix of 1000w MH and HPS. The plants were grown in soil before planting. The plants started out under 40w fluorescent light in 16 weeks, then transplanted to 2 gallon pots under the MH and HPS. Plants were then the lights were turned back to 12/12. After the females were identified, they were transplanted into 5 gallon pots. No CO2 was used. The seeds were Sensi Seeds products purchased through Ubino. Two packs, 32 seeds, were germinated in paper towels. These seeds were a bit problematic. Some didn't germinate, others showed a root, but failed to develop any further. Others broke the surface of the soil, but didn't grow any "adult" leaves, stopping with just the 2 seed leaves. I ended up with 16 seedlings, 13 "normal" looking seedlings, with 3 "runts." The runts were discarded. Of the remaining 13, 7 turned out to be female. The plants physical appearance was very similar, with good branching. Finished heights were between 42 and 52 inches with the average at 48.3. Dry, manicured weights are as follows: min. 44g, max. 83g, average 56.7g.”
The smell and flavor was a little different for each plant, with the largest one being a bit fruity. The others had a better stone and resin, however. The high is quite "stony," not couch lock, absolutely no hermies with this strain, but 2 were subject to mold, and the grow was kept a bit dry, so if you grow this, keep an eye out for the tell tale signs of "bud rot." If you can tolerate the low seedling to seed ratio, I would recommend growing this strain.” – High Dog

**Strain: California Orange**  
**Strain Type:** Sativa/Indica mix  
**Origin:** California  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1 2 3 4 5 6  

**Description:**

“A stabilized hybrid, inbred since 1980. Can be extremely resinous, including the leaves. 50% Sativa, 50% Indica. Some plants have a pronounced citrus aroma and flavor. Very strong, slightly above average.

**Specifications:**

~ Flower: 8-10 weeks ~ Harvest: 1st week of Nov.” –Dutch Passion Seeds catalog

**Growers Comments:**

"Regarding California Orange... Ed Rosenthal says he knows (it was) developed in California in the 70's.”

“As far as the Cali O, wheeweee that is one excellent smoke too. This one of the Orange mom has been around for many years. It's hard to ever doubt that this is the real deal Cali O-- smells sooo citrusy it'll make your eyes water. Very coated with a pretty good bud structure. Keeps you very stoned and mellow but will not put you down unless you smoke too much. While it's not the most potent, this is definitely on the all time high list, for smell, taste, and quality of stone.” - ~shabang~

"I'm smoking some bud from an original Orange mom right now... she smells like tang, and has a great social high. The cuts can be traced back to California over 15 years ago...." - ~shabang~

"...This is the same cut of Orange that a few other people have passed around. The yield is pretty good when you consider it is a 7-week strain. You can let it go to 52 or 55 days and it is a little thicker but not as sweet. You can get 1.5+ pounds of organic per 1K of light, in 7 weeks that's not bad! Sorry no rough estimate yet Irish, will be ready in time for New Years though. I usually have one and 2 smaller side branches; I prune off almost everything below what you see. They're usually an ounce and a half per plant, can go up to two.

I didn't mention anything on the smoke of it. I've grown her so much and figured so many others have going on about her quality of stone would be old hat. You got it though-- one of the best hybrid highs around. Not the most potent but definitely strong enough.

I was smoking earlier samples while I was trimming and more than a few times I found myself standing up to trim instead of sitting cause I had too much energy. Amazing the kind of housework you can get done when you have a bud that doesn't lock you to the couch. The smell and taste are nothing less than complete orange overload. After rubbing off my scissor hash, my fingers smelled for hours like I'd been peeling oranges instead.
of trimming buds. It was too nice of a smell to wash off so now everything around is sticky too.

This cutting has been around for 20 years, originally from California. Cross-out tests have shown it is *not* a stabilized hybrid, looks more like the offspring of two unrelateds. Whether the parents were stable is anyone's guess, but this cut is certainly what "Cali-Orange" is supposed to be. I consider it connoisseur-quality. The orange smell is unmistakable, high is first rate, and potency is good, but not great. It's really good smoke and you wouldn't think twice about the strength until you live with her a while. I wouldn't be surprised to see a more potent line made sometime soon. I say its connoisseur-quality for a few reasons:

1) The average krippy smoker wouldn't think twice about smoking the Orange—looks good, smells good, gets you high. Nothing outrageous about it, it doesn't hit you like a 2 x 4.

2) The experienced connoisseur will note subtle differences about her that make her stand out among the crowd. Besides the fast flowering time and good vigor, you have to look at the head high, the lack of tolerance you build to her, and intensity of the smell. The quality of the high is excellent. It will range from strong head rush, to relaxing, yet quite energizing.

Asking me to pick a favorite between Orange and DAB is a tough one. The DAB is more likely to impress the average smoker—resin count, bud appearance; intense rush will make DAB the weed of choice. But the Orange has a timeless quality about her. If I could only take one strain to grow on a deserted island, I would likely pick the Orange." - Shabang

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**Strain: Orange Bud**

**Strain Type:** Sativa/Indica mix  
**Origin:** California/Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**  1

**Description:**

“A 100% Skunk selection, grows with thick hard buds and orange pistils. A very appreciated variety.

**Specifications:**

~ Flower: 8 weeks ~ Harvest: end of Oct.” – Dutch Passion seedbank catalog

**Growers Comments:**

“This pretty bud lives up to its namesake with light green buds, covered in bright orange hairs. There are also tiny crystals on all the leaves and buds. Its strong skunky smell is actually tapered by the more green smell that accompanies it. Fluffy and light, the buds break up nicely, leaving your filling. The expansive strong smoke tastes a bit like a brown weed (earthy)--the skunk taste has been eliminated with some green taste lightly in the background. ***1/2" – Homepage Amsterdam

“Mine is also from Dutch Passion. I'll be honest it is not a great yielder. My first hydro/organically, the brown weed taste. My last harvest, #4, hydro/organically, the brown weed taste. But my friends prefer the OB.”

“I prefer the OB to SK#1, one of the 2 other strains I own. I'm doing it in water culture with GH nutes, in a basement with about 6'5" total height, kind a pain in da butt. My version of the...
through Jock. Genetically it is about 6 months old, and in its 2nd flowering cycle. The taste is more citrusy than brown but the brown you speak of is noticeable. The strain just isn’t as sweet as an NL.”

“...I’ve puffed orange bud all over the world from Amsterdam to London to LA and it is consistently one of my favorite strains. At best, orange bud is hispid with very long bright orange pistils, very dense “nugglet” buds, and above average crystal production. Very nice cerebral high, wonderful juicy taste. IMHO, orange bud is one of the most common high-end strains in America and Western Europe.” -Mao

"Orange bud is a great strain(at least Positronics version is.) Potent and fairly potent. Chlorophyll in orange bud due somewhat to its trippy nature. Very clear high. A little light on the yields but still acceptable. Of the 10 or so strains I've messed with it still rates towards the top. Wish mine was still around. enjoy the orange.” –kaka

"Oh, yes it sure will stretch during the first few weeks of flowering. I found that by keeping my MH 400W about 2 to 3 inches from the top of the plant and placing a fan to gently blow the tops, the stretching will be reduced. Also flush it out with plain water before switching it to 12/12 and adding bloom nutrient. It is also one of mine and many of my fellow tokers' favorite strain." -Mota

**Strain: Orange Strains**
**Strain Type:** Sativa/Indica mix  **Origin:** California  **Breeder:** Cultivators Choice
**Images:** 1 2
**Description:**
Varies

**Specifications:**
Varies

**Growers Comments:**
none

**Family: Sage Strains**

**Strain: Sage**
**Strain Type:** Mostly Sativa  **Origin:** California/Holland  **Breeder:** Undetermined
**Images:** 1 2
**Description:**
not listed

**Specifications:**
not listed
**Growers Comments:**

“About the Sage--1 of the 2 was Female. She looked sickly all grow, but snapped out of it just before flowering. She was very haze influenced. The flowers grow in big, prickly masses. The pistils are so fat they're like needles. It really looks bizarre. However, the haze also means fluffier masses and a longer flowering period. I finally stopped mine at 11 1/2 weeks. I'm sure it could have done better if given another 2 weeks or so. My real hope are my Cinderella88/sage seeds. Hopefully it will solidify the nugs while shortening the flowering period. Who knows? And the high? Well, let me just say that whatever it was that I smoked in A'dam was the most devastating stuff I've ever touched. My sage has never quite done the same, but last batch had a nice energetic up buzz. We'll see how this goes after a nice long cure. All in all, Cindy is better, but this is a great one to have around for personal stash...” – shaggy

**Strain: Sage x Big Sur**
**Strain Type:** Mostly Sativa  
**Origin:** California/Holland  
**Breeder:** Undetermined

**Images:**

**Description:**

**Specifications:**

**Growers Comments:**

“Sounds very similar to the Sage x Big Sur Holy I tried in Amsterdam. Absolutely best stuff I've ever had. One small b-hit was all we needed for a good six hours. Seeing how it's a cross, the next generation should be rather unstable. Emery has the seeds (but are they F1 or F2?). I got mine across the pond. Also way too pricey from him ($200 for 10 seeds!) Buds aren't too big, but at 47 days they're just COVERED in crystals. The harvest window is supposedly 60-75 days indicating sativa. Taste is spicy, sandlewoody. Lots of capillate-stalked trichomes as opposed to the others like WW. It's hard for me to compare this to any others as it's my first time, but I've also got one NL x Skunk x NL. Much larger buds, but they just don't have the crystal development or smell. Also, my closet temps are extreme--often 110F or more. Can't say anything about yield in terms of weight. I've only got 3 plants and the only I don't want to get into this, but there's been a lot of talk on other boards. Unless I was lied to, these are real American genetics and not "merely" a refinement of strains from Holland (not that there's anything wrong with that!)” – Shaggy

**Family: Skunk Strains**

**Strain: Apollo 11**
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland/USA  
**Breeder:** Soul, Brothers Grimm

**Images:**

**Description:**
"This indoor hybrid has a high calyx/leaf ratio & finishes flowering in 7 weeks or less. Our big-yielding, lemon-scented female clone named "Genius" because of her CLEAR, energetic, thought-provoking high was crossed with a robust Cinderella 99 male to create Apollo Eleven. Expect some variation among individuals. The best females are short, heavily branched plants with multitudes of dense, resinous bud sites - perfect for SCROG. The smoke has a sweet citrus flavour. The high is UP & HAPPY." - Bros. Grimm catalog

**Specifications:**

Flowering: 45-50 days  
Height: 100 cm  
Yield: 1-2 lbs per 1000W lamp.

**Growers Comments:**

"This Indica dominant strain was created by backcrossing a male cross of ShivaSkunk from Sensi and Princess' brother (a JH f2) back to the ShivaSkunk mother. In "cubing" terms that would be ShivaSkunk.75. Another grower I sent them to liked them a lot too. I'm glad you're having such excellent success with my strains!" – MrSoul

"I believe Apollo 13 is P88 male X Genius (Princess' more indica type sister) but still a JH F2 from the same set of seeds found at the ‘Cafe in Adam. The new A11 is P94 or (C99 the more popular name) X Genius." - Webfish

**Strain: B-52**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“A truly superior skunk selection. Grows with heavy buds. Top variety for commercial skunk grower. As with other Skunks, superior sweet taste and aroma, the well known Sativa influence is detected in its high. Super fast for a skunky strain.

**Specifications:**

~ Flower: 7 weeks ~ Harvest: end of Oct., beginning of Nov.”-Dutch Passion

**Growers Comments:**

none

**Strain: BC Skunk**  
**Strain Type:** Mostly Sativa  
**Origin:** British Columbia/California  
**Breeder:** Undetermined

**Images:**

**Description:**

none

**Specifications:**
"Of the Skunks, I like the Federation's Island Sweet Skunk, which is originally Breeder Steve of Spice of Life Sweet Pink Grapefruit indica (sweet smell!) crossed with a 1992 edition of Sensi's Big Skunk#1, then stabilized. A strong trippy high, still allowing mental alertness, good big buds, sometimes a stretchy plant (that's the Big Skunk influence), very sweet lemony citrus smell and taste. Dana Larsen, the editor of Cannabis Culture, chose Island Sweet Skunk as his favorite Federation strain when I asked him moments ago, with the Hawaiian Sativa his second choice. You can work especially well on the Hawaiian Sativa, the ISS is more trippy, but no impairment there, either.

Dutch Passion uses a Hawaiian indica in their HAW/Skunk, which is a very big yielder and a lovely stone, its 65% indica/35% sativa. The Federation Hawaiian Sativa crossed Island Sweet Skunk (tremendous potential in that cross) would be 85% sativa, 15% indica, and I would endorse it, and yields on the ISS and HAW sativa would take 9 - 14 weeks flowering.

My favorite Canadian breeder is Steve of Spice of Life, currently working with Ed Rosenthal in Zurich at the vast marijuana farms that are there. However, I smoke a strain by Federation daily, and I have samples of over 20 of their varieties at any one time to choose from, so I am very familiar with their work and their strains would be 5 out of 10 of my top 10. (Mikado, Romulan, Hawaiian Sativa, Island Sweet Skunk, and their Golden Triangle Thai sativa).

To that I would add at least one Greenhouse strain by Arjan (White Widow), who is from BC, Flo (D.J. Short, who is from western USA), when it's from the Sensi Cannabis Castle, nothing seems more affecting than the Northern Lights x Haze, but its hard to find the quality NL/Haze outside of Amsterdam even with Sensi Seed seed stock.” – Marc Emery

**Strain: Big Treat**  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:** 1  
**Description:**

"Dutch Treat Female x Big Skunk Male (Sensi '95) Faint smell. Frosted producer. Decent bud, above average harvest in 8 weeks.” - Spice of Life Seeds catalog

**Specifications:**

none

**Growers Comments:**

none

**Strain: Euforia**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**
Developed by our breeders in 1996. A very fine Skunk selection, very commercial, bumper harvest, the famous Skunk high. Taste is not as sweet as our other Skunk selections but it is one of our favorites. Good for greenhouse as well.

**Specifications:**

~ Flower: 7 weeks ~ Harvest: end of Oct., beginning of Nov.

**Growers Comments:**

none

**Strain:** Lambsbread Skunk  
**Strain Type:** Mostly Sativa  
**Origin:** Jamaica/Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“The famous Jamaican “Lambsbread” crossed with Skunk #1 (F1 hybrid). A very special taste and high. Grows with long slim buds, has a medium yield and is almost 100% Sativa.

**Specifications:**

~ Flower: 9-11 weeks ~ Harvest: 1st half of Nov. in greenhouse

**Growers Comments:**

none

**Strain:** Pole Cat  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Sagarmatha Seeds

**Images:**

**Description:**

“A synonym for a pungent skunk, this girl produces flowers and highs similar to super skunk. The buds are large with lime-green hues and orange pistils. Very nice for persons who enjoy fragrant tops and a strong stone. She is a fast finishing plant that gets you in and out of the garden quickly. Fantastic for commercial enterprises.

**Specifications:**

~ Type: Indica-sativa, indoor and outdoor. Start vegetate: 1-2 weeks after roots show. Flowering time: 50 - 55 days. Average height: 0.75 - 1 m. Yield: 300-350 grams / m2 (dried)

**Growers Comments:**
**Strain:** Sensi Skunk  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Sensi Seed Bank  
**Images:** 1  
**Description:**

A strong plant with that typical Skunky taste and high. It has a high calyx-to-leaf ratio with large, full buds. Its excellent yield makes this one an absolute must for the greenhouse grower.

**Specifications:**

none

**Growers Comments:**

“At first look, these buds seem to be red with light green leaves interspersed (of course we know that’s not really possible, but honestly it does look that way). These compact, spongy buds have a skunky undertones. Broken up, the buds take on a green, fertilized scent. When smoked, it tastes a bit spicy, like a smoky-curry flavor and is smooth and mildly expansive in the lungs. This is a good example of "creeper" bud in that it comes on slowly but expands over a period of 10-15 minutes. **3/4" – Homepage Amsterdam

“Plant Profile: Short internodes especially while a seedling through about the 8th node, dark leaves, deeply serrated; sativa/indica phenotype.  
Aroma: VERY skunky. One rolled joint sitting out in an ashtray is enough to *stink* up a large house.  
Taste: Sativa taste; grassy, fairly smooth on the palate, not fruity nor piney.  
Yield: Good, 4 3/4 oz. on a 27" plant grown primarily for seed production not yield. Pollinated by a male haze from Posi.  
Bud profile: Buds (trichomes) very gold in color, tight nuggets, fairly bulky colas. Good resin production.  
High: Excellent. Deceiving though: it is definitely creeper weed. Three hits from a joint and it keeps on expanding. 15 minute lag time at least before it really hits you. Silly stone, trippy. Not an unnerving "Haze" type high at all, cerebral with a nice body stone.  
Comments: Nice plant, great high and excellent value. A few yellow male flower parts started showing just before harvest at 80% trichome browning (yellowing).” -Uncle Ben

“It was the LACK of a skunky smell that really surprised me. If you are growing hydro your stink factor will double. I can testify that this is a fact ...(5 year hydro grower, now back in soil for 2 years). I also found these will turn hermie if you don't allow a veg time of 2 weeks or so before inducing 12/12 when doing Sensi Skunk by clones. I had 5 out of 5 turn hermie from the same mother, and found the above to be the remedy. Also, according to Alan Dronkers from Sensi, this variety has recently been back crossed to an Afghani -dominant characteristic. I will keep this variety forever. It is entered in the Cannabis Cup each year as a "standard" if it weren't for politics, it should have won years ago. I believe this to be a simple Mexican-Afghani cross, which might explain why it performs so well: it is free of the genetic mess that makes up so many of the popular varieties today.” -Siege Gun
**Strain: Shiva Skunk**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Sensi Seed Bank
**Images:**  1

**Description:**

“This cross between Skunk #1 and Northern Lights #5 is a very reliable variety. Excellent hybrid vigour and yield make this one a snap to grow. Works superbly indoors as well as in a greenhouse, similar to Skunk #1, a rich sweet pungency, but with more resin and better yield. You can almost throw those scissors away as very little manicuring is required. An absolute must for beginners or experts.” – Sensi Seed Bank catalog

**Growers Comments:**

“I know that Nevil's NL#5 was the seed mother for the "Shiva Skunk cross. He never offered NL#5 as a pure strain etc. As for Basic 5 being the same as NL #5, well, I'm taking Mr. Soul's experience etc.) One thing I can add is that I remember the original Skunks having a much more powerful stone than most of the skunks today. It may be just a fond memory but I recall having the bell sound going off in my head after smoking skunks (10 years or so ago). People say it is not an attractive strain for some. I'm not saying that today's shiva skunk is not as good as the original. I know this for a fact. I've only grown Nevil's, not Sensi's. If Dr. T's friend has an original Basic 5, this would be a rare treat. "The resin Mother that started it all" so to speak.” – Prince Caspian

"I would suggest Sensi Seed's "Shiva Skunk" (NL#5 X SK#1). Very close nodes, sweet, fragrant smoke, high calyx to leaf ratio. Great resin production. I grew this strain for 4 years in a SOG format and I was very, very impressed. Very easy to grow with one problem I had is that after about 3 years the high started to get a little weaker and the yields did go down slightly. It just seemed to lose some of its vigor. So if you used it for 2 years or so, it could very well be what you are looking for." -imposter

“I would suggest Sensi Seed's "Shiva Skunk" (NL#5 X SK#1). Very close nodes, great yield and it will finish in about 55 days. Very high calyx to leaf ratio. Great resin production. I grew it for 4 years in a SOG format and I was very, very impressed. Very easy to grow with one problem I had is that after about 3 years the high started to get a little weaker and the yields did go down slightly. It just seemed to lose some of its vigor. So if you used it for 2 years or so, it could very well be what you are looking for." -imposter

“The most potent I have had to date is probably Shiva Skunk, a close relative of Silver Pearl. This variety is hallucinogenic. Not to be smoked if you have to operate any machinery within the next several hours.” – Hyde

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**Strain: Skunk #1**
**Strain Type:** Mostly Sativa  **Origin:** California  **Breeder:** Cultivators Choice
**Images:**  1  2  3

**Description:**

“Winner of several harvest festivals, and "High Times" Cannabis Cup. Skunk #1 originated as a cross between 25% Afghani, 25% Mexican Acapulco Gold and 50% Colombian Gold in 1978, now a stabilized homogeneous strain. Blooms with long, thick buds, varying in color from light green to golden. Very high flower to leaf ratio. Soft and sweet aroma and a very strong "up" high. Excellent variety for indoor growing or greenhouse with darkening system. Very high yields. Easy
a standard against which others can be measured.

**Specifications:**

~ Flower: 7-11 weeks ~ Harvest: 1st half of Nov. in a greenhouse." – Dutch Passion seedbank catalog

**Growers Comments:**

"M9 originally developed by the Sacred Seeds Co. A winner of a number of harvest festivals. One of the most sought after strains in the world. Ten years ago the sweet Skunk #1 arose from an Afghani, a Colombian and a Thai. It is now a stabilized homogeneous hybrid with less than 5 % deviations. The breeding plants were selected scientifically. The high is very strong and up. Examination tests selected the plants with the highest percentage of THC. A THC percentage of 15% was indicated by gas chromatography. The Skunk#1 has a high calyx to leaf ratio. Large long buds. It finishes the first week of Oct. Growing tips often lime green, mature plant often has yellow shade leaves. Neither is deficiency. The yield varies from an average of 500 grams. Yields of up to 2000 grams (5 pounds!) have been reported. Indoors-experienced growers can, by using the plantlet method, harvest 400-500 grams per square meter. (11 sq. ft.)" - SSSC catalog 1987-88

"Regarding ...Skunk #1, Ed Rosenthal says he knows (it was) developed by Cultivators' Choice in California in the 70's."

"Skunk #1 = originally developed by the Sacred Seed Co. (Cali/ Holland) Sk#1 arose from an Afghani X a Colombian X a Thai. As far back as 1987 they were reporting its stability to less than 5% deviation. Now 11 years later it has to be one of the most stable strains around." -Prince Caspian

"Original Skunk#1 is a relatively true-breeding cannabis sativa crossed cannabis Afghani inbred-line polyhybrid with a heavy tendency to its cannabis sativa parentage. Original Skunk#1 was developed by Cultivator's Choice in the late 1970's for outdoor and glass house cultivation. It has also proved to produce excellent sensimilla indoors under lights. Original skunk #1 is a medium green and medium broad variety of medium height that produces large, long floral clusters with very few leaves. The yield per square foot of Original Skunk #1 grown densely packed and strongly lighted can approach 40 grams of dry flowers. The flowers have a strong sweet & sour aroma and the taste is full-bodied and satisfying. The high is powerful and highly stimulating. Original Skunk #1 requires 8 - 11 weeks of a 12 hour photoperiod to mature completely. Skunk #1 makes an excellent choice for male breeding material. It was selected from 50 different cannabis sativa cross c. afghanica F1 hybrid crosses for its consistent true-breeding qualities. Skunk #1 is an inbred-line that came from a naturally combining hybrid selected for its crossability and true-breeding qualities, rather than a forced hybrid made in an attempt to blend different varieties with specific desirable characteristics. In other words, Skunk#1 has General Combining Ability (CGA). Simply crossing a select Skunk #1 with almost any other potent variety will improve it. " –High Times magazine

"Well, that explains its massive popularity from 1980 - 1992, afterwards a decline in preference for Skunk #1 began. Skunk #1 and Big Bud, both powerful and good yielding when they came upon the scene in 1980, simply had been outpaced by the developments in the field of commercial & recreational cannabis cultivation. My favorite Skunk experiences include these strains: Island Sweet Skunk (Federation), originally a hybrid by Spice of Life, which is Sweet Pink Grapefruit indica crossed Big Skunk#1 (Sensi Seed issue 1990), is a sweet citrus Skunk with a compelling high, and matches the description of the Skunk best. 60 days flowering. Jack Herer, here, the Skunk makes the Haze work without paranoia, but its finicky and difficult to get satisfying results at home."
By the way, in the CNN show Impact, ‘The Prince of Pot’ sequence regarding me, reporter Larry Lamott was standing in a room of identical Skunk #1 single cola plants (154 in the room) at 27 days into flowering. Has anyone noticed that really reeking, road kill skunk smell that used to be pungent but less cutting smells. I think Northern Lights with its low odor genetics in the market has in time reduced the skunky smell of pot, and NL and SK#1 are so often crossed these days. The Sweet Skunk by Brothers Grimm may well be a further development of the I.S.S. by Federation." –Marc Emery

"I've grown skunk 1 and hybrids made from it for nearly 20 years. To get a really good quality crop outdoors you need to be less than 40 deg from the equator it will need at least 10 weeks. With good cultivation will make 3 to 4 meters high and yield a pound or so of buds. Indoors it needs a minimum of 50 w per sq. ft and preferably double and takes 9 to 12 weeks. NL and SK#1 are so often crossed these days. 75% sat and can't be grown like a modern indica hybrid but when grown properly it gives all the modern var.'s a good run for the money." - Oldtimer1.

"Skunk #1: This plant is super resinous, has a marvelous sweet smell (does not smell skunky at all). Harvested at day 57, it could have gone another 10 days. All pistils were brown except some at the very tips. Calyxes were swollen. The smoke is about 40% body, 60% head. I like it for relaxing. Can maintain in public. Wonderful aroma before lighting and during smoking. Buds are very dense. This one is a keeper." - Splif Lipsit

"The high is nice. It is strong, yet mellow, and yet still pretty alert. For overall quality it is comparable to couch-lock indicas that we have today, it is still a good smoke. It would be considered high-quality kryppie grade smoke, but it's not that one-hit extra special. This is definitely a good plant to start with, very easy to grow, very cheap, and should be good for any reliable source you get them from." –shabang

"I find that no matter what I do skunk just seems to be light and not dense. I've used tons of light perfect nutrients, but the stuff dried always seems airy. Its super stoney, sticky, skunky, great weed but just isn't that great for production strain." -sketcher

"I hate the taste. That's just me, most people just think "oh that tastes like good pot" but I think it is pretty bad. It has a sort of sour-milk taste, kind of bitter. Hard to describe, its really just the way the Dutch Skunk #1 tastes. When I first tried it I told him not to be offended but I don't like the taste at all. Then he told me what it is and I agreed :-)

I have been growing sk #1 for years...my seed stock was bought back in the late 80's--don't even remember the seedbank. I think that sk 1 is a classic...very easy to grow, potent, good quality. It grows well under many different growing situations, indoors or out. The plant has a lot of variation. It also takes topping well, with little shock, and you can grow beautiful plants by topping them. The taste is nothing extraordinary, and it takes a little longer to finish than many of the other strains...'bout 70 days flowering." – ol'hippie

**Strain: Skunk #1 - Basic 5 hybrid**
**Strain Type:** Mostly Sativa  **Origin:** California  **Breeder:** Super Sativa Seed Club  **Images:**
**Description:**
“M39 Skunk #1 crossed with the Basic 5. This hybrid was a harvest festival winner in its first year! The Basic 5 is a female clone which has been cultivated successfully in Holland for quite some time. It has demonstrated its value very well in indoor growing as well as in outdoor growing. We have proven that it is the best during commercial cultivating, and has been chosen by us to be the seed mother for this hybrid. The Basic 5 is a small, solid and thickset indica plant with heavy buds, suited very well for indoor growing, the high is extremely heavy. This hybrid assures excellent results for both indoor and outdoor growing. Using the plantlet method, an indoor yield of 2000 grams (more than 4 lbs.) per square meter per year is possible. These yields can be increased still further (up to 1/3) by flowering cuttings when they are only 6 inches tall. Harvest outdoors: Oct. 1.” – SSSC, 1987 catalog

 Specifications:
see description

 Growers Comments:

“I believe Basic 5 was simply a name SSSC used in the place of NL#5 because, at that time, Northern Lights wasn't yet a "household name". This would mean that M39 = NL#5/SK#1 = ShivaSkunk.
I grew M39 back in the late 80's and I have been growing ShivaSkunk during the past couple of years. Taking genetic variation into consideration, they seem to be the same plant...although slightly superior plant - it's probably just nostalgia.
Sad story: When my ex-wife and I moved into our ex-house, I had a vial with a dozen M39 seeds stashed in a box of old books. She was cleaning the basement one day and found the seeds. I acted like I didn't remember putting them there. She turned around and threw them in a pan of bacon frying on the stove. I don't miss HER at all - but I SURE wish I still had those SEEDS. I worked for SSSC for two years in the mid 80's. I never asked "Kees" exactly what Basic 5 was...though now I wish I did because I've lost touch with him over the years. I can't say for SURE if it's NL#5, but I had that impression.” - MrSoul

 Strain: Skunk Indica  
 Strain Type: Sativa/Indica mix  
 Origin: Holland/USA  
 Breeder: Positronics  
 Images: 
 Description:

“Outdoor / Greenhouse With 100% Skunk seeds, it's not possible to grow fully mature outdoor plants, because the seeds were selected for growing under artificial lights. Skunk was crossed to let it mature sooner and to make the plant stronger for outdoor conditions. This is an F2 generation as a very nice outdoor strain. Flowering period: 7 weeks · Harvest time under natural light: end of September, 2nd week of October.” – Dutch Passion seedbank catalog

 Specifications:
see description

 Growers Comments:  
none
**Strain: Skunk Passion**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**

“Skunk is the best known variety to the indoor grower. Skunk Passion is a selection of these seeds. Selection was based on early flowering. It’s no use growing these seeds outdoors in Northern climates (see Skunk/Indica). The strong pungent smell is characteristic of this variety. Mean THC levels are high. Sensitive to spidermites, over and underfeeding. Sweet and soft smoke, very high.

**Specifications:**

~ Flower: 8-9 weeks ~ Harvest: 1st half of Oct. in a greenhouse” – Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Strain: Skunk Red Hair**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:**

**Description:**

“The variety which made indoor growing possible since 1985. Still one of the growers favourite. Will even taste better outdoor if care under right conditions.

**Specifications:**

~ Flower: 8-9 weeks” – Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Strain: Super Skunk**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Sensi Seed Bank  
**Images:** 1 2 3 4  
**Description:**

“This plant is especially developed for Skunk lovers. Crossed of best Skunks
against this plant and the room becomes immediately filled with powerful Skunk aroma. Despite the smell a very pleasant high with a little more body to it than the Skunk #1. One of the winners of the 1990 High Times Harvest Festival where it clearly defeated Skunk #1.

**Specifications:**
none

**Growers Comments:**

"Super Skunk = Sk#1 X Afghani (a skunk #1 backcrossed to an Afghani indica)"

"I've grown Super Skunk (sensi'95) and it performed very well (especially since the price was like 60 guilders or so). It would make a great commercial weed-- very resinous, nice fat buds, thick deep smell, I don't like it but many people do. The high is strong and covers both sides... it will put you to sleep if you smoke too much." –shabang

**Strain: Trance**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank
**Images:** 1
**Description:**

“An upgrade of the former variety Skunk/Indica. With 100% Skunk seeds, it’s not possible to grow fully mature outdoor plants because the seeds were selected for growing under artificial lights and greenhouse. Skunk was crossed with an early Indica, to let it mature sooner and to make the plant stronger for outdoor conditions. This is the F1 generation. It has come out as a very nice strain.

**Specifications:**

~ Flower: 7 weeks ~ Harvest: end of Sept., 2nd week of Oct.” - Dutch Passion

**Growers Comments:**

none

**Family: Uncategorized Strains**

**Strain: Amstel Gold a.k.a. Passion #1**
**Strain Type:** Indica  **Origin:** California/Holland  **Breeder:** Dutch Passion Seedbank
**Images:**
**Description:**
Amstel Gold is an Indica variety developed in California in the seventies and has been grown outdoors in Holland since 1980. Smokes soft with a citrus like aroma and has a good high. Compact resinous buds. One of the best green outdoor varieties in our collection.

Specifications:


Growers Comments:

Dutch Passion was asked by AMSTEL BREWERIES to stop using the name for seeds. Now those seeds are to be called Passion #1, but I’m not using the switch name yet, its too confusing to explain name changes while genetic make-up remains same.” – Marc Emery

Strain: Bazooka
Strain Type: Indica  Origin: British Columbia  Breeder: Undetermined
Images:
Description:

An excellent green variety. Not much known about this strain but the breeder did mention Bubblegum. Good results indoors and out.

Specifications:

Specifications:

(indoors) ~ Flower: 55-60 days ~ Height: 5-6’ ~ Yield: Above Average  outdoors ~ Plant: Jun. 1st ~ Finish: Sept. 15th ~ Height: 6’ ~ Yield: Above Average” – Marc Emery Seeds catalog

Growers Comments:

none

Strain: BC Hash Plant
Strain Type: Indica  Origin: Afghanistan, British Columbia  Breeder: Undetermined
Images:
Description:

none

Specifications:

none

Growers Comments:

“This strain is the BC Hash Plant. The origin is back in the pre Russia invasion Asian type weed strains smuggled back to the islands 25 years ago. The basics were developed outdoors. Today this strain is reputed to be grown as large as 4 lbs. a plant in hydro systems over 120 days. Actually my friend Norm of Arthrology had a picture of himself in such a room brought into evidence in his trial. The strain specifications:

Specifications:

none

Growers Comments:

none
has also been grown on tables and dirt with good results. The colour is light green. It has a sweet pungent smell that loses its strength as the bags are smaller. You can pack it in your pocket in ounce quantities without everyone in your immediate area knowing someone has a bag on them. Good smoke as long as it's fully matured and cured with a bit of time. Just one slight warning. This will be resolved in time. So in these seeds you will find plants with the back genetics of 100 generations behind. To the inexperienced grower what does this mean? You will find a higher than liked ratio of males to females. Secondly you will find a variety of height and strength with in each plant. Getting ten seed that you get any two to look the same. For the personal smoke grower this is great because each plant will give a different buzz. No tolerance builds up. For the professional grower it means germinating 75 to 100 plants to find two or three mothers that you like. Needing to get that high to here is there too. Hermies. You can expect that under any real heavy stress situations, like dry out, overfeeding, and problems in flower stressing, may result in a large hermy break out. In good conditions there still may be a few stamens appearing. This is because the back breeding has not been as long as would be preferred.” – Bongblaster, Seed-Bank.com

**Strain:** Beatrix Choice  
**Strain Type:** Mostly Sativa  
**Origin:** Mexico, South Africa, Holland  
**Breeder:** Super Sativa Seed Club (SSSC)  
**Images:**

Beatrix Choice was one of the original offerings from the Super Sativa Seed Club, listed as M27 in their 1987-88 catalog, as well as their 89-90 catalog. Here is how it was described:  
"Plants were selected for the quality of the high. Extremely strong. The father was an inbred Acapulco Gold strain and the mother was a very potent Indica/Sativa strain (Afghani-south African). A great hybrid. One of our own favorites. Very suitable for outdoor and indoor growing. You can harvest an enormous amount of overpowering, trippy buds. Harvest in Holland: middle of September". - Super Sativa Seed Club catalog 1987-88

**Specifications:**

none

**Growers Comments:**

none

**Strain:** Big Mac  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Federation Seedbank  
**Images:**

"If you like indicas then you can't go wrong with Federation strains. Big Mac is a great one. It grows well, and the taste is almost a sweet hash like, the high is great unless you like munchies which it doesn't give you. Helps with pain, only draw back for me was I could not sleep for hours after I tried it (evenings) kept my mind very active but body was not going anywhere." -mota20
Strain: **Big Sur Holy Weed**  
**Strain Type:** Mostly Indica  
**Origin:** California/Holland  
**Breeder:** Undetermined

Images:

**Description:**
none

**Specifications:**
none

**Growers Comments:**

“When I went to A-dam in November, they had the SAGE bud offered by THSeeds at the Hempworks. I was told by the breeder in A-dam that Sage was Big Sur Holy Weed x Haze. I was also told that the Big Sur Holy Weed was his nicest yielding/tasting Afghan. Bud was top notch, hope this helps.” - Damion


Strain: **Blue Mountain Jamaican**

**Strain Type:** Sativa  
**Origin:** Jamaica  
**Breeder:** Wild Rose Seeds

Images:

**Description:**
Sweet, earthy taste, rare to find. Resinous large buds with few sucker leaves.

**Specifications:** Cuttings of this strain can be brought to maturity in 65-75 days of flowering immediately after rooting. Seedlings need to veg for 35-40 days. Flowering time 65-75 days

**Growers Comments:**


Strain: **Bolivian**

**Strain Type:** Sativa/Indica mix  
**Origin:** Bolivia  
**Breeder:** Positronics

Images:

**Description:**
“Imported, pure breeding Sativa/Indica: more Sativa

**Specifications:**

Appearance: looks like Mexican, slim buds  
Smell/taste: not especially great  
Height: 2m  
Yield: med  
Harvest date (Netherlands natural photoperiod): end Sept  
(# of weeks): 7-9  
Indoor / greenhouse / outdoor  
Typical Bolivian, matures early.  

Strain: **Champagne**  
**Strain Type:** Indica  
**Origin:** British Columbia  
**Breeder:** Undetermined  
**Images:**  
**Description:** none  
**Specifications:** none  
**Growers Comments:**

“Champagne is a Kush indica from Vancouver, BC I have the clone and as far as I know any seeds are hybrid only. It’s a great yielder with excellent crystal and ranks 8+ on my scale. Unfortunately, not good enough to make the grade compared to my 9+ plants, but a good indoor plant anyway.”

Strain: **Chemo**  
**Strain Type:** Mostly Indica  
**Origin:** Canada  
**Breeder:** Undetermined  
**Images:** 1 2 3  
**Description:** A legendary potent British Columbian indica strain rumored to have been developed by the Canadian government as a medicinal strain for cancer patients. Now apparently found only in cuttings or crosses such as MCW.

**Specifications:** none  
**Growers Comments:** none

Strain: **Cream Sodica**  
**Strain Type:** Indica  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:**  
**Description:**

>“Named for its live scent and colour. The finished product has a dry aroma with overtones of black currants. The heritage of this strain is the result of a cross between Gulf Island strains from neighbouring islands. The result of this cross has been...”
easily manageable and distinct strain in itself. It is intended for a hardy outdoor yielder, with excellent mold-resistant, cosmetically saleable buds. It works; the boys are getting rich.” - Spice of Life catalog

Outdoor Harvest: Sept. 7th (at the latest)
Outdoor Yield: 500 gm / plant
Indoor Harvest: flowers in 44 days
Generation: F7

Growers Comments:
None

Strain: Early Bud
Strain Type: Mostly Indica  Origin: British Columbia  Breeder: Undetermined
Images:
Description:
“Fast flowering, big buds. Fresh citrus like taste, nice high. Very similar to early girl.”  ~ Flower: 8 weeks  ~ Harvest: Sept.”  – Marc Emery Seeds catalog

Growers Comments:
none

Strain: Early Girl
Strain Type: Mostly Indica  Origin: California  Breeder: Cultivators Choice
Images:
Description:
“This is a mostly Indica variety, one of the earliest in our outdoor collection. Very potent, medium yield, with a hashy taste and aroma. These compact plants will tend to grow to one main stem, making them an ideal choice for your balcony.”  – Sensi Seed Bank catalog

Specifications:
Developed: inbred 10 plus years - Stabilised hybrid: not consistant Sativa/Indica: 10% / 90% - Appearance: many with columnar shape, tends towards Indica habit; some turn purple with cold at harvest - Smell/taste: coarse hash taste, not sophisticated Type high/strength: medium plus, physical - Harvest date (Netherlands natural photoperiod): end Sept / begin Oct 12hr day exposure harvest (# of weeks): 7-9 Indoor / greenhouse / outdoor Selected for earliness”  – Positronics seedbank catalog

Growers Comments:
"Regarding Early Girl, Ed Rosenthal says he knows (it was) developed by Cultivators' Choice in the 70's."

"Early Girl - This is a mostly Indica early variety developed in Northern California. The plants are compact and very sturdy, and will tend to grow to one main stem. Very potent, medium yield, with a hashy taste and aroma. Inbred for 4 generations and carefully selected for quality and earliness. Early Girl is an outstanding choice for growers seeking an early Indica-type.

Outdoor Data -
Height: 4 - 6 ft.
Finishing date at 40° N.: Sept. 1
Yield: 1/2 pound
Price: $50 for 15 seeds" - The Seed Bank catalog, 1989

“I grew this last year outdoors. about 5' tall at harvest, lots of short side branches, yield was about 4 oz. of average quality weed. excellent hashy taste which peaked at about 1 month of curing and then started to decline. high was average and didn't last very long. maybe due to accidental pollination. susceptible to bud mold in high humidity.” - dr.atomic

“I grew it, or at least something called Early Girl, that I got from Holland in the late '80s. It was pretty average all the way around in my opinion. About average yield, high, and everything. I got some California Orange at the same time and liked it a little better. That was a while back, though. They might have improved it in recent years.” – Been There

“I don't know where they get that crap about it finishing Sept. 1st. I was at 44 something degrees north, and they didn't finish until about the end of September. I do remember that there were a couple of bad seeds, maybe I just got some slow ones. Or maybe they were just lying too.”

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**Strain:** Early Pearl  
**Strain Type:** Mostly Sativa  
**Origin:** California  
**Breeder:** Sensi Seed Bank

**Images:**

**Description:**

“Mostly Sativa with excellent potency. Sweet, resinous and mold resistant. A popular outdoor variety.” - Sensi Seed Bank catalog

**Specifications:**

none

**Growers Comments:**

“Ed Rosenthal says Early Pearl came from the Midwest, but was a cross of Early Girl and Polly, an early California sativa.”

“I've grown this both inside and out. If you do a search, you'll probably find something written on this type; In brief, it is effectively pure sativa (though actually has..."
recessive in all respects). Inside and out, it likes to grow large. Stretch continues right through flowering, which was a respectable 8 weeks (the only virtue carried over from early girl). Buds are thin, green, sweet and sharp smell, very good sativa high- quite psychoactive (trippy?). Little paranoia, very long high. Unless you grow very big plants, yield is low, as could be expected from such a plant. At present I'm wondering if EP mother- it has decided to auto-flower. After re-potting the 10-inch plant into a 1.75 gallon container, re-vegging started, but now it looks like it's going to go back into flower again. Root mass is HUGE.” – retro13

“I grew EP last year for the first time. I didn’t get them to maturity, because of three or four major fukups by me, along with a VERY wet autumn, so my yield was almost nil. I planted out on June-1, they suffered a couple of frosts during which some purple showed. I planted them out after sexing on 12/12, which I wouldn’t do now, because once these plants start to flower, they don’t like re-vegging, so a confused bunch of semi-flowering plants was the result. Water soluble slug pellets resulted in the plants being eaten to one foot tall bare stems soon after. I re-veggied the 10-inch plant into a 1.75 gallon container, and this stopped the damage. Having been eaten back to about 18” in early July, the plants reached about 6’ by week-1 Oct. During the whole summer, they were not rained on VERY heavily, and for the last month of their lives they were in perpetual cloud/100% moisture. Only one plant showed any signs of mold (and this one showed only small patches)- which I was extremely pleased with.

They’re funny plants when it comes to cuttings. They seem to be much slower to take than most, but the huge amount of vigor that is inherent in the breed means that the cuts don’t die- they just ‘exist’. The mother plant was the result of three or four major fukups by me, along with a VERY wet autumn, so my yield was almost nil. I planted them out after sexing on 12/12, which I wouldn’t do now, because once these plants start to flower, they don’t like re-vegging, so a confused bunch of semi-flowering plants was the result. Water soluble slug pellets resulted in the plants being eaten to one foot tall bare stems soon after. I re-veggied the 10-inch plant into a 1.75 gallon container, and this stopped the damage. Having been eaten back to about 18” in early July, the plants reached about 6’ by week-1 Oct. During the whole summer, they were not rained on VERY heavily, and for the last month of their lives they were in perpetual cloud/100% moisture. Only one plant showed any signs of mold (and this one showed only small patches)- which I was extremely pleased with.

The smoke is good- smooth, sweet, menthol/lemony. It has a lot of central american Sativa ancestry. The high is long lasting and ‘happy’- a day-time smoke. The buds are long and thin. I noticed two phenotypes (ratio 14:2)- 14 plants had broad, long leaves, high vigor, high yield (finishing at 4-5’), more compact, started flowering earlier, but didn’t mature as well, more susceptible to mold, thinner leaves. Some of the large phenotype flowered with pistils the color of pink-grapefruit. Its not the easiest plant I’ve grown, and this may account for why its not more common, but its definitely is mold resistant beyond any doubt. These plants get the yield from the size of the plant, not the density of the buds, so try to ensure a good size by July, and DON'T pinch it out. I’m hoping for 3 or 4 ounces per plant this year- I've put them into my best patch.” – retro13

“A FOAF grew Early Pearl for a couple of years. It's nice and versatile. A foaf think the plant is a mix of sativa/indica. It has longer node spacing than you may like indoors like a sativa, but it grows fat wide fans like an indica. The high is kind of mixed too, a little spacey, followed by complete body freeze. Its nice...” - cuz

“I have a strain grown here for at least 10 years. I believe its Early Pearl due to the description in the Sensi catalog. Inbred for many generations, but no signs of wackyness!!! Some varied in height, but all part short, very bushy and branchy. Thick medium length bus with many crystals. Has thin sativa type leaves however. High is excellent as well as flavor, sort of sweet but not fruity. Does best in full sun, but does well in SE sun. Is one of the best strains I ever seen for indoor production. Very fast to bud, 6 weeks to 7+. The mother plant is doing better than seven weeks. A 12" plant put into 12/12 will only stretch to 20-22", but
Widow which I like slightly better for taste and high (maybe from years of smoking the former) but the yield of the EP? is 3 times that of the WW and in 6-7 wks not 8 wks. I would like to get what it was so I could reintroduce some of the possibly lost genes. However, time. If this is EP, many don't know what they're missing, cause this is THE strain for quick, crystally dense nugs. I don't know why it doesn't have a more known reputation!!" -green h

**Strain:** Early Skunk  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Sensi Seed Bank

**Description:**
“A cross between Skunk #1 and Early Pearl. Finishes two weeks earlier than smooth high, mold resistant and a good yielder.” – Sensi Seed Bank catalog

**Specifications:**
none

**Growers Comments:**
none

**Strain:** G-13  
**Strain Type:** Indica  
**Origin:** Mississippi USA  
**Breeder:** U.S. Government

**Description:**
none

**Specifications:**
none

**Growers Comments:**
“The Headquarters Seed Bank in Amsterdam, later known as the C.I.A. (Cannabis in Amsterdam), sold a strain called O.G.13b. The (mid-80’s era) catalog stated:

Variety: mostly sativa  
Cultivated: U.S. genetics manipulated in Holland  
Breeding: stabilized hybrid  
Smell/Taste: sweet and spicy. Effect: overpowering, stupefying high  
Appearance: many flower clusters, covered with resin  
Flowering: 11-14 weeks. Harvest date: late November  
Yield: Indoor - 225 to 275 grams per square meter. Outdoor - 150 to 200 grams per plant  
Height: 2 to 3 meters (Indoors: Sprawling Sativa).  
Also, The Seed Bank’s 1989 Catalog sold G-13 x Hash Plant and G-13 x Northern Lights #2. The catalog says: ‘G-13 is an outstanding pure Indica cutting reputedly discovered by the government in Mississippi. Widely grown as a commercial indoor plant in the US, G-13 has proven to be one of the best breeding plants in our collection’."
“The G-13 pure, 55 - 60 day sativa (sic), doesn't exist in male form any longer. The last pure G-13 seeds were offered in 1988 by Nevil's old bank. A description from an old catalog would be nice, but someone out there will. Sensi's version is a female propagated by cuttings from a female was pollinated by the stout afghan HASH PLANT male, and that is the G-13 I sell g-13 x Skunk by THC seeds of Amsterdam, but candidly, it doesn't get great reviews. G-13 has become very strong since HIGH TIMES magazine featured a photo of 28%, the highest they have ever seen. Sensi responded to this interest, and it is expensive. I know no one who has grown out the seeds to fruition yet. Some others strains that exist only in female cutting: William's Wonder, Garlic Bud. Anyone can think of any others?” -Marc Emery

“From an article about what Nevil Schoenmaker grew: G-13 is a very potent indica with a very strong stem and short internodes but a longer less webbed leaf. Although very strong, it seems to lack "personality" but is an excellent plant for breeding." -Hightimes, September 1990, page 50.

"If you are in the Deep South like Mississippi or Alabama, there are lots of chunky skunky badboy local bud. Sometimes people sell blowaway as "G" short for g-13. But looking at the picture, it looks more like a Kush than a fat indica leaf." -Johnny Reb

“If you want the best of the best then I suggest you start searching for the pure G13 or its hybrids. That by far is strongest bud today (I've never smoked straight WW but have had crosses with a very strong head buzz it pales in comparison to the G13 strains). I have a G13xNL; it grows medium nodes with huge fat blades. This baby produces trichomes with heads instantly with the finished its just has thick white golden look all over has a deep penetrating nose. I was told that smell is a 10 cause it's so deep and pungent, with a deep orange flavor. It produces large size golden nuggets (I have a 400; maybe with 1k it will do a lot better). The buzz will you up for a high lift, then suddenly it will slam ya back with force. VERY STRONG: I've tried against 6 strains: NL5 Sensi, AK47, Kali Mist, Yumbolt, Blueberry, Jack flash, and none can even compare in potency taste and smell.” - Dankmaster

"It seems to be predominately indica, but it could be anything. My particular variety came from the Mississippi farm. Fat leaves, red stems (leaves), usually only 5 fingers, but I've seen 6 and even seven. Super resiny, and a fast finisher. This is definately a hybrid. At least our tax money is going for something worthwhile." –Airborne

"The G-13 was 43 days in 12/12, and while I might have let it go to 50, I need the weed and it was done. I have let it go to 64 before and it was MUCH too long. The G doesn't yeild as large a cola as an AK, but the buzz is outrageous. I'm so spoiled that I won't smoke anything else. The yield is better and juicier in hydro than my previous harvest in soil. Also, with this breed I think a good veg time is about 10 days to two weeks." –Airborne

"For what it is worth, I always heard the name G-13 came from the person who actually 'liberated' the clone. G standing for Government and 13 representing the 13th letter of the alphabet = M = Marijuana. G-13 = Government marijuana" - Prince Caspian

“Sensi Seed offers g13xhashplant and that was it. It is the same as the one sold in the 80's and it is also 2/3 of Black Domina. I learned this at the Sensi Seed shop 1 day after I bought the seeds directly from Alan Dronkers hands at the Pax party house. I spoke to Tony about the Mantanuska and he said that nobody has smoked it and none is ready yet. I picked up 10 Mantanuska and 5 peak19 beans (Mantanuska x Stonehedge) for 300gilders (about $175american). Adam from T.H. Seeds (Tony's best buddy and provider of the Bubblegum and Californian genetics) told me its "Sag's big bud" with "great dense yields but not a 9 or 10 in potency" and that the Stonehedge was a "more rewarding high/plant to grow".
Strain: Kali Mist (a.k.a. Western Winds)
Strain Type: Mostly Sativa  Origin: Oregon, USA  Breeder: D.J. Short

Images:

Description:

Medical: Multiple Sclerosis“ Serious smokers know, pure Sativa is a smooth smoking experience not soon forgotten. Kali is a superb Sativa with a high calyx-to-leaf ratio, and long running tops that produce full, fluffy buds. Expect this goddess to produce a high resin content with spiral buds that Kali Mist won the 1st Place Cannabis Cup in High Times 1995 hydro competition, and is the personal stash for expert gardeners!

Specifications:

Sativa, Flower: 70-77 days (63-65 days in actual reports)  Yield: 275-425 grams/m², Height: 1.2-1.5m.” – Serious Seeds catalog

Growers Comments:

" Kali Mist from Serious Seeds was another winner (at the 1996 Cannabis Cup) in the judges' opinion. It had a high-energy, uplifting high that could cut through a dissipating high from a previous joint(not Kali) one night at about 11 p.m., another at 2.00 a.m. and then Kali cut right through my fatigue and fog, energizing me enough so that I couldn't fall asleep. Judging from the bud's appearance, Kali appears to have much Southeast Asian character. The buds are nowhere as full or weighty as any of the other samples. I suspect if it were grown outdoors, maturation would not be complete until very late in the year.

I grew Kali Mist ancestral stock in the early 80's in Oakland and those plants matured in late November, and into December. The looser, somewhat feathery buds of Kali Mist would present a problem for indoor growers looking for weighty buds. Despite these shortcomings, I liked it very much -if I were to grow for personal stash, I would grow Kali.” -Mel Franc, High Times Magazine, May 1997

“I got to smoke some KM bud this week (sent to a friend from a friend) The taste is every thing they say -floral, spicy with a funky stank that I've only tasted in types that come from the land of Aloha. BUT I would only rate the high at 7-7.5 AND it took 14 WEEKS to finish!!” - greenbear

“I have clones from two females that I'm growing for the second time, so I can relate my experiences to those who are curious about this strain. I got my seeds from Serious Seed Co., which is the bank reputed to sell the authentic article. I read Mel Frank's review of Kali Mist in a sidebar article of High Times a couple of years ago. He gave the description (and provided a matching picture) of a STRAIN that sounded quite like Original Haze. However, when I grew the seeds, they didn't look like a NL#5 had been crossed with the plant Mel described. The leaves were dense...only the individual floral clusters growing off the sides of the colas looked a little bit Sativa. The flavour and scent are spicy and delicious - the high's very pleasant, but not outstanding GOOD, as the colas are rock-solid, but the flowering period is an awkward 9...
“(The Dutch) have bred some excellent strains which have become popular, to be ruined by back-crossing to an Afghani (presumably to increase yield). Sensi's Durban. That's my personal "pet peeve" of the Dutch strains. Once a strain is established and made commercially available, it should remain the same. Or, if the breeders change the genetics else it's fraud. Serious Seeds has never (to my knowledge) admitted that the now are NOT the original genetics...but many of us here know that today's Kali Mist..."

Strain: Kong
Strain Type: Indica  Origin: British Columbia  Breeder: Laughing Moon Seed Co.

Description:

“Kong is the next step in plant genetics for yield. Easily capable of yielding 4 lbs per 1000 watts! This is not a misprint! Kong is not Big Bud, or a Big Bud derivative. They're has never been anything like this in the world of cannabis production. Kong will be the benchmark by which all other plants are judged. The mother plant was purchased for $40,000. And now after a year of intense testing and experiments crossed the Kong super plant mother with an early and potent White Russian x Bubble Gum male. Since both of these plants are from diverse genetic gene pools you can expect very good hybrid vigor. Flowering is 63 days and potency is extremely high. It doesn't get any better. This plant will blow away the best Big Bud yield. Colas for this plant will reach sizes equal to a 2 Litre Coke bottle! This plant matures in last 2-3 weeks of flowering.” – Laughing Moon catalog

Specifications:

none

Growers Comments:

"I've been promising you all a report on Kong when she finished. She's just finishing outdoors now. I've been sending ~S~ pictures and maybe he'll post them and give everyone a looksey. Kong shows 2 different Pheno-types from it's hybrid crossing. I call one tall and the other bush. The tall leans towards it's White Russian x Bubblegum side. Long slender buds up to 16". The smell and taste I've ever tasted. Ok what everyones wanted to know , the potency. One word, excellent. It rates right in there with my best. I can't honestly report on the yield yet but well over a pound and yeah I know , taller than tall , has dense , chunky buds and will be the bigger one. not as sweet as it's sister but holds her own well. The potency is very good. Tremendous production. I just got a first class digital camera and will show you through ~S~. Remember I didn't get or start these seeds until June. If you're wondering should you try Kong? I give it my highest recommendation. Good work , Paul , you've got a winner!” - Danbo

"This is my first time growing. I used 2 1K lights, 6" pots, 8 X 4 flood table, GH nutes with Pureblend growth formula. The flood table fits 36 6" pots. However, I only grew 10 female clones. About 6 hermaphrodites and 10 males were cut down. I didn't take care of my garden very well, and that is why I only grew 10 females that I grew are very fat. Extremely fat. With huge, fluffy colas. The final results are: 10 KONG Females = 35 ounces potent pot. The final weight for the ten plants after 1 week of drying and 3 weeks of curing was 33.125 oz + estimated smoking of 2 ounces during process. I've been smoking
years, and Kong is definitely rated as "better than good" high in my books."

"He said he grew them in 6" pots spread out on a 8'x4' flood table. He got SLIGHTLY more than an ounce per square foot. Which is pretty typical. So far NO ONE has come anywhere NEAR the 4lbs/lamp that's being claimed for KONG." –MrSoul

“I averaged over a pound each on the Kong. As far as the best commercial weed to grow, Holyweed is my first choice. I've seen it go over 4 lbs. though it usually averages about 2 lbs. per lamp-full.

“Still in veg. Put a few of them at 24 hrs light. (Scared a bit for hermies) They did stop their sleeping time (when the leaves go down for their night light or not). The leaves stay up 24hrs a day and they grow like mad weed. What I am seeing look to me like I’ll get the largest yield VS plants in my life. The branch system is incredible. I took a lot's of clones so they are only 4 feet high but they look like they could already be easy. The cloning was easy too so many branches. Very happy so far, you posted. Salt ferts used. In pro mix #4.

One bad side: looks like I have 2 strains here. One looks more productive than the other. I was expecting something more stable. But then I won't loose money on both seeds. Easy to grow. But for the cash cropper, you will have some work to do. Kinda nice so you clone and clone :))) I had one very weird looking male very Afghani-like. The other male the other female, talk about weird. In 18 years it is a new one to me, I'm gonna test this thing to death.” – Orchid Man

“Potency is good, definitely gets you stoned. It’s about on the potency level of an NL5 or Skunk1. It’s not up to the real big kills like AK, but it is a strong weed. The plants are super-vigorous and abnormally branchy, they'll grow very large and are not good SOG candidates-- they need big bushes. I only grew one clone, never a lamp-full, but the yield looked above average. The pheno that I got was the tall one that is really smelly. The smell and taste were just of rank, strong weed-- not fruity-- kind of musky." - ~shabang~

“I agree that Kong (hybrid) sure seems indica to me! Mine have wide leaf structure "Afghani-like"/"indica-like". Very prolific plants. It is my understanding that this strain is within the hybrid strain from LM. You got your Kong momma crossed with (Canna?) Bubblegum and White Russian, which I believe is White Widow/AK-47. Also, according to legend, Kong is a laboratory-manipulated strain.... gene splicing....???”

“Well there it is... 380 gr. dried buds on 1 plant. The newbies would say, wow, that is a lot. The plant was beside my old faithful strain and the buds on my old strain were way bigger. The plant was SO BIG THAT IT SHOULD OF GIVEN 2 POUNDs (oops caps locks)!!! I know that many breeders say only one super productive mother in those 10 seeds, but these seeds are so prolific, I have 2 principal ones, which one to clone??!! In those 10 seeds 5 plants were unusable, (genetic defect or male etc) plus another bad side is: My old strain was not affected by the white fungus but the Kong is very prone to fungus attack. Not good for a humid Place like the pacific northwest, I would not buy some other Kong seeds; I will reveg my old faithful strain. Only one seed did produce a really good mother. This very plant did pass near of being thrown away because at birth it was separated in two main branches, one male the other one female, talk about genetic aberration. So... the man is a goof in front of my friends because I did believe in a story that was false. And all the effort that I did spent on those mothers that won't give shit... So... the man is not very happy...

I have to say that the clones are behaving differently from the mother, more...
but then the mother did look promising at first then she did stop after 1 pound. So I feel that I was taken for a ride and contribute to pay for their 40,000 mother that they did not take the time to breed as it should be, now they start to sell those seed saying that it is a cross of 3 strain, it is going to be the one who will try it for sure. For 250$ I was expecting more stability. ENOUGH!

Keep you posted about the clones, it might be another story...they look good...

“Kong update, for those who would like to try the Kong, don’t waste your time and money on it, it is way too unstable and almost no resin glands. The yield is not so great and you would have to be very lucky to find the right mother in this mess of strains. My old strain, (northern light derivative) it gave me the same yield. There is absolutely nothing special about the Kong, I am very mad to have wasted my time and effort to this unstable strain. It was grown under 1000w hps and 4000w MH, I supposed to be at least 2 pounds. For the same space and light, I would of have the same yield, but not this strain.” – Orchid Man

“Here are my final thoughts about this Kong story. These clones did give a really good harvest finally; I was lucky to find the right mother.... It is indeed the largest yield by square/feet I have ever had. The time factor in mind (2 months and a half to flower) compare to 7 weeks for the formation of visible resin glands, I would suggest the Kong growers to use MH. In 2-3 weeks, more resin glands this way than under HPS. The clones under HPS gave the lower yield and potency than the ones under MH or the Sunmaster. The most potent ones were under white MH. I took the HPS's out of there completely when I have seen this. If you live in a place on heart where it is very humid, be aware that this Kong is very susceptible to fungus attack. Meaning that during the same time that the Kong took to give me this yield, a faster flowering strain because I could of done 2 harvests of the faster strain, the Kong is lagging. For those who like potency and resin production, the cash cropper with a lot of free time then it might be a good strain, but the budz on the budz, it can be a problem for those who sell their crop. If I compare the harvests I have seen, there is nothing so special about the yield of the Kong, still very unstable judging by those last Kong report we have read lately. So do not buy the Kong for my own personal smoke (potency, buzz and ordinary taste) and turnover this strain for a future crop even if the yield was really good, because of the Time/yield factor. A newbie would find this strain very interesting and he would be happy to tell his friends that he have had a hell of a good yield. I can't give the Weight details on the board, but I can say that 4 clones = 1 pound. (Almost the double weight of the northern light but it took much longer to achieve it.)

They are big plants, even if you give them only one month veg. from seeds they will be 4 feet high. They become rootbound very fast. They grow very fast and need a normal fert dose, not more than other. They won't give many visible resin glands under HPS but will still be decent smoke. The best way to do it is to use clones only, they are much more manageable than many strains in these 10 seeds; I had 4 different strains in mine, 7 females 3 males. The best looking ones (largest leaves) won't give the best yield. The best MOM looks like somewhat paler green with elongated leaves and a very extensive branching system. Use large containers.” – Frenchie
Strain: Matanuska Tundra
Strain Type: Mostly Indica with Ruderalis
Origin: Alaska
Breeder: Sagarmatha Seeds
Images: 1 2
Description:

“This variety brings back that majestic legendary marijuana from the great Alaskan Northland. Highly recommended by the best fishing and hiking guides in the Matanuska Valley. Danali “Mt. McKinley herself. A glacier of THC crystals frosts her colas and packs more power than an icepack polar bear. Persons prone to altitude sickness should use caution.

Specifications:

Type: Indica-sativa, indoor and outdoor, Start vegetate: when the roots show, Flowering time: 45-50 days, Average height: 0.5 - 0.75 meter, Yield: 350 - 375 grams / m2 (dried).” – Sagarmatha Seeds catalog

Growers Comments:

“As a matter of fact, almost all the Sagarmatha strains I tried were pretty average. The only standout was the Matanuska Tundra or whatever Tony calls it. When I went to Alaska I had the real deal Matanuska Thunderf*ck and they weren't anywhere near the same. The real Thunderf*ck has an insane "woo-hoo, I am high!!" kind of high... Sagarmatha's products all seem to be interest strains. Even Western Winds, with it's "soaring cerebral high" was indica laden.

"Alaska hasn't any indigenous strains, so it would make it very, very difficult for Matanuska to be a pure strain. Matanuska is a hybrid that grows like an Indica and has a Sativa high, that rules out the chance of it being a pure strain. It was named Matanuska because that is the name of the Matanuska/Susitna Valley, just outside of Anchorage, where the strain was first produced when it was brought into Alaska. For reference, the original name is Alaskan Matanuska Valley Thunderf*ck. The name "Matanuska Tundra" was made up by the Sagarmatha Seed Company in Amsterdam. Supposedly, Rob from Sagarmatha actually went to Alaska and pirated some genetics that were available, took them back to ‘Dam and crossed them with Dutch strains, Peak-19 being one variation. Now, seeing as how Matanuska Thunderf*ck didn't originate in Alaska, it makes it unlikely that Sagarmatha's version is Matanuska.

Exception to the rule, after years of being cultivated in Alaska, some versions have acclimatized and, in theory, could be called "true" Matanuska. Maybe... Rob found someone with some "true" Matanuska SEEDS he could smuggle back to Holland or met not a single person with seed, only clones. Also, Thunderf*ck is some of the best weed in Alaska, getting someone to give up a desirable seed or an even more desirable clone to a foreigner is an act of God. So, I would lay money Rob didn't take "true" Matanuska home with him, I can't imagine him coming or going through customs with a cutting.

By the way, the weed in Amsterdam is cultivated by private growers and sold to the coffeeshops in bulk. So regardless of what shop the Tundra was purchased at, the seed originated from Sagarmatha.” – Geronimo

Strain: Oakland Indica
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Super Sativa Seed Club

**Images:**

**Description:**

“M14 - One of the best commercial indica hybrids in the U.S. We have got these seeds from a colleague grower who has made a lot of dollars with it. The yield is enormous, a modus of 1 lbs. The potency is super. In Holland it flowers at the end of September. Some individuals will take up to two weeks more to mature. The plant in the picture turned purple because of a very cold fall.” - S.S.S.C. catalog 1987-88

**Specifications:**

none

**Growers Comments:**

none

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**Strain:** Romulan  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Romulan Joe

**Images:**

**Description:**

“One thing is for certain, the original pure Romulan has much more sativa than a simple Kush/Afghani. Much more aroma as well, it’s pungent pine bud aroma is what makes it stand out. The original mother clones have been around for about 20 years. Another term that keeps popping up when describing Romulan is the old California blue indicas. I met with Romulan Joe a little while back and discussed Romulan's heritage, I think I recall him mentioning some Mexican sativas but don't quote me on it, I wasn't taking notes, haha.” – Vic High

“It has been one of Vancouver Island's best kept secrets for a few years. Up until now, Romulan Joe from the island was all Vancouver knew of Romulan. Then I showed up with some bud and photos looking for advice about good genetics to cross it with. I caused some commotion. I was offered some serious dollars for a clone. I said no but that I would work something out with some seeds. For you breeders, take note that 18 months ago Vancouver breeders did not have access to Romulan genetics.

At that time both the Romulan that Joe was bringing to Vancouver and my Romulan was the same bud. About six months ago I returned and Vancouver's Romulan was now more potent than mine but had lost some of its flavor. I also noticed that Emery was now selling Romulan/white widow F2 hybrids. I was told that they got hold of some Romulan/white widow hybrids from Romulan Joe and I was also told that they were the source of Steve's Romulan. Steve is saying otherwise.

When I grow out the Romulan/strawberry blonde I'll know the truth. Pure Romulan is a very stable plant that produces very uniform F1 hybrids. If Steve's hybrids are uniform, then we'll know he used pure Romulan and not the Romulan/white widow that Emery used. I'll also know if Steve ever publishes a photo of a Romulan plant and bud close-up. Buds pictured in Cannabis Culture and High Times are small for Romulan and are more than likely Romulan/white widow crosses. My Romulan gets bigger buds with less light intensity.
I'm only posting this to clear up some of the confusion. Emery's Romulan white widow produces some killer bud. Steve's Strawberry blonde is very good and whether crossed with Romulan, it should produce very pleasing results. A third source for Romulan genetics will be Heaven's Stairway who will be offering Romulan/blueberry (Romberry) F1 hybrid seeds.

BTW: The only reason I feel confident that I am lucky enough to have pure Romulan genetics and how long it’s been in the area. Emery, Shaun, and the others down at HempBC only confirmed it.

-Vic High

**Strain: Strawberry Blonde**
**Strain Type:** Mostly Sativa  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:** 1  
**Description:**

“Strong mostly Sativa hybrid. Heart racing paranoid cannabinoid profile. Toasted oats. Tight little strawberry shaped bud. The edges of the sugary leaves curl with crystal! The golden stems are the blondes. Wicked personal! F2.

**Specifications:**

Flowering Period: 10 Weeks Outdoors: End of Oct  
Yield: Average  
Sea Of Green: Tight  

**Growers Comments:**

none

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**Strain: Sweet Tooth**
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:** 1  
**Description:**

“Sweet Pink Grapefruit x Blueberry Male x Grapefruit F1 Backcross to Mother. Very sweet, mostly indica. Fruity, frosty & fairly fat. Mostly lime green bud with royal purple accents. Outdoors the calyxes are prone to purpling completely. The sugar taste is almost sickly sweet.

**Specifications:**

Height: squat bush indica  
Flowering Period: 7-8 Weeks  
Harvest Outside: Mid Oct  
Sea Of Green: Thick and Plump” - Spice of Life Seeds catalog

**Growers Comments:**

“This whole garden was Sweetooth, and it turned out very nice, took 9.5 weeks to flower but the yield has totally made up for the increased wait. I can't wait to get the CO2 going with the climate controller. This winter is going to be fun.
I harvested 644 grams of smokeable bud with a 600-watt light, very efficient, new thing for me. I didn't calculate under developed buds, they have already trim leaf. 46 grams per sq./ft of beautiful colas...;-)

53.7 grams per sq./ft, 50 watts hps, 2.5 per sq./ft, clone, GH, coconut medium

Sweet Tooth is a fun plant to grow I'll hopefully have some pics of the harvest plants between 24-28 inches tall, some colas were solid to 12 inches. Very nice and the high is pretty strong. Sweetoot doesn't require much odor control at all plant. I think I've got my garden down their isn't too much other than CO2 worthless for me during the summer because I have to ventilate all the time but winter should be great.” - Shiva

“I've been growing both Shishke & Sweetooth for a while and would choose having both of them for over a year. The Sweetooth is a large yielder (50 grams large contiguous colas even on short plants. The visual of the cured bud is great yielder; I haven't quite decided if the Sweetooth can out yield the Shishke in Shishke and Sweetooth are both blue berry hybrids and I notice a lot of similar plants, but the Sweetooth has a sweet scent (no ozone required), and can take more stress live. Shishke smells kinda musky, doesn't like heat. If heat stressed it will have buds in a different garden have no herms ... otherwise, very easy plant to grow and high from the Sweetooth is just like the SOL ad "keeps us giddy & high all day buzz, the Shishke has a hashy taste, and the Sweetooth is sweet & berry.” - Shiva

“I was pretty surprised by the 'up-high' of the Shishke the first time I puffed it before with just a hit. It's nice to have for stash, but for me I build a tolerance (joints of it after being all too acquainted). Sweetooth hits like a nice funky ~wave~, smile on my face everytime, the buds smell so sweet, encrusted with trichomes that a fun to handle ... two tokes are plenty ... social indica, you can bring it to anyone.” - Shiva

“I can't really describe the phenotype differences very well with the plants in distinct looking phenotypes I've recognized. My mothers look almost identical pruned many a time & I didn't document any notes from their seedling stage them and see what happens when I flower them, when I start from seed.

One of the phenotypes makes fluffy looking, but tight strawberry shaped buds (Sweetooth in CC). The other phenotype makes a more evergreen looking bud lime green bract color & large, bigger than your hand blue/purplish fan leaves. One thing to note, the pictures that are/were on Bongblaster's site don't look like I have. Must be just a little bit different or maybe it was an earlier cross. I think first backcross, so a few differences are to be expected, but I think both phenotype quality. The I have let them go as long as 63 days of flowering time and can quality of smoke is much better around 50 days, although yield is improved at I've seen too many different looking blueberry type plants to really be able to shape. I think the one with the more evergreen shape might be a tad bit more fairly up & cerebral to me. If I smoke too much before bed I usually have to get floating 4 feet above the bed. Sweetooth is spacey smoke, not too heavy of a sentence I wrote before & laugh).”-Shiva
**Strain:** **Texada Timewarp**  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia  
**Breeder:** Undetermined  
**Images:** none  
**Description:** none  
**Specifications:** none  

**Growers Comments:**

“Texada Timewarp is the famous outdoor strain grown originally and still today on Texada Island in the Georgia Strait. I have been there, just off the coast of Powell River, by BC Ferries, specifically as a pilgrimage because I felt sincerely, "I should go to these places and find out who knows the history." since I often end up as spokesman for "us".  
Here’s what I learned:  
Texada Timewarp, this summer's planting, comes from an 18 year old clone mother, very few seeds are known to still exist, only crosses are available in seed form.  
Texada is outdoor, on Texada most Timewarp was 5'-7' at harvest, but I have seen it reach up to 13' on Texada and in neighboring Gulf Islands.  
Though it grows tall, sativa like, often with sativa like leaves, I'm not sure (its heritage) can be determined. It finishes October 1st.” –Marc Emery

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**Strain:** **Western Winds**  
**Strain Type:** Mostly Sativa  
**Origin:** not listed  
**Breeder:** Undetermined  
**Images:** 1 2  
**Description:**

“An almost pure Sativa with a soaring cerebral high. A favorite amongst Rastas who wish to have a high-energy buzz. Fantastic for conversation or romance with its relaxing and invigorating Oriental aroma and spiritual high. Whether smoked in the morning or evening, the experience is always rewarding and pleasurable. So put Western Winds in your sail and ride the high”

**Specifications:**

~ Type: mostly Sativa, indoor. Start vegetate: flower shortly after roots show. Flowering time: 70-75 days. Average height: 1.2-1.5 m. Yield: 300-350 grams / m2 (dried)”

**Growers Comments:**

“These puffy, compact buds are a uniform deep green and textured with a thick layer of white crystal fur, and thin scattered orange hairs. The scent is a strong, tangy, citrus bio smell. The buds break up into small round budlets; the stems taste a bit citrusy. When smoked, the buds taste mild and are expansive in the lungs. The high comes on quickly and is visual, stony and spacey. ****1/4” –Homepage Amsterdam

“Medium to tall sativa Thai like plant. Will grow medium length nodes with big Thai like leaves. My mother produced fat size rounds buds covered in a furry fuzz. Had a spicy like smell. Amsterdam
taste; the high is very strong UP clear and focused...the yield will determine the selection. I got lucky and had a great one out of 2 seeds"-sloppy seconds

"INCREDIBLE BUZZ!! The most unique flavor I have yet to encounter. Strong elevated buzz. Soaring through time & space with your eyes closed or open." - Prince Caspian

"About 70 days to flower, and turn up the lights!! Don’t expect a large harvest for your personal enjoyment considering the time you'll have invested in it. It is very good. If you can do it outdoors, then good for you." - The Big Weenee

"Kali mist is a winner. Matures in 65-70 days...but from what its description says the same with the one I got. Mine grow 1-2" nodes and grew to 3' and yielded dense too not fluffy and not small too softball sized side buds, really high cal, no trimming, a very spicy smell and taste with tones of incense, very clear UP focused high. One side note I have noticed with my mother is that light got messed up and she is flowering a bit temperamental."

"Vote for the strongest ACTIVE/CEREBRAL high? Kali Mist! Hands down on that high clear and focused...the kind that great when you need concentration. Hands down that's the best exotic sativa actually its pretty short too for one not medium nodes big Thai like leaves, it has been told it yields shitty well I must have a good mother I got about an oz from it also makes airy buds. Mine made some of the fattest round buds with orange hairs I've grown. Good density was not airy at all very crystallly looks like fuzz to the naked eye not very visible but it's totally covered has this strong spicy smell/taste with incense tones it about 65-70 flower time. The high is super UP strong very clear and focused a very good high for times when you need concentration. BTW if you decided Kali get it from serious and not sag's western winds they are alike but the Kali is the true winner." - Dankmaster

"In the case of multiple sclerosis an indica is a good choice, but I don't think with using a strong indica to ease the pain is that it also fries your brain and leaves you temporarily incapacitated. I would suggest either a 60/40 cross between Sativa/Indica or a pure Sativa. Kali Mist/Western Winds is an excellent pure Sativa and White Rhino is a great 60/40 cross between the two." - Nurse Hawthorne

"Kali Mist is a Serious Seeds strain. This Strain is also available from Sagarmatha Seeds under the name Western Winds. Having grown this strain, I would recommend getting Sensi Seeds' Jack Herer. The strains are very similar but the Jack has a bit more weight to it." - Prince Caspian

**Strain:** Williams Wonder  
**Strain Type:** Indica  
**Origin:** California  
**Breeder:** Super Sativa Seed Club (SSSC)

**Images:**

**Description:**

“Described as a special indica hybrid, that is short and squat in stature. It is an U.S. The 87-88 Super Sativa Seed Club catalog states that it can not flowered induced inside first. So this indica hybrid was selected solely for indoor grower...
**Strain:** **Yumbolt**  
**Strain Type:** Mostly Indica  
**Origin:** Oregon, USA  
**Breeder:** D.J. Short  
**Images:** 1 2  
**Description:**

“Yumbolt brings back that old-fashioned flavor from the hills of Humbolt Co. California. Possessing a sedative stone with an outdoor aroma, she will often induce heavy eyelids with a satisfying smile. From the first toke till the last the taste remains. A producer of large succulent flowers, this girl will qualify for every grower’s needs. Let Yumbolt produce nice dreams for you.

**Specifications:**

~ Type: Indica-Sativa, indoor and outdoor. Start vegetate: 1-2 weeks after roots show. Flowering time: 55-60 days. Average height: 1 meter. Yield: 350 grams / m2 (dried).” – Sagarmatha seedbank catalog

**Growers Comments:**

“I found that Yumbolt is very similar to Black Domina. I have smoked Yumbolt in A’dam and it was one of my favorites. I noticed a similarity between it and the Black Domina that I have been growing since 95. Since then I have grown out the rest of my original BD seed and of the 2 that I have tried so far (still drying) the #8 female tastes exactly like the Yumbolt. It was one of the fastest also, harvested at 47 days. Very resinous, you have to take small tokes or risk coughing up a lung. I think Sag offers 20 seeds for 200 fl. and Sensi sells B.D. 15 seeds for 175 fl.” – pud_420

“At one time it was hybridized, but has been around a while. I e-mailed Rosa at Sagarmatha. She said that it was a strain given to them by a friend from Humbolt Co., CA. She said there was some variation with the original strain, and through selective breeding were able to stabilize it. She said it has a very strong aroma (typical of Humbolt varieties) and a very heavy stone.” - Caterpillar95

**Region:** European Strains - Holland and Switzerland

**Family:** BubbleGum Strains
Strain: **Bubbleberry**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Sagarmatha Seeds  
**Images:** 1 2  
**Description:**

“A Bubblegum and Blueberry hybrid. This plant produces larger buds with more strength and taste than original Bubblegum. Pungent sticky flowers with an overpowering aroma provide the smoker with a bubbly high and long lasting buzz. Sure makes blowing bowls of bubbles more fun!

**Specifications:**

~ Type: Indica-Sativa, indoor and outdoor. Start vegetate: 1 - 2 weeks after roots show. Clip center cola. Flowering time: 45-55 days. Average height: 0.7-1 m. Yield: 300-325 grams / m² (dried)

**Growers Comments:**

none

Strain: **Bubbleberry X Williams Wonder**  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia/Holland  
**Breeder:** Sagarmatha Seeds  
**Images:**  
**Description:**

“We have blended the strength and vigor of Bubbleberry with the growth characteristics of Williams Wonder. Both plants compliment each other with their unique qualities. The smoke is very tasty and possesses the scent of a flowery bouquet. The high is heavy and long in duration, leaving the smoker with enough energy to be mobile. This hybrid exhibits a shorter, rounder version of Bubbleberry persuasion along with a slightly earlier flowering period. Fantastic for stash and production purposes. Definitely one of the world’s wonders.

**Specifications:**

~ Type: Indica-Sativa, indoor and outdoor. Start vegetate: 1 - 2 weeks. No need for pruning. Flowering time: 50 - 55 days. Average height: 0.5 - 0.75 meters. Yield: 300 - 325 grams / m² (dried)

**Growers Comments:**

none

Strain: **BubbleGum**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Sagarmatha Seeds  
**Images:**  
**Description:**
“1995 2nd place winner, with little details about the strains that produces it. Extremely resinous with an uplifting high. “

**Specifications:**

none

**Growers Comments:**

"I grew out the H.S. "original" version of Bubblegum. I had two ladies that were in hydro, 400W MH. They grew (untopped) to 4 and 4.5 feet high respectively. I flowered them at 12 inches tall grown from seed. Very sativa-like pattern with a huge stretch indoors. They had very strong stems and with coke can size colas stood up without support. Flowered for eight weeks for one, eighth and a half for the bigger one. They came in with 22 inch and 24 inch colas, and the smaller cola weighed six ounces wet. I didn't get to weight them again in whole. All my friends loved this smoke! They all said the taste is one of a kind, and the high was sativa-like...up and buzzy. Had my one buddy "drumming" on the table non-stop:) They were grown along with some GWS and some NL5; both of which were very potent as well, but both had a more narcotic body high. Most folks asked for the Bubblegum, which had in one case very reddish looking buds and the other lady developed buds that were brown/red looking. Both had the same taste and seemingly the same great high. Will keep it for a long time in my grow..." - Lancelot Link

And now for the Bubblegum, a little background: Definitively Adam (TH Seeds) brought from cal. to Holland a sweet smelling indica female named Bubblegum (no male) he gave it to Tony (his buddy, subsequently the owner of Sagarmatha Seeds). Cerebral Seeds split up into Sagarmatha and Serious Seeds both seed banks had the same genetics. The next year Bubblegum was 2nd place winner (1995 Cannabis Cup). Sure it was the same (only!) female available at the time. Serious Seeds took over four years to improve (cube? or further....) that female. You can find their reasons in the mail above. What I have to say is that, after having spoken with Adam himself, I've decided to buy his SPECIAL Mr.Bubble® which is a hybrid of the original cal. Bubblegum female and a original, pre-Serious Seeds, version of Kali Mist (the one that was developing at Cerebral Seeds, in fact after the split both had their version of Kali Mist/Western Winds). I think Mr.Bubble® is an outstanding hybrid because it's made of the ORIGINAL gene pool of both parents. It is now a F4, almost stable, hybrid." - Dr. Turner

"Bubble is available for 150 NLG and has 22 seeds. This has to do with low germination rates at the last tests and making up for that. I don't know the one Adam sells personally, but do know that they derive from the same genetic background. It took a while before I was pleased with the product and there was also a personal thing involved, with the person who brought
the genetics over to Holland. I waited till that was resolved to satisfaction." - Simon, owner of Serious Seeds, Amsterdam

Strain: **Double Bubble**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Undetermined

**Images:**

**Description:**

“These buds are army-green colored, crystally, and evenly covered with long dark orange (almost brown) hairs. Broken up, these buds release the scent of sweet freshly cut grass or even hay with some slightly skunky undertones. The smoke is smooth, non-expansive and has a mild sweet taste. Although the high does not hit you right away, it first creeps through your body making you feel stoned and then only moderately effects your cerebrum, allowing you to concentrate on any task at hand. **” – Homepage

**Specifications:**

none

**Growers Comments:**

none

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**Family: Jack Herer Strains**

Strain: **Apollo 11/13**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland/USA  
**Breeder:** Mr Soul

**Images:**

**Description:**

"This indoor hybrid has a high calyx/leaf ratio & finishes flowering in 7 weeks. Our big-yielding, lemon-scented female clone named “Genius” because of her CLEAR, energetic, thought-provoking high was crossed with a robust Cinderella 99 male to create Apollo Eleven. Expect some variation among individuals. The best females are short, heavily branched plants with multitudes of dense, resinous bud sites - perfect for SCROG. The smoke has a sweet citrus flavour. The high is UP & HAPPY." - Bros. Grimm catalog

**Specifications:**

Flowering: 45-50 days  
``Height: 100 cm.  
``Yield: 1-2 lbs per 1000W lamp.

**Growers Comments:**

“This Indica dominant strain was created by backcrossing a male cross of ShivaSkunk from Sensi and Princess’ brother (a JH f2) back to the ShivaSkunk mother. In “cubing” terms that would be ShivaSkunk.75. Another grower I sent them to liked them a lot too. I’m glad you enjoyed them.**" - Bros. Grimm catalog
success with my strains!” – MrSoul
“I believe Apollo 13 is P88 male X Genius (Princess' more indica type sister) both of seeds found at the ‘Cafe in Adam. The new A11 is P94 or (C99 the more popular name) X Genius.”

-Webfish

"GROW THE A-11 FIRST!!!, it is WORLD class smoke!!! But I have to warn you, if you cross Apollo 99 and Genius, 90% of everything else you grow won't come close. After you let this one slip through your fingers you will be bummed!!! The bud from Apollo has a sweet fruity/citrus taste, and a high that gives you the energy to go out and do something...even if you can't remember what it is!!! Every one that has smoked the A (my version is the A-13, Genius crossed with Cinderella99) has said it is some of the best they have ever smoked!”

-greenbear

"AFOAF grew some (Apollo) recently and got an indica phenotype that finished flowering in 50 days. The indica phenotype is very resinous, clear high. Not racy nor paranoid. Dense buds. The Durban phenotype has a stronger high than pure Durban, very clear, very racy, even paranoid. Buds very fluffy, and they flop over from their own weight. Definitely a creeper phenotype in the gene pool (Durban). The mom of A-11 is Genius, an F2 of Jack Herer crossed to an unknown male (likely a Durban imho). The dad of A-11 is Cinderella. Genius expresses the NL and Skunk side of the gene pool. Cindy expresses the Durban and Haze side. I hypothesize that the Durban gene is in both Apollo and Cindy." - Zorro

Strain: Cinderella 88/99
Strain Type: Mostly Sativa   Origin: Holland/USA   Breeder: Mr. Soul, Brothers Grimm
Images: 1 2 3 4 5 6 7 8 9 10 11 12 13 14
Description:

“This strain may be the "Holy Grail". The result of painstakingly backcrossing a VERY RARE female to her male progeny over 3 generations. This hybrid was specifically bred for indoor cultivation. Short statured & heavily branched, this plant grows LONG, dense colas with an EXTREMELY high flower/leaf ratio and OUTRAGEOUS resin production. The breeder has observed a "giant leap" in potency with each progressive generation and, as expected, Cinderella 99 has topped all previous results - her high is heavily influential & devastatingly psychoactive. A plant with all of the above is rare enough, but after a scant 50 days of 12/12! Above-average yields of crystal covered buds can be harvested every other month once a mother plant is selected and asexually propagated. One final accolade - preliminary results from the breeder indicate Cinderella 99 will breed true..."

Specifications:

~ Flowering: 50 days. Height: 100 cm. Yield: 1-2lbs per 1000W lamp.

Growers Comments:

“Cinderella 99 will be available from Brothers Grimm in January (‘99). This is the result from backcrossing Princess 3 times with her successive male offspring. Expect the same short flowering period, tropical fruit flavour, and soaring cerebral high.
“Clone flowered under a 400 watt, 42 watts/sq.ft. Grown organically in a soilless potting mix, perlite, & worm castings. Finished about 16”-18” tall. Nice high flowers be a breeze if it didn't have so much resin globbed all over it. Nugs were dense they are under the big lights. I flowered for 53 days, last 24 hours no light. I alternated Big Bloom & Hi-P fishes (Neptune’s Harvest) for food. Total yield about 15 gm of very frosty & very potent buds, but a STRONG smoke. Very “up” high. I can get a lot done instead of just vegging. By far the best I’ve grown. No shit.” – Bill Clinton

“C88 is the best so far. It has blown the socks off every Dutch variety I've grown before.” – flwr smkr

“The photo at the web site is Cafe’Girl; she is the sister of Princess (Cinderella 88), the mother I'm using to produce "Dylan's Diamond" which will be released in January. Cafe’Girl is a high yielder of super DENSE, crystalized buds in fairly LOW light levels. Scent/flavor is very much like ginger ale.” – MrSoul

“Princess was obtained from growing out seeds found in buds of Jack Herer that I purchased at the “Sensi-Smile” coffee shop, an authorized outlet of Sensi Seed Bank. Thus she is the direct daughter generation Jack Herer. The seeds were found only in the deepest part of the buds indicating that the father was an unusually early-maturing JH that the growers missed at first.” - MrSoul

“Princess was a female which resulted from a seed found in a Jack Herer bud I bought at a Sensi Seed Bank at "Coffeeshop Sensi Smile". The bud came in a 2 gr. cello-pak and was expected sinsemilla, but it had about 10 seeds so I assume she's an F2 JH. However I wanted to create seeds that would "replicate" this plant. She has the KILLER Haze-influenced high with the most DELICIOUS pineapple/evil scent, 50 day maturation in 12/12, and incredible resin production yet clearly Sativa-dominant! Last but not least: Never a hint of hermaphroditism in any of the different styles of grow.

I wanted to "cube" Princess but add a little beef to her branches because the buds were too heavy at harvest and branches needed staking to keep from flopping over. I crossed my ShivaSkunk female with one of the males from the same group of seeds that Princess came from. THIS cross gave me two different phenotypes: short & dense (potent too) or tall/HUGE (Not so potent).

Each generation is the result of crossing a male from the previous generation to Princess herself (incestuous, I know).

Blow-by-blow description of the generations:

P.50 = Heavy, single-cola type plants with mellow high (too much influence from the ShivaSkunk) Sweet fruity scent/flavor. Unstable in most traits - for example, 10 days difference in fastest/slowest maturation period in a group of 20 seedlings.

P.75 = Plants leaning MUCH more in the direction of Princess in floral cluster and bud structure, scent/flavor turned more "tropical" like pineapple. The stability was becoming better - two major phenotypes; short & dense (potent too) or tall/HUGE (Not so potent).

P.88 = Renamed Cinderella 88 when first released on the market. It grows fast and finishes its FROSTY buds in 7 weeks! Generally uniform seedlings with minor differences in floral structure and some height variance, but the smoke is quite consistent from all plants - Dense, heavy nuggets (like wild berries) and covered in resin glands, the dried buds have distinctly ORANGE pistils.

P.94 = Cinderella 99. This project has been a huge success. The strain is making a “net”work of growers with rave reviews. The Bros. Grimm too have been recognized for their excellent combination of quality products and unparalleled service after the sale. Their breeders on the net answering questions from "newbies" 40 hours/week,
details of their breeding strategies are openly discussed so that the seed buyer can feel well-informed about the products BG offer.

I personally think the plants these Cinderella 99 seeds produce are every bit as good as a cutting from Princess herself (or better). I say better because the flavor of no two plants is "identical"...a living thing. Like Princess herself, Cinderella is sweet & fruity to the palate and you're BLASTED...with the same "racy"high as Princess! The improvement comes in the greater yield and a stronger branch structure, which I accomplished by starting the original father in the cubing process. I knew I'd blend out the majority of the ShivaSkunk's stronger branches, but I was hoping to incorporate the ShivaSkunk's stronger branches because Princess had a tendency to need supports in the final two weeks of flowering. As it turns out, the name suits the strain IMO - it's a true Cinderella Story.” - MrSoul

"Jack Herer is an unstable strain bred from an unequal combination of Sk#1, NL#5, and Haze. Crossing a male and female Jack Herer creates an F2 generation which has a HUGE number of possible recombinations of the genes. I grew out some Jack Herer F2s and discovered a SPECIAL one, "Princess", which has many improvements on the original JH such as a shorter flowering time, denser bud, and a more pungent scent/flavour. I have been continually back crossing Princess with her male offspring (generation after generation) which eventually creates a stabilized strain having her special characteristics. Each generation is composed of a 50% genetic contribution from Princess (since she's the seed parent) and a 50% contribution from the pollen parent (in subsequent generations the percentage of Princess' genetics with each generation). The progression goes from Princess to P.50...at that point it's considered stabilized (a male and female P.97 can be crossed and will essentially be the same as the parents). I have been VERY pleased with the way the P.75 generation was rather stable in the sense that the individuals were all rather uniform and of HIGH quality. The P.88 seeds are available now, and the P.94 will be available around Christmas. I've combined genes from Sk#1, NL#5, and Haze, creating a plant which has characteristics distinctly different than Jack Herer, and I'm creating a stable strain from this plant...it's legitimately MY work.” – MrSoul

“I used Shiva Skunk from Sensi Seeds as a minor component in the development of Cinderella...I crossed a fine female Shiva Skunk with a brother of Princess, then grew a male from the back-cross to her the next generation gets a bit more of it. Smoking PURE Princess is a bit scary...it's too speedy and paranoia-inducing for most people. But she's so RESINOUS (see photo) and her flavour is just so delicious and fruity that I knew back-crossing her to her offspring over several generations would create a strain which is actually BETTER than the original mother in terms of a more PLEASING high. It was successful beyond my expectations.

The progression I went through was:

P.50 = Princess/(ShivaSkunk/Princess'Brother)
P.75 = Princess/P.50
Cinderella 88 = Princess/P.75
Cinderella 99 = Princess/Cinderella 88

Each generation exhibited a MAJOR jump in potency (P.50 was rather mellow, P.75 was a body/mind high with a citrus flavour, Cinderella 88 is cerebral & paralyzing with a tropical fruitiness, and Cinderella 99 is "TRIP WEED"...with more of the fruity flavour and speedy effect
“Princess.75 finished outside in northern Kentucky Oct 15, (killer smoke!) They do intend to find out! No mold and it was quite wet too.” – 27yrs

“I grew out Cinderella 88 and in my experience the Great White Shark is a more interesting line although admittedly my luck with C88 was not the best. The one female I was vouchsafed grows more like a vine then a tree and is difficult to clone and cultivate. However the psychoactivity of the stone is complex and very cerebral. This is a very potent plant, indeed. But if I confess I might have let this plant go a while ago. As it is I am trying to find ways to accommodate the finickiness because of its lineage. But I wonder if the BG's cross between their House male White Widow (Ice Princess) might not be a more propitious way of including BG's Princess genetics in one’s garden. The hybrid vigor that results from crossing two great plants of differing genetic backgrounds creates the best stock for cultivation, in my opinion.” – Moose

“I want to comment that your result with the Cinderella 88 is NOT typical: I have never seen one that was remotely "vine-like". They're usually Sativa-dominant with moderate leaf width, short & stocky stature, heavy branching, extremely high resin production. The flowering plants smell like fruity cotton-candy. In my experience, they usually root through a 2 inch rockwool cube in 10 days...and I don't even use rooting hormones.” – MrSoul

“I agree that c99 appears to be something special. Great resin production, great density at 28 days. Still no major odor(yet.) The thin leaves allow great light penetration. Sometime in the future I will do a whole garden of Cindy. What GH mix are you using on the c99 right now? She has been the most finicky feeder I've ever met.” – kaka

“Cinder: There's been a lot of talk about this strain. All I can say is that I'm very glad I grew this one. Fast, nice yields, great high. Harvested at 49 days--maybe even a little too long. While I occasionally get my occasional bud out of my jar is simply wicked. I actually got lost a few blocks from my house--shit that hasn't happened in 10 years.” - shaggy

“C-99 is very uniform. I have 4 females grown from seed that just finished their 4th week of flowering, and the only variation seems to be their height, the shortest being 3.5 feet and the tallest 4.5 feet, and all were topped once. They were started under a 400 watt MH for the first month and have been getting a full 12 hours per day of sunlight since then, and their cola's are HUGE. Wait'll you see how well they do under natural sunlight.” – Rex Feral

“My estimate for Northern States would be early October. I have a friend who was growing it outdoors in Maine (48 degrees N?), it was about 3 weeks from finished in mid-September. Unfortunately, his outdoor grow was ripped off. If you're growing in an area prone to mold, you may have problems. I have no problems in the Northeast we don't have such a problem with mold. I can only tell you the buds are DENSE (you HAVE seen the photos, haven't you?)...so it could be susceptible to mold.” - MrSoul

“If its Fruit Punch that you want, you should check out “Cinderella 88”....I’ve see backcross of, and YEEEEHAW she kicks ass. The smell is very similar to the Hawaiian... think back to when you (ok I) was a kid... remember Bubbalicious? Or Hubba Bubba chewing gum? Think about the tropical fruit flavor, and there ya go-- thats what it smells like... A sickly sweet fruit punch gum, a
with it. A first class high too... (Not to turn this into an advertisement, just a recommendation, but I've personally tried this strain and it will do it for you just like the Hawaiian).” - Shabang

“I'm kind of trying for either Kali Mist or their Himalayan Gold, essentially I'm looking for a badass sativa high that I can grow manageably indoors. -See if you can get Cinderella 88 from Mike at Weedseed. I've personally tried this smoke and it is the best, most lucid sativa high you could ask for. The breeder put a lot of time and talent into this one! Kumquat I do have 3 6' princess " crosses in my garden. They preflowered in early June which made it much easier to plan the garden space. The plants would get so tall. The secondary branching is quite thick and well developed so they would be a good yielder. It has handled our 100+ degree days w/o any problems, unlike the j. herer (only minor probs with them) and even took on a Great Dane bending one over flat on the ground of temporary splinting and bracing to be the fattest plant in the garden...which was seedbank offerings of last year.” - Desert Rat (a.k.a. M.G.)

“My head just turned full circle...This shit is good! I have to say to the brothers...Cinders passes the test with flying colours...the effect is very heady and almost hallucinogenic...very much like a potent version of silver pearl... with a smoother, fruitier taste and no nasty tickle at the back of the throat.” – Mike

“I can only answer question #3 (Does it have as strong a sativa high as haze or Durban?) … WAY STRONGER!!! At least the sample of Cinderella 88 I had was. Very tight nugs too! It was grown indoors so I expect the outdoors to be even better (just the way it turns out for me). Very fruity, mellow hitting and has a definite creep to it. The buzz is very sativa-ish and tends to make the mind wonder when trying to find something. But the energy to keep looking is there! I highly recommend it! But keep a bowl of some nice indica nearby to mellow it out! All above is strictly MHO and based on MY experience.” - dead man talking a.k.a. M.G.

“The princess I have smoked was indoor grown by a friend of mine. It is a VERY heavy sativa high bordering on paranoia at times. I found it's best when there's a bowl of a nice indica around to mellow out the edge. 3 tokes do the trick (it creeps up in about 15-20 minutes)! Very nice sweet, fruity flavor. The plants I have growing outdoors in the hot desert are doing great. They have the typical sativa x-mas tree shape and very hardy. Planted 6 eggs, got 5 plants with 3 being female. It will become a permanent fixture in my garden!” - Desert Rat

“Remember that Cinderella (88) is a Sativa-dominant hybrid, so you can expect it to do the trick (it creeps up in about 15-20 minutes)! Very nice sweet, fruity flavor. The plants I have growing outdoors in the hot desert are doing great. They have the typical sativa shape and are very hardy. Planted 6 eggs, got 5 plants with 3 being female. It will become a permanent fixture in my garden!” - MrSoul

“My report on C99....

1. Bought 10 seeds for 150 from Heavens Stairway. Took 10 days to get to me in Alaska June of 99
2. 9 out of 10 successfully germinated and grew into healthy plants
3. Kept 5 of those. Gave 4 to a buddy who pitched in for the seeds. All 5 of my
know about his.

I used pro-mix soil. This is a sterilized and nutritionless product. Make sure to add perlite 30%. By itself, pro-mix and 7.5ph tap water comes out 5.5ph so make sure you add lime to get above 6.3 or so pH. This is important. I used one-gal containers.

I used GH nutes 1/2/3 ratio for grow and 3/2/1 for flowering, 1100-1450ppm at 6.3-6.6 pH. Make sure to check your overflow water after each watering for PPM. If you do this you will catch overfert due to laziness and not checking. 1000mh about 40w/square ft

4. Took 50 clones and 95% were successful and rooted in about 7 days

5. Cinderella is a most interesting hybrid. It was selected/bred for indoor cultivation. It is a short, dense colas. The most interesting and handy feature is that you can actually tell the sex when the plant reaches about 12-14 inches tall. If it is a female, the two telltale pistils are evident at this point.

6. On my 5 females, I put them on 12/12 when they reached 24 inches. They started flowering by day two and explode within 10 days. You can harvest in 50 days

7. They have a fantastically pleasant fruity smell and you can see the resin with 10 days or so. They produce an excellent yield, require very little time to cut and trim off of the plant when you harvest. They have a fantastically pleasant fruity smell and you can see the resin with 10 days or so. They produce an excellent yield, require very little time to cut and trim off of the plant when you harvest, and the high is great. A creative, up high. Puts you in a good mood and gets you doing things. A friend of mine said she cleaned her whole house and had a good time doing it - You find humor in everything.

I have only praise for this plant and a tip of the hat to the Brothers Grimm. Thanks Guys

"Nexus> I have a Flat Scrog that's W=3ft,L=6ft,H=1ft from bottom of plants. My screen is 2 ft from a 1k hps air-cooled + on a light rail III, Well my question is how violent of a stretcher is c99 and how much of the screen should I let her fill up? I don't want c99 stretching so much she hits the light and burns, 

=Soul=> I flower my clones at 12" tall and they end flowering @ 2 ft tall yielding from 1 to 2 ounces dry. You should let the branches grow to 8" above your screen then switch to 12/12. This allows your lamp enough distance from the plants (the light mover HELPS)

Nexus> I got 4 c99s and 6 Mr. Nices in the screen growing in a drip/NFT custom made system. I am about 1-2 weeks away from flowering depending on c99? Also how powerful of a yielder is c99, I have heard sooooo much spam in the past about her.

=Soul=> It's easy to be misconstrued as "spam" when a strain is getting valid feedback. In the case of the Cinderella line. It's truly impressive to have combined rapid flowering and hermaphrodite resistance in a potent, tasty, good-yielding, true strain. That's BOUND to earn some glowing reviews. To illustrate the yield I'll simply say that a 12" clone of C99 consistently flowers into a 2-foot tall plant with an average yield of 1.5 ounces, depending on how densely they're arranged. I have found that 40 clones (10 RW slabs @ 4 plants per slab) in a 4'x8' area is about optimal. I grow the plants with single colas, or at most, two main colas. They are supported by using twist-ties to attach each cola to wires running the length of the rows. This increases yield by forcing the garden into a light-efficient profile. When you let the colas "fall all over one another" the final 2 weeks of this abuse takes its toll on bud production. It's best supported...you'll get a fine yield.

One C99 distinction that helps is the high flower to leaf ratio. When your buds
Strain: Jack Flash  
Strain Type: Sativa/Indica mix  
Origin: Holland  
Breeder: Sensi Seed Bank  
Images: 1  
Description: none  
Specifications: none  
Growers Comments:

“Jack Flash does go a bit long in the flowering, it grows in two types one very Sat/Haze influenced, tall 5'-6' with huge "Heads on Sticks" that dried at over 1 oz. each! there were 5 of them on one lady in a 5 gal pot, she took about 76 days, but was worth every day. The other type grows very Indica like this type, that was very fruity with a nice trippy high that gave way to a indica-dom. takes about 60 days to flower, also very well worth the wait, was amongst the best Indica they had ever smoked, and the taste cured is fantastic. And the strain is very easy to take care of. It was really nice, and it yields great in both forms. Out of 7-8 different strains grown Romberry and Jack Flash are definite repeats, as they are both in the Veg closet again. There's really only one place to get Sensi stock (IMO) but the price is OK considering they give ya 16 beans, in that respect there only a/b 5$ each. Sorry for the long post but its a favorite and I wanted to give ya my $.02.” - Budm

“Afoaf has grown and continues to grow Jack Flash, its a great strain, although variable, IMO the variations are unique and all are quality in there own way. Here's the way the first grow went, 3 ladies were in pots of BCGA's Super Soil recipe, there were 3 different ladies, one was in a 5 gal pot she was a haze dominated phenotype, she grew out in a "heads on stick" fashion, big huge heads, she was toped once at the 6 node, she grew into 6 big heads, each dried to 20-35 grams she yielded just over 5 oz's, of great tasting wake and bake, uplifting sativa smoke. Another lady was sort of the runt, she was in a 3 gal pot also pinched at the 6th node, she had more of a indica phenotype, nice tight colas with red pistils, great smoke very fruity, but yield was bad, at about 20 grams. The 3rd lady was awesome, also in a 3 gal pot, pinched at the 6th node, she grew the densest nugs, smelled like lemon, tasted like lemon/hash, and the high was very thought provoking, but its best attribute was its wonderful taste, she yielded about 1.5 oz. All said I really like this strain. The haze influenced lady was crossed with a Posi Big Bud in hopes of bringing down its size (5.5') and flower time 63 days under 80 watts/s.f. of mixed spectrum light.” -Budm

“This is a really good plant. it finished at 50 days has a lemon taste/ with a peppery aftertaste. High is UP with no sleepiness. I was afraid that it would be too similar to my Cinderellas due to their background, but the Jack Flash is very different in taste and high. jack flash is lemony and Cindy is like the other is sour. The only drawback is an increased paranoia level. The up high does also create a slightly discomforting "edge" , but its mixed in with a lot of laughing (which I like), and intriguing ideas), aphrodisiac effect ( a must, he he)and yield (big calyx buds) I highly recommend this for someone looking for an up high, lemon taste, and good yield.” - Triage
Strain: Jack Herer
Strain Type: Sativa/Indica mix  Origin: Holland  Breeder: Sensi Seed Bank
Images: none
Description:

“Combining three of the strongest secret varieties kept by Sensi resulted in this multiple hybrid of many years of selective breeding. Highly resinous.

Specifications:

Flowering: 50-70 days. Height: 150-180 cm. Yield: up to 125 gr.” –Sensi Seed Bank

Growers Comments:

“Jack Herer = Sk#1 X NL#5 X Haze. This multi cross has been stabilized over the past couple of years and is now reported to be very even and consistent.”

“I grew Jack one time. The plants varied incredibly. One plant was done in 7 weeks. Dark, lush, green. Dense buds with a deep sweet odor. Great heavy indica buzz. On the other end of the spectrum, I had one plant that took 10 weeks to finish. This one was very haze predominant. Black color and scent, but the buzz was strong with the heart pounding sensation of a strong haze buzz..... So I would have to say that Jack Herer is an excellent but very inconsistent strain. Although all the plants had excellent results when finished, I found that growing jack in a smaller growing setup (less than 10 plants) was sort of frustrating because of the 3-week difference in finishing times. In conclusion, if you grow jack keep your eyes open for both very early and late finishers. The wait, although seemingly forever, was well worth it.” – smoking man

“Pros: Grows well, healthy, vigorous, bushy plants, lots of foliage and big (forearm sized) colas. Seemed to clone well, good yield. Fairly smooth smoke with a sweet citrus smell/taste. Cons: Medium-long flowering period, not nearly as potent as one would expect from all of the hype. There are many more potent varieties that have a significantly shorter flowering period. A friend who also grew it had the same opinion. AK47 still has my vote; just over six weeks to finish and very potent.” - Sabre

“This light forest-green colored bud is made even lighter by its tiny white crystals and long, thick brick-colored hairs that are few but noticeable. The buds seem to be made up of smaller buds and clusters, sort of like grapes. This bio has a mellow, steady, sweet, green smell with just a hint of that skunkiness we love. Dense buds surround tiny (and tasty) stems. The smoke is tasty, sweet and smooth. The high is quick and expands for quite some time with stony, visual, and a bit silly effects. ***1/2

Strain: Jack Herer x Haze
Strain Type: Mostly Sativa  Origin: Holland  Breeder: Sensi Seed Bank
Images: none
Description:

Specifications:
**Growers Comments:**

“This sweetly scented mix is forest green in color with few, long, brown hairs. The bud structure is lent from its Hearer lineage, while the color is most certainly descendent from the Haze. The buds swell oddly like freshly shaven carrots, and are very sticky when broken up. The nodes are coated in white crystals. When smoked, the bud releases thick clouds of sweet, tangy, tasty smoke which expand substantially in the lungs. The high hits quickly and really sends you for a whirl – it is visual and Trippy. This mix surely brings out the best in both buds.****1/2” – Homepage Amsterdam

**Strain: Polm - a.k.a. Jack Herer**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Positronics

**Images:**

**Description:**

none

**Specifications:**

none

**Growers Comments:**

“I ordered the Polm special from Jock. He said it was Jack Herer.”

“I have just finished some of Jock’s Posi Jack Herer and have one that keeps on adding to its white, fat cola like the Eveready bunny. It just won't quit after 11 weeks, although harvesting time is prolly within a week or two. Think you will like it. Nice profile, short internodes, average harvest from 12/12 light set has been around 9 weeks.....typical indica/sativa leaf, excellent calyx/leaf ratio, great high that you're good for the night. Doing a seed program and am coveting the seeds.....

“I have been expressing my opinion that I haven't been really impressed with the Jack Herer is definitely Wacky Weed. I mean this stuff is like being in Alice of Wonderland! Creeper weed, nice body stone, very potent head stuff which is psychedelic and just plain goofy! We must have laughed and played head games until we settled in for the night.

I have never complained about the grow profile of the limited Dutch strains I have grown, and this particular plant had 1/2" internodes, huge thick colas (yeah, it's the one that went a little moldy).

Got 4 3/4" oz of sensi (minus the seeds buds) from a 27" plant. My journal on this states: "Short internodes, dark leaves, bushy, 11 leaves per leafset, hybrid, heavy profuse flowering.”

Now....this is what’s just plain fascinating....this lady leaves a distinct taste and feel on the palate that is like a very subtle menthol taste, somewhat piney and having a fresh earthy taste. It leaves an interesting aftertaste like a fine wine would - very pleasant. Anyone else have this type of palate experience?” – Uncle Ben Dejo
Strain: **Princess 75**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland/USA  
**Breeder:** Mr Soul

**Description:**  
none

**Specifications:**  
none

**Growers Comments:**

“(Sk#1 x NL#5) x (Sk#1 x NL#5 x Haze)) x (Sk#1 x NL#5 x Haze)  

6 seedlings are off to the races. Princess was obtained from growing out seeds that were purchased in Amsterdam at the "Sensi-Smile" coffee shop, an authorized outlet of Sensi Seed Bank. Thus, it is considered to be an f2 generation Jack Herer. The seeds were found only in the deepest part of the buds indicating that the father was an unusually early-maturing JH that the growers missed at first. Princess smells very much like pineapple both during flowering and when dried too, like rotting meat, which has been linked with the most devastating weed (notably the Durban/Thai hybrid from SSSC, years ago). The taste is connoisseur quality when it's cured; VERY intense for a lot of people. Dr. atomic actually refused to smoke any on our second meeting, after getting rather "hazed and confused" on the first sampling we did together a couple of weeks before, so he decided to try Shiva Skunk and found that more mellow and to his liking. Two hits of Princess will induce your body to tremble involuntarily and your heart to race and paranoid thoughts...very much like Haze, but not quite as intense. It also has a "creeper" quality that makes it easy to over-indulge...you get progressively higher during the first 10 minutes after smoking. Look at the May '98 issue of High Times' centerfold and find "Yellow Cab"...that's EXACTLY what the finished Princess buds look like. The "frosting" of stalked, capitate trichomes on the flowers and smaller leaves gives them a "furry" appearance much like Haze.

Princess grows vigorously, and is rapidly maturing...6 to 7 weeks of 12/12. It feeds heavily and requires about 50% stronger nutrient solution than an Indica does. It stays short, for a Sativa-dominant strain, and finishes at about 3 ft indoors. The yield from such a plant is about 20 grams.

Mr Soul has been "cubing" the clone of Princess so the seed line will be Princess.75 to obtain males for the creation of Princess.88. Seeds of the 0.88 generation will be ready by mid-July and should produce excellent plants, albeit not perfectly stable yet...but nearly. He plans to back-cross once more after that to arrive at 0.94 Princess genetics, which should be a stable, true-breeding seed line with females "replicating" Princess reliably.

This strain is exactly what most people believe doesn't exist; a Sativa which grows VERY well indoors, stays short, and matures as rapidly as an Indica (faster than many), and has the great KILLER Sativa high/flavor. The yield is fine too. Mr Soul finds that the Indica strains are too leafy/stalky for him, whereas Princess has an extremely high flower/leaf ratio and therefore produces almost no waste.

"Current crop is Jack Herer x Unknown (Nickname - Jack's Heir): Seeds - I bought a 2 gram bag of Jack Herer buds (1996 Cannabis Cup winner) in Amsterdam at "Sensi Smile" coffee shop. The buds were supposed to be sinsemilla, but I was pleasantly surprised to find a fair amount of resin. The high was found the high to be cerebral and energetic, but not too long lasting; the buds are quite resin coated. Of the 6 seeds I attempted to germinate, every one was successful and produced a 50% male/female ratio. Seedlings - Very consistent and uniform in looks and growth. The Indica is a three-way hybrid itself). Rapid growers. Typical internodal spacing shows signs of both Indica and Sativa heritage. Large, broad bladed leaves, but light green, not Indica. Somewhere in between in between stature.
Mother plants (J1 and J3) - Grow vigorously and bushy. J1 is the hardiest looking of the two females.

Father plants (J2 and J4) - Grow vigorously and bushy. J4 is the hardiest looking of the two males (surprisingly, this J4 grew from a seed I'd characterize as a "runt", about half the size of his siblings' seeds). Unfortunately all clones of J4 were lost and I have only a "decent" supply of pollen from his flowers.

Clones - Very quick to root (10 - 14 days) with a success rate of 90 to 100%. Several small, poorly rooted clones eventually came around and flowered nicely. Rooting occurs independent of the method used;RW cubes with pH 6 or 5.8, Rootone or not, seems to make little difference.

Flowering - Once rooted, the RW cube is buried up to its top in a 6 inch round pot of 50% perlite 50% Hyponex Professional Soil Mix, fertilized initially with Miracle Grow 15-30-15 at 1/2 tsp. per gal. of pH 6.5 water. Once looking well at 12cm tall, flowering is begun with a 12hr light/dark cycle. During the first week they "shoot" up 30 to 50cm with large fan leaves but suddenly look over-fertilized (Miracle Grow has urea-based nitrogen) with curling at the tips of the leaves. They respond virtually overnight to a good, thorough leaching with plain water, then they take on a dark green color and start to "bud out" rather than get taller. During flowering, feeding is switched to Shultz’s Bloom 10-60-10 at 1/2 tsp. per gal. of pH 6.5 water; I soak the pots and wait a couple days until they get lightweight before the next good soaking. Flowers appear Sativa-like and extremely resinous, except that they continue to get progressively fatter and denser, much heavier buds than the Jack Herer itself does. I would guess that the father of the seeds was a skunk or similar strain, since the calyx to leaf ratio is so high; the flowers just keep sprouting out in all directions, with resin coated leaflets interspersed between flower clusters. The leaves, all but the fan leaves, are covered in stalked resin glands from base to tip. Sample smoking of immature buds which were culled (tried to flower them in RW cubes but they died) after two or three weeks of flowering proved to have a sweet, skunky taste and produced a very "happy" high, not at all paranoia-inducing. The finished product should be excellent.

Currently, I have several healthy, rapidly budding clones that are in their third week of flowering and may well finish before their eighth week. The lowest four branches of one J1 clone were selectively pollinated using the J4 male's pollen and should yield roughly 50 seeds. My hope is that these seeds will produce plants with a great variety of fine characteristics. The outstanding gene pool should ensure that, inbreeding concerns aside, then I'll have a great breeding project: trying to select individuals for future crosses which will incorporate the best characteristics of that diverse group.” - Mr Soul

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**Strain:** Rosetta Stone
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Mr Soul

**Images:**

**Description:**

Rosetta Stone is a fast-flowering plant with heavy resin production and average yield. It is generally an easy plant to work with. It was created by pollinating a unique Ginger-Ale female (Ginger Ale makes the densest nuggets we've ever seen) with a male we've tracked for a long time as a reliable resin-enhancing father. Rosetta Stone is a super potent, wonderfully sweet, fruity smelling Sativa/Indica hybrid. A definite keeper in any connoisseurs garden. - Bros. Grimm seed catalog

**Specifications:**

Flowering: 50-55 days  
Height: 120 cm  
Yield: 1-2 lbs per 1000W lamp

**Growers Comments:**

"I like growing rapidly-maturing strains with very high flower/leaf ratios. I chose..."
dense buds frosted with resin glands. I can't STAND leafy strains. Princess has a sister I call "Cafe' Girl", which makes a GREAT production plant in 7 weeks of 12/12. The colas are BIG and DENSE and RESINOUS. Her buds taste quite like the old Colombian Gold we used to smoke in the late 70's...very warm, friendly and non-paranoia inducing. She's an excellent yielding plant to boot; I could fill my 4'x8' flowering space with 40 clones of Cafe' Girl and easily yield 60 ounces of Grade "A" sinse...that's an average of 1.5 ounces per square foot! Cafe' Girl is the mother of "Rosetta Stone", a White Widow hybrid. -Soul

**Strain: Willy Jack Jack Herer**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Sensi Seed Bank
**Images:**
**Description:**
none
**Specifications:**
none

**Growers Comments:**

“The Willy Jack Jack Herer is a domestically produced version of the Sensi original. I found the genetics to be pretty messy, in that there was a great deal of variation between the different plants. However, the mother I went with has a relatively short flowering period (about 60-65 days) and big crystal formation, and it was definitely worth the meager price and growing them out to find the best one. The high is very active / cerebral, but you can still feel the indica. In my opinion, it's like a skunk that is more heavily influenced on the sativa side. If you flush it properly or grow organic, it should end up tasting sort of like pecans...”

Jack Herer is a high light plant. For good bud density you'll need at least 30 watts / sq. foot. It's such a bitch, probably the haze presence (Jack Herer = haze x nl #5 x skunk #1) makes it a bit of a pain in the butt to grow. Likes to stretch if you let it. Tie the girl down!!! All in all, recommended.” -frank white

“Mine does have nutty flavor but with an undertone of catpiss.....good high...crazy but flower time is good....55-60 days. Definitely worth the price if you can grow out several to find a good momma.” – Capn Howdy

**Family: KC 33 Strains**

**Strain: KC 33**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** KC Brains
**Images:**
**Description:**
“Dutch variety, crossbred with a Thai and Brazilian weed, special for the outdoors, but inside also a number one. A favorite outdoors variety right through Europe.

**Specifications:**

~ Flower: 8 weeks, 8-10 outdoors ~ Harvest: Sept. “ – Positronics seedbank catalog

**Growers Comments:**

none

**Strain:** Leda Uno  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** KC Brains

**Images:**

**Description:**

“This variety is a sativa/indica cross (a hybrid of a KC 33 male and a Brazilian) with a lemonlike aroma.

**Specifications:**

~ Flower: 6-9 weeks ~ Harvest: end of September”-Positronics catalog

**Growers Comments:**

“There are a few Dutch hybrids that might qualify that smoke up like a sativa and grow like an indica, well sort of, nothing really grows like a sativa except a sativa. Some of those Dutchies are a great compromise between a high " high " and something that finishes in months not seasons. Search any of the Dutch seed bank home pages and zero in on any hybrid with 60% or more sativa in it e.g. kc33, Leda Uno etc. and that should do the trick. You can grow full-blooded sativas indoors but it takes forever and I mean forever. Leda Uno has leaves on the thin sativa side, big fat indy type colas, finishes fast (for a sat. dominated type), excellent for indoors or out and the high is like good champagne, an uppy, energetic, talky, happy and intelligent buzz. It’s the type of smoke that makes you want to get up and do something, not just eat chocolate and channel surf in a horizontal position. Everyone has his or her favorite and Leda’s mine. Easy to grow, pretty as a pin-up and great for close, packed-in, SOG type growing, but the high is what will grab you, women love it !!! etc. a real daytime smoke. It used to be available in a/dam @ Interpolm opposite the train station, but I’ve seen it at other seed resellers there. Recently (this year) I’ve heard they were out of stock but maybe they have it in now? But if you can get it, do so. If you are used to those heavy, sleepy, valium type lows that some full blooded indys give you, you like it even more, sort of like Colombian marching powder in a green sort of way.”

“Originally bought at.... Interpolm in Amsterdam in July ‘96, although I saw it at a number of coffeeshops and seed sellers through out the city, a year and a half later. I thought I better tell you where I bought it so if you get a bad lot and hate it; come fall, you wont hate me if your version is a sub-standard one! If memory serves me correctly (hmmmmmmmm!) its an indoor/outdoor variety (an easy to grow, pretty as a pin-up and great for close, packed-in, SOG type growing, but if you can get it, do so. If you are used to those heavy, sleepy, valium type lows that some full blooded indys give you, you like it even more, sort of like Colombian marching powder in a green sort of way.”
excellent for close together, one stalker growing if un-tipped and forced to flower at a short height it will have one big cola (topping seems to reduce yield not increase it unless it is done at a young age). I hope you get the same genes that I got, you'll be happy. try to do a seed crop (male Leda Uno x fem Leda Uno ) and have lots of seeds to play with, give away and breed, I wish I did ! (I crossed local sativas trying to get something stronger, bigger and better), its got that Dutch taste, indica growth pattern, sativa leaves and high ...there are lots of available ...silver pearl, NL x haze, early pearl, kc33 etc and most will give excellent results. You seem to be growing lots of indica dominated varieties so you might not be so dazzled by its finishing date as I was, at the time, I had only grown Thai and other south east Asian full blooded sativas, not Dutchies, so a 60 day flowering stage passes like a blink compared to those equatorial types, if I was going on a seed buying trip I'd buy strains like Cali orange and any of the pearls or any strain that is fast and

Strain: Leda Uno x Northern Lights
Strain Type: Sativa/Indica mix  Origin: Holland  Breeder: Amsterdam Aloha
Images:
Description:

“Source: Amsterdam Aloha (I did the cross) Started flowering on 8/7 at 40* north latitude. Finished and harvested 9/15. Appearance: Outdoor plants (late start - June 21) were bushy 5 footers with nice sticky colas. Cultivation: Creek bed on edge of corn field. Only visited the patch 3 times. I planted clones, using slow release 14-14-14, visited once to cut back weeds and foliar feed, and then harvested.

Specifications:
none
Growers Comments:
none

Strain: Mango
Strain Type: Indica  Origin: Holland  Breeder: KC Brains
Images:
Description:

“Mango is a 100% Indica variety, a F-1 hybrid of KC-33 and Afghani. High yields and some plants are very early.

Specifications:
Growers Comments:
none
<table>
<thead>
<tr>
<th>Family: Purple Strains</th>
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<tbody>
<tr>
<td><strong>Strain:</strong> Purple #1</td>
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<tr>
<td><strong>Strain Type:</strong> Sativa/Indica mix</td>
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<tr>
<td><strong>Origin:</strong> Holland</td>
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<tr>
<td><strong>Breeder:</strong> Dutch Passion Seedbank</td>
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<tr>
<td><strong>Images:</strong> 1</td>
</tr>
<tr>
<td><strong>Description:</strong></td>
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“A strong plant (50% Indica, 50% Sativa), easy to grow. Purple Afghan seeds have been crossed in Holland with Indica and Sativa varieties since 1983. The plants are fully adapted to the Dutch climate and have a respectable yield. This variety has calyxes that turn purple, starting at the beginning of flowering. Up to 90% of the plants turn purple. Has rough, but subtle aroma and a very good high.

**Specifications:**

~ Flower: 8 weeks ~ Harvest: 2nd half of Sept., 1st week of Oct.” - Dutch Passion catalog

**Growers Comments:**

none

| **Strain:** Purple Haze  |
| **Strain Type:** Mostly Sativa  |
| **Origin:** Holland  |
| **Breeder:** Positronics  |
| **Images:**  |
| **Description:** |

“Produced from Mexican, Colombian, South Indian and Thai varieties. Incredible resin development. Produces clear energetic high.

**Specifications:**

none

**Growers Comments:**

“This medium-grade outdoor Sativa is very, very dark purple, almost black, with brownish-red hairs, and lightly coated with crystals. When breaking it up, they are THAT dark! The stems taste like peppermint, and buds smell like chlorophyll, cut grass. When smoked, the bud tastes like a high grade outdoor Thai. Good for campfire! The high creeps up on you, is spacey, and a bit uplifting. Much better out of a bong than a joint, or pipe. ***” - Homepage Amsterdam

| **Strain:** Purple High  |
| **Strain Type:** Indica  |
| **Origin:** Holland  |
| **Breeder:** Dutch Passion Seedbank  |
“Original Dutch outdoor variety, strong plant. Almost all plants turn a rich purple, easy to grow, early finish. 100% Indica, unusually fragrant smell. Tastes a little rough, but delivers a clear and sharp high.

Specifications:

~ Flower: 6-7 weeks ~ Harvest: mid to late Sept.” – Dutch Passion catalog.

Growers Comments:

none

**Strain: Purple Skunk**
**Strain Type:** Mostly Sativa  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank

**Images:**
**Description:**

“This variety is a hybrid (F1) of Purple #1 and an early Skunk. About 50% of the plants turn purple during flowering. The variety is 87.5% Sativa and 12.5% Indica.

Specifications:

~ Flower: 8-9 weeks ~ Harvest: 1st week of Oct.” - Dutch Passion Seeds

Growers Comments:

none

**Strain: Purple Star**
**Strain Type:** Indica  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank

**Images:** 1
**Description:**

Very strong and easy to grow purple variety (100% Indica). Very resinous, heavy yielding. The aroma is a little rough, but the variety produces a very strong high. About 50% of the plants turn purple.

Specifications:

~ Flower: 6-7 weeks ~ Harvest: 2nd half of Sept., 1st week of Oct.” - Dutch Passion Seeds

Growers Comments:

none
**Strain: Shaman**
**Strain Type:** Mostly Sativa  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank
**Images:** 1  **Description:**

This is the former variety Purple Skunk. This variety is a hybrid (F1) of Purple #1 and an early Skunk. About 50% of the plants turn purple during flowering. The variety is 87.5% Sativa and 12.5% Indica.

**Specifications:**

~ Flower: 8-9 weeks ~ Harvest: 1st week of Oct.” -Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Family: Trinity Strains**

**Strain: Buddha**
**Strain Type:** Mostly Indica  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank
**Images:** 1  **Description:**

“Another favorite from our collection, developed by our breeders in 1996. A female Oasis/Shiva/Haze crossed with a male Oasis/Shiva/Skunk. The talk of the town in Amsterdam in 1996.

**Specifications:**

~ Flower: 8 weeks ~ Harvest: end of Oct.” -Dutch Passion Seeds catalog

**Growers Comments:**

“I grew DP Buddah on my last crop and you did not miss much. In fact I wish I could have moved on to a strain with more potential. Basically the problem was very low potency and very little taste with most of the commercial bud in my area being superior. I still have an OZ stored away that I can not be bothered to smoke.” -Glaeken.
**Strain: Hempstar**  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**

“Developed as a tribute to all the Hempsters and the International Hemp Movement. A three way cross between Skunk, Oasis and Haze, it is the combination of the three major varieties. This strain has an enormous potency and sticky Sativa high. The taste is very mild.

**Specifications:**

~ Flower: 9-12 weeks ~ Harvest: end of Nov.” – Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Family: White Widow Strains**

**Strain: Great White Shark**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Arjan, Green House Seed Co.  
**Images:**

**Description:**

“Taste: The fruitiness of the Indicas with a strong presence of the widow and skunk tastes. Smell: A rich fragrance of flowers and fruits with the odour of a White Shark. Visuals: Orange haired fullness of the super skunk that glistened in the crystal rain of its widow father origins. Touch: The colas are sticky and solid -just like the original parents. Stone: Seductive high feeling for the jaws of his namegiver. Family Heritage: A cross between a Super Skunk and White Widow.” – Green House Seed Co. catalog.

**Specifications:**

Vegetative Time: For indoors a suggested minimum of 2 – 4 weeks. For outside germinate May or by the end of spring. Flowering Time: For indoors a suggested time of 8 weeks. For outside, it will be ready early autumn. A substantial yield will be expected. Achievements: 2nd - Place - BIO-Award 1997, 2nd - Place - Cannabis Cup 1997” – Green House Seed Co. catalog.

**Growers Comments:**

“There is something so enchanting about the way the buds have formed on these plants. Like not so little snow cones sitting delicately atop their verdant, leafy bases. Like the plants
something! And one thing I have noticed. The skunkiness that accompanied the beginning of flowering has pretty much dissipated entirely at this point. The floral clusters now have a divine aroma like fresh wintergreen. And the resin crystals are starting to coat both the calyxes and the subtending leaves. Yummy. I really like these plants, can you tell?

Someone was wondering about stretching with this cross. They are not small, more like moderately big with significant but not unmanageable internode lengthening during flowering. I know this is impressionistic, but they are too far along in their development to give you a retrospective percentage of the stretch to the original seedling size at the time flowering was initiated. Cloning is super easy with GWS and the slips grow like wildfire. It is an ideal plant for double-stemming. I look forward to sampling the final product which I understand ripens fully in about sixty days. It will also be interesting to see how much more bud growth occurs in the final fifteen days.

**Strain: K2**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Homegrown Fantaseeds

**Images:**

**Description:**

“It’s the little sister of the White Widow Bio, short plant ideal for people with little space. Very soft taste and decent high. Grown very much by local growers, a perfect compromise between quality and yield. Very good yield.

**Specifications:**

~ Flower: 8 weeks” - Homegrown Fantaseeds catalog.

**Growers Comments:**

“This white crystal covered compact bud is mostly pale green with patches of dark green and contains sparse clusters of orange-red hairs. It has a strong sweet green scent with just a hint of pine. Not particularly flavorful when smoked, K2’s flavor is mild green with a bio taste. The smoke is smooth but expansive in the lungs. The high comes on quickly and is spacey and mellowing and just a bit visual. ***1/2” – Homepage Amsterdam

**Strain: Lady Widow**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Undetermined

**Images:**

**Description:**

none

**Specifications:**

none

**Growers Comments:**
“Daughter of the White Widow plant. This bio is yet another example of Holland’s cannabis breeders’ next generation of Neder-weed. These medium green, smallish buds are so covered with white crystals that they appear much lighter than really are. Its red hairs are sparse and short. The buds smell a bit mild, citrusy. And sweet--like a powered lemon drink mix. The smoke is expansive in the lungs and has a spicy citrus taste. The high is constant, mellow and pretty stony. ***1/4” – Homepage Amsterdam

Strain: Misty
Strain Type: Mostly Indica
Origin: Holland
Breeder: Homegrown Fantaseeds

Images:

Description:

“Sister of White Widow. Short, bushy plant yielding a high THC content.” - Homegrown Fantaseeds

Specifications:
none

Growers Comments:

“Misty (a supposed sister of WW) is thought by many to be a just one of the many different genetic incarnations of WW. It is said to be a much more stable variation of the WW line.

"Misty seeds are strong variety. Short leaves, light green, strong bud, big clusters, very resinous... smells sweet, and grows very fast. 4 weeks until flowering, 8-9 weeks for full flowering."

"On a smoking excursion to Amsterdam last September I got a chance to sample Misty as well as da Widow, and see both side by side. They look almost exactly the same, side by side, under intense light. One could easily think they came from the same plant. I saw this in person at Positronics as somebody was trying to sell the Skunkmaster some Widow as I was standing there, and he compared it to some Misty (the house special) I had just purchased in the smoke room in back. The Misty is a *fairly* strong plant in my opinion, about a 7 on a scale of 1-10. Equivalent to a good Northern Lights in potency. The Widow, maybe a little higher but still not great. This is just my opinion of course." -SonOfLights

"10 seeds were ordered from Jocks and all but one germinated using the old paper towel. Germinated seeds were then planted in rockwool cubes and all 9 sprouted. Last week when I saw them they were about 3-4" tall under flouros with 2 lagging behind. (They looked healthy I just think they were working on their 4th node. I forgot how old but I would guess around 12 days of them were showing good branching characteristics." -Ratchet

"Misty from Homegrown Fantaseeds. It was real easy to grow. Yielded over 2 oz. under a 250!!! Tastes sweet like sugar. Connoisseur quality cannabis. Best I’ve had. Chronic from Serious is great too yields even better than Misty."

"...The Misty is really sweet. Chunky thick bright green nugs with little delicate deep orange hairs. Lots of bud mass in the Misty. The Nugs are really fucking green. They're very sticky, and VERY powerful. This shit knocks you on your ass, and it stinks. The kind of shit I’ve got a 1/4 in my backpack I’ll be smelling in the car when I've got a 1/4 in my backpack in the trunk. Yield is way better than average. I've seen half once single stalk 3-footers that were flowered at 6"-8". A joint
before you're half way into it. Split a modest one with a friend and you'll be in Oz for hours. 2 modest bong hits or one mother load will put you on your back. If you want more info on Misty check out the Homegrown Fantaseeds web site. Misty was the key ingredient in White Widow, and although the WW family is probably unstable, of the 7 Misty seeds I started there were no even size variations. Misty is definitely the better choice unless your #1 concern is yield, and don't get me wrong yield for Misty is BIG. I don't have the link anymore for homegrown, but I'm sure it's easy enough to find. Misty is definitely amongst my 3 favorites, but I haven't tried a lot of the new stuff. My number one so far has been NL5xHaze, and number 2 is either misty or blueberry." -Skywalker

"...AK-47 from Serious Seeds, and Misty from Homegrown Fantaseeds were both KILLER. Both the AK and the Misty have a great yield, and a knock you on your ass stoned to the bone. I like the sweet taste and sheer power of the Misty the best personally." -KITSCY DUB

**Strain: Original Misty**
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Homegrown Fantaseeds

**Images:**

**Description:**

“A truly beautiful plant misted all over with bulging THC glands. A good producer of donkey dick tops, combined with prize-winning quality, gourmet taste and a sweet aroma. This plant has it all.

**Specifications:**

~ Flower: 8-9 weeks" - Homegrown Fantaseeds catalog

**Growers Comments:**

“If you are looking for the best quality and yield combination I would recommend Original Misty from Homegrown Fantaseeds. Misty is a stabilized sister of white widow with a bigger harvest potential and a sweet taste. I've heard that all of the white widow hybrids are very unstable, but I saw almost zero variation between plant growth patterns in my experience with Misty. I got an even larger yield out of Misty but only a very little bit larger. It did however have a sweeter taste and an even more powerful stone than the Chronic. Flowering period for Misty was 8-9 weeks, and I harvested a little more than a 1/2 oz from each SOG style planting. After 2 weeks rooting under flo's I veg for 2 weeks under MH and then flower for 8 weeks under HPS.” - Stoned Silly

**Strain: White Rhino**
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Green House Seed Co.

**Images:**

**Description:**

“Afghan X Brazilian & So. Indian. Somewhat a mystery strain. Suffice to say it has 60% Indica to 40% Sativa ratios expressed with a definite freak in its family.”
Flowering time is 8-10 weeks respectively. Although the flowers will appear to be ready after 8 weeks, the extra two weeks is to allow THC to spew out of the glands leaving a coat of white on your nugs. You must be patient with this strain unless you’re wasting your time.

"In the case of multiple sclerosis an indica is a good choice, but I don’t think it is the best choice. The problem with using a strong indica to ease the pain is that it also fries your brain and leaves you temporarily incapacitated. I would suggest either a 60/40 cross between Sativa/Indica or a pure Sativa. Kali Mist/Western Winds is an excellent pure Sativa and White Rhino is a great 60/40 cross between

**Specifications:**

~ Flower: 10 weeks." – Green House Seed Co. catalog

**Growers Comments:**

“This crystallly, olive colored bud is sparsely covered in brownish red hairs and proud and bubbly. This bio has a pungent, green scent; some have even said it has sort of a shit smell to it. Very fluffy somewhat dense buds break apart nicely and leave your fingers sticky. Not mouth wateringly tasty, it tastes a bit brown for such a green plant, depicting its Mexican heritage. The smoke does well through water, eliminating the need to cough all together.

"Flowering time is 8-10 weeks respectively. Although the flowers will appear to be ready after 8 weeks, the extra two weeks is to allow THC to spew out of the glands leaving a coat of white on your nugs. You must be patient with this strain unless you’re wasting your time. TO EVERYONE WHO GROWS THIS STRAIN I'M BEGGING YOU ALL TO WAIT THE EXTRA TWO WEEKS THAT IS NEEDED FOR THC PRODUCTION!!"

--Ganja-k

"In the case of multiple sclerosis an indica is a good choice, but I don't think it is the best choice. The problem with using a strong indica to ease the pain is that it also fries your brain and leaves you temporarily incapacitated. I would suggest either a 60/40 cross between Sativa/Indica or a pure Sativa. Kali Mist/Western Winds is an excellent pure Sativa and White Rhino is a great 60/40 cross between

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**Strain: White Russian**

Strain Type: Sativa/Indica mix  Origin: Holland  Breeder: Serious Seeds

Images:

Description:

“With the combined power of White Widow and AK-47, this potent plant became an easy winner of Cannabis Cup ‘96 organic pot award. Select best female for future cloning.

Specifications:

~ Flower: 8 weeks” – Serious Seeds catalog

Growers Comments:

“Winner of the 1997 Cannabis Cup. This bud is mostly sea green (yellowish-green), green, and has clusters of reddish-tan hairs. Very light tan crystals coat the entire bud and bio with an undertone of skunk. When smoked, the bud tastes sweet and floral. The high is spacey, stony, a bit forgetful and lasts strongly for 2 hrs or more! 10 good hits and you're set for a while.

****3/4” – Homepage Amsterdam

“White Russian (Grey area) again very complex high, but tends a little more to the indica side. Great with coffee.” - Prince Caspian

“Very strong hash oil taste, I give it a 9.2. Both WW and White Russian are in the

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and good yielders the Russian is my favorite. It’s my fav. strain, 70-75 days flower, very good it's my fav. still after a year and 1 that I would recommend WW. x

“It is my best yielding strain, better than SK#1. There is some variability in the phenotype, but the squatty ones w/ the best yield for future clones. Definitely the best weed I have smoked. A comment from a couple of 60's stoners who made the mistake of splitting 1/2 a joint: "Too much...waaaay too much...I was tripping!" These are experienced smokers BTW. I find it to be very cerebral, extremely potent (but not a knock-out indica type of stone) and, w/ 2 bong hits of (early) buds, you'll be up/trippy high. You won't be able to sleep, that's for sure. I would recommend with the exception of Nevil's Nepali (which I can't find anymore) or his Haze.

Strain: White Widow
Strain Type: Sativa/Indica mix  Origin: Holland  Breeder: Ingemar
Images:  1  2

Description:

“Taste: The major player is a freshness laced with many fruits, but because of the strength of the crystals - the only real taste goes hand in hand with the expectorant effects of the THC. You can taste it. A strong pungency first hits you, then follows a sour sweetness with the final whiff...turning sweet. If a plant could have a strong body odour then the White Widow needs a deodorant. Visuals: If you have ever seen a green plant grown in a snowfall then that's it. It has a dense covering of the sort of hairy crystals we all craving for. Touch: If you manage to touch this plant without sticking to the leaves or your fingers will be coated from growing it properly. It has intense crystal formation that needs to be touched to be believed! Stone: After the first puff, that daunting warm feeling of impending stoniess comes over you. You feel it just under your eyes and throughout your body in time. It is a serious heavy highness. Family Heritage: Originally the union came from a Brazilian and an Indian - Suffice to say the combination is 60: 40 sativa to indica. – Green House Seed Co. catalog

Specifications:

Vegetative Time: At least 2 to 4 weeks if on Bio. On Hydro it is only recommended to grow it for 2 weeks. Flowering Time: On both mediums it is suggested to flower (12 hour light) the White Widow for 8 weeks, but 10 weeks will really give you the crystals you are after. We suggest the final 2 weeks to turn the lights off altogether - or at least down to 8 hours. This keeps the flowers plant into giving up its last drop of goodness as crystal to protect the flower. Achievements: 1st Place - BIO - HTCC - Award 1995.” – Green House Seed Co. catalog

Growers Comments:

“The most rewarded variety of recent years in Holland. The plants are white of THC-glands, even on big parts of the fan leaves. A very soft smoke and great high. Very potent. Specifications: ~ Flower: 8 weeks ~ Harvest: end of Oct.” – Dutch Passion seeds

“It is a serious heavy high. Heritage: Originally the union came from a Brazilian and an Indian - Suffice to say the combination is 60% Sativa to 40% Indica. The most rewarded variety of recent years in Holland. The plants are white of THC-glands, even on big parts of the fan leaves. A very soft smoke and great high. Very potent. Specifications: ~ Flower: 8 weeks ~ Harvest: end of Oct.” – Dutch Passion seeds
1st place winner 8th Cannabis Cup, 1st place winner 8th international Hydro Cup. A medium height, Indica dominated variety with a sweet ‘Skunky’ high. Incredibly resinous with profuse white, crystallized flowering heads. Delicious odor and taste.

Specifications: Outside/Indoor/greenhouse
Flowering period 8-10 weeks for crystals (50-60 days), outside 10-14 weeks.
Height: Inside: 60-75 cm, outside 1.50-2.00m
Yield: up to 150 gr.
Harvest time under natural light: End of October.
Appearance: Very strong plant with big leaves.” - Sensi Seedbank catalog

“This fabled bio probably derives its name from its whitish appearance created with tiny white crystals. The bud is almost absent of hairs, save sparse brown ones. Its scent is mild and flat with the tiniest touch of green that tells droves of its parentage. Light, semi-sticky buds snap apart from yucky tasting stems, perhaps overfertilized. The smoke has a mild flowery full taste. The high is a little of everything—a bit cerebral, a bit forgetful and stony. Nice trippy feeling but very mild. ***” - Homepage Amsterdam

“Arjan at the Greenhouse first introduced the White Widow strain in 1995. All reports that I have read state that it has a very complex lineage. In Amsterdam most every coffee shop now sells different "WW". One sample from the Green House Centrum, one from Homegrown Fantasy (Hydro), and one from a local's shop called coffee shop "Tops". All three were very different. Arjan's favorite of the lot came from the green house. It was a nice bud but it didn't smell as strong as the others remembered from previous trips to Adam. The Hydro from Homegrown fantasy was excellent, as was the super resinny sample from "Tops." Other items that I have read state that WW is still very much unstable and therefore you could get almost anything."

"The way Marc told it was like this: Arjan had a WW on display at some expo and Dutch passion/aloha stole a clone and hybridized it. That is the plant we bought for 130.00. This plays a part in the great variance we see in the plant; it's not just WW being unstable, we know generations- gene recombination produces various phenotypes representative as well as different genotypes. It's great if you're a breeder because you can begin to dial in your own preferences. I have one f2 plant I believe to actually be a throwback to the original WW. It is considerably larger and more indica than the rest." -LadyJ

“It's a very strong weed (which has unfortunately had the effect of spoiling me for other herbs, which seem not to get me high like they used to), but not too sedating. And extremely tasty, I've run across (makes NL seem weak, odorless). Strange that the widow won her to be VERY easy to grow in organics. A smallish medium yielding plant that isSUPER tasty. I been smoking along time and I prefer a tasty herb that you can puff and then it knocks you on your ass after one hit and tastes like pure THC almost narcotic. Some of my friends loved it but most were like me.”

“I heard that the mother was First Lady which parentage comes from Mullimbimby Madness a stable sativa strain down here in Aus. The father I heard was from a Dutch Shiva Skunk (NL#5 x Skunk#1) giving it the famous white crystal.” - Delta9

“White Widow: This plant at 60 days did not have the advertised heavy resin (not a good sample). smell was minty sweet. plant is fluffy and leafy. looks like NL high is a bit racy, and both I and my co-sampler found it made all the blood drop from the brain when standing up. tendency to feel faint. Very easy to clone. buds fluffy. Plant is prone to powder mildew on the fan
leaves. Not recommended.” - Splif Lipsit

“I'm also growing DP white widow. I have also found the fragrance to be very sweet in a skunky kind of way. This stuff is stony, but the taste leaves much to be desired. There's not much body to the flavor. I still have 3 mothers and can't decide which one is the keeper. Overall, I'm kind of disappointed in all the hype about it. I too have not had the good fortune to get buds that are caked with white frosting, but, hey, I had to see for myself. I, too, have had the problem with the powder mildew on the leaves when it gets close to harvest. I have have to do lots of manicuring to get that stash that I really want around. It doesn't get smoked.” - potattic

“I voted for the WW at the 8th Cann Cup. It was fantastic, Arjan at the awards show said the seed would come in 2-3 years. I returned and got these seeds from his shop and they are excellent. Out of 5 females, 1 was short and dense, not very branchy, just over 7 wks. The rest were taller and had a consistent heavy crystal, great smell and great stupefy high. I have my first harvest of WW was A++, I had to actually concentrate when driving my car as there was profuse and on the big fan leaves. Taste is very good, def. KIND. Taller ones I assume the taller are dominant to the Sativa side and have the taste influence. All females where KIND, but I couldn’t keep all so I gave up only on the one Indica dominant plant. I want to keep all of the 3 sativa dom. ones. I suggest this strain (I got mine at the Greenhouse in Amsterdam) to anyone. Great for personal stash, one of the best tasting strains I ever had and one of the best all around highs, VERY strong, stupefying yet not sleepy. Should be best crossed with fast, heavy yielding Indica for communication growers.”- Wood Duck.

"The WW-'s finished pretty tall, at about 15-18 inches and yielded about 21 grams each. They had a consistent heavy crystal, great smell and great stupefy high. I am having a little trouble drying this strain as it seems to dry unevenly. The WW was just smoked today for the first time and I liked it a lot. I wont classify it as anything spectacular but a .25 gram joint glued me to the chair pretty hard!” – James Hetfield

**Strain:** **White Widow X Northern Lights #5**  
**Strain Type:** Mostly Indica  
**Origin:** British Columbia/Holland  
**Breeder:** Undetermined  
**Images:**  
**Description:**

“White Widow gives Northern Lights #5 a powerful boost in this strain. Like a Super Beetle with a Porsche engine, this Indica will pack a lot of power.

**Specifications:**

~ Flower: 55-60 days ~ Height: 3-4’’  

**Growers Comments:**

none
Family: Uncategorized Strains

**Strain: Amsterdam Flame**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Paradise Seeds  
**Images:** 1 2  
**Description:**

“This outstanding plant of excellent quality with her sparkling looks is selected for the lovers of cannabis best. Her wonderful high and soft subtle taste carries us like a summer breeze, telling tales of mysteries. A plant worthy for the ‘canna’seur. It is not saying too much, it is hard to wait for harvest time!

**Specifications:**

~ Type: mostly indica, Flowering time: 50 - 56 days, Yield per m2: 400 - 500 grams.

**Growers Comments:**

“Well here’s my detailed report on my AMSTERDAM FLAME" (Paradise). Grown in organics with mostly Guano of different strengths. One being high Phos (for flowering) the other high Nitro (for growth) and so on ... 53 day flowering period. Small staunch indica, purple/orange hairs, and nectarine smell. Large main cola, crystallizing like an Alaskan winter. In fact crystallizing so well that you can hardly see very much leaf, only the crystals upon them. Looks like I put it in the freezer or something..." – Mirage

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**Strain: Black Domina**  
**Strain Type:** Indica  
**Origin:** Holland  
**Breeder:** Sensi Seed Bank  
**Images:** 1  
**Description:**

none  
**Specifications:**

none  

**Growers Comments:**

“Sensi Seed offers g13xhashplant and that was it. It is the same as the one sold in the 80's and it is also 2/3 of Black Domina. I learned this at the Sensi Seed shop 1 day after I bought the seeds directly from Alan Dronkers hands at the Pax party house. I spoke to Tony about the Mantanuska and he said that nobody has smoked it and none is ready yet. I picked up 10 Mantanuska and 5 peak19 beans (Mantanuska x Stonehedge) for 300gilders (about $175american). Adam from T.H. Seeds (Tony's best buddy and provider of the Bubblegum and Californian genetics) told me its "Sag's big bud" with "great dense yields but not a 9 or 10 in potency" and that the Stonehedge was a "more rewarding high/plant to grow" and that the "peak19 was a perfect compromise/partnership." - Damion
“Black Domina. It’s a day ender, you wont do anything but slump there for quite a while. For me it is the hardest full indica I have ever grown, or smoked, and I have been to A-dam which is where I got turned onto it by a bro from a coffee shop. The coffee shop is a direct competitor of Sensi’s, and even he said it will floor you, it did.” –Greco Roman

“Greco, I know just what you mean. It’s one of those breeds that you gotta smoke to really understand. It’s got a taste like no other Indica (pure ) out there! Not for those seeking “sweet smoke” though. Tastes like Hash Oil.

ps- it’s good outdoors as well...very early.” – Bdubs

“I purchased some Black Domina seeds from the Sensi Seed bank the last time I was in Amsterdam. I wasn’t too impressed with my final product. True it was very resinous and smelled like blackberries but the high wasn’t that desirable. I also made the mistake of trying to grow a B.D. outside. Since it is an indoor variety only it does very poorly under natural conditions. I ended up with some runny nugs and just ok bud.” – Bill Wonderful

Strain: **Chitral**  
**Strain Type:** Mostly Indica  
**Origin:** India/Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**

This variety is a hybrid of Chitral and Skunk, Chitral being the variety of the famous Chitral hash of the seventies. Hybridized with Skunk, the variety tends to be even stronger. Good harvest, nice herbal taste and strong “physical high”.

**Specifications:**

~ Flower: 8 weeks ~ Harvest: 3rd week of Oct.

**Growers Comments:**

“This bud has thick layers of orange-red hairs surrounding darker colored green nodes. The crystals are not very obvious, but are noticeable. It has a sweet green scent with skunky undertones. Buds break up stickily and the stems taste more like mint or blueberry stems than skunk. It tastes skunky with an undertone of citrus, like orange peel. It’s thick and expansive in the lungs and will make you cough. The high comes on quick and is lazy and stony. Doesn’t give the munchies! ***” – Homepage Amsterdam

Strain: **Chronic**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Serious Seeds  
**Images:**
**Description:**

“Chronic is the plant to grow when yield and quality are top concerns. Mostly an Indica this plant can produce up to 600 grams per m² while not compromising quality. Chronic has a strong high with a heavy resin content. Smokers that know and grow choose this plant for both appearance and it’s sweet scent. Winner of 3rd place hydro division in the 1994 High Times Cannabis Cup, this is chronically the best choice for growers that are tired of losing quality when gaining yield. Indica/Sativa bred with powerful effect and sweet smell in mind. Quality without compromise, serious flower power!

**Specifications:**

~ Mostly Indica, Flowering time: 60-67 days, Yield: 400-600 grams/m² – Serious Seeds catalog

**Growers Comments:**

“I’ve grown Chronic. I’ve heard several different ideas about the genetic origin. The second was NL x Big Bud x Afghan. I am personally more prone to believe the first. It’s a certain mildly sweet aroma and taste that I didn’t notice at all in Chronic. I noticed more characteristics other than a giant fucking yield. Chronic has a very slightly spicy stone. If you are looking for the best quality and yield combination I would recommend Original Misty from Homegrown Fantaseeds. Misty is a stabilized sister of white widow with a bigger harvest potential and a sweet taste. I’ve heard that all of the white widow hybrids are very unstable, but I saw no plant growth patterns in my experience with Misty. I got an even larger yield but only a very little bit larger. It did however have a sweeter taste and an even more overpowering stone. If you are looking for the best quality and yield combination I would recommend Original Misty from Homegrown Fantaseeds. Flowering period for Misty was 8-9 weeks, and I harvested a little more than a 1/2 oz per SOG style planting. After 2 weeks rooting under flo’s I veg for 2 weeks under MH and then flowering period for Misty was 8-9 weeks, and I harvested a little more than a 1/2 oz per SOG style planting. After 2 weeks rooting under flo’s I veg for 2 weeks under MH and then flower for 8 weeks under HPS.” – Stoned Silly

“Chronic is a strain developed by Cerebral Seeds. After this company split up into Serious seeds & Sagarmatha Seeds, both parties kept the strain. Serious sells it under the Chronic name and Sagarmatha sells it under the name Slyder. Actually Sagarmatha ran into some problems with the germination rate of some of their Slyder seeds. They have stopped carrying it FOR NOW until they get a few new batches. Personally that the Slyder would return very soon. The origins of this classic strain are “ a Northern Lights crossed with an Afghani ”. Very, Very Heavy/ sleepy buzz. Tons of resin, relative small bud structure. Very well suited for SOG application.”

“As for the Chronic, I’m extremely impressed. All the claims of high yield and potency seem to have been true; haven’t got the total weight of my grow yet cause the MONSTER colas (two feet long x four inches thick) are still drying, but the first three plants (which weren’t the biggest) gave over 100 grams each and the last three look like they’ll weigh in even more. There is a bit of variance in the plant growth patterns in my experience with Misty. I got an even larger yield but only a very little bit larger. It did however have a sweeter taste and an even more overpowering stone. If you are looking for the best quality and yield combination I would recommend Original Misty from Homegrown Fantaseeds. Flowering period for Misty was 8-9 weeks, and I harvested a little more than a 1/2 oz per SOG style planting. After 2 weeks rooting under flo’s I veg for 2 weeks under MH and then flower for 8 weeks under HPS.”

“Our Chronic clone started with germinated and sprouted. The seed gave up 7 females with 3 males. During veg these plants were similar in appearance but differed somewhat in growth rate under flouros. All of these Chronic plants had long leaf stems with leaf blades somewhere between an indica and sativa as far as width and color. The color was a darker green with a nice shine.

1 and 2- These two were practically identical in all aspects so what the heck. They grew like sativas. They were cut down around 10 weeks and could have gone on longer. All of the chronic were cut down in approximately 10 weeksù68 days. Some were probably ready a few days earlier though. Braided
describe the bud structure. Buzz was good and yield was decent but both these plants were chopped because of the long flower time. These plants also had the city skyline look to the buds since branches were just about all horizontal.

3- Got shaded bad and after a test smoke was chopped since it wasn’t as good as others. It could have been a decent plant but we’ll never know.

4- This one here was the winner as far as yield goes but since they were all somewhat crowded it’s the real champ. This will be a nice plant to grow since it grows like a sativa and tolerates hard times than indicas. This plant placed well in the buzz department too, 2nd. Buds have the braided look with smaller calyxes than 1 and 2. They were fairly tight buds considering this plant was on the edge of the grow.

5 and 6- Yep these two were practically identical as well. Heck they even yielded the same. These were completely different in bud structure than all the others. They have small calyxes without the braided look; they are much more compact than the others are. Buzz place was a close 3rd for both of them.

8- Don’t know how this one yielded since it was the buzz champ and got chopped during flowering like the hand was a ginzu.

This buzz is nice and the yield won’t be too bad either. This was the prettiest one of all and has the braided look with smaller calyxes than 1 and 2 with a nice orange color for flowers. More on the final report since not much attention was paid to this characteristic.

Aroma: This had possibly the most pleasing smell for weed, ever smelled in these parts. The stuff smells like light perfume or garden flowers, very nice.

Buzz: The buzz from 8 is about the same for all of them except for potency. When the plant was chopped early it had a definite sativa feel to it and it was even reported that someone had visual distortions after smoking it when tired. Once the thing matured the buzz turned more into an indica type thing that could knock some folks down but really isn’t couch lock at all, its just that the potency causes burn out when the buzz wears off. But mostly the weed has the sativa edge. Since little was smoked when the plant should have been harvested let’s leave this until the final report from clone, it’s better than average right now.

Taste: The taste was pleasant and tasted somewhat like it smelled. More on the final report since not much attention was paid to this characteristic.

Yield: Because these plants were flowered for 2 weeks under flouros before moving to Jr., and because they were somewhat crowded, and because they yielded as much or more than any other plant grown from seed in cc Jr. - flick

**Strain:** Domino  
**Strain Type:** Indica  
**Origin:** British Columbia  
**Breeder:** Breeder Steve  
**Images:** 1  
**Description:**

“Tangy indica, wicked crystal.

**Specifications:**

Height: short, will grow wide with veg Flowering: 6 Weeks Harvest Outside: early Oct. Yield: Average  
**Life Seeds catalog**

**Growers Comments:**
**Strain: Durga Mata**  
**Strain Type:** Indica  
**Origin:** Holland  
**Breeder:** Paradise Seeds  
**Images:** 1 2  
**Description:**

“This cross of two super Shivas, selected for their resin content is mind blowing but nevertheless tasteful and she is easy to grow. A plant to get familiar with the world of cannabis.

**Specifications:**

Type: indica, Flowering time: 50 - 55 days, Yield per m2: 350 - 450 grams” - Paradise Seeds catalog

**Growers Comments:**

none

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**Strain: Dutch Dragon ®**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Paradise Seeds  
**Images:** 1 2  
**Description:**

“This dragon of Dutch descent is a spectacular plant for indoor growing. High yields with short flowering period. Superb quality along with long sticky colas. Its sweet taste and strong potency makes her the favourite to many regular smokers.

**Specifications:**

Type: Sativa indica, Flowering time: 50 - 55 days, Yield per m2: 400 – 450.” - Paradise Seeds catalog

**Growers Comments:**

none

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**Strain: Early Riser**  
**Strain Type:** Sativa/Indica mix  
**Origin:** Holland  
**Breeder:** Sagarmatha Seeds  
**Description:**

“Early Riser is our first variety especially developed for outdoor production. Several generations of select breeding -choosing individuals with the shortest flowering period combined with the highest density of...” - Sagarmatha Seeds catalog

**Growers Comments:**

none
cannabinoidal resin - have produced a wonderful example of botanical wizardry. This species is truly worthy of supporting the same high quality standard of exceptional cannabis that Sagarmatha has provided for her scrutinizing clientele. The aroma and flavor of Early Riser is sweet with a minty aftertaste. The high is uplifting and motivational, releasing the sun's natural energy with every bowl, so let the sunshine in and don’t get burnt!

~ Type: Indica-Sativa, outdoor. Flower period ends: Mid. September. Average Yield: 400-600 grams/plant” – Sagarmatha seedbank catalog

Growers Comments: none

Strain: Eclipse
Strain Type: Mostly Indica  Origin: Holland  Breeder: Dutch Passion Seedbank Images:
Description:

A new variety, mostly Indica with a sweet taste. Somewhat a version of the bubble gum/bubble berry famous by American clients. This is one for the young and the young at heart.

Specifications:

~ Flower: 8-10 weeks” –Dutch Passion Seeds catalog

Growers Comments: none

Strain: El Nino
Strain Type: Mostly Indica  Origin: Holland  Breeder: Green House Seed Co. Images:
Description:

Haze X Super Skunk Brazilian X So. Indian. 25% Sativa/75% Indica

Specifications:

Vegetative Time: For indoors a suggested minimum of two weeks. For outside of spring. Flowering Time: For indoors a suggested time of 9 weeks. For outside, substantial yield will be expected.” – Green House Seed Co. catalog

Growers Comments:

“El Nino is Haze xSuper Skunk x Brazilian x So. Indian. Tastes very earthy with a hint of Haze. Dense, highly

Growers Comments: none
resinous buds, but a low yielder. The high could have and should have been better when you look at the parents. Tried it at last years Cup, didn't even finish the spliff.” –Geronimo

Strain: **Five-in-One**  
**Strain Type:** Sativa/Indica/Ruderalis mix  
**Origin:** Holland  
**Breeder:** Undetermined  
**Images:** none  
**Description:** none  
**Growers Comments:**

“The strain called “5 in one" was my favorite. Very high calyx to leaf ratio. There was hardly any trimming to do on these awesome buds!!! It was all bud I swear to ya!!! They reached maturity at about 15 inches and each plant had many medium size nugs. The stems on these babies were strangely thin, so thin that as they were growing up I thought they were going to suck. I used shiskabob sticks to hold the buds up and the closer they were held to the light, the denser and bigger the bud was. The smell was something fruity. The taste was great too, actually the first time I can say I actually could feel the different taste of this awesome strain. These babies yielded almost a Z a piece so needless to say I am happy with them." -James Hetfield

Strain: **Fourway #1**  
**Strain Type:** Sativa/Indica/Ruderalis mix  
**Origin:** Holland  
**Breeder:** Sensi Seed Bank  
**Images:** none  
**Description:** none  
**Growers Comments:**

“Four Way #1 is a hybrid of 4 different strains, 25% Indica, 25% Ruderalis, 25% Northern Light, and 25% Skunk #1. As a whole the Four Way #1 cross has the Indica appearance. The plants are strong and easy to grow. Some of the plants give very high yields, so select a clone. The plants have a minimum amount of leaves and grow well developed buds. A very good smoke in taste and high. Not susceptible to spidermites.” –Sensi Seed Bank

Strain: **Hollands Hope**  
**Strain Type:** Sativa/Indica mix  
**Origin:** California/Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:** none
“One of the first Dutch Outdoor strains, grown in Holland since the early eighties. A heavy Indica variety with a knock-out high. Very mold resistant. Highly recommended.

**Specifications:**

~ Flower: 8 weeks ~ Harvest: end of Sept., 1st week of Oct.” – Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Strain:** Hollandsch Hoop  
**Strain Type:** Sativa/Indica mix  
**Origin:** California/Holland  
**Breeder:** Positronics  
**Images:**

“Developed: inbred 10 plus years Stabilised hybrid Sativa/Indica: California Sativa crossed with Indica  
Appearance: big long clusters, green to goldish at harvest Smell/taste: sweet

**Specifications:**

Type high/strength: good taste and strong Height: 3-4m Yield: very high Harvest date (Netherlands natural photoperiod): begin Sept. 12hr day exposure harvest (# of weeks): 7-9 indoor / greenhouse / outdoor

**Growers Comments:**

none

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**Strain:** KC36  
**Strain Type:** Indica  
**Origin:** Holland  
**Breeder:** KC Brains  
**Images:**

“I grew KC 36 from KC Brains, it is a very unstable strain, out of 30 seeds I got 2 good plants, I could discern 3 "varieties" one has very fluffy Buds and small calyxes, this one you can forget. Another one has extreme big calyxes but very few. The "real one" has big calyxes and extremely big buds and is a very good yielder. One of the good plants tends to get Bud rot cause of the massive Buds, the other is immediately after you turn the lights to 12/12 (about 5 Days). Flowering time
mothers do not start flowering, give them 20 hours light, my most promising plant just started flowering under 16 hrs light. Resin production is only strong in some plants. The real one should have a honey like smell. Cant think of anything else right now.

I am not sure myself if I should keep them, I got the seeds as a present. I would never buy a strain that is unstable like this myself- cause I might even have been lucky that I got the 2 good plants - you might buy 20 seeds and it is all crap, and you don’t catch the "hybrid vigor" super plant. I suspected from the look and feel of the good ones that they might be Jack Herer stolen from Sensi and being F2 Seeds they are more unstable than Jack Herer, and J.H. is very unstable. But its just a guess. Yield is very good - High is good. If you decide to try this strain out look out for a mother with these huge fat flowering growths where each flower or calyx is really fat, and the Colas are fat. Leaves are as with other varieties like NL or WW. Look for resin production and big calyxes - a stable strain-but yield is mediocre. The KC 36 high is between Indica and Sativa, but nice no sativa "thinking in circles". few things are nice very fast start of flowering, explosive bud formation, short flowering period, high yield.” -Baron

**Strain: Nebula**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Paradise Seeds
**Images:**  1  2

**Description:**

“Like the name suggests this plant is covered with twinkling shiny THC glands. Its flavour and scent, marvelously sweet is a delight to even the most experienced smoker. She is bound to get you into the realm of space. Her buzz is typically transcendental and it is known she takes you far beyond your grasp. When you want to join the worlds of nebula, she is waiting to give you universal depth.

**Specifications:**

Type: indica/sativa, Flowering time: 56 - 62 days Yield per m2: 350 - 450 grams

**Growers Comments:**

none

**Strain: Night Queen**
**Strain Type:** Sativa/Indica mix  **Origin:** Holland  **Breeder:** Dutch Passion Seedbank
**Images:**  1

**Description:**

“A 1997 upgraded strain. Very early flowering, very productive, a Sativa/Indica mix which is sweet, Sativa high.

**Specifications:**

~ Flower: 6-8 weeks ~ Harvest: end of Sept., 1st week of Oct.” – Dutch Passion
Growers Comments:
none

Strain: Peak 19
Strain Type: Mostly Indica  
Origin: Holland  
Breeder: Sagarmatha Seeds
Images:
Description:

“Peak 19 was the original western name for Mt. Everest. With similar magnitude and strength as the majestic mountain herself inspires, F1 hybrid Peak 19 will fulfill your cannabis desires. The potency of this plant will take you soaring high above the rigours of daily existence. Thought provoking and physically stimulating, the highs associated with Peak 19 are somewhat trippy in their nature. This smoke should be enjoyed mostly by sure-footed high altitude experienced Sherpas or persons with a high sense of adventure. Stonehedge and Matanuska Tundra is one of Sagarmatha's most prized and "flavourite" delicacies, providing a palatial delight and a celestial height for every high mountain trekker.

Specifications:

Type: mostly Indica, indoor and outdoor. Start vegetate: shortly after roots show. Flowering time: 60 days. Average height: 1 meter. Yield: 350-375 grams / m2 (dried).” – Sagarmatha seedbank catalog

Growers Comments:

“Well let me tell ya the most impressive strain since afoaf's first strain which was Romberry, has really come along nicely, its Peak19, and in both of its phenotypes its a real sight, it comes in a Stonehedge and Mat Tundra expression, they both start frosting with trichomes early (2 weeks), the Tundra expression, they both start frosting with trichomes early (2 weeks), the Stonehedge is great when you need a really short plant, the spec at Sag says they are a/b .5-.75 meter, that afoaf has is 18", after 4 weeks 12/12, they stretch so little, it was forced at 13", and basically all of its branches are starting to form one whole plant connected cola, It would be great in "Arena" style grows for the rows that need short style plants, or any grow where height is a factor. Also "Magic Crystal" (WWxCalO) from Ingmar is a great strain also, the odor is unmistakably "Orange" at 4 weeks 12/12, and the flowers are twice as fat in diameter as any of the 5 strains in the grow, Ingmar must select against skinny colas, because the "Ingmars Punch"(WWxSkunk) was the same really fat colas, I guess 17 years attributes in strains, that's a lot of time to grow out lots of generations, and do lots of selecting and backcrossing.” – Budm

“About the Peak 19s, they were great the F1s have 3 types one that sticks to the Stonehedge sativa phenotype, however in this strain its not tall, lanky, and skimpy, it reaches a height that are frostier then many indicas. The next expression sticks to the Matanuska Tundra expression, they both start frosting with trichomes early (2 weeks), the Matanuska Tundra is short and stocky, at maturity, after stretching the gal was just 18", and she would provide a really short grow and stony smoke, Then there is a homogenized phenotype, that is between the two, it's like getting three strains in one pack“ Now the F2s my friend made are turning out as good or better then the F1s, the male used in the pollination, was very impressive, nodes were under one inch, he was very stocky, lush, and stinky at maturity, he pollinated one Stonehedge type gal, My friend harvested his first Peak 19 F2, and its every bit as good as its mom
taste is great with out curing, it will be real nice when cured. So far two out of three F2s, are the taller Stonehedge type, they have a great up "wake and bake" soaring high, and one is shorter, and will prolly be more Indica like, from the Mat T parent.” -Budm

Strain: **Pluton 2**  
**Strain Type:** Indica  
**Origin:** Holland  
**Breeder:** Super Sativa Seed Club (S.S.S.C)  
**Images:**  
**Description:**


**Specifications:**
none

**Growers Comments:**
none

Strain: **Sensi Star**  
**Strain Type:** Mostly Indica  
**Origin:** Holland  
**Breeder:** Paradise Seeds  
**Images:** 1  2  
**Description:**

“This hybrid is a great indoor plant. She produces powerful, resinous and very sweet aroma speaks for itself. One of world’s best stuff for heavy smokers. It is breathtaking and gets you stoned to the bone.”

**Specifications:**
Type: mostly indica, Flowering time: 55 - 60 days, Yield per m2: 350 - 450 grams.

**Growers Comments:**

“I harvested the SS in early October. 4 plants, each with a 1oz. cola (big and fat) and about 1/2 oz of lesser buds. This weed is probably about as potent as Northern lights, although the taste are very lemony, fruity. Nice, smooth powerful weed. I'm quite happy with it actually, even though I keep trying to tell myself its not as good as the NL#9 I grew with it, every time I light a j of SS, I'm surprised at the potency.” – KGB

“It is a very good cross for its potency. Yep, the high is more complex than most, fairly low, matures from 50-60 days. There’s much variation in this strain, so select your favorite. Be glad to answer any specific questions.” –stix
“Received Sensi Star through HS, 10:10 for germination. All very uniform looking females, all short, very vigorous and dense in growth. I put them into bud after they were about 12-14”. All had minimal stretching under my 1000w hps and using CO2 with temps in 75-85 range. Out of my 4 females, one had a mold problem at 6 weeks and the other 3 are about 2 and a half feet tall and ready to harvest any day. They have huge, very dense, THC covered buds. A great indoor plant that seems to have great commercial value.” -Brends

Strain: **Silver Pearl**
Strain Type: Sativa/Indica mix  
Origin: Holland  
Breeder: Sensi Seed Bank
Images: 1

**Description:**

“This 3 way hybrid contains Early Pearl®, Skunk #1® and Northern Lights®. This hybrid is quicker and sweeter than the Shiva Skunk®. Excellent indoor and greenhouse results. Plants exhibit frosted resinous characteristics of the Northern Lights #5® and the sweetness and calyx-to-leaf ratio of Early Pearl / Skunk. One of our favourites and in 1994 the winner of the mixed Indica/Sativa category.

**Specifications:**

Flowering: 45-50 days. Height: 100-125 cm. Yield: up to 100 gr. Finishing date in greenhouse: mid-October. Yield in greenhouse: up to 500 gr.” – Sensi Seed Bank catalog

**Growers Comments:**

“My Silver Pearl is beyond wonderful! VERY HALLUCINOGENIC tastes sweet like honey, not my favorite flavor but a great accomplishment. I sent away for silver pearl seeds from mike 12 days ago, he says they are on the way so I’m hoping for Friday, then greenthumb at my friends house!” Damion

“Silver Pearl hallucinogenic? You bet it is! Never grew it (but have the golden ticket to do so, thanks mike) had it last year grown by a friend (he purchased seed in Adam himself) I’m a heavy toker and Ill tell you, 2-3 bong hits to be high as a kite, 6 or more and you’ll start seeing what I mean, enjoy an even better ride!” – Damion

“You said that the taste of the silver pearl had no noticeable Skunk taste in it, target with the silver I’ve smoked and the Early Skunk (EPXSK#1) that I have sweet with almost minty undertones) seems to be the dominant trait carried by this strain. The High of the EP X SK #1 is kind of heady and very functional. One of my favorites for the morning are a couple of hits at lunch.” - D

“Silver Pearl is a taller plant the stone is more up, while Super Skunk is shorter stone -haven't grown either since 90 so may have changed but both were nice.” – Oldtimer1

“Old timer described the 2 perfectly: Super Skunk will give you that couch potato stone and Silver Pearl is more energetic/hallucinatory. I'd go with the pearl unless your growing for yield.” – DAMIONSIN

“I just finished super skunk and have Silver Pearl coming right behind it. the
but nothing all that special. IMHO the silver pearl will be the better strain.” – NYC

“If I was given the choice, I would choose Silver Pearl over Super Skunk anytime. This plant has the power of NL (after 2.5 weeks flowering the buds are so resinous they stick together), the ease of growth of skunk (never goes hermy), and the delicate class of the sativa Early Pearl. This has to be one of my favorite smokes - the smoke is sweet, orangy-incense, and the high is a full-on trippy head rush. I'm no great fan of anything to skunky- its all a bit the same, I think its best to mix it with other things.” – retro13

“For the other side of the coin, I've grown Super Skunk (Sensi '95) and it performed very well (especially since the price was like 60 guilders or so). It would make a great commercial weed - very resinous, nice fat buds, though not the densest. Good deep smell, I don't like it but many people do. Covers both sides... it will put you to sleep if you smoke too much. I would say it be better if the weed is just for you, or the SSkunk if it is more commercial.” – Shabang

“This plant has the power of NL (after 2.5 weeks flowering the buds are so resinous they stick together), the ease of growth of skunk (never goes hermy), and the delicate class of the sativa Early Pearl. This has to be one of my favorite smokes - the smoke is sweet, orangy-incense, and the high is a full-on trippy head rush.” – retro13

“We didn't grow out enough SP to make a decision on variability, but this I can say: its growth characteristics are looser than NL, with slightly lower yield. Its taste is thick, warm, sweet- slightly sour. Its very vigorous. The high is not bad. At first, it can be quite shocking (giving a 'hangover' after a night on it), but after you get used to it, the 'power' hit lasts about an hour, is slightly sativa/indica cross type high. Its not couch lock, nor is it get up and go speed. As far as variability is concerned, I've worked a bit with early pearl (one of the parents), and have decided that this strain is much more variable than I previously assumed. There are two main phenotypes, and when bred against other things, I've seen quite a few different groupings of characteristics. As far as I'm concerned, SP is likely to be kept, just because it's a regular, not too indica, and without having all the hassles of the harder sativas to weed out. If I was you, I'd plant as many seeds as you've got and see what comes out. It can have a very nice growth pattern- early and advanced branching, but looser nodes than NL. The leaves (EP trait) which makes manicuring as easy as a walk in the park.” – retro13

Northern Lights x Silver Pearl: “These dark green buds are completely coated with almost flesh colored. Their structure is highly compact as small buds break up nicely to release a super-sweet green bio scent (quite expected from this lineage!). The taste is sweet and fruity and expands slightly in the lungs. The high is spacey and visual and comes on quickly. It’s a bit forgetful and a bit lazy, a nice rainy-day-got-nothing-else-to-do bud. ****1/2” – Homepage Amsterdam

Power Pearl: “This is the daughter of the Silver Pearl. These buds are a bright light green, sparsely coated with even lighter crystals and covered in short orange-red hairs. They are very pungent. The smoke is full bodied, skunky, and unbelievably smooth! The high is energetic and takes just a few minutes wait to some on. ****” – Homepage Amsterdam

**Strain: Stonehedge**
**Strain Type**: Sativa/Indica mix  **Origin**: Holland  **Breeder**: Sagarmatha Seeds

**Images**: 1 2

**Description**:

“Stonehedge is a marijuana of megalithic proportions. This plant has vigorous growth and excellent crystalline structure. By far the largest and densest sativa we have. Her lineage consists of an old style Cambodian type plant with a slight Western Winds influence that enhances the sativa strength and pleasure. The high she possesses is soaring and overwhelming, providing the smoker with a lithographic outlook. Whether taken in the evening or after work her magic is well received. Not recommended for operating heavy equipment "unless it's you." Second Place Winner 1998 Cannabis Cup

**Specifications**:

Type: Indica-Sativa, indoor and outdoor. Flowering time: 55 - 60 days. Average height: 1 meter. Yield: 350 grams / m2 (dried)” – Sagarmatha catalog

**Growers Comments**:

"Tony, an American and owner of the Sagarmatha seed shop in Amsterdam, said that the original seeds had been given to him by some Vietnam vets (so much for the "breeding" efforts). These vets in turn said that they were the result of their breeding a local (Californian) strain with a Cambodian plant. The Sag site in the last months has added a reference to Special K in Stonehedge description, so perhaps they re-bred it with Special K. In any case, it is supposed to be a "manageable" Sativa, with a decent yield and remarkable good taste (even when some reports state it has a heavy Indica influence as well). Special K, which may or may not be in there, is Sag's (corrupted) version of Serious AK-47 (Sag and Serious are spin-offs from a previous company called Cerebral Seeds, and it seems to me Serious got to keep the two true stocks, the ones that make up AK-47 as a F1 hybrid).

I believe that indeed most of Sag strains are not bred or developed by them, but rather heirlooms or private stock given to them by their network of American friends, as it is the case with Early Riser (Rosa, co-owner of Sag, said that this one was a Cali Orange selection given to them by a friend). Matanuska is most likely totally unrelated to the real deal from Alaska (people number of local strains, adding to the confusion) but rather related to an NCGA experiment (involving a NL with some alleged G-13 in it) dating back to the time they (Sag and NCGA) teamed up briefly. They just appropriated the Matanuska name, as it had a mystique, and applied it if they registered it as a trademark, which they can in Holland. Sag are very liberal with seed names --their "NL#9" has no Northern Lights at all, but rather is a combination of Jack Herer, White Widow and Durban (yeah, nice mix). As you see, its all very seedy (hehehe) and the only way to ascertain quality is to grow the stuff. I even suspect that Sag permanently lost some of their own strains, as several of them where out of stock for more than a year (rip-offs and boycotts at their seed grow operation) and suddenly (suspiciously) resurfaced... perhaps today's Stonehedge is not the original, but a female clone crossed with a male Special K to get a seed line going (that would explain the new reference to Special K in the description).

More ramble than you bargained for, eh? Sorry... got carried away, the story of strains reads like a novel. Hope this helps though." -Adam Tripper

“I grew out ten seeds earlier this year. The plants were quite robust and large. Although you could see some indica influence in the leaves, Stonehedge grows like a sativa with internode spectrum. It needs a lot of light and even then the yield is somewhat exiguous. The flowers begin to put on some weight after fifty days of flowering. The aroma is earthy grapefruit bouquet if I were pressed for a description. There is excellent..."
up markedly after fifty days of flowering. The high is intense and long-lasting.

I like the way the smoke tastes and makes me feel but I am not happy about the yield. Ten seeds were not sufficient in this case to get a mother of truly outstanding character. Perhaps another female would produce a heavier yield. I do not know.” - Moose

“Don’t know too much about Stonehedge's parents. It was indica dominant, dense nugs and a hashy flavour. A "stony" party killer-type herb. Pretty average when compared to some of the others.” - Geronimo

**Strain: Swiss Miss**
**Strain Type:** Mostly Sativa with Ruderalis  **Origin:** Switzerland  **Breeder:** Positronics

**Images:**
**Description:**

Imported: Switzerland  
Pure breeding Sativa/Indica: looks pure Sativa  
Appearance: looks like Mexican Sativa  
Type high/strength: lightweight smoke  
Height: 2m  
Yield: med  
Harvest date (Netherlands natural photoperiod): end Sept  
12hr day exposure harvest (# of weeks): 8-10 indoor / greenhouse / outdoor  
Early flowering (good breeding stock for earliness), good for the Dutch Alps

**Growers Comments:**

none

**Strain: Top 44**
**Strain Type:** Mostly Indica  **Origin:** Holland  **Breeder:** Interpolm Growshop

**Images:**
**Description:**

none

**Specifications:**

none

**Growers Comments:**

“The top44 is a cannabis strain developed in Holland some years ago, it's mostly Indica and something else, there are a lot off speculations what this 'else' might be. The top44 is an impressive fast flowering plant, I never heard of a strain that has flowering time from only 6 weeks (44 days), but gives big resinous buds in this short time. At first the Top44 was popular under cash growers in Holland, later on the home growers did find the great ability of the strain too, it's able to switch between vegetative and flowering. As the strain mostly stop after one week you put at in flowering. It will go inside and also outside and it's an easy compact growing plant, it is easy to get in one off the many cannabis growshops, this may change because the Dutch law is getting harder for the bigger clone producers. Because it is an compact
SOG setup, it gives one long cola if you grow 4 plants the sq./feet like in the closed from the picture beside, there are growing 49 plants on soil, used are 4 liter containers and a 600 watt (Natrium) lamp, total space used in this case is 9 sq./feet, in this setup we normally grow only one week vegetative, this way we are able to get up to 6 crops a year. At the growshow (sample setup in a growshop) from Nederlicht Growshop we could see that the top44 is doing very well if it gets more space and time. On the picture beside you can see one big plant that they did grow three months vegetative (18/6), they used a 600 watt (natrium) lamp and the plant was in a 50 liter container, if you plan to grow bigger plants rule one is use big containers. This plant did give 350 grams of the finest buds. The high is really great, strong and euphoric alike and the indica part off this plant gives a relaxed feeling overall, smoke it and let flo your mind. If you plan to grow bigger plants rule one is, use big containers. This plant did give 350 grams off the finest buds. The high is really great, strong and euphoric alike and the indica part off this plant gives a relaxed feeling overall, smoke it and let flo your mind. It has its own taste and is very sweet, the buds are very smelly and sticky, it has red hairs after 6 weeks. Smoke this flowering a bit longer to get an ultimate effect, the top44 adds a lot of resin to the buds. " – Jock

"There are a few around here (Flick?) that have the real Top44 from Holland that they got as a cutting from Jock. The seeds available from him are not the same as the cuttings he has. The company without much reputation yet.. But they're getting around the net since WeedSeed picked them up. But its not a very popular strain except in Holland / the rest of Europe as a commercial plant." -shabang

"50+ grams/s.f. Spacing at only 2 per square foot in 48 days isn't too bad. I'll agree that the 44 days is pushing it and the plant is better buzzing 4 or 5 days later but you can harvest at 44 and be satisfied with the yield. It's a great buzzing social indica that grows fast and heavy." –flick

"I've grown it from seed and from cuttings that were supposed to have been from the breeder himself...It didn't mature in 44 days (under lots of light) and it didn't yield enough. I have grown out at least 35 strains in the past 2 years and it was the most disappointing." - Muir!

“Grew Top 44 from seeds through Jock (I think they're Nirvana's). Not shwag, but not top grade nederweed by any stretch. First of all, it didn't finish in 44 days. It took 54 days to reach 90% withered pistils under 45 w/sf of mixed MH/HPS light. They were less than 10% withered at 44 days. Visible trichome production is about 50% of what you'd expect from a top-grade strain (no sugar frosting). Secondly, like most strains whose main claim to fame is earliness, Top 44 is before changing to a 12/12 photoperiod began flowering at about 6 biological weeks old. This screams Ruderalis genes to me. It was cloneable, however, and the clones did veg out for some time with just one week longer to wait. I ended up giving 3 Zs of Top 44 buds away because I had no desire to consume them."

Potency was overall a disappointment, but better than expected considering the Indica stone, about a 6 out of 10, 10 being that yet-to-be-smoked perfect bud. On the plus side, it has textbook “mini-baseball bat” buds with virtually no bud leaves to snip out. The clones grow straight up with no branching, making the strain ideal for SOG, less so for ScrOG. These traits no doubt are behind its Dutch rep as a good commercial crop strain. Will I grow it again? Probably not.” -B420

Flick’s TOP 44 REPORT:
Bank- This strain did not come from a known bank but rather an unknown (to
Holland. Supplier: Jock

Because this strain was sent as a cutting rather than seed I can’t say that you will get the same results buying Top 44 seed from any bank that offers them. I do know that Jock is working with some Top 44 seed stock looking for something with the same quality as the clone ma that was sent. The plant I will be talking about. Here are a few things you should know before considering this plant based on the info presented.

Notes

Plant was approx. 2 months from the day it rooted when put to flower. I think it was about 3 years old genetically. Plant had approx. 20 cuts taken at 3 different times prior to induction (63w hps per sq.’ for 10 hours, light balancer, CO2?, GH nutes) (The question mark on the CO2 is because the tank ran out at some point and I can’t be sure exactly when it happened so I don’t know how long it was off.) Plant was grown using a wick system that turned into a water culture deal when the roots grew out of the pot.

Plant was grown using the Screen of Green method (ScrOG—for those in the dark it’s a horizontal trellis used for training rather than wires making for easier and better training strategies).

Plant suffered a dry out of the res. which hurt the root system some (it was caught pretty quick.) After this dry out yellowing started. I believe it was due to some root damage but it could just have been because the fast growth rate required more N than I was feeding it. I’ll find out next go round. (Because of this I ended up overcompensating with N too long into the flowering stage and ended up with leafier bud than I should have.)

Days Till Harvest

The first bud was snipped at 37 days with approx. 50% of flowers having turned. Main harvesting took place on day 42, 43 and 44.

Growth Characteristics

This sucker is fast! I’ve never seen a plant flower this fast. It sounds just like the Shiskaberry that Shiva raves about. NOW I know why he loves the Shiska and why I will love one soon too! Because of the speed of flowering and the condition of the plant when put to flower I failed miserably trying to fill the area I wanted too on the screen. The plant stopped growing after only 6 days! It’s not only a fast flowerer it veg’s at a quick pace as well. The plant does well under low light levels. Found this out by letting it spend time under flouros during veg to help keep tight nodes for future cuts. Add this to the fact that I grow this plant very well when compared with those towards the middle of the grow and I don’t think you could go wrong with any light and this plant.

Just to give an idea how fast this plant flowers. I still have my NL#5 and put one under the screen just to get it out of the way (Remember I’m looking to kill this thing off soon because of the constant flowering it does). The Top 44 was put to flower about 19 days after the NL5. The Top 44 caught up to the NL in 3 weeks as far as flower growth goes and passed it in 4. It was amazing to watch especially after spending so many years with mostly sativa bag seed.

Yield

Because of my failure with the screen it’s impossible to give an accurate grams/sq.’ number. Because the plant stopped growing 6 days after induction I ended up with a circle of buds in the middle. (I didn’t start the plant in a corner since I put an NxS plant there in case I failed—-I hate empty space in a flowering area). Best guess on area covered is somewhere between 1.5 and 2.25 square feet. With that said.. 84 grams, dry was the total harvest weight for quality bud. The small amount of cooking bud was not counted in this figure. (There wouldn’t have been much cooking bud at all if I had trained well since big buds were shading smaller ones due to the poor training).

Bud Condition

Buds were nice and tight with orange to red rust colored hairs when done. Rather than the larger resin glands I see with the N x S the T44 has small resin glands. While the N x S looks like a coat of crystals the T44 glands look like a coat of light snow or heavy dust. Many areas of the buds looked like I imagine WW looks, white ;-) Note: This plant piles on the resin in the last few days, I don’t recommend
know I won’t do it again.

Aroma
It was nice to get something that smelled good in the grow to compensate for the N x S when it is growing. It smells of citrus, fruity, with the skunk lurking in the background is the best way I can describe it. It isn’t over powering but did require more than a baggy to contain the smell when I brought an ounce to someone.

Buzz
When I cut the bud at 37 days with the 50% withered flowers I test smoked it. He doesn’t smoke as much as I do but he isn’t a lightweight by any means, he smokes one joint an hour and 15 minutes. He liked it but didn’t like it for driving since he was spacing out so much. I thought the whole thing was kind of funny myself and I’m sure you know I was all over him on every missed turn. (Little did he know I wasn’t exactly catching them either ;-) I didn’t like the buzz from this early bud at first, it was too speedy and after a while. The other thing that wasn’t too impressive from it was the staying power of the buzz.

Now the buds harvested later were a completely different story. Mature buds definitely not couch lock weed but you can find comfort in your big buddy if you want to soar, then quickly settles into a body and mind buzz conducive to thought and you can verbalize those thoughts without difficulty ;-) This is a social indica.

The buzz lasts quite a while and slowly turns into a couch lock thing if you don’t smoke any more. As a head grower I would keep the plant just for the buzz I like the buzz since couch lock isn’t all there is to life, I guess ;-) If I were still growing for dough I would love this plant and will keep it in case I get back into the game someday.

Yo money tree folks... people like the looks and smell of this weed. I don’t have any other comments on the buzz yet but will include them in the additional T44 info that will be given in the next Flo Sheet.

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**Strain:** Twilight  
**Strain Type:** Indica  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**
“A beautiful purple variety with high yields and Afghan taste. Heavy buds and high. 100% Indica.

**Specifications:**
~ Flower: 7-8 weeks ~ Harvest: end of Sept., 1st week of Oct.” - Dutch Passion Seeds catalog

**Growers Comments:**

none

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**Strain:** Valley Girl  
**Strain Type:** Mostly Indica  
**Origin:** Holland/USA  
**Breeder:** Sagarmatha Seeds  
**Images:**

**Description:**
“This variety is a Cheyenne Indica with a skunky influence, for lovers of fragrant weed with a strong buzz. Take this girl just before bed and have a seductively sedative session. Her name derives from her stupefying qualities. Gag me with a bud.

**Specifications:**

Type: Indica-Sativa. Start vegetate: 1-1.5 weeks after roots show. Flowering time: 50-60 days. Average height: 1 m. Yield: 275-350 grams / m² – Sagarmatha catalog

**Growers Comments:**
none

**Region:** Indo-Asian Strains - Afghanistan, India, Nepal, and South East Asia

**Family:** Afghani Strains

**Strain:** Afghani
**Strain Type:** Indica  **Origin:** Afghanistan  **Breeder:** Dutch Passion Seedbank
**Images:**
**Description:**

“A pure variety, never hybridized, imported from Afghanistan, grown in Holland. Very broad leaves, 100% Indica. Heavy buds with lots of resin. Some plants turn purple at harvest time. Aroma and flavor are heavy, almost medicinal. Very strong, physical, practically narcotic high. Average yields.

~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.” – Dutch Passion catalog

**Growers Comments:**
none

**Strain:** Afghani #1
**Strain Type:** Indica  **Origin:** Afghanistan  **Breeder:** Sensi Seed Bank
**Images:** 1 2 3
**Description:**
“The Afghani part is a very short Christmas tree-like plant, 100% Indica, very resinous and very consistent. The F1-cross with Skunk #1 gives the variety a bigger yield and better taste. Very good “up” high.

~ Flower: 8-9 weeks ~ Harvest: 1st week Nov.” -Sensi Seed Bank catalog

Growers Comments:

“Afghani #1 is basically selected Afghanis back crossed with themselves to produce short squat plants with lots'o resin.”

"I'm not sure who's is best, but I can tell you what Sensi's Afghan #1 grows like. The only other Afghan I ever grew was given to me as seed. Those plants grew to about 3-foot bushes and looked like little fluorescent green golf balls. The Sensi, however, is completely different. The leaves are huge and rounded, but they aren't dark the way Sensi describes them in their catalog. The Hindu Kush is a lot darker. The Afghan #1 is tall and thin and hasn't filled out the way I would have liked. I know it has nothing to do with ferts because everything I used is organic. Bat guano, a touch of cow manure and bone meal and fed every 2 weeks with a mild mix of fish emulsions, 5-1-1, into flowering and not nearly as vigorous as the Hindu Kush. In my opinion, this might be due for a genetic boost.”-Pauly

Strain: **Californian Dream**  
**Strain Type:** Indica  
**Origin:** California/Holland  
**Breeder:** Nevil  
**Images:** 1  
**Description:**

"Californian Dream (Afghan #1 x Californian Buddha) is a cross of two adapted northern Californian Indicas, which create a fast growing, hardy, 5 foot bush which produces chunky potent buds covered with sticky, smelly glands. Beautiful colour and excellent cast. A favourite. In middle Europe they mature in late September. In southern Europe they mature September 1. Indoors copious buds mature in resinous nuggets in 50-60 days." -Legends Seeds catalog

Growers Comments:

indoor

none

Strain: **Mazar**  
**Strain Type:** Indica  
**Origin:** Afghanistan  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**
“This is an upgraded selection of the former valued Afghan Skunk. A 1997 improvement was made on its yield. The taste is softer than before. The Afghani (Mazar-i-Shariff) part is a very short Christmas tree like plant, 100% Indica and very resinous. The F1-cross with Skunk #1 gives the variety a bigger yield and better taste. Very good “up” high. As both parents are very consistent, the offspring is very consistent too.

~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.” – Dutch Passion Seedbank

**Specifications:**

~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.” – Dutch Passion Seedbank

**Growers Comments:**

“Started with 10 seeds and all germinated and sprouted. Two sprouts didn’t push out real leaves, it wanted to, but couldn’t get it done... chop went the blade. Of the 8 that were left 3 were female and 5 were male. Of hermies with the Mazar was heard but none were seen. This is unquestionably indica in appearance and smell. Wide dull dark green blade serrations. Two of the 3 females were somewhat similar in appearance during flower but the other was doing it’s own thing. They looked pretty much identical during veg growth. Differences showed in bud structure. The oddball had the braided city skyline look. I’ll explain later. The other two had smaller calyxes.

2- First let me tell ya bout some weirdness. The plant grew leaves from some of its leaf stems. Weird huh, anyway. This plant suffered from shading of taller plants but did OK considering. It was kept mainly for how well it did through the shading since curiosity was peaked by its performance. This plant was an accident and wasn’t smoked by anyone that knew they were smoking it. It’s a mystery plant until grown from clone.

3- This bad boy girl grew a fat top bud and may have been the heaviest of the three if it didn’t suffer from some overcrowding vs. the top producer. This bad girl also had the heaviest covering of resin. This has potential to be a producer except for the long flower period, which would need speed.

Note: All of the plants were harvested in approximately 10 weeks but it could have been done earlier and probably should have been. So just figure a 9 weeker for now.

5- Yep this is the braided one and this is what was meant. The plant was trained so that the main stem was horizontal. Looking at the big bud from eye level gave you a city skyline look of braided hair with the big calyxes. This plant also had a nice covering of resin and were smoked. It was also the heaviest plant. The one possible problem with this girl was the occurrence of male flowers. The early in flowering but that was it. An eye was kept on it as the male flowers until a few days before harvest. The late start of a male flower may have been due to leaving them to flower too long before chopping day. The late start of a male flower may have been due to leaving them to flower too long before chopping day.

Aroma: An earthy spicy thing with a skunk background. Not overpowering would probably require attention when packaging.

Buzz Above average. NL x Shiva hates this plant in this neck of the woods and for good reason. Mazar is an up and comer that could become the next couch lock champ when it’s old enough. This was stoner weed period but...

It was harvested much too late which could have caused this type of buzz. There was a buzz lurking so we shall see. If it wasn’t because of the late harvest there will be some KOs when others get to smoke this chit.

Taste Distorted by feeding. It had a spicy taste to it that isn’t bad and could be good if the right feeding schedule.
Yield: Slightly above average with 5 better than that.
Comments: This is looking like one of those plants no one likes to smoke because it ends their day. It's surprising that it took as long to finish with this strain, we'll see what happens when we improve with age and better growing conditions.
Curiosity is peaked about the type of buzz that will be had when the plant is harvested a few weeks hence. Except for the shading was a problem for this strain so yield is really up in the smoke right now. All and all so far so good with the buzz making up for the long flower time." – Flick

**Family: Kush Strains**

**Strain:** Hindu Kush  
**Strain Type:** Indica  
**Origin:** Northern India, Pakistan  
**Breeder:** Sensi Seed Bank  
**Images:** 1  
**Description:**

“Pure Indica, one of the most constant kind. Best start for anyone who wants an inundation like taste, large firm buds, above average yield.

**Specifications:**

~ Flower: 8 weeks” – Sensi Seed Bank catalog

**Growers Comments:**

“I’ve grown Hindu Kush 3 times and it’s a beautiful but extremely stinky plant. I really like the smell, but the odor of the Kush is difficult to control even when using ozone. After working on the garden I’d always have to take a shower to get all the resin off my arms and from leaning over plants etc. Hindu Kush is a great way to earn the nickname 'skunky' ... Kush smells a whole lot more like a skunk than Skunk#1 (smells sweet to me).” – shiva

"The Hindu-Kush from Sensi averages about 2.5 to 3 oz’s of sticky, sweet, grape smelling bud per plant. It starts flowering the first week of August and is ready by the third week of September here in the Midwest." – Sensi Seed Bank catalog

**Strain:** Kush  
**Strain Type:** Indica  
**Origin:** Northern India, Pakistan  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**
“A heavy budding plant that produces crystals galore. Good rich smoke, excellent indoors and outdoors. Clones very easily.

**Specifications:**

(indoors) ~ Flower: 60-70 days ~ Height: 110-150 cm ~ Yield: 300-325 gr/sqM (outdoors) ~ Plant: Jun. 1st ~ Finish: Oct. 1st ~ Height: 5-6’ ~ Yield: 2-4 oz ~” – Dutch Passion catalog

**Growers Comments:**

none

**Strain:** Masterkush  
**Strain Type:** Indica  
**Origin:** India/Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**

“A F1 cross between two different Hindu-kush strains. Yield is high. Excellent taste and strong high. One of our favourites.” – Dutch Passion seedbank catalog

**Specifications:**

none

**Growers Comments:**

“This light-green colored bud has dark forest-green leaves protruding and is covered in long hairs that range in color from bright orange to almost white (mostly strawberry-blond). The scent is sweet and citrusy with green bio-y undertones. The taste, however, is surprisingly mild for this fairly strong-scented bud. It almost doesn’t even have a taste besides the general burnt bud (brown) taste. It is also non-expansive in the lungs. The high is mildly visual with a light head-change. ***” – Homepage Amsterdam

"My personal experience with MasterKush, grown naturally under mostly-controlled conditions, outdoors: a rather long finish time (mid-late October) and can grow very tall, even in a 5 gal. pot. Huge plants when grounded. I live in the desert so mold has never been a prob for me but these buds are unusually thick and long so I would expect mold probs in a more humid climate. (but that's just a guesstimate) The stone is not toooo intense but definitely longer lasting than most and IMHO, well worth the space and time (if you can get by the potential mold prob). Very smooth and mellow flavor too. Not a major aroma producer while growing either." -Mohave Green

"The only strain that I have that I can for sure say came from the breeders all were female (lucky eh?) and all grew very uniformly, I kept the best 2 and grounded. I live in the desert so mold has never been a prob for me but these buds are unusually thick and long so I would expect mold probs in a more humid climate. (but that's just a guesstimate) The stone is not toooo intense but definitely longer lasting than most and IMHO, well worth the space and time (if you can get by the potential mold prob). Very smooth and mellow flavor too. Not a major aroma producer while growing either." -Mohave Green

"The only strain that I have that I can for sure say came from the breeders and seeds were given to me by a friend who purchased all were female (lucky eh?) and all grew very uniformly, I kept the best 2 and grounded. I live in the desert so mold has never been a prob for me but these buds are unusually thick and long so I would expect mold probs in a more humid climate. (but that's just a guesstimate) The stone is not toooo intense but definitely longer lasting than most and IMHO, well worth the space and time (if you can get by the potential mold prob). Very smooth and mellow flavor too. Not a major aroma producer while growing either." -Mohave Green
“It turns out that the Master Kush from Aloha is a very potent strain. It knocks me out but maybe my body chemistry is different from yours! It grows real well and the floral clusters have a grape flavour, maybe. Of the ten seeds I grew out, there was a lot of variability in the growing characteristics of the plants. Several were very sativa-dominant. The one I kept as a mother is short-statured and a heavy producer of many small, hard buds. I still cultivate it because I love the hashy smell it releases but as I said, it's effect upon me is mostly a narcotic one in nature.” –Moose

<table>
<thead>
<tr>
<th>Strain: Smokey Bear</th>
<th>Strain Type: Mostly Indica</th>
<th>Origin: India/Holland</th>
<th>Breeder: Dutch Passion Seedbank</th>
</tr>
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<tbody>
<tr>
<td>Images: 1</td>
<td>Description:</td>
<td>Produced by Dutch Passion, a cross between the famous Masterkush and KC 33. A very nice outdoor plant.</td>
<td></td>
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<tr>
<td>Specifications:</td>
<td>~ Flower: 8 weeks ~ Harvest: 3rd week of Sept.</td>
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<tr>
<td>Growers Comments:</td>
<td>none</td>
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**Family: Ruderalis Strains**

<table>
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<tr>
<th>Strain: Ruderalis</th>
<th>Strain Type: Ruderalis</th>
<th>Origin: Russia</th>
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<td>Growers Comments:</td>
<td>none</td>
<td>“Pure Ruderalis, despite flowering automatically, finishes in no less than 10 weeks so there is absolutely no use for the plant other than setting flower in equatorial varieties and my own experience.” - Lady J</td>
<td></td>
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</table>
| “Ruderalis: real Ruderalis is a single stem plant like a willow whip and x number...
will begin flowering irrespective of light hours. Once this is in a strain it never goes away even if all auto flowers are weeded out, it will reappear after a generation or two when the dominant form recombines to the dominant form of sickle cell anemia except you can’t tell the carriers with Ruderalis. Ruderalis doesn’t have large colas either. In the early days of wild strain collection, indicas from Afghanistan were mistakenly called Ruderalis they were early flowering with large colas. They can be revedegated early, but can be revedegated. The difference is that with real Ruderalis once flowering is initiated it can’t be revedegated you can root cuttings with just a few flowers under 24 hr lighting and it just makes tiny colas. It’s not a thing to pass on to future generations.

You can’t tell if the (Ruderalis) gene is in a plant by the look. A friend of ours was developing a version of white widow from a Canadian source extremely potent and resinous after several generations of auto flowering turned up so they destroyed the whole line seed stock and all. Why do you think there might be Ruderalis in your strain it seems pretty unlikely to me. A couple of Canadian seed banks have used it in the early days of wild strain collection, indicas from western Afghanistan were often mistaken to be Ruderalis they were early flowering with large colas. They also will often initiate flowering early, but can be revedegated. The difference is that with real Ruderalis once flowering is initiated it can’t be revedegated you can root cuttings with just a few flowers under 24 hr lighting and it just makes tiny colas. It’s not a thing to pass on to future generations.

Strain: **Ruderalis Indica**
Strain Type: Indica/Ruderalis mix  Origin: Russia, Central Asia  Breeder: Sensi Seed Bank
Images:
Description:
“Flowers automatically Outdoor. Ready 3 * months start to finish. Good for Northern or rough outdoor areas.” – Sensi Seed Bank catalog

Specifications:
none

Growers Comments:

"The main advantage of the Ruderalis line is that they flower automatically without regard to the amount of light vs. darkness. It’s a good strain if you want to grow outdoors and live up north or in a relatively short growing period. You could cross it further with quality strains, but you might lose the auto-flowering feature of the Ruderalis." -BK_Greenthumb

"I've grown Sensi's Rud. Skunk. The Indica was (apparently) originally a result of much work by Nevil with NL in mid 80's. The HUGE and in-surmountable problem with this variety is mold resistance (or rather, a lack of it): Ruderalis is NOT mold resistant, nor is Northern lights, and nor is skunk. It's for a very specialist environment: northern latitudes, low rainfall (were I come from, this one melted to nothing in early Sept., well before it matured). On top of that, it doesn’t taste that good that with auto flowering, you get no chance to filter for sex, so you've got to grow all your seed. Only 25% of the seed planted will be early flowering female (75% of your plants will either be male or mature to late to be any good!)" - retro13

"The ones I grew (from Sensi) flowered at 24/0, but only some of the plants were excellent male and a nice but low-potency female. The male produced a nice smell. Made some F2 seeds for further breeding. About 100 days from seed to harvest. -Epikur"
Family: Shiva Strains

Strain: Shiva
Strain Type: Indica  Origin: India/Holland  Breeder: Undetermined
Images:
Description:
“Pungent Afghan smell with Indica. Short bushy plant. Heavy good quality crop. Best for inside cultivation.”

Specifications:
none
Growers Comments:
none

Strain: Shiva Shanti I and II
Strain Type: Mostly Indica  Origin: India/Holland  Breeder: Sensi Seed Bank
Images:  1  2  3
Description:
“This Afghani with its penetrating Indica aroma is one of the better yielders in the collection. Its pleasant taste and above average potency make this an attractive variety for beginners.”

Specifications:
none
Growers Comments:
"The Shiva Shanti I is a 3 way hybrid which consists mostly of an Afghani strain and 25% Skunk because of its aroma characteristic. The Shiva Shanti II contains a smaller part of this Skunk and another Afghani. It is a less stable 4-way hybrid but quality wise very nice. The flowering time will be somewhere between 45 and 55 days. It is also an F1."- Alan Dronkers, Sensi Seed Bank

“Shiva 2 is a quick, crystally below average yielder. It has a very up quality to the high.”

Family: Southeast Asian
Smoked some Cambodian in 67. It was the best we had ever seen at that time. About the size of the later Thai sticks but it was one bud, the length of a fold lock bag, light gold, $15.00 ($10.00 for 4 fingers at that time) till it kicked our ass. Haven't seen any since.

Family: Uncategorized Strains

**Strain:** Cambodian  
**Strain Type:** Sativa  
**Origin:** Breeder: Native Strain  
**Images:**  
**Description:**  
**Specifications:**  
**Growers Comments:**

"Smoked some Cambodian in 67. It was the best we had ever seen at that time. About the size of the later Thai sticks but it was one bud, the length of a fold lock bag, light gold, $15.00 ($10.00 for 4 fingers at that time) till it kicked our ass. Haven't seen any since.

**Strain:** AK-47  
**Strain Type:** Sativa/Indica mix  
**Origin:** Afghanistan/Holland  
**Breeder:** Serious Seeds  
**Images:**  
**Description:**

"A 1995 Cannabis Cup winner. This is a very popular sweet plant. 3rd place winner 9th Cannabis Cup. A very potent 50% Indica/50% Sativa cross nicknamed The Killer! Aromatic, sweet tasting producing an incredible debilitating high. Excellent indoor and hydroponic results. This is a truly militant strain! Expect severe cerebral damage. Takes no prisoners! Highly recommended. An absolute must! AK-47 shot us into 2nd place as a seed company in the 1995 cup, and in '94 it blew away the judges and took 2nd place in the hydro competition along with 3rd place in the overall Cannabis Cup. The short flowering time and hard compact buds that ooze glistening trichomes are a delicacy to the proud farmer. An Indica/Sativa bred with powerful effect and sweet smell in mind.  

**Specifications:**

Mostly Sativa, Flower: 50-57 days, Yield: 250-350 grams/m2, Height: 100-150 cm.

**Growers Comments:**

"Nevil went to great expense to obtain seeds, a commitment that is best illustrated by him making the secret trip to Mazar-i-Sharif in northern Afghanistan. According to the Moslem legend, one of Mohammed's sons died in Mazar-i-Sharif. Consequently, it is a very holy city. It is also known for high quality hash. Although hash from the area had been readily available in the late 70's, the Soviet invasion greatly reduced exports. In 1985, an Afghan refugee told Nevil the (cannabis) fields around Mazar-i-Sharif were being destroyed. "That was what I needed to hear" says Nevil, " I caught the next plane to Pakistan to save the strain."

"After being smuggled into a refugee camp in Peshawar while lying on the floor of a car, Nevil made contact with a 30-year old Muslim fanatic who had a throbbing vein that ran from between his eyes straight up to his forehead. The man took a lump of black hash out of his pocket and told Nevil, " Peaceful people that we are, we wanted to convey in a sentence the power of this plant, "A real one hit wonder". AK-47 shot us into 2nd place as a seed company in the 1995 cup, and in '94 it blew away the judges and took 2nd place in the hydro competition along with 3rd place in the overall Cannabis Cup. The short flowering time and hard compact buds that ooze glistening trichomes are a delicacy to the proud farmer. An Indica/Sativa bred with powerful effect and sweet smell in mind.  

**Specifications:**

Mostly Sativa, Flower: 50-57 days, Yield: 250-350 grams/m2, Height: 100-150 cm.

**Growers Comments:**
his uncle, a man known as Mister Hashish. Surrounded by four men pointing machine guns at him, Nevil set about negotiating with Mr. Hashish, a Mujahedin commander, and finally persuaded him to send a squad of his men 280 miles into Soviet occupied territory and come back with two kilos of seeds. Nevil added "He thought I was ridiculous because I didn't want to buy hashish or opium. Nobody had ever come out to buy seeds, and at first he had no idea what I was talking about. I tried explaining genetics to this tribal hash leader in sign language. When he finally figured out what I wanted, he asked too much money. I took a zero off his price and gave him 10% up front. He called me a bandit, but I had the seeds four days later." - Nevil Schoenbottom, High Times Magazine, March 1987

“If you got the real stuff from serious, the trick will be remaining patient while the seeds produced two outstanding mothers, each of which are about the best seeds I have ever had (plus a few other very interesting plants).

My seedlings didn't show a lot of vigor, but that may have been from overwatering. I was completely new at the whole thing. They tend to be pretty sativa in appearance and slightly indica types. They show preflowers at about six weeks, and do best topped back. They grow a lot, and stretch if you're not careful with them. My best smoking mothers, but they were tall. Just not great branching. Best to grow them SOG with tighter mother that branched like crazy, but the buds were stringy and stemmy and that's why I never had any problems with infestations or nutrients. You can give them high nutrient doses and they do fine. Flowering time tends to be long, between 56-70 days, depending on the strain. It can be short, but it hurts the yield. Yields in general were not great, but then neither is my growing experience. Others report pretty good yields from what I hear.

The high is just plain supreme. Very up, cerebral, but smooth and completely non-psychoactive. My musician friends completely love the stuff. Very compatible with activity, especially creative pastimes. Good for parties also. Very social." – Castanza

“AK47 (Blue Bird Coffee shop): “Nice & complex high. Flavorful taste. Elements of both sides of the cannabis spectrum are clearly pronounced.” - Prince Caspian

“These dark green buds are very resin-y and have bunches of short, red hairs throughout. This hydro has a very pungent, sweet, skunky green smell that will make your mouth water and will put a smile on your face. One or two small, crystally stems are the non-smokables you get. The fluffy, compact buds break up nicely and will leave a sticky residue on your fingers. The smooth, skunky smoke tastes sweet and flowery, though it's a bit of a cougher. Overall, the taste is outstanding. Not overly visual, a strong, cerebral high, conducive to listening to music, watching a movie or maybe hanging out at a coffee shop. It makes you to open your bag of Oreo's or order 'patat' on your way home.” - Dankmaster

“If a sledge hammer to the head is what your looking for then AK is your girl how it grows and yields depends on which side of spectrum is more dominant. I have 2 mothers: one mostly indica and shorter nodes large nuggs with a fat top it built buds much different than the other that went the usual way sorta stacked single blade leaves it didn't decrease in blade num
gland production and a killer spicy wood-like smell. It flowered for about 50 days. The mostly sativa grew a bit larger and longer nodes but flowered much better than the indica, with large nugs covered in twice as much glands as the other. It flowered for 75 days, giving it the best potency; the smoke will tear your lungs apart and will smash ya within minutes. Smoking too much of this one would get a headache. Guess its very strong but not strong enough for me. I’m breeding my AK indica with G13xNL pollen that was I given its already been given the name Uzi. I found when I smoke too much of this one I would get a headache. Guess its very strong but not strong enough like G13xNL and plan on breeding my AK indica with G13xNL pollen that was I given its already been given the name Uzi... Well hope that helps ya out its 2nd best in my book and nothing beats the G13-NL.” – Dankmaster

“This type of question is always difficult to answer... Northern Lights is a real favorite of mine, that is because it gets me really mellow without blowing my brains out. NL5 x Haze is a similar type of stone but much more potent, and after a few tokes leaves me happily floppy! AK47 is not my type of high... it makes me unable to function without making a super human effort, and I am not super human.” – Mike

“NL is a great plant: taste, high, potency, yield, and growth wise. AK is stronger and yields more. But I’d have to say you probably wouldn’t want to smoke the AK all day if you’re a chronic toker as many of us are. It will give you a headache/non-functioning state of bliss. NL is a more functional high (but still very strong) with a trademark taste and growing ease, short stature. NL has sidebranching also. I’d prefer picking a general winner, but enough to pinpoint a personal winner for you. A clone is the way to go where a single bud can fill a room but it still smells [at least serious seeds version does] a good one. I should keep the house sweet! I’m not that impressed with AK a big initial hit then it fades away so you need another.” - Oldtimer1

I’ve grown the AK-47 and in my opinion its a better high and much easier to grow than WW. I got the seeds from Greenhouse in Amsterdam. I believe it was by Serious Seeds. It grows reasonably tall and flowers in about 7 weeks from 12/12. It tends to flower on its own but not so much as to be a major problem. The ones I grew out were fairly uniform but there was some variation. The smell was good and the high was excellent.”-Greenman.

“Seriously, IMHO, skunk X big Bud or AK-47 are excellent strains for the experienced grower. Skunk strains are stable, pure strains and very predictable when purchased from reliable sources. AK-47 is a multi-way hybrid with excellent yield when grown well, with a world class high.” - Kohala

“This one is hard to say since its a strain that reflects both sides of spectrum. Will grow short to medium and short to leggy nodes will grow sativa like fans or more indica style. This all depends on what you pick...an indica style had big fat nuggs, a bit airy though with a different budding structure and clusters, not usual way of decreasing fans blades...Very nice strong spicy smell and taste...Very good wood-like taste...Very nice strong high...A Sativa will grow a bit longer and on the better side of the spectrum....it produces hard fat nuggies, not really big but bigger than the indica. It also had much stronger smell of spice and woody taste...And the high is like taking a sledge hammer to your head!! That by far is the best one and you don’t need to search for another...you will be very happy with both” - sloppy seconds

“A Sativa-Indica hybrid that produces a quick stone with a long lasting cerebral high. She is tall with large girth and giant calyxes. The aroma is spicy with a slight sandalwood taste. This girl is a high grade indica and has a very pungent, sweet, skunky good taste. So wake and bake with a bud of AK.” – seedbank catalog

“These dark green buds are very resin-y and have bunches of short, red hairy crystals. The buds are less green with more hairs. This hydro has a very pungent, sweet, skunky good taste. So wake and bake with a bud of AK.” – seedbank catalog

“These dark green buds are very resin-y and have bunches of short, red hairy crystals. The buds are less green with more hairs. This hydro has a very pungent, sweet, skunky good taste. So wake and bake with a bud of AK.” – seedbank catalog

“Non-smokables you get. The fluffy, compact buds break up nicely and will leave your fingers. The smooth, skunky smoke tastes sweet and flowery, though it...
Strain: **Himalayan Gold**  
**Strain Type:** Mostly Indica  
**Origin:** India  
**Breeder:** Arjan, Green House Seed Co.

**Images:**

**Description:**


**Specifications:**

Vegetative Time: For indoors a suggested minimum of 2 – 4 weeks. For outside germinate - May or by the end of spring. Flowering Time: For indoors a suggested time of 8 - 10 weeks. For outside - it will be ready early autumn. A substantial yield will be expected. Achievements: Special for Outdoor - But a nice surprise for the"glasshouse-grower".” – Green House Seed Co. catalog

**Growers Comments:**

“I sampled Himalayan Gold while in 'Dam last year. It's an extremely cerebral herb. The kind of high where you can't control your thoughts well enough to formulate a sentence to explain how you feel!! The taste reminded me of Colombian, kind of tawny and light, it was pale green/gold with yellow/brown pistils. Seeing as how it has the sativa high you could guess that it would also have the sativa growth traits.” – Geronimo

Strain: **Kerala Skunk**  
**Strain Type:** Mostly Sativa  
**Origin:** India/Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“This Southern Indian variety is crossed with Skunk #1 (F1 hybrid). As a whole the plants have a Sativa appearance (87.5% Sativa, 12.5% Indica). The buds have a sweet exotic smell and taste and a very clear medium strong high.

**Specifications:**

Strain: Mangolian Indica
Strain Type: Indica  Origin: India/Holland  Breeder: Sagarmatha Seeds
Images:  1  2
Description:
“This variety produces an almost pure Indica with fantastic mango bouquet and a slight skunk influence and is delightfully fragrant. The stone is long lasting and non-motivational daze.

Specifications:
~ Type: Indica, indoor and outdoor. Start vegetate: 1 week after roots show. Flowering time: 55-60 days. Average height: 1 m. Yield: 300-325 grams / m².

Growers Comments:

Strain: Mullimbimby Madness
Strain Type: Mostly Sativa  Origin: Australia  Breeder: Undetermined
Images:
Description:
none
Specifications:
none
Growers Comments:

"I have crossed a Mullimbimby Madness female to a almost pure indica male outdoors and took 13 weeks to finish budding and was huge, to big. Lucky for high fences and no nosey neighbors. The buds were sticky long colas with a strange smell, very fruity and real lady fingers and it had a extremely high calyx to leaf ratio. The father showed signs of pollen sacs after 5 days and the female of the variety finishes in 50 days. Hopefully when I grow out the seeds I can get an earlier producing type like the mother suitable 4 indoors. Maybe after a few backcrosses who knows. I have tried the mum indoors but is to uncontrollable like a octopus. The Madness gets to big 4 indoors even if you put it in straight on 12 hrs but hopefully crossed with a indica might bring it back a little.

I've heard many conflicting reports as to what actually is the parent makeup of Mullimbimby. I know for sure that there is Thai, Colombian, Mexican, Hawaiian, New Guinean, Indian and early seventies many a hippy and surfer traveled to those wonderful areas of personal stash. From what I gather after talking to a few of the older guys to get the finished product. They kept adding strains after guys came back and grew out their seeds.
they had a plant that was near perfect they stopped and started to let it pollinate itself over many years. It's very Sativa apart from the Lebanese but I think 4 the wait it is well worth it.” – Delta9

“Indica plant produces dense, crystallized buds with a strong aroma. Originally developed from seeds obtained in Afghanistan. The strain was crossed with a potent Northern Light to make it possible to be cultivated indoors. This variety is superb for indoor production because of low smell and high yields with punch. She produces a strong lethargic stone that induces an imagined paralysis or weightiness to the feet. Often will "slide" their feet instead of lifting them, usually from the television to the kitchen and back again. Hence the name Slyder. Best enjoyed around the house on lazy Sundaze. So smoke another toke, and slide into another reality.

~ Type: almost pure Indica. Start vegetate: 1 week after roots show. Clip center cola. Flowering time: 55-60 days. Average height: 1 meter. Yield: 300-325 grams / m² (dried)"

~ Strain: Slyder
Strain Type: Indica
Origin: Afghanistan/Holland
Breeder: Sagarmatha Seeds
Images: 
Description:

“This Indica plant produces dense, crystallized buds with a strong aroma. Originally developed from seeds obtained in Afghanistan. The strain was crossed with a potent Northern Light to make it possible to be cultivated indoors. This variety is superb for indoor production because of low smell and high yields with punch. She produces a strong lethargic stone that induces an imagined paralysis or weightiness to the feet. Often will "slide" their feet instead of lifting them, usually from the television to the kitchen and back again. Hence the name Slyder. Best enjoyed around the house on lazy Sundaze. So smoke another toke, and slide into another reality.

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~ Type: almost pure Indica. Start vegetate: 1 week after roots show. Clip center cola. Flowering time: 55-60 days. Average height: 1 meter. Yield: 300-325 grams / m² (dried)"

~ Growers Comments:

none

~ Strain: South Indian x Skunk #1
Strain Type: Mostly Sativa
Origin: Kerala, India
Breeder: Positronics
Images: 
Description:

“F-1 hybrid Sativa/Indica: 87.5/12.5 Appeararence: like Skunk #1, but more Sativa smell and taste. – Positronics seedbank catalog

~ Specifications:

Height: 2m Yield: med. Harvest date (Netherlands natural photoperiod): begin harvest (# of weeks): 10-12 indoor / greenhouse” – Positronics seedbank catalog

~ Growers Comments:

none

~ Strain: Special K
Strain Type: Sativa/Indica mix
Origin: Afghanistan/Holland
Breeder: Sagarmatha Seeds
Images: 1 2
**Description:**

Same heritage as AK-47. "A Sativa-Indica hybrid that produces a quick stone high. She is tall with large girth and giant calyxes. The aroma is spicy with a slight sandalwood taste. This girl can satisfy any connoisseurs' taste. So wake and bake with a bud of Special K." - Sagarmatha seedbank catalog

**Specifications:**

Specifications ~ Type: Indica-Sativa, indoor. Start vegetate: flower shortly after roots show. Flowering time: 65-75 days. Average height: 1.2-1.5 m. Yield: 325-425 grams / m2 (dried).” – Sagarmatha seedbank catalog

**Growers Comments:**

"Nevil went to great expense to obtain seeds, a commitment that is best illustrated with a secret trip to Mazar-i-Sharif in northern Afghanistan. According to the Moslem legend, one of Mohammed's sons died in Mazar-i-Sharif. Consequently, it is a very holy city. It is also known for high quality hashish from the area had been readily available in the late 70's, the Soviet invasion greatly reduced exports. In 1985, an Afghan refugee told Nevil the (cannabis) fields around Mazar-i-Sharif were being destroyed. "That was what I needed to hear" says Nevil, "I caught the next plane to Pakistan to save the strain"

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The high is just plain supreme. Very up, cerebral, but smooth and completely non-paranoid. No racing. My musician friends completely love the stuff. Very compatible with activity, especially creative pastimes. Good for parties also. Very social.“ – Castanza
“AK47 (Blue Bird Coffee shop): “Nice & complex high. Flavorful taste. Elements of both sides of the cannabis spectrum are clearly pronounced.” - Prince Caspian

“These dark green buds are very resin-y and have bunches of short, red hairs throughout. This hydro has a very pungent, sweet, skunky green smell that will make your mouth water and will put a smile on your face. Overall, the taste is outstanding. Not overly visual, a strongly mellowing high is conducive to listening to music, watching a movie or maybe hanging out at a Coffeeshop. - Dankmaster

“If a sledge hammer to the head is what your looking for then AK is your girl! - Dankmaster

“How it grows and yields depends on which side of spectrum is more dominant. - Dankmaster

“This type of question is always difficult to answer... Northern Lights is a real favorite of mine, that is because it gets me really mellow without blowing my brains out. NL5 x Haze is a similar type of stone but much more potent, and after a few tokes leaves me happily floppy! AK47 is not my type of high... it makes me unable to function without making a super human effort, and I am not super human.” – Mike

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“A Sativa-Indica hybrid that produces a quick stone with a long lasting cerebral buzz and giant calyxes. The aroma is spicy with a slight sandalwood taste. This girl has a strong wood taste. So wake and bake with a bud of AK.” – seedbank catalog

“These dark green buds are very resin-y and have bunches of short, red hairs throughout. Some buds are less green with more hairs. This hydro has a very pungent, sweet, skunky green scent and will put a smile on your face. One or two small, crystally stems to chew on are all the non-smokables you get. The fluffy, compact buds break up nicely and will leave plenty of pollen on your fingers. The smooth, skunky smoke tastes sweet and flowery, though it is expansive in the lungs and a bit of a cougher. Overall, the taste is outstanding. Not overly visual, a strongly mellowing high ensues that is conducive to listening to music, watching a movie or maybe hanging out at a Coffeeshop. Buy your bag of Oreo’s or order ‘patat’ on your way home. **** ” – Homepage Amsterdam

Strain: Super Chrystal
Strain Type: Mostly Indica
Origin: India/Holland
Breeder: Homegrown Fantaseeds
Images:
Description:

“Super Chrystal is produced by Homegrown Fantaseeds. Super shiva mix. 75% Indica, beautiful and nice plant to grow. Strong oriental taste, heavy stone. Low compact plant.

Specifications:

~ Flower: 7-8 weeks” - Homegrown Fantaseed catalog

Growers Comments:

“A follow up on Super Crystal from HGF, the first go around out of three beans only one female resulted, and she was whorled and not very good, medium quality smoke, Super soil, organic ferts 80 watts per sq. ft., of mixed spec light, 2 gal pots no CO2. The second set of 3 beans yielded 2 ladies of only slightly better quality, the only bright spot being that they yielded about 40 grams per gallon. Super Chrystal will not be a repeat, I
guess it really does go to show, that cup winners mean nothing, the samples can be one thing and the beans sold to the public another. Don't get me wrong, no conspiracy theories or collusion or anything, I just mean very variable outcomes. I'm sure allowed to grow out enough seeds, one can find examples that are like the plants that generated the samples to win the CCup, but they were not in this.

**Strain:** Thai  
**Strain Type:** Sativa  
**Origin:** Thailand  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

“This variety grown in Holland is a pure Sativa, selected for short size and easy to cultivate.

**Specifications:**

~ Flower: 10-14 weeks ~ Harvest: end of Nov.” – Dutch Passion seedbank catalog

**Growers Comments:**

“This dry, compact, seedy bud is dark brown with some dark green spots. The buds are dry, compact, and runny and also lightly resinous. It has a spicy, earthy scent and an earthy, dry, pungent, and energetic. ***1/2” – Homepage Amsterdam

“If its a Thai indica, its not really a true Thai, but probably will be great anyway. It is unique in many ways and is at the far opposite side of the cannabis family compared to indicas, many growers cross Thais with their wonderful high with to faster finishing Indies to get a plant with an up high that will finish under two months. Thais grow fast, tall and are similar to a willow tree with long thin floppy branches, but matures slow (indoors they need lots of light wattage, buds, 25 or 30 just wont be enough, try for at least 50 watts/sq.ft. or more, cut the leaves towards the end of flowering, they don’t mind higher than average grow room temperatures (under 90F/30C) and expect to wait forever to harvest, 100 days is normal under ideal conditions. Nobody grows pure Thai indoors although reducing the flowering stage "lights on" period each week or day from the time you turn the lights to flower them, go from 12.5/11.5 gradually reduce the expected 3 month flowering time will speed up the harvest date by a week or more, about 3 hermies, 4 males and 3 females out of ten seedlings would be normal. Most Thai crosses have seeds with dark lines or other markings on them. Most Thai crosses have seeds with dark lines or other markings on them. Thais tend to have long thin leaves, be mold resilient due to the very thin wispy long buds, don't "resin up" as much as indicas, drop most of their multi fingered leaves as it approaches harvest time and you have to be on the look out for the odd male flower which tend to appear at any time but mostly during the middle to late stages of flowering. If you discover a male flower on a "female" (they are called "Katoeys" in Thailand) pick it off, but if you see 3 then 4 then more pull the whole plant otherwise you'll have enough seeds to grow an acre next summer! dry it and try it out or if the weather permits plant it outside. The only good hermie is a dead one. Try to very lightly pollinate some branches on your young females, some say it will stop hermies developing although I do it sometimes, I'm not sure if it actually works. The growth patterns, shapes, heights..."
and bud sizes vary greatly with Thais I have seen, I guess, due to cross breeding for quicker turnover (make that the bent Cambodian army generals and Thai gangsters) over the last 25 years. Some Thais have a Xmas tree shape with 2-ft long continuous buds and a main cola, while others look like a willow tree with knotty dreadlocks at harvest time. The high can vary greatly too, with Thai/hybrids going from a hard instant knockout punch to a spacey speedy high. The average Thai is strong, a bit druggy and a bit spacey. If you manage to grow it to its full potential and pick it just right hmmm although I’ve tasted some home grown Thai that was very heavy and others that were almost trippy, nothing beats a good home sub-tropical grown Thai with that trippy ride, beats the hell out of those tasty 49 day Dutch weeds.” - bone-tired

**Strain:** Voodoo  
**Strain Type:** Mostly Sativa  
**Origin:** Thailand/Holland  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1  
**Description:**

“A green strain, developed from Thai parents in 1997. The Thai parents having grown in Holland already. A very strong plant with long thick buds. Has a Thai aroma and a clear, fresh smell. Sativa high, very productive.

**Specifications:**

Specifications: ~ Flower: 7 weeks ~ Harvest: 1st week of Oct.”

**Growers Comments:**

none

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**Region:** African Strains

**Family:** Durban Strains

**Strain:** Durban  
**Strain Type:** Mostly Sativa  
**Origin:** South Africa  
**Breeder:** Sensi Seed Bank  
**Images:**  
**Description:**

“A very early strain from South Africa. Durban is a compact Sativa with a sweet smell, one of the most reliable early outdoor varieties, it will produce chunky, solid buds even in poor conditions.”

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haven't tried Durban, you are missing out on one of the easiest-to-grow, high quality varieties in the world.

Durban Poison
- Outdoor / Indoor

“This strain is famous throughout the world. Non hybridized sativa. Not only confined to Natal, but grown widely across South Africa leading to variable quality. Our seeds selected only from experienced growers giving consistent ‘kick ass' plants loaded with resin. Height 6 - 9 ft, flowering period 8 weeks outdoors, 10 weeks indoors.” - African Seeds catalog

Durban Poison - Native
- Outdoors / Indoors

“Specially selected seeds from crops grown in the wild, these seeds will give high yields and large buds. Nice herbal taste and strong 'physical high'. Flowering period 8 weeks. Also good indoor results.” - African Seeds catalog

**Specifications:**

Finishing: end of Sept. Height: 1.5 - 2.5 m. Yield: up to 400 gr.” - Sensi Seeds Bank Catalog 1995

**Growers Comments:**

"I grew Sensi’s Durban this year and it has the anise flavor (dry toke) and it gets a relaxed body high with a mild mind high. It is worthy grow for personal purposes, low yield. Many of my friends who are indica smokers said they could still function, but felt high.” - Mota

"2 many males+2 little potency+2 small a yield = on sale baby"- toker2

“The West Coast variety never finished outdoors in time in Seattle. I grew it twice and pulled it early due to mold both times. I'm guessing it would have taken until mid to late October. Don't know.” - SCW

“Same with the Dutch version- mid to late October.” - danny

**Strain:** Durban Poison  
**Strain Type:** Mostly Sativa  
**Origin:** South Africa  
**Breeder:** Dutch Passion Seedbank  
**Images:** 1 2

**Description:**

“Imported from South Africa, produced in Holland. Exclusively inbred, never hybridized. Large long bud leaves, buds are also large and long with lots of resin. A sweet licorice flavor similar to Thai. High yields. Well suited for out crossing with late bloomers to produce an earlier flowering. Also does very well under artificial light.

**Specifications:**
Flower: 8-9 weeks ~ Harvest: end of Sept.” – Dutch Passion catalog

**Growers Comments:**

"South African (called Durban Poison by some) is the most inconsistent or, more accurately, has the most strikingly different varieties of all marijuana originating from a single country… If you come across what is called South African or Durban Poison in the US, quite probably it originated from stock developed in the 1970’s by breeders in the San Francisco Bay area….The unnamed breeder had two primary concerns-high potency and early flowering-and he succeeded wonderfully with both goals. This Durban Poison strain has broad leaf blades almost like Afghani but long internodes like sativas. Stigmas may be pure white, red, pink or a delicate purple. Branches grow with differing lengths like Thai, and the profile may be from an eight foot ovoid down to a four-foot squat bush. This Durban is fast-growing, hardy, very early to mature, very potent, fragrant. What more could a grower ask?"-Mel Frank

“M3 Pinetown Durban South Africa Sativa. Known also as Durban Poison. A great high, similar to Thai. One of the earliest maturing original Sativa’s. Very suitable for making hybrid crosses. In Holland it flowers the second or third week of September (Outdoors). Taste is sweet. $45 for 15. (Suitable for indoors/outdoors)"-From the Super Sativa Seed Club Catalog 1987/1989

"I was reading that a certain durban sold from a breeder is superior to the others sold from other breeders. No, Sensi is not the superior Durban (I think). Ask around, and make sure you buy the best strain of Durban. It is renowned for it’s early flowering characteristic, it can go outdoors or indoors very high in a fast flowerer. It is also very stable, so you can easily breed your own.“-Big Bong

"I bought some HBC durban (dutch passion) last winter and grew a very nice crop of their durban 1/2 inddor and finished outdoor by mid-spring. a friend gave me 6 of his S.S.B. durban and i grew them out this summer and harvested about 4 weeks ago. both company's durban grew very much very much better. better taste and buzz anyway. even the aroma during growth was different. HBC and S.S.B. durban has with Dutch Passion's version and stay away from Sensi's on this one. I have not tried Big Bong but i and others who have sampled both ssb's version and dutch passion's version agree that D.P.'s is much much better. both were grown in the same soil (except for the partial indoor growth with 500k mh with the d.p. durb.) and all other possible grow conditions difference is almost nothing….they grew under very similar conditions. s.s.b. is still at or near the top of my list of the best seedbanks but i kinda missed with this one. this, of course, is mostly just MHO but others agree. I know what i'm talking about and hang here will put in their 2 cents worth before someone orders and is unhappy a few months down the road."-durban grower

"The trick is to not allow too much upward growth- on node 7 or 8, pinch out. Take the bottom 2 branches of. You should be left with about 6 branches which will rapidly bush out to form a crown that will now fill out into colas. Final plant should be just over 2 foot from seed or 1.5 foot from cutting. High is totally unbelievable- its like the first time you got stoned, but with a cerebral and euphoric. Yield is average, nothing a cash-cropper would be impressed with. "-Norweigian Wood

"Mel Frank says that he knows the breeder in California that developed Durban Poison, and that it came from 2 females out of 16 grown from 1 variety out of six that came from South Afr"

~ Flower: 8-9 weeks ~ Harvest: end of Sept." – Dutch Passion catalog

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"Mel Frank says that he knows the breeder in California that developed Durban Poison, and that it came from 2 females out of 16 grown from 1 variety out of six that came from South Afr"
worth a damn. What he doesn't say is that there must have been some other plants in the mix; a male, eh?

He notes that genetics among growers in SA were already all jumbled up from the sources they had to draw on, so the claims that Durban is a pure sativa have to be taken with a grain of salt.” - SCW

"I'm trying some Durban from Aloha out right now in SOG. I've harvested a sea of her going now. I've stretched more than I wanted or expected under the 1K Agrosun MH, I was aiming for 2 foot high at finish but will probably hit 2.5. You can train and prune and tie her all over but it won't change the node spacing which makes for the lankiness. Budding them around 6 to 8 inches, or 5 days of vegetative time. The yield should be good, not great.. it won't be huge like a good indica with flowering times and amount of resin (how many cycles per year can you do). I have no idea if these plants are even distant relatives of the seeds you might get.” - ~shabang~

"I messed around with Durban in a 24" sog setup, and it just wouldn't work, it stayed fairly short, so I cloned it for a mother and put it aside for some months and thought of the Durban, so I cloned it up and ran 5 of them under the screen and an HPS conversion bulb. The Durban wanted to run a bit, but that was OK with the screen. Now is a number of 4-8" flower spikes about the size of large cigars, and they are still for a couple of weeks. I think it will mature nicely, which is good, as Durban is bit spindly, yes, but I can live with that; this is not for production, just personal use. I think that Durban can work in some inside environments, or maybe just the right Durban. Like I say, so far, so good.

It's 1 foot to the scrog screen and that gives me another foot until the tops are too close to the light. I may raise the screen a bit next time, as the longest Durban bud is 8 inches. I let the screen filled up the scrog screen (not exactly a scientific process), and that took about 3-4 weeks from the rooted clones. Sorry, I don't keep a log book or anything like that, so I'm guessing to some extent. From the time the lights went to 12 hours, the Durban looks to finish about 8 weeks, that's sooner than I thought, and I'm basing it on the proportion of white to brown hairs, never actually having Durban go all the way. Outside I had to harvest it early due to mold. I think I'll let it go two more weeks, while I'm away on vacation, to see if it puts on some weight, which will be about 9 weeks from lights out. The sweet indica being grown in the same air chamber is already dead ripe.

One thing about Durban; it's very prone to mold. I recommend denuding all the stalks beneath the screen and using a fan to provide air flow to that area. I lost several stalks to mold before I opened up the dead space.

Oh, and one last thing. Remember, I tried Durban sog last year, and it sucked. I had to pull them all out and start over. It was just this one Durban that seemed to have the potential to some extent, to turn out to be ideally suited to scrog. I can't promise other Durbans will work good.

"I grew out sensi durban. Potency on a 1 to 10 a solid four. Very pretty plant but not practical to grow. And too many males. No soaring sativa high."-seedydive

“\"I`ve just grown out the durban from sensi....this seed came in original sensi packaging but it was bought when sensi had the buy 1 get 1 free sale going on....\"I`ve never grown any other sensi compare...potency is the biggest disappointment from what I`ve had. early results Sept 20th....the high did not pick me "up"...a mild sativa high...\"-straydog

"I grew Dutch Passion's version. It's not worth paying for. From what I hear, this is if you're looking for a pure sativa with an anise flavour. My plants looked like shit, that the plants were absolute crap, just that they were not worth the $11 a seed, the blueberry seeds had more value. They were good enough and uniform enough..."
hermie plants to create backup seed before I dump the lot. I think the wild bank in Africa would be the best source. With any luck, I'll have some coming in the mail any day. I saw some pics of traditional durban leaves at lyceum. Dutch Passion's... "Today I tasted some Durban Poison for the first time. The plant was not mature yet, all pistils still white on day 60 of 12/12. Durban has a very clear energetic high for me with almost no body or less body. The aroma is sweet, like tai. It looks a bit like tai also, but much smaller calyxes. It is fun to talk on, go out in public, and energetic. I can see now why it is a nightmare in ScrOG/indoors and I would not recommend the physical characteristics. It stretches like crazy, and the buds are very fluffy and airy. the colas also fall over the 2nd month of bloom. I do not know why it is touted as an early variety. The head is great, but I think a cross to Skunk to increase density and resin is in order."

**Strain: Durban Poison X Mighty Might**
**Strain Type:** Sativa/Indica mix  
**Origin:** British Columbia  
**Breeder:** Federation Seedbank

**Images:**

**Description:**

"Better outdoors than Durban alone, yet a better yield than Mighty Might alone."

**Specifications:**

- (indoors) ~ Flower: 60-65 days ~ Height: 110-140 cm ~ Yield: 300-325 gr/sqM
- Plant: Jun. 1st ~ Finish: Sept. 8-15th ~Height: 5-6’ ~ Yield: 3-4 oz" – Heavens Stairway catalog

**Growers Comments:**

none

**Strain: Durban X Skunk**
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Positronics

**Images:**

**Description:**

"Origin: South Africa and California Type: F1 hybrid Composition: 12.5 % indica  
seedbank"

**Specifications:**

- Flowering-Time: 8-10 weeks Environment: Fit for inside, outside, and greenhouse plant has long, sticky buds and many branches Smell/Taste: High, soft taste
- 200-500 gr. Harvest-Time: ± 10 October" – Positronics seedbank catalog

**Growers Comments:**
"Very simple pedigree: its an F1 cross of two stable strains: durban poison and skunk (probably skunk#1). It's not the most potent strain ever, but it is nice. Durban gives a good flavour to the plant (durban has a slight taste of aniseed, coffee or liquorice), which grows slightly larger than average skunk (but can still be cropped under 2ft easily), plant tends towards a bush (no single stem shit here), buds are pungent. Yield is lower than many indicas, but quite respectable compared to skunk. The reason for the cross was that durban is considered by many to be a bitch to grow, with a resultant lower yield than ideal, so some of D's worst traits (height, yield, variation in high, hermaphrodite tendencies and cutting problems) have been moderated by crossing to skunk. I wouldn't grow it outside. If I liked skunky weed (purely a matter of personal taste), then this would be a plant I would grow first off, along with Kerala skunk (similar, but from southern India, slightly more trippy). I think on the whole, a very good plant. " - Durban

Strain: Durban/Thai
Strain Type: Mostly Sativa  Origin: South Africa/Thailand  Breeder: Super Sativa Seed Club (SSSC)
Images: none

Durban-Thai Highflyer/ S.S.S.C. "M8 A Thai strain inbred for 4 generations crossed with our Durban South Africa sativa. Very sweet resinous buds. The high is very strong and up. One of our own favorites. Harvest outdoors: the second week of Oct. Suitable for indoor growing as well. $55 for 15" - S.S.S.C. seedbank catalog 1980s

Specifications: none

Growers Comments:

"I recently got my hands on seeds from my FAVOURITE SSSC strain - Durban/Thai. I have 5 healthy seedlings going as we speak (5/7 germed from 11-year-old seeds). I grew a whole room full of these babies about ten years ago and they were SO KILLER, with the kind of SICKLY-SWEET scent that makes your mouth water...so resinous that the joint would be BROWN by the time you'd smoked half of it. It had this "evil" scent like rotten meat when you broke up a bud. I'm going to be crossing Durban/Thai with a Haze hybrid I'm developing over the course of 1999. I'm really excited about this project!" – MrSoul

"The original SSSC Durban/Thai cross is one of my personal favourites that I grow every year. I believe that the mother was the Thai and she came from the fourth generation of selecting individuals which best suited indoor cultivation. This Thai mama was SWEET, I'm sure it's the Thai you remember (circa 1977?) with a head-trip high? I now have a SUPERB female D/T that I flower clones from. I see/smoke this plant! In 8-9 weeks of 12/12 she's ripe...a really FAST Sativa because of the Durban influence, the ripening buds smell like foot perspiration...really FUNKY. Thankfully it cures to a delicious licorice scent/flavour and is wickedly cerebral. DTC99 resulted from pollinating THIS female with my best C99 male." - soul

Durban Thai Home Hybrid

"Those are hybrids of Durban/Thai crossed to NL#5/Sk#1 x Hawaiian...the breeders call it Durban Thai Home Hybrid, or DTHH. I had 50 from this generous friend & he even gave me more seeds (11 years old), which is how I got my special D/T lady." - soul
Malawi is the spaciest smoke I've ever had. I used to have this thing that happened a few times as a teenager where I'd get some killer smoke from AFOAF that would literally make me blind for 20 minutes to a half hour within 10 minutes of smoking it, a little too much too quick. Malawi is that kind of smoke. It's like you're still there but vision changes to lights and shadows and sounds become muted. You will see flashes of light and things in your peripheral vision will catch your eyes. The high was fast without all the physical sensations of the indicas. Darkest leaves I've ever seen, almost look black. I pulled em at 75 days with 20-30% could have went another month to round out the buzz. Yield was similar to Durban, not much but worth the wait if that's what you like. For me it's the kind of smoke you'd take out to get a reaction and they will vary, it's too much if overdone.” - Frank

“AFOAF grew hers out when Greenthumb first brought them out last year. Leaves were enormous and the darkest green(looked black) I've ever seen. Took em unfinished at 85 days(20% turned). This is definitely personal head stash and one to take out for special occasion. The high was like tripping for me, lots of visual effects and somewhat short lived. I made the mistake of smoking an indica shortly after coming down from the Malawi and I couldn't move for a couple of hours. Can be a typical unruly sativa to grow requiring lots of attention. Worth the effort if that's what you're looking for, I prefer a more rounded and much mellower buzz.” - Frank

Outdoors Summer Report: This baby definitely has Sativa in its genes. 6 feet and will probably add another foot before its done. Big Christmas tree type plant. Buds are bursting out from every possible node! Even the flowers are huge. It is the spaciest smoke I've ever had. It's like you're still there but vision changes to lights and shadows and sounds become muted. You will see flashes of light and things in your peripheral vision will catch your eyes. The high was fast without all the physical sensations of the indicas. Darkest leaves I've ever seen, almost look black. I pulled em at 75 days with 20-30% could have went another month to round out the buzz. Yield was similar to Durban, not much but worth the wait if that's what you like. For me it's the kind of smoke you'd take out to get a reaction and they will vary, it's too much if overdone.” - Frank
lower branches are putting on bud weight! Awesome....only wish I had a Tropical sun.” – Sensi

Power Plant (mostly Sativa) was developed in 1997 from new South African genetics. This strain has been inbred only, never hybridized. Very rich in THC. It is a strain with an enormous grow potential. Indoor as well as in a greenhouse the plants have an enormous yield. Indoors flowering starts already one week after turning back the light cycle to 12 hours. Outdoor flowering starts late, but the plants ripen very fast. This variety is very uniform. Strong “up high”, very soft smoke.

~ Flower: 8 weeks ~ Harvest: 2nd week of Oct.” – Dutch Passion catalog

“I grew one Power Plant outdoors at the 39th. The seed was germinated on July 1st, and finished on Sept. 24 at 15 inches tall. I was quite happy with both the potency and yield. If it had been a tall, full season plant; the yield probably would have been enormous. The plant grew more like an indica then I expected, but had a very good, long lasting sativa up high to it. Unfortunately, I lost all the other seedlings, and failed to regenerate the mother after harvest. I did, however, get a few seeds from crossing her with a Thai male, but that hybrid won’t grow outdoors in my area. It seemed to me that power plant was exactly like the description at H.S. said it was, except the plant finished 2 weeks earlier, and looked about half indica. I wish I had more of it.” – 67ed

“Let me preface this by stating I have 8 yrs of gardening experience. I found that it was a bit temperamental to start the seedlings. Of the 6 of ten that survived = 1 tall male, 1 short male, 1 tall female ( with slight but controllable hermie traits ) 1 short total female and 2 very hermie “females”. As a indoor/ greenhouse stock it can become a big plant very quickly with some plants exhibiting the typical sativa structure. The 1 short female looks like it will produce well even though I only used an 8 in. pot for the trial run.

The harvest is about 2 weeks away so more detailed info at that time. It is a very branchy plant and might do well in a ScrOG set up. If the result is of high quality, I will devote a hydro farm unit to it the next go round to see how the totals compare to the much more indica stock that is most of the room, maybe just as personal stash. Now I will not say that I am beyond mistakes but I had very bad survival rates with the first batch in peat pellets and much better results the second germination round using oasis cubes instead of peat pellets. The seeds are very small and produce very small seedlings that need a little more pampering than more robust seedlings. Of course there are always new things to learn when working with a new stock.” – Rippo

“Hermies tendency, not rich in resin, medium in power and shit to grow.” – elman

“I had a good experience growing power plant outdoors. I only grew one female so I can’t say about uniformity. I was surprised that it appeared mostly indica, but for me, the high was more sativa than indica.” – Dope

**Strain:** Power Plant  
**Strain Type:** Mostly Sativa  
**Origin:** South Africa  
**Breeder:** Dutch Passion Seedbank


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soaring too. Also, it finished two weeks before (Sept 23) the description said it would.

“Power plant was very hermy and might do for outside or green house but I found it was good and uppy but not “soaring”. I have dropped it from this next go round.”

**Strain:** Swazi  
**Strain Type:** Sativa  
**Origin:** Swaziland, Africa  
**Breeder:** Positronics

**Images:** 1

**Description:**

“Imported: Swaziland, Africa Pure breeding: never outcrossed Sativa/Indica: pure sativa Appearance: very large resin covered bracts, seeded or not; long slender buds, very low leaf-to-flower ratio Smell/taste: exotic taste, nice smell – Positronics seedbank catalog

**Specifications:**

Type high/strength: strong, fairly clear Height: 2-3m Yield: very high Harvest: end Nov 12hr day exposure harvest (# of weeks): 9-14 Indoor / greenhouse / outdoor Seems more mold resistant than other varieties.” – Positronics seedbank catalog

**Growers Comments:**

“Swazi: For outdoor growers we now have the famous Swazi, know for early flowering, disease resistance, very sweet sativa taste and high. A truly unique variety from Swaziland South Africa. Outdoor height: 7-9 ft. Outdoor yield average: 1 lb. Finish date: Sept. 15 at 40 degrees latitude.” – High Quality Seeds catalog

“I looked in both of my SSSC catalogs (1987-88, 1989-90) and they did not offer a SWAZI strain. The only South African strain that they listed was a PineTown Durban Poison (M3). As for item # M5. It doesn’t exist in my catalogs. Their listings are M1 Napali, M2 Manilla Fillipino, M3 Durban, and M6 Indica-creeper hybrid. I then checked out my Original Seed Bank catalogs from the same time period. Nevil offered a Swazi strain (pure) for the first time in Nov. of 1987. It is listed again in his 1988 catalog. By 1989, Swazi (pure) is no longer being offered. (One Swazi hybrid that was introduced in 1988, is still listed in his 89 catalog, HashPlant/NL#1 X SWAZI).” – Prince Caspian

**Strain:** Swazi X Skunk  
**Strain Type:** Mostly Sativa  
**Origin:** Holland  
**Breeder:** Dutch Passion Seedbank

**Images:**

**Description:**

100% Sativa crossbred with a Dutch Skunk. This is a real bargain, slow but with a strong high.
Specifications:
Specifications: ~ Flower: 9-14 weeks

Growers Comments:
none
Family:

**Strain:** Blue Mountain Jamaican  
**Strain Type:** Sativa  
**Origin:** Jamaica  
**Breeder:** Wild Rose Seeds

**Images:**

**Description:**
Sweet, earthy taste, rare to find. Resinous large buds with few sucker leaves.

**Specifications:** Cuttings of this strain can be brought to maturity in 65-75 days of flowering immediately after rooting. Seedlings need to veg for 35-40 days. Flowering time 65-75 days

**Growers Comments:**
none
Use either hypertext list to access Ganja Strain Database

194 Ganja Strain Listings (By Region)
194 Ganja Strain Listings (Alphabetical Order)
Chronology of The War On Drugs (Neal Smith)
Multinational Corporations And The War On Drugs (Damuzi)
Cognitive Liberty Part I (Richard Glen Boire, Esq)
Cognitive Liberty Part 2 (Richard Glen Boire, Esq)
Disquisition On The War On Drugs (Richard Glen Boire, Esq)
Marijuana Growers Guide (Frank/Rosenthal)
Marijuana Botany Chs 1-4 (Robert Connell Clarke)
Afghanistan, India, Nepal, and Southeast Asia

Afghani Strains

Durban Strains
- Durban
- Durban Poison
- Durban Poison X Mighty Might
- Durban X Skunk
- Durban/Thai

Uncategorized Strains
- Malawi
- Malawi Gold
- Power Plant
- Swazi
- Swazi X Skunk

Region: African Strains

Afro-Asian Strains

Durbar

Indica strains

Kush Strains

Ruderalis Strains

Shiva Strains

Southeast Asian and Indo-Asian Strains - Region: African Strains

Papaver Somniferum

Himalayan Gold

Kerala Skunk

Mangolian Indica

Mullimbimby Madness

South Indian x Skunk #1

Super Chrystal

»Back To Index
BC Big Bud is a stabilized 65% indica/35% sativa, the Dutch Big Bud (Sensi) is all indica. BC Big Bud has
tremendous resin, it's the crystally bud on the cover of the Cannabis Culture #18 (Steve Kubby header), and a
citrusy scent. Usually only available in clone, (hence the crosses, it's usually the female in those Romulan x BC
Big Bud or Mikado x BC Big Bud), it is now available in seed (pure) at $50 CN/$40 US for 10 seeds. Giant seeds,
The Big Bud was the same as usual. The buds are large for sure, but this strain just doesn’t do it for me. They reached about 15 inches in height and yielded at least an ounce each. I’ve grown this strain 2 times before and to be honest I thought it came out poorly originally because they were my first crops, but even this latest batch, which was grown and dried as perfect as I have ever done, still pales as far as potency goes. This will be the last batch I grow of this strain.

While I’m not going to say that Big Bud isn’t a good strain, it’s not as magical as many people seem to think. They are big, but not significantly larger than many other top strains. The potency is good but not knock you off your feet good. There is huge variations from plant to plant, some are killer and deserving of some of the legends, but the majority are just typical (of high quality strains). Overall, a good plant as long as you don’t expect miracles. I just finished a reseed high yields, 25% has something special to it. Cash cropper’s friend just doesn’t do it for me. They have no relevance despite what mythology persists about them. Very nice smoke, the Dutch Big Bud can be a good yielder like BC Big Bud but the high is more sativa like.” – Marc Emery

Winner of the Cannabis Cup in 1989. Mostly Indica. All plants have guaranteed high yields, 25% has something special to it. Cash cropper’s

Friend has been growing supposed BB for a while now, and let me say that the BB from Sensi I grew and selected a perfect mother (maybe just great luck?), but mine sure is different. Much greener, tastier, more potent, amazing. 8-10 in my opinion. But even Sensi says that 25% are “Special”. So I’d advise germing the whole batch (pack) of seed as to give yourself a better shot at a primo Mom! Good luck dude. If you never grew any exotics before, try an easier strain. You really kind of need to know what your doing (selection wise).”

Piece of crap – hard to clone. I grew a few seeds from a seedbank selling Sensi BB, and I’m glad I didn’t waste time and space with any more than 2 females. Maybe I was unlucky and didn’t score that hard to find large producer. Dunno. The plants were grown indoors under plenty of light. They were big in circumference, with spread out bud yield. I was expecting fatty kolas, but nope. It looked more like Holland/Canada Big Treat than
Afoaf has a Posi Big Bud Mom that is 70% pistils ripe, with cloudy heads in about 43-45 days and it yields real nice. Its a real tough strain, eats ferts big time, not the strongest most devastating buzz, however it has a long duration 4 hours, but a repeat for sure, the strain has really “grown on me.” Its just an all-around good strain, now if it took 55-60 days it would be history, its speed to harvest is a big consideration.” –Budm

Undetermined

Two of butter, that turned out way too strong was a complete runt, I don’t know why I even let her live. Plants were vegged in an aeroponic/NFT system for 3 weeks under a 1000MH with an AgroSun bulb. They were about 18-20 inches tall when switched. Each plant was topped twice. Flowering was in an NFT system. The first 2 weeks a single 1000MH w/ AgroSun was used. A second identical light was added at the third week. Flowering took about 70 days. These were the most crystallized plants of this variety that I’ve ever grown. Slow cured over 1 1/2 months. First on newspaper, then into paper bags, then into mason jars. Smell is incredible. High is incredible. Normally I find BB a little less potent that I’d like. This crop just floors me. High starts out mellow, upbeat, then when you start the second round of bong hits it just hits you like a wave. Immediate couch melt. Cancel your plans, you’re not going anywhere. But it lets your mind stay sharp, which is the best thing about it. Overall I was pretty pleased with this harvest. I had a couple problems in the early weeks of flowering with mites, and then nearer the end the cold started to set in a bit. I had one plant that was a monster! A good 8 inches taller than all the other plants, I ended up having to tie her down. 4 huge colas each around 4x11. That plant probably yielded almost 4 ounces alone.“ -

Seedbank

Big Bud itself is not a very good strain Big Bud and Skunk #1, Green Spirit is a hybrid of Big Bud and Skunk #1. Was developed because Big Bud itself is not a very consistent strain, with very big differences among individual plants. By crossing Big Bud and Skunk #1, Green Spirit became quite homogeneous. Good results under artificial lights. Clear and strong high. The plants have
Green Spirit is a short resiny 8 week strain that crystallizes nicely and has a real bomb taste. The only drawback I see is the mold susceptibility trait inherited from its Skunk#1 forefathers. - Mcgee

A super potent Blueberry Indica, coated with a strong concentration of tall standing trichomes. This produces a long-lasting very narcotic experience - body high blueberry. Short (80 cm) stout kush plants that produce.

Blue Moonshine is NOT a White Widow cross. It is similar to the “Whites” only in its glandular resin coating. Blue Moonshine is a cousin to Blueberry, and is derived entirely from within my personal gene pool collection.

I liked it a lot. It’s mellow, weird, trippy yet down to earth. I crossed it with my best NL female and so far, NL-BM smells like heaven. I’d say it smells like Bubblegum, but I know there’s a strain out there with that... So anyway, I found B.M. a lot like the description; strong but don’t get it if you want your ass kicked (it isn’t that way.) However, if you like mellow, different stones, I highly recommend it. Yield pretty good; nugs too hard if such a thing exists, quick: takes about two months or so; sorry I’m too busy to get terribly scientific about it. (and as I grow in about 12 CUBIC feet, you don’t want my numbers. I doubt anyone shares them.) And these are only my experiences and current opinion. I reserve the right to change my mind, which I may. Oddly, I’m just not sure about the Blue Moonshine, which is weird because I have an opinion on all others. Going to start all B.M. beans soon (Moving to bigger local and I swear I’m starting every bean in my personal gene pool collection."

Dutch Passion seedbank catalog

~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov.

Heaven’s Stairway catalog

~ Flower: 9-10 weeks ~ Harvest: mid Nov.
ur most pure and oldest sativa lovers. Wrap these velvety buds.

roots show. Flowering time: 65

The buds, and yield are a bit low. I would say it does MUCH better

ARANCE: Very short plant -up to 80

- height, nodes and density

- thick, rock-solid clusters with

- blue hue to the tops. Good side

- small thick leaves. TASTE / SMELL:

- berry, with a sweet hashy berry flavor

- floaty, very visual buzz. It is

- widow, but is not very heavy. YIELD:

- nodes with thick solid clusters with

- plant indoors but the BlueWidow

- talk but rather many stems

- slender when flowering. Very
Top 3 NCGA's strains in potency according to Marcel (NCGA assistant): BlueWidow (hands down the best so far)

- When looking at the BlueWidow it does best indoors. It does well outdoors but start it indoors under natural day length, clone it then place it outdoors. I found when it was grown outdoors from seed it tends to make a single 6 ft bud. Not the best use of space. When cloned though it reaches the same 6 ft but yields about four times as much. Harvest date outdoors California is 2nd week in October. If you can go to the 3rd or 4th its just delightful keeper in my grow. It has the same kick as itself. It matures in 45-50 days.

- I have grown out a Blueberry x White Widow cross, BlueWidow. It is a definite keeper in my grow. It has the strong berry taste (very strong) and a kickass buzz, more than just blueberry itself. It matures in 45-50 days with a moderate yield, but yielded more than my NL strain. I will do a new grow with BlueWidow and C99. 2 awesome strains. You won't find BW but a F2 is out there called TwoBlue. Taste and Buzz are the most enjoyable aspects of this.

- Here's a great tip for you people just starting out. Don't get caught in the hype about how great Sensi, Serious, Sagarmatha and Greenhouse are. They are very good but they are just very good commercial pot. The strains have lost their original zip. Widow is more powerful and has more blue absolutely destroys the original Stinger buds that still have distinct blueberry and vigor. Not to mention their price.

- I have the blue/widow at 43 days 12/12. I began flowering when nodes staggered. I don't think it will be more than a fair yielder, but I think this is going to be a very potent strain. The leaf from this is as strong as our Widow.

- Well I can tell you about BlueWidow or BW I'm the one that had the idea for this strain to cross with a very nice blueberry mother... BW grows short to medium nodes fat fan leaves that will go more sativa as it enters flowering... the budding is slow at first been then explodes.... She produces nice thick solid clusters with orange hairs very high calyx/to leaf ratio.... Smell like a strong house cleaner that tingles the nose and strong hashy berry taste... high is very strong nice up not very heavy high. Hope this helps.

- BW is very nice STRONG body high but if your looking for something quite clear and focused... I would go with Kali Mist its VERY up and super clear great sativa energy, although BW is very nice yielder of solid buds the Kali I have yields quite good and is quite dense def. not what I've heard or it description says. It gotta a very nice spicy with incense tones taste... I love it I got 9 clones ready to go with 9 AK. AK is heavy slammin high but very clear and focused... I would go with KW and the other very nice yielder of solid buds the Kali I have description says. It gotta a very nice heavy slammin buzz then you would want...
Happy hunting."

owers after 4-6 weeks of continuous lighting and J.H. mix; these plants do not grow from thick indica to more slender sativa and nuggs Blue Widow and it is a little less yield on this 1, but I never lost his sense of smell and taste on occasion...I almost as long as the others (keep in mind density are all the same with

In short nodes thick dark green fuller than that when u flower her most hurts the eyes to look at it explodes the lungs VERY STRONG. Not, good side branching buds will between small thick leaves has a few via:). I tried some leaf from it 10% male leaf after sexing the plants. I of its own. can’t wait to try the for our purposes. I too have noticed plants don’t have any center stalk (that’s beside the point), but he are uniform and almost as wide a flavor and aroma that leaves me than makes up for that."

Taking a main stem like most plants, into flowering, so I am curious and this leaf "kicks ass"!

Broken blueberry and crossed it with Stone Blue which is a cross of Widow is almost as good sacrificing

ith week of 12/12, both stand of resin. They are also kinda bushy the clones had to rejuvenate. My th node, still parallel that to having more room root

ave yet to sample any... but I can plant planting. They are all very be the fastest (well, the MCW is a garden, though. If it smokes like it this fall." - m.g.
I always wind up harvesting about a week earlier than I should. The upper leaves on the smaller one have now turned a robust purple, kind of like Japanese maple leaves. Very exotic looking and very resinous, but alas such a low yeilder. Her big sister is really coming around though and looks about a week and a half from harvest. Harvested around Day 60 and 61 - 2 BW from seed, each very different. 6 clones with 3 weeks left. Smaller, more resinous, very-purple girl was a low yeilder (31g from a manicured 18" plant w/ 4 colas). Smooth and fragrant with a very up high. Such a clear, functional high, in fact, that one wonders if they are still high.

Larger plant was a better yeilder, 46g 24" topped plant with 4 dominant colas and 2 smallish ones. For all the difference in looks, the high is very similar. Energized, not wiped out. All in all it was a fun project and I've got the BW around for a while." – D.

Early flowering will also tend to produce hermies. It is best to wait for the plant to develop sexually before flowering it. My BlueBell is a great example of an OUTDOOR plant. I have grown it and several of my patients have grown it too. The results have been zero hermies. Yet when it hit the market I got several email complaining about it being a hermy. Now that it is only

floros (24/7) then cut back to 12/12 for a couple of weeks before transferring her to the HID bud room. Plant really stretched at that point for the first few days and then I noticed that my HPS light was coming on, then powering off, and then coming back on over and over again. Bought a new bulb and the plant quit stretching. At this point the buds took off, at about golf ball size the top calyxes turned dark, bright pink and the small leaves around the buds frosted. I had a male that looked a lot like the female BlueBell so I grew him long enough to get pollen and seeded one of the branches. This seemed to make the plant respond with additional calyxes on all the buds (maybe)

Plant is extremely easy to clone. It had approximately 20 nodes and I took the bottom 10 for clones. Even a small side bud with a 1/2" of stem rooted ok. They seemed to have a hard time breaking out of bud mode after a week out of town and my plant only being fed once a day, most of the pink coloring on the buds is gone. The frosting of THC is at ridiculous levels. Fan that was blowing on the top of the plant got turned off and the plant tried to save itself from the heat by coating its top buds (all that’s left thanks to over active pre harvest testing) with THC. Smoke now tastes more and more like hashish and is probably could grow the buds another 2 weeks but have a bunch of clones outgrowing their space in the veg.
It seems like you can harvest this beauty a little early for the berry tasting high or wait for them to finish growing the small frosted bud leaves.

A 10 sq. ft. room gave me 10 oz of BlueBells. This batch was very fast. Buds are almost white with THC and sticky as glue. I sprouted a few seeds that I made from the BLB Mom but they were not the first to create it. I think all the seedbank versions of Blueberry originate with DJ Short, but he was not the first to create it. I think he improved upon it though. Also, I think Blueberry is predominantly a fruity Kush. And I think I remember reading in an earlier CC issue that DJ incorporated Thai into it to give that uplifting high. - Vic High

Growing BlueBells in the late 1970's. A large producer under optimum conditions. A dense and stout plant with red, purple and finally blue hues that usually cure to a lavender blue. The finished product has a very fruity aroma and taste of blueberry. It produces a notable and pleasantly euphoric high of the highest quality and is very long lasting. Medium to large calyxes.

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The name “Afghan” (indica) was assigned to the original P1 Afghan stock that came to me one generation removed from its region of origin via the northwest growing community (and to the plants grown from this stock). The name “Hindu Kush” was assigned to the “Kush” looking varieties that developed from the f2 (and
beyond) crosses of the P1 Highland Thai (sativa)/P1 Afghan (indica), and, P1 Chocolate Thai-Oaxacaan
sativa)/ P1 Afghan (indica) crosses. The resulting F1's of the P1 cross were uniform hybrids. The f2's, f3's and
beyond were universally diverse. Among the variance developed what came to be known as "Hindu Kush",

To help clarify, allow me to describe the subtle differences that I observed between the two. Both grew short
and stout with wide leaves and both matured early. The leaves of the Afghan had slightly shorter stems and
shorter stemmed Afghan leaves side branching, especially from earthen" odor and a lighter green
top more downward, exposing the leaf during later maturity. Also, the "skunky-musky-earthen" than the basic Afghan. The Kush
stemmed leaves, many of which had large swollen bracts and flowers). The Kush, some with aroma like
rowed from) Robert Connell

began, berry, or otherwise from my own (the original P1 stock). Technically, the
Hindu Kush region (Northeastern Himalayas) is associated with Afghanistan/Northwest Frontier north of
trains. I hope this has helped to

"Blueberry from new genetics" was a strain in the market. I simply authorized the Dutch Passion description for Marc's catalogue. Perhaps, at some point, I should re-do these descriptions.

of my own varieties. I am only interested in using pure, land-race varieties acclimated in their particular region of origin. Until more of these become available, I have plenty of my own stock (much still untested) to work with. Look for new varieties in

the seed trade.

natha release, and all subsequent. The second phenotype is more vigorous, I've found the first phenotype
who bought the first batch direct from

ow of the second (wider leaf)

ow of the second (wider leaf)

Again, these are now of the second phenotype seeds and the Amsterdam

The difference is that it is a knockoff

ent, tended to grow a bit taller than the first phenotype, but potency and flavor good. I'm going to top only once or not at all in
ic trait. I used ‘feminized’ seeds and was enthusiastic about this variation. For me, it worked.

- Tokko

Stems appear a bit woody for cloning but I think this is a strain-specific trait. I used ‘feminized’ seeds with 4x4 results but I’ve seen posts where other growers didn’t seem so enthusiastic about this variation. For me, the cost of power and the hassle of sexing made the choice a no-brainer. - Tokko

... 4 were boring lowdown indica stone 1 quite zippy and 3 quite up and they put a smile on your face I like the last three and will save them for breeding. - Oldtimer

... Blueberry keepers are my most popular, although not most potent. The smoke is soo clean and sweet. It’s like it actually clears your sinuses but with a sweet berry flavour. When being transported, it I would not recommend Blueberry unless you want to become an experienced grower quickly. Blueberry, although a quality plant, will test a beginner’s ability. It’s usually the first plant in my garden to tell me that I’m doing something wrong. If your a beginner, why not go with a proven such as NL5? - Vic High

... I received mine from BC Seeds, WOW. I used to grow with stash seeds. No more. Blueberry in 65 days budding time produced 1.8 Oz per s.f., with 55 watts per s.f., vented highly. The strength and the taste were a 10 on 1-10 with skunk #1 being a 5. - Vic High

... have been supplied by centers in 45 - 55 days. Reported to be mostly indica plant 2 - 3' high that matures in 45 - 55 days. Reported to produce large crystalized buds with natural occurring blueish hues and an unmistakable berry taste and aroma. Of the ten seeds, I got 5 males and 5 females. They all started out looking very deformed with wrinkled leaves and variegation. At first I thought it was do to excessive inbreeding but later found out that the strain was treated with cholchicine. Two males and one female were precocious and would not stop flowering regardless of light cycle. These were discarded. Of the remaining 3 males, two would not shed pollen (they would flower but the pollen would not drop). These were also discarded. The fifth male (BL-9) was by far the most robust and fortunately did shed pollen. It was used to pollinate select mothers. Two of the females produced great buds that didn't smell like blueberry so seeds were collected (BL-9 was father) and then discarded. The final 2 females were what I was looking for (BL-8 & BL-10). Very robust and they produced the sweetest berry like smoke. Clones of both were kept as mothers and seeds produced with BL-9 as the father. These clones matured at about 3 feet tall. with a few side branches. All deformities have disappeared in mature plants and successive clones. They have very thick stems. The main colas are about 12" long with tight crystalline oval buds. They appear to be well suited to sea of green application. They have a high calyx to leaf ratio. Buds are bluish and purplish and smell like such sweet blueberries. They are not my most potent strain but are my favorite. The smoke is very sweet and good tasting and the high is uplifting and pleasant. To date, the blueberrys have been grown to 18 to 24 inches, placed into bud, and finished at about 36 inches, yielding about 1 to 1 * ounces per plant. They have been grown in 5 gal grow bags containing the super soil mix. To try to figure the best pruning method, the following trial was conducted.

... Started with 35 clones (18 BL-8 and 17 BL-10) that were placed into 5 gal grow bags containing the super soil mix. When they reached 20 inches, 13 were placed into flower (Group A) while the remaining 22 were pruned back to 12 inches. When these 22 clones reached about twenty inches, 10 were placed into flower (Group B). The remaining 12 (Group C) were pruned back to 18" and placed into flower when they reached 20".

... These clones were grown amongst other clones in a 12 by 12 area lit by 2 1000w HPS and 1 1000w MH on a fast moving suncircle. One HPS was in a horizontal reflector, one in a vertical reflector and the MH was in a
Harvested main colas and then let the rest of the plant continue for a week so that the lower buds would fill.

Each plant took up 1.5 sq ft for a total of 19.5 sq ft. This means that I yielded .61 oz per sq ft by growing.

If the entire 12 by 12 area was filled in this way, a total of 1.28 * 144 = 184.32 oz (11.5 lbs) would be produced by just 3 lights. This works out to be about 3.8 lbs per light over a 7 week flower period. Pretty impressive.

In order to get an idea of what wet bud yields I weighed some colas after they were manicured but wet and still on the stalk (just prior to hanging to dry). They weighed 46.2 oz. After drying and removing the stalks they were manicured but wet and still on the stalk (just prior to hanging to dry). They weighed 46.2 oz. After drying and removing the stalks they weighed 7.75 oz and an average of .64 oz.

Each plant took up 1.5 sq ft for a total of 18 sq ft. This means that by pinching the tops twice, I yielded .43 oz.

1 and 2, still germinated but one sprout started a little on the small side. The plants were pretty similar with the exception of one that had more oval shaped leaves, wider and rounded on the leaf blade serrations. Once the plants went to flower differences were seen. Oh yeah. These plants had a strong smell.

Note: The male developed leaf mold and since it was the only plant of many to show a weakness to mold its history. Of the three females two were keepers, for now, while the other was weak, and weak is a kind word. That's the best that can be said of it. It produced the most bud. It's an interesting plant though. Plant was harvested at approximately 50 days. Buzz was slightly higher than average for this age.

Note: For a reference point a typical commercial weed is considered below average in buzz. This one was much lower than average. The yield wasn't impressive but... the smell is strong. That's the best that can be said of it. It's likely to take longer when bigger and getting more light, it was on the edge and shaded somewhat this go round.

The short flowering time was likely due to the size of the plant, very small. It's likely to take longer when bigger and getting more light, it was on the edge and shaded somewhat this go round.

Buds on this and 1 look the same. White pistils and a heavy covering of resin. The plants grow small buds at every node that were pretty tight considering they lived on the edge of the grow. More veg time under white light would help this plant to pick it up in the yield department I suspect. As far as all the colors DP advertises maybe it's a matter of color blindness or something but all that's seen is deep, dark and flat green right now. But if you look at the buds when the light is at a certain angle they do look like they have a blue tinge? it's due to the
I think it'll start showing its psychedelic colors when the lighting angle is achieved, maybe as it gets older it'll start showing its psychedelic side. For now if you really want blue weed: you make believe whenever that lighting angle is achieved note I suspect like many plants this plant will show colors outdoors if it does show colors.

3- This plant grew well and would have had an acceptable yield except it slacked when the time came to produce resin. Slack isn't even the word it's more like failed. It almost literally had zero resin. Because the other 2 were nice plants this one was given a second chance before meeting its maker. Meet its maker it did, good riddance.

Aroma: These babies stink. They smell when they're young, the vegging, rooting and flowering. The smell from just 2 vegging plants, 1 and 2 caused more noticeable odor than half the same grow filled with no. They didn’t smell like blueberries to me, but did have something added to the sweet skunky indica odor that has a berry quality to it. It is becoming stinkier as it ages too. For those of you that have friends that are impressed with smell this would be a winner. Max security calls for paying big time attention to odor control in the grow with these. Except of course for 3 which doesn’t smell like anything but the lawn.

This weed would present a packaging challenge if you need to move it for some unknown reason -

Buzz: As stated the two remaining plants had better than average potency for this age. Both were definitely indica types buzzing with 2 being somewhat unique with a heady floaty type thing going on. More later when everything else worth keeping there is that is different. There is on who stays and who goes then. If it shows an early mature. If it shows an early for surprises." - flick

If happened. It turned out to be a

ended up using clones from two relatively slow growing, and formed with the other plants started right off turning

red-purple, a nice addition to the camouflage, as the eye reads the color as bark from a distance. The fan leaves stood out straight from the plant with the sweet skunky indica odor that has a berry quality to it. It is becoming stinkier as it ages too. For those of you that have friends that are impressed with smell this would be a winner. Max security calls for paying big time attention to odor control in the grow with these. Except of course for 3 which doesn’t smell like anything but the lawn.

The flowering period was amazing! The buds were purple from the get-go, with small lime-green hairs. The older the plant got, the more it became purple, all the way down to the fan leaves. What a beauty! The smell wasn't sweet, rather it was skunky; mild, and not noticeable from a distance. It's safe for backyard growing.

Now, there were some problems. First, of course, it did not mat-ure. If it shows an early mature. If it shows an early for surprises." - flick

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fogger a couple of times, not for the poison, but for the reproductive chemicals, and that was fairly successful. I'll do it again next year.

I did develop a couple of grey mold spots in the middle of October, and I pulled the plug about two weeks before full maturity. Good thing, as the weather turned impossible (50s, constant wet), before nature laughed at us with a late Indian summer.

The flowering period was amazing! The buds were purple from the get-go, with small lime-green hairs. The older the plant got, the more it became purple, all the way down to the fan leaves. What a beauty! The smell wasn't sweet, rather it was skunky; mild, and not noticeable from a distance. It's safe for backyard growing.

Now, there were some problems. First, of course, it did not mature when it was supposed to (September). There may be many reasons why (I'm working on it), so it's too soon to tell if it was my fault or just the plants nature. In Seattle, if this plant performs as it did this year, it wouldn't work most years. But I call it stalwart, because it was undaunted by several rainy periods in late September and early October that would have melted for surprises. – flick

I hadn't planned to use Blueberry as my outside crop this year, it just sort of happened. It turned out to be a

ended up using clones from two relatively slow growing, and formed with the other plants started right off turning with red-purple, a nice addition to the camouflage, as the eye reads the color as bark from a distance. The fan leaves stood out straight from the plant

fogger a couple of times, not for the poison, but for the reproductive chemicals, and that was fairly successful. I'll do it again next year.

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I've smoked, but it gets the job done. It doesn't last very long, unlike my indica homey for instance. You can definitely remember to deliver it to your vocal cords in

are greatly washed out in gland hash as any of my other pots. It certainly isn't a sleep pot. It does taste

So, what is this stuff good for? Gland hash, I'm thinking (varietal differences are greatly washed out in gland hash). I couldn't see smoking the pot that much. I don't like the high as much as any of my other pots. It definitely isn't daytime or driving pot, no way, and it's not narcotic enough to be a sleep pot. It does taste

lovely, as advertised, but so what? Aside from the great beauty of the flowering plant, which is just wonderful, I

Sagarmatha seedbank catalog

I've had Flo for a while now (grown a couple crops w/ her)...As for the potency/high: Not much "body stone" at all, the high is pretty clear (meaning it's not confusing or stupefying like some), kinda "up" y'know -- makes you want to go and do things (not like my NL cross, that's couch-lock stuff). Not real visual/hallucinogenic, and not the longest lasting stone (but certainly respectable - maybe stoned for ~an hour off 2 medium bong hits), but definitely worthwhile. Really unique, but not *the* most powerful stuff. I really like this one, although the yield is way down there compared to other strains. Hope you like her as much as I do.

I'd recommend this variety IF it isn't the only strain you'll be growing. I say this because she yields pretty low: small calyxes in small spear-shaped buds. This is definitely my lowest-yielding strain. But also the most unique. It really does taste like Nepalese hash. Also, the plant is beautiful to look at, dark maroon-colored stems w/ dark green leaves. Nice smell, too, not skunky or stinky at all, it's a very sweet floral kind of scent. I've heard varying reports: 60% sativa,
weed, you know, you can wake n
the morning (sometimes), and
most thought I wasn't high -- the
ppy, slightly visual, cerebral

the finishes (in my room) at 2' or
ere the two. To repeat myself, I
tumper crop (she won't). I'd guess
- 1/2 oz per 2' plant."-Zachary

ail about 7-10 days for the
taste like Royal Nepal. High was like
strain. I grew both Blueberry and

ent breeder's strains came from
supposed to be related--probably
ng

le that do not like blueberry. Its
kid of leafy. Lots of resin on the
leaves. grows long, Superskunk
y big buds. I have been pleased
like blueberry. Unfortunately, one
ore intense. There's a peppery
reek or two earlier than Blueberry.
tial to the oranges, and sweet

up is unknown but 1 puff told me
ty fast. it also has a noticeable
azy about the blueberry taste but
puts you in a daze, a dreamy
ling. I like Cinderella in the

others. One was an indica dominate
up...the weed tastes real
er after this one you are going to
ant to do that,...so roll another and
uzz will relax ya so you can
on my face and deep perception
especially when you want to talk
e definitely more potent...but I

body, 10% head high. Matures
in color. Difficult to clone, gets
e high is very physically relaxing
I've grown 4 crops of Flo. It is very difficult to clone and not very hardy. I lose 40% of the clones, and just lost 2 plants when my hydro system was shut off accidentally. All the other strains survived without any harm, but the Flo dried out beyond recovery. This is not an easy strain to work with. The only reason I keep growing it is because of its fragrance and taste. I love the hashy fragrance and taste. It is truly an exceptional strain in this regard. The seedlings I grew were not very uniform in this regard, which might explain why yours does not have high from it. something that is a blueberry and taste similar. your

ask because one female was more on. but she still wants to growth...and they have resin glands." –

roots never got very frosty, and the gray. The bud appearance looks like the Flo got a thumbs down." -

and could think of.

00 gr/sqM” – Marc Emery Seeds

Blueberry crossed with Northern Lights #5. A combination only a stoned mind could think of.

NL5 x Blueberry. Got them from Emery. Potent, resinous. Under 60 days. A mix of NL power with Blueberry Kush high. Good yields. Squat, muscular vigor. My only disappointment is that they don't exhibit Blueberry
erry male. The hybrid retained the Romulan quality aroma and taste from the buds seen in Aug. 98 High Times.

The high is up, for an indica, and 8.5 Taste--9 or higher! This is what the best way I know how to describe tastes to have a rich well drained soil, weeks 18-6 from seed, 10-12

nice taste but I would still pick

ental of 50days 24/0 400mh, in 2gal application. Flowered under 400hps clouds. Nice 75-80% brow hairs, 50% 30% of the bud material was left 2oz's each. Being the first grow, It fantastic yielder. I really thought I would surely take a 1000watt are awesome! The Romberry dense, stalked trichome frosty amount of light to produce Expect Centerfold Colas on Your	amount of help from the great people that I think are worthy of a

t colas with as little as 35 watts heritage and original breeding when flouros were popular, and does well under low light

I thought I had 3 Roms, but one with prolific pre-flowering. Also, them go 72 days. Actually, I everything worked out in the end. to set me up for MONTHS!

your face. The flavor's coming out
The heavy early. Large production mother (mostly Afghani) crossed with a glistening Blueberry Male, for added flavor. Frosty leaves produce exceptional screening dreams. F1 to Shiske mother backcross.

Flowering Period: 6 Weeks Outdoors: Early Oct. Yield: Huge (up to 3lb per light)" - Spice of Life Seeds catalog

I've grown the shishke topped and cola style on two occasions and would say that shishke is a better yielder ode it got bigger than I wanted it. /ft with almost all extraneous pruning the lower branches in my after you start 12/12 and you'll have good(could have been better but ays and not 6 weeks as advertised. n me out indica stone. Not too

. Had 3 sizes but all eventually put highest leaf-calyx ratio while the manicured bud with the smallest one once pinched plant) and the h buds" along with a nice main uzz and taste but there's better to other strains and lots of grow and minimal care. I did a few ality of the outdoor grow...also (if that makes any difference) but I purchased mine last winter from

buds are fat and sticky with a berry Blueberry look to them, based . The only problem I have with the shable for what it is, it is enough to

in it, if anyone is interested. A row are only from one of the
Shiskaberrys that I have tested. With further testing I will find the definitive Shiska mum.

Aroma - The smell put a smile on a friend's face tonight when I pulled out da' sample. But kaka has yet to smell a thing. Allergies are a killin' and ka ain't a smellin'. A bunch of Shisks are drying and I can't smell them left with a hint of on the mild side. I'll have to see.

Yield - While there were some runts in the group, most of the plants ended up heavy yielders. Plants were 5' been killer. 3 mothers had the above average, especially

Hairs are orange and few leaves that density is definitely above average. sure, not that I'm complaining. Possibility. Lots of sticky fingers. The of a good mother. As soon as 2'(runts) to 3'(fatties).“ - kaka

Id say top after the 5th or 6th inside branches too, as they willners. If you train the plant right you 3 feet tall. My current grow I tried the bushy/big leaf I would try to grow no

b (sort of) flavor. very smelly other and clones easy. but very prob. tall...maybe 6-8"... but I a prob. most excellent long and em with all branches of the bed... btw, I'm at 36 of Sept to mid-Oct, if I recall
More information on StoneBlue: Day 37 of 12/12 - Very uniform hybrid, indica dominant expressed in two sub-phenotypes. More resin at this point than nc5a or blueberry; the individual glands are smaller but more profuse. The smell is very similar to blueberry and nc5a. Appears that the aroma gene has been fixed quite well in blueberry. Sample tokes at this time produce quite a strong physical effect (on me at least) with typical indica stone. I expect flowering to be in the 60-day range. Some fan leaves will turn yellow - this appears normal as all other parameters are in order. Yield estimated from visual comparison to bb and nc5a looks much better than the other two strains. StoneBlue has very good lateral branching. 5 seeds were germinated, of 5 seedlings I ended up with 4 females. This plant will need more than 6 weeks veg for full sexual maturity, at week six of veg the nodes had just begun to alternate. - Lady J

Two Blue (F2 Blue Widow) from HS - Have 3 females in day 23 of flowering. Flowers look similar but plants very different in shape (1 is tall and lanky - me no like, 1 is short and stout but not bushy enough - ehhh, 1 is short, stout, bushy and bud crazy - mmmm, me likey. Hope to pollinate 1 branch of the latter to cop some seeds. Will let you know in about 30 to 45 days re: buzz and taste. Two Blue, as an F2 hybrid, has lots of flowers.
Colombian Widow is a cross of Greenhouse’s WW and a skunky two hit Colombian. The Colombian female was chosen for its robust growth, relatively short flowering time for a tropical, dense buds and stickiness. It is a two hit lady with a piney aftertaste. She is crossed with a WW male with good branching. The result is a well branched, sticky Colombian with an intense mind bending high. The plants branch and bud extensively and are great for weaving its numerous long branches through the screen. Expect buds to really begin putting on the bulk at about week 6. 8-10 for flowering then train the plants and you

The Super Sativa Seed Club (SSSC) bred a Thai strain for four generations to stabilize its traits favoring indoor cultivation. SSSC’s famous Durban Poison male was used to pollinate a particularly sweet Thai female from this fourth generation. The hybrid was called “Durban Thai Highflier” by SSSC is has quite a reputation among Cannabis “Old-timers”. They exhibited the best genes from both sides of their heritage, maturing early and remaining reasonably compact due to the Durban’s influence. True Thai weed is sickly sweet, but when crossed with the Durban, the hybrid took on a taste distinctly like black licorice. Bros. Grimm decided to cross a particularly early-maturing female SSSC Durban Thai with a Cinderella 99 male. A limited quantity of seeds is now available. Expect a hybrid that is heavily Sativa-dominant, yet suited to indoor cultivation. “ - Bros. Grimm Seeds

Bros. Grimm
These buds are very compressed with many seed husks. They are a deep army green colored that seem brown from a distance and are sparsely covered with brown hairs. The scent is a little brown (dirty), a little chemical and a very little green. Since the Hawaiian comes from a long distance, its appearance could be greatly altered from its travels. It seems to have had many crystals, and its compactness is certainly a result of its shipping. When smoked this bud tastes very full, almost meaty (BBQ) with both green and brown flavors. The smoke is not particularly expansive but is very harsh because the buds have been overly dried in transit. If it were nicer aesthetically it may

An old Island strain that comes out of Afghani and Blueberry seedlines. Long and fluffy to start but thick and sweet with a pinkish hue after 8 weeks. Odiferous flowers with intense resin production, this plant has a deep green colour on upper leaf surfaces, but the underside of the leaves are light green at first, becoming almost white at maturity. Recommended by my carny friend "Resin Rene".

Veg 1 wk for sea of green. Yield 9oz full size. 1oz in a 2 gal. pot. Harvest outdoor Oct 14
The Hawaiian Indica by Sensi (and that is the Hawaiian used in the excellent BC Seed Co strain, NL x Hawaiian, as well as the Classics Hawaiian Indica, Hawaiian/Kush) is like a summer day, dreamy. The big buds, that I can identify more readily that any other strain of the fat cola bud type, the pistils are often tinged red, rose, pink, (usually white), are wide round buds, offering great dreamy high and larger than moderate potential yields. Hawaiians indicas, somewhat like Thai indicas especially sativas, don't handle stress well, so an already proven environment of conscientious grow room care should be the phase you feel you have evolved to in grow experience. A Hawaiian Indica really adds flesh to small yielding indicas (I would like to see White Widow crossed Hawaiian Indica, I think that might have profound benefits and influences). Hawaiian indicas, in my Hawaiian Indica used to be more popular 10 years ago, when there was more Hawaiian outdoor available shipped off outside of Hawaii. With the severity of the Marijuana Extermination Program of the USDEA, Hawaiian outdoor is simply not found outside of the former Sandwich Islands these days.” -Marc Emery

Lighting was a 50/50 mix of 1000w MH and HPS. The plants were grown in soil with organic ferts mixed into the soil before planting. The plants started out under 40w fluorescent light in 16 oz. cups for approximately 4 weeks, were vegged for another 4 weeks, and most were transplanted into 5 gallon pots under the MH and HPS. Plants were vegged for another 4 weeks, then the lights were turned back to 12/12. After the females were identified, most were transplanted into 5 gallon pots. No CO2 was used. The seeds were Sensi Seeds products purchased through Ubino. Two packs of seeds were also used for the Hawaiian. The germination rate for this strain was a perfect 40/40. The branching for this strain was quite a bit more "vertical" with much less branching than the Californian. Some were mostly a dominant main cola. I think this strain may be well suited for a SOG set up. Several of these plants were also subject to mold. Of the 12 best, finished heights are 42 inches for the smallest, 64 inches for the tallest, with the average at 52 1/4. Dry, manicured weights are as follows: min. 36g, max. 65g, average 48.6g. The flavor of this strain is a bit citrus. Some of the bud has a definite "lemon pledge" flavor to the smoke. A good up high, but I have to smoke a little more of it than most other bud to get the effect that I like. Many of these showed some hermie traits, like growing anthers on stalks among the female pistils, but
Mostly Indica (F1 hybrid) with exceptionally broad leaves. Lots of resin on leaves as well as flowers, with a musky hash like aroma. Strong physical high. Yields are above average. Short rounded plants.

I am about 10 days from harvesting NL#5 and NL#5xHawaiian right now. The NL#5xHawaiian would definitely be a good ScrOG strain. It is very vigorous, very bushy, and has branches that are easily manipulated (not I got these from Richies but noticed that they started cracking open after being in my sock drawer for about 2 weeks. 5 out of 12 cracked open and had to send these to my sister (she had room to start them). Also noticed that there were a high percentage of mutants. These seem to have all new growth coming out of the same node. Looks like a cabbage. I got one mutant of the 4 seeds I started but killed it. My sister is flowering of the 3 normal females, 2 are average and one is outstanding. The outstanding female (mother) was topped and has 4 colas about 18" long each. These are really packing on the weight now. The secondary budding is amazing. I pruned all the lower branches and leaves before flowering but this has all grown back now.

Dutch Passion Seedbank

Breeder: Undetermined

> Ion Seeds catalog

> period): end Oct 12hr day exposure

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> now. The secondary budding is

> has all grown back now.
Everywhere you look is bud. Even the lower buds that don’t get much light are frosted with crystal (not as dense
and pulled it at 5 weeks. I thought outstanding female but left it. It
nothing else). It was some of the and tropical. Even the leaves lasted for about an hour (5 weeks ct. I would highly recommend this t them from Richies.”- Scotty
layer of tannish resin crystals. It smells like its Northern Lights is very brown, like a Colombian.

*** 3/4- These buds are made up of nug clusters that are entirely coated in white crystals. The cannabis
only but lightly covering the bud. It taste much like incense--a quite doesn’t cloud your head, allowing

Haze seeds were bought from Martijn, the heir apparent to Wernerd’s genetics of Positronics fame. Current "haze" was said to be a descendant of the legendary cutting “rescued” by Neville at the Seed Bank, so I

Germination on Haze was poor (6 out of 10), not surprising as seeds looked almost lettuce green, three Phenotype was a surprise (even when Martijn said that this “haze” was of the #19 lineage “lightly” crossed with a short node, short flowering indica for manageability), quite indica dominant: small leaves, up to five medium-width short fingers, very light green, overall kind of “tender” looking. Very sensitive plant to minor

an unusual smell... in between cellophane and grapes (imagine simultaneously smelling the clear plastic covering a new audio CD and Welch’s concord grape juice, and you’ll have a close idea). High was intense, UP, heart-racing, but not overwhelming

High was easily), buds very oily, not resembling BCGA "supersoil" mix.

Planting is known under, its “Haze (Martijn) was super-strong but in order today has 13% indica in it.

dice (looks indica), but on the other hand, pale green, has no skunk odor at all in its feeding regimen (it immediately

art in height and flowering time, and its breeding material, good structure

bank

Functionally Haze is a pure Sativa strain. It is crossed with Skunk#1 to get a bigger yield, a softer taste and a shorter flowering period. Truly superior sweet taste. The high is incredibly clear and up energy. A very favorite strain from our collection. Very high yield for an almost 100% Sativa variety. Flowering period: 10-12 weeks Harvest time under natural light: end of Dec. Really tasty strong plant, indoor, 8
I'm not sure how close the genetics are, but I recently did some haze x skunk from Dutch Passion. What I had was lots of hermies, only one true male out of 10 seeds, 4 real females, each different, from sativa type to mainly indica—yield low, taste sweet, sweet, sweet. High up, very potent. Best plants were sativa type, small cola tops 3.5 ft plant with 2 weeks veg, 8 weeks to mature. I had one of the females that was impressive, producing more resin than white widow growing with it but the high from this plant wasn’t too intense though. I probably won’t keep strain long but I’m not sorry I grew it either.” - Stix

I just finished a couple of crops of this strain from Dutch Passion. It’s a very sweet smoking (lots like Skunk1 but sweeter) and if you get a good mother it can be pretty potent. Out of ten seeds had 1 male, 4 hermies and 5 females with one keeper (makes me wonder about the breeding). It’s pretty rough on the lungs but I enjoy it if I have to keep moving while stoned. It is a very clear energetic high. Fairly low yield. I wouldn’t recommend it.

“Some DP strains are in the big leagues, they just aren’t superstars. I presently have one from them called haze/skunk that I really enjoy and smoke a lot, but from most standpoints seed from better breeders can beat it on all points -Potency, yield, stability, etc. We aren’t saying they are like bag seed at all, just do...” - Stix

“The NL5 x Haze has an unusual leathery or sandalwood taste, a VERY expanding smoke (that is, when you inhale it, it just keeps expanding in the lungs). The high from some peoples report is supposed to be “up” but I get so stoned on it I can’t get up and move, don’t know if it is different in mothers or us smokers. I’ve had friends who are heavy duty smokers who can’t take more than a few hits of NL5 x Haze. The Haze x Skunk on the other hand is not an extremely potent smoke in the same way—it’s plenty potent but not debilitating like the NL5 x Haze is. The taste is much sweeter, but like most skunk strains, it burns my lungs after smoking lots of it. Another curious thing about the NL5 x Haze, the high lasts for me about four hours, the Haze x Skunk about the normal two. If you choose the NL5 x Haze, grow a less potent variety along with it for “daytime” smoking, the NL5 x Haze is so potent it burns me out if I smoke it all day.” - Stix.

Some HazexSkunk from Dutch Passion had 4 real females, each different, up, very potent. Best plants were sativa type. I had one of the females that was impressive. The high from this plant wasn’t too intense though. I probably won’t keep strain long but I’m not sorry I grew it either.” - Stix

I tried Haze skunk from clones. When flowered at 6-10 inches they ended up about 2-3 feet. They would work. A pure thai I had ended up at about 5 feet when flowered from clones and could be problematic." -Chemo

Sweet smoking (lots like Skunk1) seeds had 1 male, 4 hermies and 4 real females, each different, from sativa type to mainly indica—yield low, taste sweet, sweet, sweet. High up, very potent. Best plants were sativa type, small cola tops 3.5 ft plant with 2 weeks veg, 8 weeks to mature. I had one of the females that was impressive, producing more resin than white widow growing with it but the high from this plant wasn’t too intense though. I probably won’t keep strain long but I’m not sorry I grew it either.” - Stix

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Haze is a late sativa from America, widely agreed by experts to be the best pot in the world. Very popular in the 70's, it nearly became extinct in recent years as growers switched to easier varieties. We managed to salvage a few viable seeds from the last crop grown in America and we have used them to produce some remarkable hybrids. Haze is known for an extreme, almost psychedelic spaciness. The fragrance is complex and deep with a dry flowery perfume over a base of dark leathery animal tones. When used in a hybrid it adds fascinating notes of depth and complexity to the taste, as well as a unique addition to the high. While not for everyone, the most jaded connoisseur will often find haze irresistible. –The Seed Bank catalog, 1988

Regarding Haze, Ed Rosenthal says he knows it was developed by Cultivators' Choice in California in the late 60's also. Haze takes a long time, in fact Ben Dronkers said in a recent interview that a true Haze takes 8 months to flower! Yow! In fact, Haze seeds are very pale, never dark. A seeded Haze takes upwards of 16 - 20 weeks for good seeds. The high is pulse racing, I would say even paranoid. In fact, I have reservations about recommending Haze, because I have seen irregular behavior in some of its regulars. I think Haze is extremely powerful and cannot be used casually, because it plays to deep emotions is what I have observed. That said, it also makes a difficult cross because often a cross with Haze imparts the Haze flowering time and modest yield but not its intense & dominating high. In my opinion Haze does not cross indicas well, its better suited to a sativa, whether that be a Skunk (as in Super Silver Haze) or another. I prefer the sativa high of a Durban, Hawaiian Sativa, Sensi Skunk, Joker's Haze/Skunk (not a replica of any Dutch strain). I must say Willy Jack is busy trying to find the perfect Haze cross, as he has crossed Haze with Black Domina, Big Bud, Jack Herer, Early Girl, Hindu Kush, William's Wonder, and maybe others I've forgot in order to find the perfect cross, maybe take the 'edge' off the Haze as well as the desirable quickening of flowering.

I tried to get pure Haze seeds from Positronics through the 3, one turned to be a sativa/indica profile, but nice internode lengths, medium green medium wide leaves, and cannot be used casually, and the other two turned out hermie like, one very hermie which unloaded its pollen on some others, the other which a few days before harvest started showing weird misshapen male parts in the midst of the female flowers. The calyxes were very purple as well as the underneath of the small, wide, dark green bud leaves - very indica looking. No pollen released on this one. Am I disappointed? You bet. Had visions of pollinating a real, pure, sativa haze with some of my babes. From everything I've read, haze has been bastardized by the Dutch, it's no longer pure. You don't know what you're being a little cynical, I don't think I'm going to order from overseas anymore. Read another post that the haze...
Another grower got from Homegrown Fantaseeds was very Afghan-like. Heard also that Positronics, Dutch Passion and Homegrown are all affiliated, so, if I were ordering from one of these banks and they all had the "same" strain, I would go with the best price. Homegrown is able to up its prices based on the awards won on some of its stock at the Cup. This kind of crap will eventually hurt the Dutch. A lot of their stuff is prone to herms, a big negative as far as I'm concerned. Think their interest lies in profits rather than breeding out rotten genotypes. If I am paying $4 to $25 a seed, I want a first class product, with no misrepresentation from the grower.

" - Uncle Ben Dejo

I have tried HGF's Haze. It most certainly is not the real deal. There is a lot of indica bred into it. I'm not sure if there is any real original Haze in it at all or if they just called it Haze for sales reasons. It grew well, cloned easily and even had a great pineapple smell. The potency on the other hand was not there at all Sativa/indica

" - RedDevil

They introduced Haze X NL #5. Today the Sensi Seed Bank offers NL#5 X Haze. I do not know if the listing of Haze first in the "Name" as opposed to the listing today of NL#5 first in the "Name" has any real bearing on the formulation of this cross. I do know 88 version (Haze X NL#1 ) states 'Haze X Northern lights has been the most reliable haze hybrid so far and is our favorite smoke. It is a bit stretchy and difficult to grow but well worth it'.

1988 Catalog the Seed Bank introduced a Haze X NL #1 hybrid. In 1989 they introduced Haze X NL #5. Today the Sensi Seed Bank offers NL#5 X Haze. I do not know if the listing of Haze first in the "Name" as opposed to the listing today of NL#5 first in the "Name" has any real bearing on the formulation of this cross. I do know

researching for a superb Sativa/Indica hybrid that is suited for indoor growing but still retains the unique sativa qualities in the high. The Hazes have been known to occur among sativas and some Hazes may include nausea, dizziness, fainting and loss of bowel and bladder control. Extreme introspective behavior is considered normal"

" - Uncle Ben Dejo

One item that may be of interest is that in the 1988 Catalog the Seed Bank introduced a Haze X NL #1 hybrid. In 1989 they introduced Haze X NL #5. Today the Sensi Seed Bank offers NL#5 X Haze. I do not know if the listing of Haze first in the "Name" as opposed to the listing today of NL#5 first in the "Name" has any real bearing on the formulation of this cross. I do know

the 89 version were indeed
I grew that strain in '89 and your right, one of the wildest highs I have ever had from pot. The pistils must have been almost an inch long when they were fresh. It took 4 months for them to come but I never regretted... 

Available in Holland the last people are selling a version of haze - I don’t think it’s available in Holland. The last people selling it were Positronics; their stock went to Dutch Passion, and I think they are selling a version of haze modified by them as they state a finish time of 9 to 10 weeks to suit the hurry up boys. Original haze takes at... 

I would strongly suspect that this hybrid, despite it being carried by Dutch Passion, Homegrown Fantaseeds, and Positronics, originates in a single breeding operation (same exact genes, regardless of source), since all three seed companies have been consolidated under one owner. Which helps explain why all three seed... 

Hehe... sounds like a strong sativa. I have a Haze19Xskunk#1 (Positronics) that kicks out bud with a distinct ‘heart racing’ feeling. This bud keeps me wide awake. Zero to LSD in two tokes. This may be of interest to those wishing to grow killer sativa outside and have it mature. I grew Haze #19 from TAC and had 80% of the plants start flowering after 3 months regardless of day length. I have no explanation for this but I talked to Mike at TAC and he said that this is common with Haze #19 which is very variable. We are still getting 14 hours of daylight and my Haze has been flowering for two months. It is typical Haze potency but you need to be fairly experienced to grow it properly unless you have a good location. The reason being that it grows very tall and... 

I grew a haze19 X skunk#1 strain I got from Jock, and enjoyed growing this strain. The resin it produces is delicious in odor... sugary & citrus. The high from the buds is strong! The plants were harvested in about 55 days. The scissor hash was incredible. With the 2 out of 10 ten females I grew, I didn't locate a plant worthy of the strain corral. The yields weren't too good with this plant. I'm very happy with my new indica strains now. I've had some totally meditative smoking sessions with the shishkeberry... detailed closed eye visuals while relaxing, ahh! that’s my kinda’ weed. Good luck with the haze X skunk... if you can find a good yielder, it'd be a great strain. I let my haze X skunk plant go, but I crossed it with a shishk male to try and make a worthy... 

Started with 10 seeds, all 10 germinated and sprouted. Had 6 females and 4 males with this variety all but one of them grew well. No males were...
kept after indicating sex, probably a mistake. This variety was a pleasant surprise with yield and especially
of the 6 females 5 of them were just about identical in growth both during veg and flowering. They had leaves
somewhere between the indica dark and sativa light green with midsize width blades. The one loner plant
showed its differences during flowering. While the majority had bud covering most of the stem this one grew
Because they were so similar in growth just three were kept to be grown from clones. They were all worthy
mothers though. As a matter of fact if you had to or wanted to do a seed crop from plants grown out in Jr. as of
now these would be a better choice than even my favorite the NL x Shiva
5- This one was the highest of the yielders and came in third in buzz with the plants that were killed off. Not a
distant third just third. The plant matured in approximately 8 weeks. This ma actually has production potential
6- This baby was the lowest of the yielders but came in a strong second in buzz. It also finished in
10- This was the rebel of the bunch. Difference in growth weren't that noticeable during veg but this plant
showed its colors during flowering. The others had bud formation up and down the stem while this one grew
chunky buds at every node. This made for a longer manicure but it was worth it since this plant has the best
buzz. It also finished in

4- Since it was so similar to the other two I kept it this was a no brainer. The plant was the perfect
example of uniformity and I didn't want to trade that for anything. You're not going to get anything
overpowering, but fairly

5- It was the highest yielder with the plants that were killed off. It has an aroma that is not sativa intense but it has an
edge, not sativa intense but it has an
ya know. You’re not grinning
sider plants in the stable Top 44

8- This 61514 At this early age the buzz is in the same class as the older plants in the stable Top 44
and NL x Shiva. Imagination knows how the buzz will be when the plants are older. The oddball - 10 û with the superior buzz has more of an edge and leans towards a sativa side more than the
other two. The weed already has a nickname- Sunshine Weed; the buzz is better in the sun. I guess it’s
towards a sativa side more than the
better in the sun. I guess it’s all works out to a good thing, very

9- So good but not great.

Taste: Distorted by feeding- nothing to write about nothing to bitch about. Good but not great.
Yield 5 has production potential and was kept for that reason. The yield from the others was at least average.
As a whole taking all plants into consideration yield was better than average and there is a possibility of all
ScOG potential with this strain. Also curious to see how the yield department with age this will be
6- This one is the new stone champ without doubt. It could be already NL x Shiva is dusting off the belt for transfer." - flick

Nevil Schoenbottom, Green House Seed Co.
Pedigree: Almost pure Haze with just a hint of Indica (Northern Lights). Strength: The most potent variety of its kind on or off the market. Not recommended for inexperienced smokers - too trippy - too profound.

Flowering Times: Indoors: should be started under 12 hours of lights. The earliest will finish in 14 weeks (25%). Those that take much longer than this are usually discarded as not practical. Outdoors: should be grown in the Tropics + started just before the onset of autumn. Yields are surprisingly good - the longer flowering time is usually compensated with extra large yields, both in and outdoors. Not for the novice smoker.

OW HPS on a 14 hour light/10 hour dark schedule. After that, light period was slowly decreased for two weeks, at which time, they were put on 12/12 and flowered (about March 10). Sometime in late March or early April (I forget) the damned old hps bulb went dead! Fortunately, the weather had warmed up so that I could take them outside during the afternoon, and inside under a bank of fluorescents for some hours after that. Now, it's warmed up enough to leave outside for 11 hours each day. I selected two females and one male which had the pure haze phenotype, and I fully pollinate the females for just now slowing down. I'm on so soon as the tallest is only 2 ft. It would stretch to about 5 ft. once no indication of NL! Some of the traits, and apparently, for hidden yield is very poor at this point! The final yield is hard to judge what the final pot plant would have a fair yield. nous yield, but indoors-no! It is le of the best there is, than a lot

Bottom, Sensi Seed Bank

The result: an extremely potent plant ahead of its competitors. The high provides for lush growth, heavy bud

- Sensi Seed Bank catalog
Will produce 4-6 ounces per plant. 10 -12 weeks Yield: up to 100 grams” -

It is a potato. Needs lots of lights.

Some crystals, put into the nation's water probably not the best for a newbie, no shit, this happened to a friend. Be sure you've got plenty of water, and you'll be better off lots of fuel!! But be careful ... if you go before you know it. I would leave a little longer (70 days) but worth

experienced smokers do strange things. Nevil's version of it and they are great.” – Stix

10-12 weeks to finish and worth the trouble they are causing. Has to be the Haze.

with NLxHaze from the bc seed co. When it became apparent that they were not doing anything, I revegged all three and after a while the plats and their offspring have just begun to break soil. I'll just go with the flow and play jr. scientist trying to find out if it was enviromental or genetic. It was great and worth the money but still not the best I ever had... growing conditions could have

way smaller as a result, but the bud strain so into flowering they

awaiting for the chance to grow out. Never had the pleasure of growin.
worth it, with tight, large, crystally buds. Its mostly sativa, LOOSE been budding, and 90% of this order will be worth keeping, to so many people. Perhaps the 40 watts ft/sq. or else it was my fault would have been a big plus and every minute in both grows. I'm really samples weren’t too potent at all-well in the smoke and that’s always the product produced. Fat tight

I have a few NL#5 Haze that I have just harvested, I was really happy with the product produced. Fat tight buds, minimal stretching. and mine was from Mike, straight from Sensi. Mine gained height of around 5 and a half-foot, they yielded pretty well as well. I bent them over and it increased the yield.” – Mirage

I've just finished growing out ten NL#5 x Haze females. Firstly the seeds were bought in Sensi for USD 150.- You get 16 seeds to a pack. Germination saw 15 seeds pop, out of which 5 were males. I let the plants vegetate until 2 feet in height - mistake. On going to 12/12 the plants took off towards the ceiling. They eventually reached 6 feet and were a regular pain in the ass to look after; buds bending branches over, running buds etc.... (I'm using 600W HPS in a 5 x 5 grow room). The plants were just about mature after I'm now in the process of drying and curing with the intention of selecting the best mother afterwards for regen. I must say that I'm disappointed in the quality at this point. The buds I've smoked so far have had a really nice taste and are very smooth to smoke. The high, however, leaves something to be desired. Although I

There seems to be a high variability in potency among the ten plants. My experience tells me that I'm not going to find a killer here. Manicuring a cola from a plant always gives me a clue to its potency. I use a scissor and if it gets clogged up by resin I know I have a good smoke. Only one of these plants had this ability. However, I'm reserving final judgement until the plants are fully dry and mostly cured (about another 3
This excellent quality strain is from Nepal and contains a high level of THC. Grow it from fertile soil and add nursery supplements to the water. This excellent quality strain grows up to 1.75 meters high and is especially loved by musicians around the world. 100% Sativa, a hard plant to grow but famous for its special qualities. A classic Sativa high, and good results for those who do not mind to wait a little longer. Strong, compact plant, mellow. Original Lambsbreath from Jamaica. Pure Sativa with light Skunk crossing. Flowering time 10 or 12 weeks. (1st two weeks 14 hours of light / 8 weeks 12 hours of light / last 2 weeks 10 hours of light). Has narrow leaves, a plant with yellow-white long buds.

Name: Original Lambsbreath
Type: Stabilized F1-Hybrid
Sativa: 88%
Flowering time: 8 - 12 weeks
Cultivation: Inside, outside and greenhouse
Appearance: Slender leaves
Aroma: Spicy odour
Height: 1.50 - 1.75 m
Yield: 400 - 500 grams

Haze (Katsu coffee shop)
This place came highly recommended to me from Tony at Sagarmatha. They are said to have "the best Haze in all of Holland". Trippy buzz with a similar taste to the Kali but not quite the same. Very cerebral in nature. Like the onset of LSD right before it really kicks in. Some what apprehensive feeling with heart racing aspects. This bud is for experienced smokers only. It could really freak you out.

The most mind-blowing weed BY FAR, that I've ever smoked (in 25 years of steady smoking) is Haze. It's like taking LSD. I can't even rate a second or third because NOTHING ELSE COMES CLOSE TO HAZE." –Mr Soul

Positronics Sativas: Colombian, Mexican, Thai and South Indian (from BC Seeds catalog). Mine are so limp that the large new Sativa fans are drooping and the Sativa strain takes it easy on the grove. did our haze have long skinny leaves? grow into flowering green tips grow them outside into a longer light cycle and you will get some long buds of the bunch when mature.
produce 5-10% special plants and be 75% female. Out of 5 mother plants, there is one that is a little different from the others. The leaves are a tad bit wider and the plant is definitely showing more vigor than its sisters."

- Toker2

"That's what I thought, Wernard at Positronics got one of the original clones. I got a handle on the general growing characteristics, how's the high? Is the Posi. Haze as potent as the Haze reputation?"

-Uncle Ben

"In the seventies we tried several times to grow original haze in the UK all to no avail we were using cool white and grolux and didn't know about LEDs. In the eighties we tried again using 100w per sq ft the selected ladies were still growing at 18w and would not finish in Holland can be the same. Some of the extreme sativas with short time indicas the anoid, some people reported it's too expensive and difficult to grow but it was a memory. The shortest we got the seed to harvest was 9w at 12hrs."

- Oldtimer1

"I just finished some Positronics original haze for the most part under 44w/sq'. the clones were taken from outdoor mothers. The outdoor buds at 7 weeks had far better potency and taste than the indoors had at 12 weeks. It did make some righteous size buds indoors and a nice yield, approx. 2 oz/plant. Unfortunately, it just didn't have the kick of its outdoor mother. I really believe haze needs far more lumens.” – toker2

"Haze is a sativa hybrid. If I remember right, they mentioned Mexican, Colombian and Thai in varying degrees. This would explain some of the variation I saw in the hybrids Nevil sent me. Some of the extreme sativa characteristics included one plant with a 6" sport in 24hrs. That happened right after the induction of the male."

- Oldtimer1

"Posi haze is mostly Colombian x Mexican with small amounts of Thai and south Indian. It was created by “the man” who tends to be quicker. Bio (in soil) tends to be quicker. Bio (in soil) is a hydro base. Of course there is some variation from grow room to grow room, even though it's the same strain. Haze is one of our most popular strains and is well worth the wait. A real up high of cosmic proportions.” - Homegrown Fantasy

"This sounds close to my strain, except the very best go to between 16 and 18 weeks, Homegrown Fantasy must have done what they call improving the strain to reduce the hrs to 10 to 13 because that's not what Positronics started with. In fact it is very close to what you get with an F1 cross between original haze and original skunk No 1 which is probably closer to the truth. The other thing is to grow original haze well indoors light levels in excess of 100 w per s.f. are needed it is not an economical crop.” - Oldtimer1
A classic Sativa high. Good results standard for all Sativa’s. Was one of ‘97.

We have spent years searching Haze, the most powerful Sativa in indoor growers. The stems taste like flower nectar. The high hits you right away with a stony, vegetative high that could leave you wandering around Dam Square wondering which way your hotel is.

I have both silver haze and skunk x haze in early bloom outside right now. I planted them around half may. The silver haze looks much more like a Sativa with longer internodes and sparser leaves. I topped it when it was very small so it wouldn’t get too tall and this has turned out nicely. The plant is also about 1 m in height and about 1.50 m in diameter. The appearance of flowers was fast (also +- 4 days) but they are leafier and more...
concentrated on the tops of the branches. The smell is much softer then the skunk haze and much “hazier” (If you have smoked real haze you know what I mean, there is nothing like it!) “-Smurf

This variety made Dutch Passion the “High Times Cannabis Cup” winner in 1992. Formerly this strain was called “Haze Skunk”. Still one of the best for the Dutch Passion team. Original Haze is a pure Sativa strain. It is crossed with Skunk #1 to get a bigger yield, a softer taste and a shorter flowering period. Truly superior sweet taste. The high is incredibly clear and energetic. A very favorite strain from our collection. Very high yield.

I had the opportunity to acquire some Super Haze from Henk in late September. They got through customs just fine. I germed in soil of a fine mixture in early October. Of 12, 11 germed and unfortunately 5 turned out to be herms with largely male characteristics. 2 true males, 4 females. Fairly broad, medium degree leaf serrations, and max 7 blade leaf structure. These babies grow fairly quickly in veg under my 250w HPS with 320w supplemental fluorescent. Problem was though in flowering as this strain took too long to finish. Took about 6 months total. Very deceptive in that the buds will look beefy, but the hairs take more time to turn than any other stain I have encountered. My guess is that this strain will perform much better in high light - temperature situations. I am going to try outdoors now and compare. Under the 250 light and the floros I got some nice 6 - 8 inch colas but they were not as tight as a big light setup would produce. I accidentally pollinated more bud than I had intended to when my pollen collection cup hit the fan...whoops...oh well, now I have enough seed to grow a small forest. And believe me when I say they ought to rename it Redwood bud. -Grower

In the new Dutch Passion catalog, Henk the owner insists on calling his HAZE/SKUNK cross which won the Cannabis Cup in 1993 now called ‘SUPER SILVER HAZE’. The Super Silver Haze that won the Cup is by Greenhouse Seeds. Henk is fairly proprietary about names, he has registered many of his own, so he must be fairly convinced the Super Silver Haze is an identical Haze Skunk cross.” – Marc Emery

Isn’t Dutch Passion’s variety Haze/Skunk called Super Haze? The Super Silver Haze is Skunk/Haze/NL. I was just at the Greenhouse and they have the genetic backgrounds of most of their seeds printed right on the seed pack.
Pedigree: Composed of the most commercial strains, known to the civilized world - Skunk, Northern Lights + Haze. Royally bred from 3 precious High Times Cup winners. Awards: 1st place High Times Hydro Cup '97, '98, 1st place High Times Grand Cup '98. Strength: Overpowering combination of Indica + Sativa Highs. It leaves you gasping for reality. Flowering Times: Indoors: 8-10 weeks, with top yields, heavy resin production. Outdoors: Finishes by end of Oct. in the northern hemisphere, or end of May/June in the southern hemisphere. This complex hybrid is the cutting edge in practical Haze hybrids designed to astound both the grower and smoker alike. Highly Recommended." – Green House Seed Co. catalog

Close sources say Arjan bred the SSH (nl x haze x skunk) in the Sensi Seed breeding rooms (Cannabis Castle) with royally bred Sensi strains. It's basically the same exact thing as Jack Herer, but with one difference. Arjan had some reputed misunderstandings with Sensi Seeds, and took the strain with him, The key difference is that Neville donated his special pure isolated "Haze" strain to the SuperSilverHaze which made it slightly better than Sensi's version. Neville went on to screw Arjan in much the same way Arjan screwed...
from the Northern Lights #5 is the short height and, if possible, the trichome gland production. The only

Once you have a stable version of those two, cross a NL#5 x Haze male with a Super Skunk female, thus

making it “Super”. The main reason Greenhouse Seed Co. created SSH was because a little while back quite a

few people were upset with the consistency and potency of the NL#5xHaze. So the Greenhouse breeders

crossed it with a Super Skunk to give it more stability and up the ante on potency. Plus, I’m sure they needed

The difference between Jack Herer and Super Silver Haze is the NL#5 is the male in the original cross of SSH,

Jack has a tendency to show a bit

an Indica growth pattern due to

SK#1 taste and stone, lots of resin

I just harvested the second SSH female. and am impressed it has a strong SK#1 taste and stone, lots of resin

Heavy budding and lots of crystals makes up this plant, larger colas than Kush alone. Smooth smoke and

MCW is a very nice strain to grow and smoke. Matures around 55-63 days. I suppose that MCW is fairly mold

resistant because 2 other strains I had developed a white “cottony” looking mold inside of the buds, but MCW

didn’t even though she had really phat buds. The buds are nice and tight. I have 2 mcw females, both are very

stony, one has more flavor than the other does. The flavor is excellent in taste. The mcw with more flavor

occasionally puts out a few sterile male pollen anthers, which has never pollinated anything, I have had these

I suppose that MCW is fairly mold
mold inside of the buds, but MCW

have 2 mcw females, both are very

sterile. The mcw with more flavor

injected anything, I have had these
mch's going for quite a while now and I prefer the one with the occasional anther, even though the other mch

"Ncga's Chemo cross (MCW) would do any garden proud! It's my personal favorite of this year's crop and although it's a low yielder, the flavor/buzz more than makes up for it..."

"And, for what it's worth, IMHO, that MCW was the best of the bunch! Without a doubt, try to keep that strain going! The others were fine, but MCW just gave you (or me, anyway) that energy rush that is truly incredible! If you EVER have any extra of that let me know.... I'd drive across 3 states for that..."

dec. 15. all grew normally except for the males. kept the tallest one has 100's of developing seed pods are pretty avg. to what was (I was harvest for the outdoor). #1 is very easy to clean too). Two main colas early in growth. I expect an than most plants, very frosty with and works well for the med. users me too (failed back from 6

"Whitney Farms premium potting soil" cut by a 1/3 with "Whitney Farms cactus mix". Vegged under 1 1000W Sunmaster MH conversion and 2 1000W HPS...after sexing, reduced to 1 HPS and the Sunmaster in a 4 x 8 x 7 space. Tried Mylar this year for the 1st time. Didn't notice much difference between it and plain white walls. Mylar is a real pain to keep clean and

"Mighty Mite is a famous BC indica strain from the Himalayas cultivated for 12-15 years here. It is uniquely suitable for indoor or outdoor cultivation. All Mighty Mite varieties and hybrids feature a dominant main cola

Flowering Period: 7-8 weeks. Height: 2.5'-3.5" - Marc Emery Direct Seedbank Catalog

Breeder: Undetermined

L2 - 15 years here. It is uniquely..."
Seeds take up to 14 days to germinate. Huge cola! Indoor/Outdoor. From a population of 3000, 50 of the best females were selected to produce a definitive 90 day strain. This generation will show a much higher consistency of commercial grade bud development. Yield: 3-4 oz to oz for the experienced grower. For a smaller window of profile outdoors, the strain can be started as early as February indoors, and then placed outdoors in May. Mighty Mites can even be started as late as August and finished outdoors in October. For indoor/outdoor germination to harvest is 90 days. They can be grown indoors for 24 hours under continuous light. Not recommended for cloning.


Breeder: Dr. Greenthumb
ds 18 sprouts. Out of the Niagara, 17 sprouts, and from each and rooted later. Both types threatened to outgrow the space, so I had to bend them. Out of the Niagara, 9 were female. Out of the Niagara x shiva, 11 were female. Clones were taken from each and rooted later to be put into my hydro system. Growth was better than I've ever seen; in fact both types threatened to outgrow my space heightwise, so had to bend them a bit. I harvested last weekend. The yield on both looks good, but I have no actual weight as both are still drying. I would say in the area of 400 grams a square yard. The buds look fat and dense. The Niagara buds have almost no leaf, just pure flowers. I have not seen a less leafy plant before, what a head rush. The buds look fat and dense. The Niagara x shiva is more indica and has more leaf. I have no idea about taste yet but the quick dry I have been smoking is far more potent than anything I have ever grown before, what a head rush. Some of my friends say it's too potent or accused me of spraying it with something. The Niagara x shiva is less potent than the Niagara, and more physical but I would say it is more potent than any of the strains I have grown before.

I have some 5 week old Niagara plants that were ordered from Doc Greenthumb. The plants look good and are 12-15 inches tall and appear to be very healthy. I germinated 10 seeds and all but one sprouted. Plants have been under 18/6 light cycle and all have been pre-flowering and revealed they sexed. 5 females and 4 males. One of the males started flowering at 3 weeks and had to be moved out of the room so it won't pollinate the females. The staminate pollen sack looked like it would release the pollen anytime. I have never had this happen before in the vegetative stage. Have heard that some Ruderalis strains flower regardless of the photoperiod. Has anyone ever had this happen before? I am down to 8 females only out of a 30 seed order. And not the first PINK HAIR. All normal color. :( Finishing out the budding of them to sample the quality. Since they did not produce the pink hairs, I wonder if I got the strain I paid for? 3 of the males fully showed and produced pollen while under 24 hrs light. That I have never seen before. I saved the pollen from those 3 males. There were a lot of hermaphrodites, at least 8. Some of the females showed under 24 hour light. I have dropped the females all down to 10 hours a day to finish them out. All males and hermaphrodites are dead. I hope they did not send me industrial hemp!!!! Or maybe straight Ruderalis? But they finish at different rates so I wonder if it was stable at all? Or maybe I was sent different types of seed? I thought that F1 hybrid seeds would produce even traits? I thought that the traits would not vary.
large plant you may not wanted that with clones instead of buds." -

He it was a really good-looking plant.

Shiva goes hermy. 6 other of same

Smells minty. Good crystal

grape smell in some mint in

years of light within three weeks. Only
best of the 4 bad yielders 1 was fairly
(at best) in potency. The taste
many of the popular Dutch strains
it is not for indoor growers. All in all
never grown, this did not take the
at you're going to be growing. I
look for someone who is just
!

ower under 430W HPS. One female
ished males. Started flower at 14"
onger and HUGE. Topped once.
be great with 1 plant under 430W).
as advertised in type, production,
advertised." – Al Phadog

and an early Afghanistan, both of
't finish in Canada, but he crossed
hybrid that flowered early like it's

Three of the other four have
is the tallest of the bunch as well
ut very slow growing about 10"-12"
orous looks much like a

orn under a Sunmaster 1k cool
worm castings. I had no problem
er filled out. The Niagara was a

o flowering the Niagara's had very
topped at 12 inches tall but the 5
growth that was a hassle to control.
The plants were ok smoke but I really can't say because they were never finished due to space constraints. – Unhappy Camper

...My understanding of this strain WAS that it was a cross between Afghanistan and Oaxacan strains. There was no mention of Ruderalis in it's genes, but 3/12 of these little $#@&er's are flowering under 24/0 after 8 weeks. These plants showed preflowers at the 6 & 7 nodes at 6 weeks, which I thought was odd but counted my lucky stars, thankful I could start weeding some of these out as things were getting pretty crowded. Well at 8 weeks, they're one approx. 10+ nodes and flowering! Also, the description of Niagara at Doc's site compared this plant indoors and out, which led me to think that this would do ok indoors. – T. Aich See

I haven't grown any of doc's strains to harvest yet, but, I have Niagara, and NiagaraVE growing indoors right now, which will be thrown outside sometime in May. I have read that the Niagara is an indoor/outdoor plant, but I fail to see how this strain could possibly be grown successfully indoors. I will say that all plants are very vigorous, with quite a bit of variation between individual plants. They have quite large internode spacing, and these plants will be enormous when...
the Afghani-like plants. Since I will clip their tops once, at the fifth internode, the faster they get there, the

er, but the other 2 are very

18/6 straight to 12/12. They don't

All in all, it is an interesting crop to observe. I don't care about the variability much, I can simply choose the

Another thing is they are prone to going hermy when you switch from 24 or 18/6 straight to 12/12. They don't

do this outdoors with the gradual decline in daylength (so I hear). All 4 females did this to me. One was way

The mother plant was OK but not great. After a couple of clonings, however the bud size, resin output and

(47W/sf in a flood/drain table). I really like the Niagara buzz. It hasn't got the immediate high of resin, good branching, clones

definitely the 1st smoke of the day. It's a

I have a feeling they will do well outdoors. I've only grown them under lights (47W/sf in a flood/drain table).

The buds filled out pretty good for a sativa. Still a little bit loose and fluffy though. Of the 4 females I had only

one was worth keeping. The other 3 were very low yielding and poor in the THC department.” – Red Devil

from the Doc, but from Heaven’s Stairway. Six were male (one a slow-growing runt with very sparse flowers); two were female--one was robust

two were female--one was robust and fairly tight buds, good amount of trichomes, glossy leaves on buds. The other was a runt, with very few

(runs on my grow results), but the bud I'd never waste space on (the high--my current, ill state is from the cold)--my best female with the three more Niagara from seeds for more

any of the short, bushy ones are

I've been sick since my harvest so can't really judge the high--my current, ill state is

I crossed my best female with the three biggest males, who tested about the same in potency. I don't plan to grow more Niagara from seeds for more

wait until a few weeks into flowering (2-4) and you should be able to tell if any of the short, bushy ones are

my original plan of using Haze, Durban Poison, or one of Doc's Heritage varieties instead of Niagara. But hey, I think this my be the most

potent weed I've smoked in a long while--if it is, it definitely is a subtle, up kind of high. I have two clones of

two other strains--I bought three other strains for future use; and 2) cross with each

Wait until a few weeks into flowering (2-4) and you should be able to tell if any of the short, bushy ones are

Northern Lights (recent sample of green bud tells me I'm going to like this plant)…. Niagara is good,

Northern Lights (recent sample of green bud tells me I'm going to like this plant)…. Niagara is good,

Niagara is too subtle and
I've grown it from seeds and clones indoors. I only had 2 females out of 8 seedlings; both males and females were quite variable in stature and flower production. One female was a worthless runt with very little potency and production. The more potent female produced a subtle high (little body) that was not especially long-lasting. Personally, I don't like it as much as varieties with more "body" to their high (I'm not talking couch-lock high, but something with some "feel" to the high). It isn't a great producer–the buds are on the "airy" side, though they plump up some at about 8-9 weeks of 12/12. It clones easily (I've only cloned after 4 and 5 weeks of 12/12 and it took 2 & 3 weeks for the cuttings to root and start growing). It seems to be somewhat resistant to fungi (I had a fungus attack that wiped out my last grow, including the Niagara, but the California Orange seedlings and Northern Lights clones were wiped out first).

I'm glad I tried it, and I plan to grow some more to breed and blend (the bud) with indica-dominated strains, to produce more indoors. The only strain I don't want to tip off that I'm

I've had some trouble with Niagara in the early seedling stage…I believe it must have been the soil because I really found out what my problem was their harvest time and I wanted to ask for a question or two to help me determine the proper time to harvest your strain. Both were done outdoors and have a very high and then they are still developing pistils as large and thick colas. If you look amber color of the resin inside the resin colored resin than darker amber years ago. The temperature is very high and humidity here...sunrise is at about 7:30.

High...we sampled a bud last night that survived MY environment and it is worth every penny.” - Eric

...amber; and right up to and trichomes, and density in the given time; then allowing the further develop and pile on the

eage...it's a waste of time in my thumb

Breeder: Dr. Greenthumb

large yield. Recommended for Sweet
Frost Resistance - Spring Very Good, Fall Good. – Dr. Greenthumb seedbank catalog

...read to believe. I have grown out Greenthumbs Niagara and X Shiva. Not "da bomb" I was led to believe. I have grown out way better Dutch varieties. Please remember that this is strictly my opinion I have read that other people have...

- Indica Queen

...when they were 3 weeks old. Nuts ready to bust, I caught them to show sex for at least automatically at sixty days.” – Robin

...has a little (recessive) amount indoors in a small area, but if I...

r: Dr. Greenthumb

...potent. Large yield. Potency: 3*

Frost Resistance - Spring Excellent, Fall Good. – Dr. Greenthumb seedbank catalog
Individuals were selected to breed UNIQUE true-breeding version of the classic NL#5. The Brothers Grimm seed catalog.

This is my first crop with a 1K light. All 8 plants were grown in 2.5 gal containers, organic super soil. Seven Aurora B females from a ten seed pack. Vegged for 50 days and all finished flowering within 50 days. The Aurora B came on strong in the last two weeks. I didn't really expect what I ended up with, but they really bulked up well during the last two weeks of flowering. I topped the three tallest ones and they produced slightly more than the untopped, but the ones that I didn't top turned out to have some really nice colas. One ended up being around 18 inches long and 3 inches in diameter, plus a cluster of smaller flowers around the base of the main shoot. Their scents ranged from pungent, (the big cola) to the lemon scent that I've heard some of these plants produced, and all of them were very frosty. The smaller plants were the ones that tended to smell like lemons. Overall, I ended up with just over 13.5 oz's, including 11 oz's of Aurora B, from 8 plants. A happy camper. The AB kind of creeps on ya. It starts out as a light feeling in your forehead right after lighting up, and a couple minutes later you're feeling pretty damn good. After about an hour or so, my ass had grown roots to the couch and I found myself in a daze, trying to watch Rocketman on the Disney channel. heh heh. I'm no big time grower, and this is the first time I've grown a strain of NL, but I'd rate the AB an 8 out of 10. It's a more AB potency doesn't get much better, if you're looking for an indica that is. It's a severe stone, makes me eat

Club (SSSC)
absolutely the most powerful strain I have ever come across. I have purchased & grown many of the newer bragged on strains and still am looking for something that will even come close to this strain. I'm not saying that this variety is the most potent, just that in my over 15 yr. search this is what I've found to be the strongest so far.“-Clone

M39 by SSSC was "Basic#5"/Sk#1, but I BELIEVE "Basic#5" was actually NL#5, but SSSC weren't allowed to say so. You're actually looking for NL#5/Sk#1 which is available from Sensi Seed Bank, they call it "ShivaSkunk".

"90. Much used for cross breeding and of N.L. Sweet taste and very

Northern Lights® has dominated the Cannabis Cup in ‘88, ‘89, ‘90. Much used for cross breeding for indoor growing: compact, productive plant for the indoor grower.

This variety has been around for years; it has great name recognition. It is disease free, and easy to grow. The yield is above average though not perhaps quite as great as some of the Big Bud hybrids. It can be grown using any method including SOG, others and it was put out of its
Again, like the rest of the Positronic stock grown out so far, these plants were close to identical in appearance. It didn't take after the NL x Shiva.

The buzz was acceptable but it didn't take after the NL x Shiva to be fair, and even though it was worth keeping for a harvest from the one female was not very impressive grown from seed and turned herm. The buzz was acceptable but it grew like chit. Very airy bud with little resin and a lot of leaf. The buzz made it worth keeping for a harvest from clone one time to see if it could redeem itself. Because the buzz got better it was given one more chance even though it still showed male flowers. Clearly and freaked, doubtful but

Dutch Passion seedbank

"Flower: 45-50 days ~ Height: 100-125 cm ~ Yield: 300-325 gr/sqM" – Dutch Passion seedbank catalog

"Northern Lights #1 = Described as a true breeding strain (Stable) of Afghani origins. Northern Lights #135A = Available commercially for just a short while (87-88) from the original Seed Bank. Described as "a fast finishing hybrid of Northern Lights and an Afghani". This sounds a lot like the forerunner of the Oasis is our Northern Lights #2 selection. A very strong plant, almost spider

~ Flower: 8-9 weeks ~ Harvest: 1st week of Nov." – Dutch Passion Seeds catalog
Northern lights #2 = originally a Hindu Kush X Thai cross. It was selectively inbred and developed into a stable strain. Strains have little or no taste or smell and taste. The buzz was it. I think you can go wrong with a strain.

0 years of select inbreeding. Bred for vigorous growth, high yield, and superb high. A must for growers who prefer short bushy plants. The buds at outdoors, flowers quickly and has a "Christmas tree" bud, the plant looks like one.

NL#5 is NL with another plant crossbred. Part indica, part sativa. Grows great outdoors, flowers quickly and has a pretty good yield. I know a few that have grown it. Call it the "Christmas tree" bud, the plant looks like one.

I got NL#5 never had any problems with cloning, also if its real NL#5 (which is Pure NL) it has almost no smell at the end of the flowering cycle, it is Pure NL) it has almost no smell. 8 weeks--bam! I have found this flowering. NL is a great indoor plant. I grew Sensi Seeds NL#5 and it was one of the best plants I had ever seen. VERY distinctive aroma and taste, ooong. Plus its one of the best and fast (8 weeks), wont grow much more, which I consider nice. Only problem I have ever had is I heard that too much colas tend to catch bud rot, and the colas are down to max. 50% rh. you and I heard that too much air humidity would show up some indica aspects and hit and had a very dull buzz.”

"(For multiple sclerosis) my friend is currently using a pure indica (NL#5) with good results..." - pot newz
After years of heartfelt requests for a Northern Lights strain, Sagarmatha has engineered a superior version of the NL legend. NL#9 delivers the finest qualities expected from that variety: a short plant with a voracious stone and minimal smell. The flowering time is acceptable and fat chunky nugs can be expected. Fantastic for gardens where smell is an unfavorable factor. Also fine for persons who desire a heavy, lethargic stone.

#1 flowered for 52 days, 2 and 3, 56 days. Yield: 300 - 325 g/m² (dried, indoor). – Sagarmatha seedbank catalog

My 3 NL#9 girls were harvested last week, dried and are curing now. Plant #1 flowered for 52 days, 2 and 3, 56 days. I have to say that this is some of the best smoke of all time for me! Looks white in the bag slow clean burn, great taste, kick-ass high. I yielded about 5oz. off 3 plants. NL#9 is a Sag product. Info I've gotten says I chatted with Rosa from Sag some months ago, she said it was WW, NL#5 and Durban.... I've grown it too and Durban.... I've grown it too for sure and lasts a solid 2 hours won't contain its hashy smell...I saw and j and he is a REAL hardcore.... fass in 18 years...this is some good

I've heard great reports about this

smiths and the yield is pretty good. My... very fluffy, and very visible for harvest the smell is so strong that one thing is that if you are using CO2 gams with my nutrient mixture and

One of buddy's growing the
Strong sweet weed, much THC, with big buds and few leaves. Improvement on, and has a stronger taste than

The one I know is the NL X Shiva cross from Aloha which I like and have grown continuously for years. It is

very potent, wonderfully aromatic and complex. It is also pretty easy to grow and finishes fast despite the fact

A fine blend of sweet orange flavoured Californian strains, combined with a skunky hash flavoured Indica. A

versatile plant which performs well under all conditions. The more heavily branched specimens tend to be the

Flowering: 45-50 days. Height: 100-130 cm. Yield: up to 125 gr. Flowering in greenhouse: mid-October. Yield in

Lighting was a 50/50 mix of 1000w MH and HPS. The plants were grown in soil with organic ferts mixed into

the 16 oz. cups for approximately 4 weeks, then vegged for another 4 weeks, after which most were transplanted into 5 gallon pots. Plants were grown through Ubino.

Two packs, 32 seeds, were germed in paper towels. These seeds were a bit problematic. Some didn't

eroot, others showed a root, but failed to develop any further. Others broke the surface of the soil, but

stopped with just the 2 seed leaves. I ended up with 16 seedlings, 13 "normal" looking seedlings, with 3 "runts.

The runts were discarded. Of the remaining 13, 7 turned out to be female. The plants physical appearance was very similar, with good branching. Finished heights were between 42 and 52 inches with the average at 48.3. Dry, manicured weights are as follows: min. 44g, max. 83g, average 56.7g. 

Breeder: Sensi Seed Bank
The smell and flavor was a little different for each plant, with the largest one being a bit fruity. The others had a better stone and resin, however. The high is quite "stony," not couch lock, but very nice. There were absolutely no hermies with this strain, but 2 were subject to mold, and the grow was kept a bit dry, so if any of you grow this, keep an eye out for the tell tale signs of "bud rot." If you can tolerate the low seedling to seedling.

A stabilized hybrid, inbred since 1980. Can be extremely resinous, including the leaves. 50% Sativa, 50% Indica. Some plants have a pronounced citrus aroma and flavor. Very strong, fairly clear high. Yields are

roughly 1.0-1.5 pounds per 1K of light, a bit different for each plant, and also depends on the conditions. The grow was kept a bit dry, so if any of you grow this, keep an eye out for the tell tale signs of "bud rot." If you can tolerate the low seedling to seedling.
of trimming buds. It was too nice of a smell to wash off so now everything around is sticky too.

This cutting has been around for 20 years, originally from California. Cross-out tests have shown it is *not* a stabilized hybrid, looks more like the offspring of two unrelateds. Whether the parents were stable is anyone's guess, but this cut is certainly what "Cali-Orange" is supposed to be. I consider the C/O to be connoisseur-quality. The orange smell is unmistakable, high is first rate, and potency is good.

Potency is good, but not great. It's really good smoke and you wouldn't think twice about the strength until you live with her a while. I wouldn't be surprised to see a more potent line made with this cutting going around.

泄-- looks good, smells good, gets

make her stand out among the
smoke qualities-- the complex
The quality of the high is just
AB is more likely to impress the
look like the better weed. But the

Passion Seedbank

very appreciated variety.

right orange hairs. There are also
pered by the more green smell
fingers a little tacky. The
taste has been eliminated with

first harvest, soil/chemical, it had a
taste is there, but the is a citrus
skunk #1. I prefer skunk #1 to it,

er culture with GH nutes, in a
The Orange Bud is from Positronics
A strain that is about 6 months old and in its 2nd flowering cycle. The taste is more citrusy than brown but the brown you speak of is noticeable. The strain just isn't as sweet as an NL.

"...I've puffed orange bud all over the world from Amsterdam to London to LA and it is consistently one of my favorite strains. At best, orange bud is hispid with very long bright orange pistils, very dense "nugglet" buds, and very tasty. Sunsets are great on the yields but still acceptable. Of the 10 or so strains I've messed with it still rates towards the top. Wish mine was still around. enjoy the..."

Oh, yes it sure will stretch during the first few weeks of flowering. I found that by keep my MH 400W about 2 inches from the top of the plant and placing a fan to gently blow the tops, the stretching will be reduced. Also flush it out with plain water before switching it to 12/12 and adding bloom nutrient. It is also one of mine:
About the Sage--1 of the 2 was Female. She looked sickly all grow, but snapped out of it just before flowering. The pistils are so fat they're like needles of flowers and a longer flowering period means fluffier masses of flowers and a longer flowering period. I finally stopped mine at 11 1/2 weeks. I'm sure it could have done better if given another 2 weeks or so. My real hope are my Cinderella88/sage seeds. Hopefully it will solidify the nugs while shortening the flowering period. Who knows? And the high? Well, let me just say that whatever it was that I smoked in A'dam was the most devastating stuff I've ever touched. My sage has never quite done the same, but last batch had a nice energetic up buzz. We'll see how this goes after a nice long cure. All in all, Cindy is better, but this is a

Sounds very similar to the Sage x Big Sur Holy I tried in Amsterdam. Absolutely best stuff I've ever had. One small b-hit was all we needed for a good six hours. Seeing how it's a cross, the next generation should be more stable. Also way too pricey from him ($200 for 10 seeds!) Buds aren't too big, but at 47 days they're just COVERED in crystals. The harvest window is supposedly 60-75 days indicating sativa. Taste is spicy, sandlewoody. Lots of capillate-stalked trichromes as opposed to the others like WW. It's hard for me to compare this to any other as it's my first time, but I've also got one NL x Skunk x NL. Much larger buds, but they just don't have the crystal development or smell. Also, my closet temps are extreme--often 110F or more. I'm hoping to reveg & clone. Can't say anything about yield in terms of weight. I've only got 3 plants and they're for personal consumption only. I don't want to get into this, but there's been a lot of talk on other boards about "real" American genetics. Unless I was lied to, these are real American genetics and not "merely" a refinement of strains from Holland.
This indoor hybrid has a high calyx/leaf ratio & finishes flowering in 7 weeks or less. Our big-yielding, lemon-scented female clone named "Genius" because of her CLEAR, energetic, thought-provoking high was crossed with a robust Cinderella 99 male to create Apollo Eleven. Expect some variation among individuals. The best females are short, heavily branched plants with multitudes of dense, resinous bud sites - perfect for SCROG. The smoke has a sweet citrus flavour. The high is UP & HAPPY. - Bros. Grimm catalog

This Indica dominant strain was created by backcrossing a male cross of ShivaSkunk from Sensi and Princess' brother (a JH f2) back to the ShivaSkunk mother. In "cubing" terms that would mean that your plants are ShivaSkunk.75. Another grower I sent them to liked them a lot too. I'm glad you're having such excellent results.

I believe Apollo 13 is P88 male X Genius (Princess' more indica type sister) but still a JH F2 from the same set of seeds found at the 'Cafe in Adam. The new A11 is P94 or (C99 the more popular name) X Genius." -Webfish

A truly superior skunk selection. Grows with heavy buds. Top variety for commercial skunk grower. As with other Skunks, superior sweet taste and aroma, the well known Sativa influence is detected in its high. Super

Seeds catalog

Indetermined
Breeder Steve of Spice of Life uses a stretchy plant (that's the Big Skunk influence) on a 1992 edition of Sensi's Big Skunk#1, then stabilized. A strong trippy high, still allowing mental alertness, good big buds, sometimes a stretchy plant (that's the Big Skunk influence), very sweet lemony citrus smell and taste. Dana Larsen, the editor of Cannabis Culture, chose Island Sweet Skunk as his favorite Federation strain when I asked him moments ago, with the Hawaiian Sativa his second choice. You can work especially well on the Hawaiian Sativa, the ISS is more trippy, but no

Dutch Passion uses a Hawaiian indica in their HAW/Skunk, which is a very big yielder and a lovely stone, its potential in that cross) would be 85% sativa are substantial, though it

I met Ed Rosenthal in Zurich at the vast greenhouse, and I have samples of over 20 of their work and their strains would be 5 out of 10 of my top 10. (Mikado, Romulan, Hawaiian Sativa, Island Sweet Skunk, and their Golden

To that I would add at least one Greenhouse strain by Arjan (White Widow), one strain by Joker (Snow Spice for now), who is from BC, Flo (D.J. Short, who is from western USA), when it's from the Sensi Cannabis Castle, nothing seems more affecting than the Northern Lights x Haze, but it's hard to find the quality NL/Haze outside the Netherlands. Decent bud, above average...
Developed by our breeders in 1996. A very fine Skunk selection, very commercial, very heavy bloom, bumper harvest, the famous Skunk high. Taste is not as sweet as our other Skunk selections but it is one of our “The famous Jamaican “Lambsbread” crossed with Skunk #1 (F1 hybrid). A very special taste and high. Grows to super skunk. The buds are very large with lime-green hues and orange pistils. Very nice for persons who enjoy a bountiful harvest, fragrant tops and a strong stone. She is a fast finishing plant that gets you in and out of the garden quickly. Fantastic – Type: Indica-sativa, indoor and outdoor. Start vegetate: 1-2 weeks after roots show. Flowering time: 50 - 55 days. Average height: 0.75 - 1 m. Yield: 300-350 grams / m² (dried)” – Sagarmatha seedbank
A strong plant with that typical Skunky taste and high. It has a high calyx-to-leaf ratio with large, full buds. Its

"At first look, these buds seem to be red with light green leaves interspersed (of course we know that's not
really possible, but honestly it does look that way). These compact, spongy buds are mildly scented with fresh
skunky undertones. Broken up, the buds take on a green, fertilized scent. When smoked, the Sensi Skunk
tastes a bit spicy, like a smoky-curry flavor and is smooth and mildly expansive in the lungs. This is a good
example of "creeper" bud in that it comes on slowly but expands over a period of 10-15 minutes. **3/4” –

The 8th node, dark leaves, deeply

stink* up a large house.

yield. Pollinated by a male haze

buds. Good resin production.

om a J is plenty in that the high

y stone, trippy. Not an unnerving

ower parts started showing just

sting hydro your stink factor will

oil for 2 years). I also found these

ng 12/12 when doing Sensi Skunk

above to be the remedy. Also,

crossed to an Afghani, the mothers I

this variety forever. It is entered

ould have won years ago. I believe

ems so well: it is free of the genetic
This cross between Skunk #1 and Northern Lights #5 is a very reliable variety. Excellent hybrid vigour and yield. High calyx-to-leaf ratio, you can almost throw those scissors away as very little manicuring is required. An absolute must for beginners or I know that Nevil's NL#5 was the seed mother for the "Shiva Skunk cross. He never offered NL#5 as a pure strain etc. As for Basic 5 being the same as NL #5, well, I'm taking Mr. Soul's word for it. (Due to previous work experience etc.) One thing I can add is that I remember the original Skunks having a much more powerful high having an underlying buzz or perhaps this is why it is such an old strain as 10 years ago. I don't remember the original Basic 5, this would be a treat.

I would suggest Sensi Seed's "Shiva Skunk" (NL#5 X SK#1). Very close nodes, sweet, fragrant smoke. Great resin production. I grew this strain for 4 years in a SOG format and I was very, very impressed. Very easy to grow, cloning is a breeze. Only problem I had is that after about 3 years the high started to get a little weaker and the yields did go down slightly. It just seemed to lose some of its vigor. So if you used it for 2 years or so, it could very well be what I'm not saying that today's Shiva Skunk is not as good as 10 years ago. I don't know this for a fact. I've only grown Nevil's, not Sensi's. If Dr. T's friend has an original Basic 5, this would be a real treat. "The resin Mother that started it all" so to speak. – Prince Caspian

The most potent I have had to date is probably Shiva Skunk, a close relative of Silver Pearl. This variety is hallucinogenic. Not to be smoked if you have to operate any machinery within the next several hours.” – Hyde

Skunk #1 (75% Sativa, 25% Indica) was a cross between 25% Afghani, 25% Mexican Acapulco Gold and 50% Colombian Gold. Inbred since 1978, now a stabilized homogeneous strain. Blooms with long, thick buds, varying in color from light green to golden. Very high flower to leaf ratio. Soft and sweet aroma and a very strong "up" high. Excellent variety for indoor growing or greenhouse with darkening system. Very high yields. Easy to manicure. This variety serves as...
Flower: 7-11 weeks. Harvest: 1st half of Nov. in a greenhouse. – Dutch Passion seedbank catalog

"M9 originally developed by the Sacred Seeds Co. A winner of a number of harvest festivals. One of the most sought after strains in the world. Ten years ago the sweet Skunk #1 arose from an Afghani, a Colombian and a Thai. It is now a stabilized homogeneous hybrid with less than 5% deviations. The breeding plants were selected scientifically. The high is very strong and up. Examination tests selected the plants with the highest percentage of THC. A THC percentage of 15% was indicated by gas chromatography. The Skunk#1 has a high calyx to leaf ratio. Large long buds. It finishes the first week of Oct. Growing tips often lime green, mature plant often has yellow shade leaves. Neither is deficiency. The yield varies from 400-1000 grams, with an average of 500 grams. Yields of up to 2000 grams (5 pounds!) have been recorded. Indoors-experienced growers can, by using the plantlet method, harvest 400-500 grams per square meter. (11 sq. ft.)" - SSSC

Cultivators' Choice in California in

Skunk #1 arose from an Afghani X a less than 5% deviation. Now 11 years later an

Original Skunk#1 is a relatively true-breeding cannabis sativa crossed cannabis Afghani inbred-line polyhybrid with a heavy tendency to its cannabis sativa parentage. Original Skunk#1 was developed by Cultivator’s Choice in the late 1970’s for outdoor and glass house cultivation. It has also proved to produce excellent sensimilla buds. The flowers have a strong powerfull and highly stimulating. The flowers have a strong powerfull and highly stimulating. The flowers have a strong powerfull and highly stimulating. The flowers have a strong powerfull and highly stimulating. The flowers have a strong powerfull and highly stimulating.

Original Skunk #1 is a medium green and medium broadleaf variety of medium height that produces large, long floral clusters with very few leaves. The yield per square foot of Original Skunk #1 grown densely packed and strongly lighted can approach 40 grams of dry flowers. The flowers have a strong sweet & sour aroma and the taste is full-bodied and satisfying. The high is powerful and highly stimulating.

Original Skunk #1 requires 8 - 11 weeks of a 12 hour photoperiod to mature completely. Skunk #1 makes an excellent choice for male breeding material. It was selected from 50 different cannabis sativa cross c. afghanica F1 hybrid crosses for its consistent true-breeding qualities in a broad range of crosses. Skunk #1 is an inbred-line that came from a naturally forming hybrid selected for its crossability and true breeding qualities, rather than a forced hybrid made in an attempt to blend two previously selected individual varieties with specific desirable characteristics. In other words, Skunk#1 has been selected for its naturally high General Combining Ability (CGA). Simply crossing a select Skunk #1 with almost any other potent variety will produce a fine flower.

Well, that explains its massive popularity from 1980 - 1992, afterwards a decline in preference for Skunk began. Skunk #1 and Big Bud, both powerful and good yielding when they came upon the scene in 1980, simply had been outpaced by the developments in the field of commercial & recreational cannabis cultivation. My favorite Skunk experiences include these strains: Island Sweet Skunk (Federation), originally a hybrid by Spice of Life, which is Sweet Pink Grapefruit indica crossed Big Skunk#1 (Sensi Seed issue 1990), is a sweet citrus Skunk with a compelling high, and matches the description of the Skunk best. 60 days flowering. Jack Herer, here, the Skunk makes the Haze work without paranoia, but its finicky and difficult to get satisfying.
me, reporter Larry Lamott was standing in a room of identical Skunk #1 single cola plants (154 in the room) at 27 days into flowering. Has anyone noticed that really reeking, road kill skunk smell that used to be distinct has given way to other pungent but less cutting smells. I think Northern Lights with its low odor genetics and indica dominance in the market has in time reduced the skunky smell of pot, and NL and SK#1 are so often crossed these days.

The Sweet Skunk by Brothers Grimm may well be a further development of the Spice of Life Sweet Skunk, as is "I've grown skunk 1 and hybrids made from it for nearly 20 years. To get a really a good quality crop outdoors you need to be less than 40 deg from the equator it will need at least 10 weeks from the equinox to finish. With good cultivation will make 3 to 4 meters high and yield a pound or so of good bud per plant. Indoors it needs a minimum of 50 w per sq. ft and preferably double and takes 9 to 12 weeks to finish on 12 hrs. Its 75% sat and cant be grown like a modern indica hybrid but when grown properly gives all the modern var.'s a "Skunk #1: This plant is super resinous, has a marvelous sweet smell (does not smell skunky at all). Harvested at day 57, it could have gone another 10 days. All pistils were brown except some at the very tips. The smoke is about 40% body, 60% head. I like it for relaxing. Can maintain in public. Wonderful aroma before lighting and during smoking. Buds are very dense. This one is a keeper." - Splif Lipsit

"I hate the taste. That's just me, most people just think "oh that tastes like good pot" but I think it is pretty bad. It has a sort of sour-milk taste, kind of bitter. Hard to describe, its really not disgusting or anything, it's just the way the Dutch Skunk #1 tastes. When I first tried it I told him not to be offended but I don't like the taste."

I have been growing sk #1 for years...my seed stock was bought back in the late 80's--don't even remember the seedbank. I think that sk 1 is a classic...very easy to grow, potent, good yield. It is very forgiving and grows well under many different growing situations, indoors or out. The plants are similar in size, with little variation. It also takes topping well, with little shock, and you can grow beautiful short, bushy plants indoors topping them. The taste is nothing extraordinary, and it takes a little longer to finish than some other hybrids...

Club (SSSC)
M39 Skunk #1 crossed with the Basic 5. This hybrid was a harvest festival winner in its first year! The Basic 5 is a female clone which has been cultivated successfully in Holland for quite some years and which has demonstrated its value very well in indoor growing as well as in outdoor growing. The female Basic 5, which proved to be the best during commercial cultivating, has been chosen by us to be the seed mother for this hybrid. The Basic 5 is a small, solid and thickset indica plant with heavy buds, covered plentifully with resin. So, suited very well for indoor growing, the high is extremely heavy. This hybrid assures excellent results for both indoor and outdoor growing. Using the plantlet method, an indoor yield of 2000 grams (more than 4 lbs.) per square meter per year is possible. These yields can be increased still further (up to 1/3) by flowering cuttings. – SSSC, 1987 catalog

I believe Basic 5 was simply a name SSSC used in the place of NL#5 because, at that time, Northern Lights was known to most people. I grew M39 back in the late 80’s and I have been growing ShivaSkunk during the past couple of years. Taking genetic variation into consideration, they seem to be the same plant...although my memories of M39 are of a Sad story: When my ex-wife and I moved into our ex-house, I had a vial with a dozen M39 seeds stashed in a box of old books. She was cleaning the basement one day and found the seeds. She showed them to me and I acted like I didn’t remember putting them there. She turned around and threw them in a pan of bacon frying on the stove. I don’t miss HER at all - but I SURE wish I still had those SEEDS.

I worked for SSSC for two years in the mid 80’s. I never asked “Kees” exactly what Basic 5 was...though now I wish I did because I’ve lost touch with him over the years. I can’t say for sure if it’s NL#5, but I had that Outdoor / Greenhouse With 100% Skunk seeds, it’s not possible to grow fully mature outdoor plants, because the seeds were selected for growing under artificial lights. Skunk was crossed with an early Indica, to let it mature sooner and to make the plant stronger for outdoor conditions. This is the F2 generation. It has come out as a very nice outdoor strain. Flowering period: 7 weeks · Harvest time under natural light: end of...
Skunk is the best known variety to the indoor grower. Skunk Passion is a selection of these seeds. Selection was based on early flowering. It’s no use growing these seeds outdoors in Northern climates (see Skunk/Indica). The strong pungent smell is characteristic of this variety. Mean THC levels are high. Sensitive to...
Skunk aroma. Despite the smell a very pleasant high with a little more body to it than the Skunk #1. One of the winners of the 1990 High Times "Super Skunk = Sk#1 X Afghani (a skunk #1 backcrossed to an Afghani indica)"

"I've grown Super Skunk (sensi'95) and it performed very well (especially since the price was like 60 guilders or though not the densest. Good both sides... it will put you to

Seedbank

An upgrade of the former variety Skunk/Indica. With 100% Skunk seeds, it's not possible to grow fully mature outdoor plants because the seeds were selected for growing under artificial lights and greenhouse. Skunk was crossed with an early Indica, to let it mature sooner and to make the plant stronger for outdoor conditions.

Seedbank catalog
Amstel Gold is an Indica variety developed in California in the seventies and has been grown outdoors in Holland since 1980. Smokes soft with a citrus like aroma and has a good high. Easy to grow, grows with long main branches.

Dutch Passion was asked by AMSTEL BREWERIES to stop using the name for AMSTEL GOLD seeds. Now those seeds are to be called Passion #1, but I’m not using the switch name yet, it’s too confusing to explain name.

An excellent green variety. Not much known about this strain but the breeder did mention Bubblegum. Good for indoor and outdoor, flower: 55-60 days, height: 5-6', yield: above average, plant: June 1st, finish: September 15th, height: 6', yield: above average.

This strain is the BC Hash Plant. The origin is back in the pre Russia invasion of Afghanistan and the Indo Asian type weed strains smuggled back to the islands 25 years ago. The basics were developed outdoors. Today this strain is reputed to be grown as large as 4 lbs. a plant in hydro systems over 120 days. Actually my friend Norm of Arthrology had a picture of himself in such a room brought into evidence in his trial. The strain Breeder: Undetermined.
green. In larger quantities it has a sweet pungent smell that loses its strength as the bag size increases. You can pack it in your pocket in ounce quantities without everyone in your immediate area knowing someone has a bag on them. Good strong smoke as long as it's fully matured and cured with a bit of time. Just one slight warning. This will be resolved in time. So in these seeds you will find plants with the back genetics of 100 generations behind. To the inexperienced grower, what does this mean? You will find a higher than liked relationship of male to female for one. Secondly, you will find a variety of height and strength within each plant. It's not too likely with only ten seeds that you will get any two to look the same. For the personal smoke grower, this is great because each plant will give a different buzz. No tolerance builds up. For the professional grower, it means germinating 75 to 100 plants to find two or three mothers that you like. Needless to say, the worst sign you want to hear is there too. Hermies. You can expect that under any real heavy stress situations, like dry-out, overfeeding, and problems in flowering, a large hermy break out. In good conditions there may still be a few stamens appearing. This is because the back breeding has not been as long as it would be.

**Breeder:** Super Sativa Seed Club (SSSC)

Super Sativa Seed Club, listed as M27 in their catalog: "M27 A U.S. hybrid top strain. The father was of an inbred Acapulco Gold strain and the mother was a very potent Indica/Sativa strain (Afghani-south African). A great hybrid. One of our own favorites. Very suitable for outdoor and indoor growing. You can harvest an enormous amount of overpowering, trippy buds. Harvest in Holland: middle of September." - Super Sativa Seed Club catalog

**Seedbank:** Federation

A very nice short bush that yields well, and the taste is almost a sweet hash-like high. Great unless you don't like the munchies, also helps with pain. Only drawback for me was I could not sleep for hours after I tried it one night (save for early evenings) kept my mind very active but body was not going anywhere. - mota20
When I went to A-dam in November, they had the SAGE bud offered by THSeeds at the Hempworks. I was told by the breeder in A-dam that Sage was Big Sur Holy Weed x Haze. I was also told that the Big Sur Holy Weed was his nicest yielding/tasting Afghan. Bud was top notch, hope this helps. – Damion

Sweet, earthy taste, rare to find. Resinous large buds with few sucker leaves to cull. – Wild Rose Seeds

Appearance: looks like Mexican, slim buds
Smell/taste: not especially great
Type high/strength: medium
Height: 2m
Yield: med
Harvest date (Netherlands natural photoperiod): end Sept 12hr day exposure harvest
(\# of weeks): 7-9

Indoor / greenhouse / outdoor
Typical Bolivian, matures early.” – Positronics seedbank

Cuttings of this strain can be brought to maturity in 65-75 days of flowering immediately after
Champagne is a Kush indica from Vancouver, BC. I have the clone and as far as I know any seeds are hybrid only. Unfortunately, not good enough to make the grade compared to my 9+ plants, but a good indoor plant anyway." -Lady J

A legendary potent British Columbian indica strain rumored to have been developed by the Canadian government as a medicinal strain for cancer patients. Now apparently found only in cuttings or crosses such as "Named for its live scent and colour. The finished product has a dry aroma of orange Pekoe Tea with overtones of black currants. The heritage of this strain is the result of a cross between 2 extremely successful Gulf Island strains from neighbouring islands. The result of this cross has been grown out for 7 years and is an..."
"Easy to manage and a distinctive strain in itself. It is intended for a hardy outdoor yielder, with excellent mold-resistant, cosmetically saleable buds. It works; the boys are getting rich." - Spice of Life catalog

"Fast flowering, big buds. Fresh citrus like taste, nice high. Very similar to Early Girl. This is a mostly Indica variety, one of the earliest in our outdoor collection. Very potent, medium yield, with a hashy taste and aroma. These compact plants will tend to grow to one main stem. An ideal choice for your outdoor garden. Developed: inbred 10+ years. Stabilised hybrid: not consistent. Sativa/Indica: 10% / 90%. Appearance: many with columnar shape, tends towards Indica habit; some turn purple with cold at harvest. Smell/taste: coarse hash taste, not sophisticated. Type High/Strength: medium plus, physical. Height: 2m. Yield: med plus. Harvest date (Netherlands natural photoperiod): end Sept / begin Oct. 12hr day exposure harvest (# of weeks): 7-9. Indoor / greenhouse / outdoor. Selected for earliness." – Positronics seedbank catalog

Very potent, medium yield, with a columnar shape. An ideal choice for your outdoor garden.

Regarding Early Girl, Ed Rosenthal says he knows (it was) developed by Cultivators' Choice in California in the

1980s. It was pretty average all the way around in my opinion. About average yield, high, and everything else. I got some California Orange at the same time and liked it a little better. That was a while back, though. They might have improved it in

Early Girl and Polly, an early

I grew this last year outdoors. About 5' tall at harvest, lots of short side branches with plenty of buds. Yield was about 4 oz. of average quality weed. Excellent hashy taste which peaked at about 1 month of curing and then started to decline. High was average and didn’t last very long. Maybe due to accidental pollination.

I grew it, or at least something called Early Girl, that I got from Holland in the late ‘80s. It was pretty average all the way around in my opinion. About average yield, high, and everything else. I got some California Orange at the same time and liked it a little better. That was a while back, though. They might have improved it in

4 something degrees north, and there was a lot of variation between seeds, maybe I just got some slow ones. Or maybe they were just lying too.
I grew EP last year for the first time. I didn't get them to maturity, because of three or four major fukups by me, along with a VERY wet autumn, so my yield was almost nil. I planted out on June-1, they suffered a couple of frosts during which some purple showed. I planted them out after sexing on 12/12, which I wouldn't do now, because once these plants start to flower, they don't like re-vegging, so a confused bunch of semi-flowering plants was the result. Water soluble slug pellets resulted in the plants being eaten to one foot tall bare stems soon after. I reverted to my other type of (non-soluble) slug-pellet and the damage stopped. One plant re-grew in veg form, the others continued in semi-flower. Something odd happened then- which you should take note of- I had 18'' to 2' chicken wire fences around each plant, but somehow some bastard rabbits ate the newly growing plants (this was early July)- rabbits that could CLIMB FENCES!. I created a 'goblet' effect outwards around the top of the wire-tube, and this stopped the damage. Having been eaten back to about 18'' in early July, the plants reached about 6' by week-1 Oct. During the whole summer, there was no single week that they were in perpetual cloud/100% moisture. Only one plant showed any signs of mold (and this one showed only small patches)- which I was surprised to take than most, but the huge amount of vigor that is inherent in the breed means that the cuts don't die- they just hang around and don't do much. I took cuttings of my over-wintering mother which took about 3 weeks to take- during this time, the cuts didn't look ill, and didn't grow, they just 'existed'. The mother plant doesn't do well indoors- mine seemed to get freaked out and started to flower. It flowered though most of winter, then suddenly decided to revert, I think. The smoke is good- smooth, sweet, menthol/lemony. It has a lot of central and south American Sativa in its ancestry. The high is long lasting and 'happy'- a day-time smoke. The buds are long and thin. I noticed two phenotypes (ratio 14:2)- 14 plants had broad, long leaves, high vigor, high yield; 2 were much shorter (finishing at 4-5''), more compact, started flowering earlier, but didn't mature as well, more susceptible to mold, thinner leaves. Some of the large phenotype flowered with pistils the color of pink-grapefruit.

Its not the easiest plant I've grown, and this may account for why its not more common, but its well worth it. It definitely is mold resistant beyond any doubt. These plants get the yield from the size of the plant, not the density of the buds, so try to ensure a good size by July, and DONT pinch it out. I'm hoping for 3 or 4 ounces.

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A FOAF grew Early Pearl for a couple of years. It's nice and versatile. A foaf grew some in and out. indoors in rockwool under a 400w it yields just <1 oz. at 3 ft. by topping them. outdoors its close to 1 lb. at 6 ft. finish around the end of September out, 8 weeks in. A foaf think the plant is a mix of sativa/indica. It has longer node spacing than you may like indoors like a sativa, but it grows fat wide fans like an indica. The high is kind of mixed too, a little spacey, followed by complete body freeze. Its nice... — cuz

I have a strain grown here for at least 10 years. I believe its Early Pearl due to the description in the Sensi catalog. Inbreed for many generations, but no signs of wackyness!! Some variety in height, but for the most part short, very bushy and branchy. Thick medium length bus with many crystals. Has thin sativa type leaves however. High is excellent as well as flavor, sort of sweet but not fruity. Does very well outside and is the best strain I ever seen for indoor production. Very fast to bud, 6 weeks to 7+. The mother I picked finishes in less than seven weeks. A 12" plant put into 12/12 will only stretch to 20-22", but many side branches. I have White...
Widow which I like slightly better for taste and high (maybe from years of smoking the former) but the yield of the EP? is 3 times that of the WW and in 6-7 wks not 8 wks. I would like to get a backup of this strain if I knew it looks fantastic after all this time. If this is EP, many don’t know what they’re missing, cause this is THE strain for quick, crystally dense nugs. I don’t know why it doesn’t have a more known reputation!!”

“Green Horne

A cross between Skunk #1 and Early Pearl. Finishes two weeks earlier than Skunk #1 outdoors. Sweet smell, Skunk #1 outdoors. Sweet smell,

The Headquarters Seed Bank in Amsterdam, later known as the C.I.A. (Cannabis in Amsterdam), sold a strain

Yield: Indoor - 225 to 275 grams per square meter. Outdoor - 150 to 200 grams per plant. Also, The Seed Bank’s 1989 Catalog sold G-13 x Hash Plant and G-13 x Northern Lights #2. The catalog says: G-13 is an outstanding pure Indica cutting reputedly discovered by the government research program in Mississippi. Widely grown as a commercial indoor plant in the US, G-13 has proven to be one of the best.
The last pure G-13 seeds were offered in 1988 by Nevil's old bank. A description from an old catalog would be nice, but I don't have one, but someone out there will. Sensi's version is a female propagated by cuttings for the last 10 years, the sativa female was pollinated by the stout afghan HASH PLANT male, and that is the current Sensi offering. I sell g-13 x Skunk by THC seeds of Amsterdam, but candidly, it doesn't get great reviews. The interest in G-13 has become very strong since HIGH TIMES magazine featured a photo of G-13 with a claimed THC level of 28%, the highest they have ever seen. Sensi responded to this interest, and it will be hard to knock off, so some others strains that exist only in female cutting: William's Wonder, Garlic Bud. Anyone can think of any others?"-Marc Emery

"From an article about what Nevil Schoenmaker grew: G-13 is a very potent indica with a very strong stem and short internodes but a longer less webbed leaf. Although very strong, it seems to lack "personality" but is an

If you are in the Deep South like Mississippi or Alabama, there are lots of chunky skunky badboy local bud. Picture of G-13, it leafs look at lot

Pure G13 or its hybrids. That by far whose with a different type and if WW is G13xNL; it grows medium nodes with lime green hues so its when near mixed citrus like smell. I've been flavor. It produces small to medium high is very UNIQUE; it will take STONG: its the best cause it been lash, and none can even compare

A variety of the "pure" G13 I believe 5 fingers, but I've seen six and at least our tax money is going for

And the weed and it was done. I large a cola as an AK, but the is better and juicier in hydro is about 10 days to two weeks."

Who actually 'liberated' the clone. G T = M = Marijuana. G-13 =

Sold in the 80's and it is also 2/3 the seeds directly from Alan and he said that nobody has means (Mantanuska x Tony's best buddy and provider of great dense yields but not a 9 or 10 row" and that the "peak19 was a
Multiple Sclerosis is a serious condition, and is the personal stash for

Kali is a superb Sativa with a high calyx-to-leaf ratio, and long running tops that produce full, fluffy buds. Expect this goddess to produce a high resin content with spiral buds that carry an extremely spicy scent.

Kali Mist won the 1st Place Cannabis Cup in High Times 1995 hydro competition, and is the personal stash for

Yield: 275-425 grams/m2, Height:

I grew Kali Mist ancestral stock in the early 80's in Oakland and those plants matured in late November, and into December. The looser, somewhat feathery buds of Kali Mist would present a problem for indoor growers looking for weighty buds. Despite these shortcomings, I liked it very much - it was my favorite high- and if I were to grow for personal stash, I would grow Kali.

I got my seeds from Serious Seed Co., which is the bank reputed to sell the authentic article. I read Mel Frank’s review of Kali Mist in a sidebar article of High Time’s Cannabis Cup a couple of years ago. He gave the description (and provided a matching picture) of a VERY Sativa-dominant strain that sounded quite like Original Haze. However, when I grew the seeds out, I got a hybrid which looked like a NL#5 had been crossed with the plant Mel described. The leaves were wide and the colas long and dense... only the individual floral clusters growing off the sides of the colas looked “kind of” Sativa-influenced.

The flavour and scent are spicy and delicious - the high’s very pleasant, but not outrageous. The yield is GOOD, as the colas are rock-solid, but the flowering period is an awkward 9 1/2 weeks!” – MrSoul

MrSoul
the best example is Kali Mist, only
something similar happened to

Kong is the next step in plant genetics for yield. Easily capable of yielding 4 lbs per 1000 watts! This is not a
misprint! Kong is not Big Bud, or a Big Bud derivative. They're has never been anything like this in the world of
cannabis production. Kong will be the benchmark by which all other plants are judged. The mother plant was
purchased for $40,000. And now after a year of intense testing and experiments, is finally available. We have
crossed the Kong super plant mother with an early and potent White Russian x Bubble Gum male. Since both
of these plants are from diverse genetic gene pools you can expect very good hybrid vigor. Flowering is 63
days and potency is extremely high. It doesn't get any better. This plant will blow away the best Big Bud yield.

Colas for this plant will reach sizes equal to a 2 Litre Coke bottle! This plant really packs on the weight in the
finishing outdoors now. I've been

-Kong shows 2 different
Pheno-types from it's hybrid crossing. I call one tall and the other bush. The tall (9') leans towards it's White
Russian x Bubblegum side. Long slender buds up to 16”. The smell and taste are incomparable. It's the best
I've ever tasted. Ok what everyones wanted to know, the potency. One word, excellent. It rates right in there
at my estimation. The bush (10'),

They both are heavy with crystal
production. I just got a first class
digital camera and will show you through ~S~. Remember I didn't get or start
these seeds until June. If you're wondering should you try Kong? I give it my highest recommendation. Good

This is my first time growing. I used 2 1K lights, 6" pots, 8 X 4 flood table, GH nutes with Pureblend growth
formulas. About 6 hermaphrodites and

smelling pot pretty steady for a few
He said he grew them in 6" pots spread out on a 8'x4' flood table. He got SLIGHTLY more than an ounce per square foot. Which is pretty typical. So far NO ONE has come anywhere NEAR the 4lbs/lamp that's being "I averaged over a pound each on the Kong. As far as the best commercial weed to grow, Holyweed is my first choice. I've seen it go over 4 lbs. though it usually averages about 2 lbs. per plant." - Danbo

Still in veg. Put a few of them at 24 hrs light. (Scared a bit for hermies) They did stop their sleeping time hrs a day and they grow like mad my life. The branch system is like they can support half a pound r. Start flowering next week keep than the other does. For the price, I strains. Had 7 female out of 10 to, to get your mother. They all look / Afghani, did not look like the dividing into two main stems, one m having a lot's of fun with it too.

of an NL5 or Skunk1. It's not up to and abnormally branchy, they'll only grew one clone, never a all one that is really smelly. The ~shabang~

structure and smell there are a lot of genetic goings-on anna?) Bubblegum and White Kong is a laboratory-manipulated

very it is nice, but me I say bullshit. Here as big and smell better. THIS SO, I would of been better off with say that there is most of the time unstable that you end up with 3 were unusable, (genetic defect or fungus but the Kong is very it were it rain all the time. I would seed did produce a really good it was separated in two main to summarize, I look like a stupid about the space and time and is not very happy....

resin and look more promising,
but then the mother did look promising at first then she did stop after 1 pound. So I feel that I was taken for a ride and contribute to pay for their 40,000 mother that they did not take the time to breed as it should be, now they start to sell those seed saying that it is a cross of 3 strain, it is going to be a mess again or what, I won't be the one who will try it for sure. For 250$ I was expecting more stability. ET VOILA FOR THE KONG>>>>>

Keep you posted about the clones, it might be another story...they look good but who knows....” – reposter

“Kong update, for those who would like to try the Kong, don’t waste your time and money on it, it is way too unstable and almost no resin glands. The yield is not so great and you would have to be very lucky to find the right mother in this mess of strains. My old strain, (northern light derivative) went faster and give very near the same yield. There is absolutely nothing special about the Kong, I am very mad to have wasted my time and effort to this unstable strain. It was grown under 1000w hps and 4000w MH, salt fert, 1 plant = 380 gr. It was supposed to be at least 2 pounds. For the same space and light, I would of have the same yield with my old

They are big plants, even if you give them only one month veg. from seeds they end up being 4 feet high. @ month veg and they finish at 7 feet. They become rootbound very fast. They drink more than other strain: the main mother plant was drinking 4-6 liters a day. They have a very extensive branching and root system. They won’t give many visible resin glands under HPS but will still be decent smoke. More resin glands under

Unfortunately, they are not the best producers that I have seen but only one of the best, which is deceiving if we think at all the time needed to finish the crop. I have had some of the earlier seeds so; things might have

The most potent ones were under this super cool white MH. I took the HPS’s out of there completely when I have seen this. If you live in a place on heart where it is very humid, be aware that this Kong is very susceptible to fungus attack. If we think about the Time factor: I could of get the same yield with in (with clones) during the time the Kong is not really for you. For a buyers will search for the resin gland of the Kong to the numerous Big Bud it is just a very good yielder but the final thoughts are: No, I would (taste) and No neither I won't use Time/yield factor. But yes, a

newbie would find this strain very interesting and he would be happy to tell his friends that he have had a hell of a good yield. I can't give the Weight details on the board, but I can say that 4 clones = 1 pound. (Almost the less exotic for the mother, the exotic looking ones (largest leaves) won’t give the best yield. The best MOM looks like somewhat paler green with elongated leaves and a very extensive branching system. Use large
This variety brings back that majestic legendary marijuana from the great Alaskan Northland. Highly recommended by the best fishing and hiking guides in the Matanuska Valley. The buds are huge and solid as Danali "Mt. McKinley" herself. A glacier of THC crystals frosts her colas and packs more power than an icepack.

Type: Indica-sativa, indoor and outdoor, Start vegetate: when the roots show, Flowering time: 45-50 days, Average height: 0.5 - 0.75 meter, Yield: 350 - 375 grams / m² (dried). — Sagarmatha Seeds catalog

As a matter of fact, almost all the Sagarmatha strains I tried were pretty average when I think back. The only to Alaska I had the real deal. Thunderf*ck has an insane indica dominant "sit down and a laden." — Geronimo

for Matanuska to be a pure strain. Jules out the chance of it being a uska/Susitna Valley, just outside Alaska. The name " Matanuska Tundra " , Rob from Sagarmatha actually ck to 'Dam and crossed them with Thunderf*ck didn't originate in

s of Matanuska have become from Sagarmatha got lucky and to Holland. Doubtful, while there I the most sought after weed in ble clone would take an act of , especially seeing as how he is him coming or going through d to the coffeeshops in bulk. So rom Sagarmatha." — Geronimo
M14 - One of the best commercial indica hybrids in the U.S. We have got these seeds from a colleague top grower who has made a lot of dollars with it. The yield is enormous, a modus of 1 lbs. The potency is super. In Holland it flowers at the end of September. Some individuals will take up to two weeks more to mature. The plant in the picture turned purple because of a very cold fall. - S.S.S.C. catalog 1987-88

One thing is for certain, the original pure Romulan has much more sativa than a simple Kush/Afghani. Much more aroma as well, it's pungent pine bud aroma is what makes it stand out as something unique. The term that keeps popping up when discussing Romulan is the old California blue indicas. I met with Romulan Joe a little while back and discussed Romulan's heritage, I think I recall him mentioning some Mexican sativas but don't quote me on it, I wasn't sure.

It has been one of Vancouver Island's best kept secrets for a few years. Up till about 18 months ago, Romulan Joe from the island was all Vancouver knew of Romulan. Then I showed about 18 months ago at HBC with some bud and photos looking for advice about good genetics to cross it with. Boy did I create a commotion. I was offered some serious dollars for a clone. I said no but that I would be happy to work something out with some seeds. For you breeders, take note that 18 months ago, Vancouver breeders did not know a thing about Romulan.

Romulan was the same bud. About six months ago I returned and Vancouver's Romulan was now more potent than mine but had lost some of its flavor. I also noticed that Emery was now selling Romulan/white widow F2 hybrids. Emery's employees told me that they got hold of some Romulan/white widow hybrids from Romulan Joe and that was their Romulan base. I was also told that they were the source of Steve's Romulan. Steve is saying otherwise. When I grow out the Romulan/strawberry blonde I'll know the truth. Pure Romulan is a very stable plant that produces very uniform F1 hybrids. If Steve's hybrids are uniform, then we'll know that he used pure Romulan and not the Romulan/white widow that Emery used. I'll also know if Steve ever decides to publish a photo of a Romulan plant and bud close-up. Buds pictured in Cannabis Culture and High Times are small for Romulan and are more than likely Romulan/white widow crosses. My Romulan gets bigger buds with less light intensity.
I'm only posting this to clear up some of the confusion. Emery's Romulan white widow produces some killer bud. Steve's Strawberry blonde is very good and whether crossed with Romulan or Romulan/white widow, it should produce very pleasing results. A third source for Romulan genetics will be Heaven’s Stairway who will be BTW: The only reason I feel confident that I am lucky enough to have pure Romulan is because of it’s stable genetics and how long it’s been in the area. Emery, Shaun, and the others down at HempBC only confirmed it.


This whole garden was Sweetooth, and it turned out very nice, took 9.5 weeks to flower but the yield has totally made up for the increased wait. I can't wait to get the CO2 going with my climate controller. This winter...

These seeds are from the first backcross. Very sweet, mostly indica. Fruity, frosty & fairly fat. Mostly lime green bud with royal purple accents. The sugar taste is almost sickly sweet.

Height: squat bush indica Flowering Period: 7-8 Weeks Harvest Outside: Mid Oct. Yield: Above Average-Good
I harvested 644 grams of smokeable bud with a 600-watt light, very efficient outcome. Over a gram a watt is a new thing for me. I didn't calculate underdeveloped buds, they have already been turned into butter with the 53.7 grams per sq./ft, 50 watts HPS, 2.5 per sq./ft, clone, GH, coconut medium, ebb&flow system.

'Sweetooth' is a fun plant to grow. I'll hopefully have some pics of the harvest soon. Very large colas, most plants between 24-28 inches tall, some colas solid to 12 inches. Very nice quality nuggs, nice sweet smell, and the high is pretty strong. Sweetooth doesn't require much odor control at all, very state of the art indoor plant. I think I've got my garden down there isn't too much other than CO2 which is on the way. CO2 will be just to keep the temp in check.

'I've been growing both Shishke & Sweetooth for a while and would choose 'Sweetooth' over Shishke after having both of them for over a year. The Sweetooth is a large yielder (50 grams a sq./ft). Sweetooth makes large contiguous colas even on short plants. The visual of the cured bud is great. The Shishke is a heavy yielder; I haven't quite decided if the Sweetooth can out yield the Shishke in perfect temperature conditions.

Shishke and Sweetooth are both blueberry hybrids and I notice a lot of similarities in the veg growth of the two varieties. I like more stress (it gets hot where I live, clones from the same mom), the high is strong & up. The Shishke is intense. Both plants have fairly "up" high.

It's rattled me pretty hard to it very quick (smoking fat joints makes a wave~), hard to describe, it puts a smile upon trichome, dense nuggs to a party and not put the hurt' on me. Shiva

I can't really describe the phenotype differences very well with the plants in veg state, but I'll tell you the two distinct looking phenotypes I've recognized. The one with the more evergreen buds (looks just like the ad for Sweetooth in CC) makes fluffy looking, but tight strawberry shaped buds. The other phenotype makes a more evergreen looking bud, but both share a very similar lime green bract color & large, bigger than your hand blue/purplish fan leaves.

One thing to note, the pictures that are/were on Bongblaster's site don't look anything like the other Sweetooth I have. Must be just a little bit different or maybe it was an earlier cross. I think Sweetooth was sold after it's first backcross, so a few differences are to be expected, but I think both phenotypes I found are very equal in quality. The I have let them go as long as 63 days of flowering time and can honestly say that I think the quality of smoke is much better around 50 days, although yield is improved at 63.

I've seen too many different looking blueberry type plants to really be able to tell which plant is influencing the shape. I think the one with the more evergreen shape might be a tad bit more potent but maybe not; both are fairly up & cerebral to me. If I smoke too much before bed I usually just get back up or else I feel like I'm floating 4 feet above the bed. Sweetooth is spacey smoke, not too heavy of a feeling at all (as I look at the
Texada Timewarp is the famous outdoor strain grown originally and still today on Texada Island, a longish island in the Georgia Strait. I have been there, just off the coast of Powell River, by BC Ferries, specifically as a pilgrimage because I felt sincerely, “I should go to these places and find out who knows the history.” since I grew up with Texada Timewarp, this summer’s planting, comes from an 18 year old clone mother, very few seeds are known from her. I have seen it reach up to 13’ on occasion. Though it grows tall, sativa like, with sativa like leaves, its heritage can be determined. It has a unique Oriental aroma and spiritual high. Whether smoked in the morning or evening, the experience is always rewarding and pleasurable. So put Western Winds in your sail and ride the high tide.

~ Type: mostly Sativa, indoor. Start vegetate: flower shortly after roots show. Flowering time: 70-75 days. Average height: 1.2-1.5 m. Yield: 300-350 grams / m2 (dried)” – Sagarmatha seedbank catalog

These puffy, compact buds are a uniform deep green and textured with a thorough covering of white crystal fur, and thin scattered orange hairs. The scent is a strong, tangy, citrus bio smell. The buds break up into small round budlets; the stems taste a bit citrusy. When smoked, the buds taste green, mild and bio-y and are expansive in the lungs. The high comes on quickly and is visual, stony and spacey. ****1/4” – Homepage

Medium to tall sativa Thai like plant. Will grow medium length nodes with big Thai like leaves. My mother produced fat size rounds buds covered in a furry fuzz. Had a spicy like smell with added incense tones to the smell. The buds break up into small round budlets; the stems taste a bit citrusy. When smoked, the buds taste green, mild and bio-y and are expansive in the lungs. The high comes on quickly and is visual, stony and spacey. ****1/4” – Homepage
the selection. I got lucky and had an elevated buzz. Soaring through time with my highest flower to date.

About 70 days to flower, and turn up the lights!! Don't expect a large harvest from this one, consider it a treat for your personal enjoyment considering the time you'll have invested in it. It is highly regarded and very popular.

Says of its yield and height are NOT the same with the one I got. Mine grow 1-2" nodes and grew to 3' and yielded an ounce. Her buds were quite dense too not fluffy and not small too softball sized side buds, really high calyx to leaf ratio, hardly any trimming, a very spicy smell and taste with tones of incense, very clear UP focused high. One side note I have noticed with my mother is that light got messed up and she is flowering a bit not much but sorta

It is the best choice. The problem with using a strong indica to ease the pain is that it also fries your brain and leaves you temporarily incapacitated. I would suggest either a 60/40 cross between Sativa/Indica or a pure Sativa. Kali Mist/Western Winds is an excellent pure Sativa and White Rhino is a great 60/40 cross between the two." - Nurse Hawthorne
Yumbolt brings back that old-fashioned flavor from the hills of Humbolt Co., California. Possessing a sedative stone with an outdoor aroma, she will often induce heavy eyelids with a satisfying smile. From the first toke till I qualify for every grower's needs.

Sagarmatha seedbank catalog

I found that Yumbolt is very similar to Black Domina. I have smoked Yumbolt in A'dam and it was one of my favorites. I noticed a similarity between it and the Black Domina that I have been growing since 95. Since then I have grown out the rest of my original BD seed and of the 2 that I have tried so far (still drying) the #8 female tastes exactly like the Yumbolt. It was one of the fastest also, harvested at 47 days. Very resinous, you have to take small tokes or risk coughing up a lung. I think Sag offers 20 seeds for 200 fl. and Sensi sells at Sagarmatha. She said that it was some variation with the original strain, and through selective breeding were able to stabilize it. She says it has a very strong aroma.
more strength and taste than original Bubblegum. This plant produces larger buds with more strength and taste than original Bubblegum. Pungent sticky flowers with an overpowering aroma provide the smoker with a bubbly high and long ~ Type: Indica-Sativa, indoor and outdoor. Start vegetate: 1-2 weeks after roots show. Clip center cola. Flowering time: 45-55 days. Average height: 0.7-1 m. Yield: 300-325 grams / m² (dried)” – Sagarmatha Seeds

We have blended the strength and vigor of Bubbleberry with the growth characteristics of Williams Wonder. Both plants complement each other with their unique qualities. The smoke is very tasty and possesses the scent of a flowery bouquet. The high is heavy and long in duration, leaving the smoker with enough energy to be mobile. This hybrid exhibits a shorter, rounder version of Bubbleberry persuasion along with a slightly earlier flowering period. Fantastic for stash and production purposes. Definitely one of the world's wonders. ~ Type: Indica-Sativa, indoor and outdoor. Start vegetate: 1 - 2 weeks. No need for pruning. Flowering time: 50 - 55 days. Average height: 0.5 - 0.75 meters. Yield: 300 - 325 grams / m² (dried)” – Sagarmatha Seeds
Extremely resinous with an uplifting

support.

six ounces wet, the other seven

buzzy.

very potent as well, but both had a

shocking buds, and the other lady

indica female named Bubblegum

(TH Seeds) and when in ‘94

had the same genetics.

definite Adam (TH Seeds) brought from cal. to Holland a sweet smelling indica female named Bubblegum

(no male) he gave it to Tony (his buddy, subsequently the owner of Sagarmatha Seeds) and when in ‘94

cerebral Seeds split up into Sagarmatha and Serious Seeds both seed banks had the same genetics.

I think Mr. Bubble® is an outstanding hybrid because it’s made of the ORIGINAL gene pool of both parents.
These buds are army-green colored, crystally, and evenly covered with long dark orange (almost brown) hairs. Broken up, these buds release the scent of sweet freshly cut grass or even hay with some slightly skunky undertones. The smoke is smooth, non-expansive and has a mild sweet taste. Although the high does not hit you right away, it first creeps through your body making you feel stoned and then only moderately effects your cerebrum, allowing you to concentrate on any task at hand. **“ – Homepage Amsterdam

This indoor hybrid has a high calyx/leaf ratio & finishes flowering in 7 weeks or less. Our big-yielding, lemon-scented female clone named “Genius” because of her CLEAR, energetic, thought-provoking high was crossed with a robust Cinderella 99 male to create Apollo Eleven. Expect some variation among individuals. The best females are short, heavily branched plants with multitudes of dense, resinous bud sites - perfect for SCROG. The smoke has a sweet citrus flavour. The high is UP & HAPPY.” - Bros. Grimm catalog

This Indica dominant strain was created by backcrossing a male cross of ShivaSkunk from Sensi and Princess' brother (a JH f2) back to the ShivaSkunk mother. In "cubing" terms that would mean that your plants are ShivaSkunk.75. Another grower I sent them to liked them a lot too. I'm glad you're having such excellent
but still a JH F2 from the same set (popular name) X Genius."

You, after you have grown this cross ose!!! So clone all your females, if Apollo has a sweet fruity/citrus even if you can't remember what it bred with Cinderella88. The A-11 is y have ever smoked!" - greenbear

ed around 50 days, and a Durban nse buds, low odor. Very racy, even paranoid. Buds very type in the gene pool (Durban). (likely a Durban imho). The dad

he Durban and haze side.

et, and floppy like Durban, means

Greenbear Seeds

of a VERY RARE female to her male r, leaf ratio and OUTRAGEOUS resin agressive generation and, as influenced by Haze; clear, energetic at Cinderella 99 finishes flowering reeking of tropical fruit aromas can ly propagated. One final accolade - -Brothers Grimm seedbank

the "cubed" generation resulting ct a true-breeding strain with the " - MrSoul
ess medium, 1:1:1 ratio of GOOD lower to leaf ratio, manicuring would se for a 400watt, but not tight like alternated Big Bloom & Hi-P fishes tent well manicured buds. Good just vegging. By far the best I've

town for all around goodness.” – flwr

a 88's mom). Cafe'Girl is the seed January 1999. She's a beauty - BIG
 our is very much like ginger ale.” –

that was purchased in Amsterdam at

bought in Amsterdam near the

characteristics were so fine I

Haze-influenced high with the most

resin production, doesn’t stretch -

m after 2 years of cloning & many

buds were always too heavy at

produced a male which was then to indicate the fraction of Princess

1 to Princess herself (incestuous, I

from the ShivaSkunk) Sweet fruity

and bud structure, scent/flavor

major phenotypes; short & dense

and produces excellent yields of

in floral formation and some height
gglets of fruity scented & flavored

ORANGE pistils.

ain has been embraced by the

recognized for their excellent

's NO OTHER seed bank that has

and the info is first-rate; even
ever can feel well-informed about the

details of their breeding strategies are openly discussed so that the seed buyer can feel well-informed about the

crossing with some ShivaSkunk genes in the traits from ShivaSkunk in the branches because Princess had a

crossed and the offspring are this project is going; even the other uniform and HIGH quality. The

each time I back-cross to her the next generation gets a bit more of it. Smoking PURE Princess buds is a bit scary...it's too

Each generation exhibited a MAJOR jump in potency (P.50 was rather mellow)...P.75 has a well-balanced

P.75 has a well-balanced with a tropical fruit flavour, and

I am most impressed with these topped plants. They have buds to the bottom of the stem, great for SCroG

3 lovely ladies

Created with the Keepsake Studio.

MrSoul

MrSoul

MrSoul

Princess.75 finished outside in northern Kentucky Oct 15, (killer smoke!) The 99's should also, I would think. I have grown out Cinderella 88 and in my experience the Great White Shark is a more interesting line although admittedly my luck with C88 was not the best. The one female I was vouchsafed grows more like a vine then a tree and is difficult to clone and cultivate. However the psychoactivity of the floral clusters is very intense and the stone is complex and very cerebral. This is a very potent plant, indeed. But if I didn't know it was Cindy, I confess I might have let this plant go a while ago. As it is I am trying to find ways to accommodate the plant's finickiness because of its lineage. But I wonder if the BG's cross between the original princess and a Green House male White Widow (Ice Princess) might not be a more propitious way of including Bg's Princess genetics of differing genetic backgrounds.

I want to comment that your result with the Cinderella 88 is NOT typical: I have grown an awful lot of them, and I have never seen one that was remotely "vine-like". They're usually Sativa-dominant hybrid phenotype with a flower/leaf ratio and unparalleled resin production. The flowering plants smell like fruity cotton-candy. In my experience, they usually root through a 2 inch rockwool cube in 10 days...and I don't even use rooting hormones.” – MrSoul

"Cinder: There's been a lot of talk about this strain. All I can say is that I'm very glad I grew this one. Fast, nice yields, great high. Harvested at 49 days--maybe even a little too long. While most really bite ya in the ass, the occasional bud out of my jar is simply wicked. I actually got lost a few blocks from my house--shit that hasn't happened to me in years!" – KGB

"C-99 is very uniform. I have 4 females grown from seed that just finished their 4th week of flowering, and the only variation seems to be their height, the shortest being 3.5 feet and the tallest 4.5 feet, and all were topped once. They were started under a 400 watt MH for the first month and have been getting a full 12 hours per day of sunlight since then, and their cola's are HUGE. Wait'll you see how well they do under natural sunlight.” – Rex

"I agree that c99 appears to be something special. Great resin production, great density at 28 days. Still no major odor(yet.) The thin leaves allow great light penetration. Sometime in the future I will do a whole garden of Cindy. What GH mix are you using on the c99 right now? She has been the most finicky feeder I've ever met.” –

"If its Fruit Punch that you want, you should check out "Cinderella 88"….I've smoked the mother that this is the backcross of, and YEEEEHAW she kicks ass. The smell is very similar to the Hawaiian... think back to when you (ok I) was a kid... remember Bubbalicious? Or Hubba Bubba chewing gum? Think about the tropical fruit flavor, and there ya go-- thats what it smells like... A sickly sweet fruit punch gum, a little undertone of "stink" to go
looking for a badass sativa high like at Weedseed. I've personally the breeder put a lot of time and They are nothing like the j. herer with a more sativa look. The plants ing, although I had no idea these with tight node spacing so looks to unlike the j. Herer (only minor prob and! It sprung right back after a bit each btw, includes most of the "hot"

"Cinders passes the test with h like a potent version of silver throat." – Mike

"or Durban?!)... WAY STRONGER!!! At indoors so I expect the outdoors and easy to take in too much as it mind wonder when trying to find but keep a bowl of some nice indica e.” - dead man talking a.k.a. M.G.

The only person I know who has disliked Soul's weed is BB. Taste is a personal thing but I think we know that it is obvious that it is high grade

"The princess I have smoked was indoor grown by a friend of mine. It is a VERY heavy sativa high bordering on paranoia at times. I found it's best when there's a bowl of a nice indica around to mellow out the edge. 3 tokes do the trick (it creeps up in about 15-20 minutes)! Very nice sweet, fruity flavor and tight nuggets. The plants I have growing outdoors in the hot desert are doing great. They have the typical sativa x-mas tree shape and very hardy. Planted 6 eggs, got 5 plants with 3 being female. It will become a permanent fixture in my garden!"

"Remember that Cinderella (88) is a Sativa-dominant hybrid, so you can expect it to be a LITTLE "leggy" when grown from seed. However clones from a good mother will stay quite short - I flower 12" clones for 7 weeks in 2-gal containers of organic soil to produce a 2.5' plant which yields about 2 ounces. Yes, "crystal" production is AMAZING...the stalked resin glands appearing on bud leaves as early as 3 weeks of flowering look like white

"..."1. Bought 10 seeds for 150 from Heavens Stairway. Took 10 days to get to me in Alaska June of 99

"2. I kept 5 of those. Gave 4 to a buddy who pitched in for the seeds. All 5 of mine turned out to be female. Don't
I used pro-mix soil. This is a sterilized and nutritionless product. Make sure to add perlite 30%. By itself, pro-mix and 7.5 pH tap water comes out 5.5 pH so make sure you add lime to your mix. Add lime until you get a pH at 6.3-6.6. Make sure to check your overflow water after each watering for PPM. If you do this you will catch any overfert in time. You will find that about every 3rd water should be plain water or you will overfert. I've had 2200 PPM overflow water at times.

Cinderella is a most interesting hybrid. It was selected/bred for indoor cultivation. It is a short, plant with dense colas. The most interesting and handy feature is that you can actually tell the sex when the plant reaches about 12-14 inches tall. If it is a female, the two telltale pistils are evident at this point.

I started flowering by day two and with 10 days or so. They produce when you harvest, and the high is pleasant. A friend of mine said she cleaned her whole house and had a good time doing it - You find humor in everything.

Thanks Guys" -Mr. Worthington

I made a Flat ScrOG that's W=3ft,L=6ft,H=1ft from bottom of plants. My screen is 2 ft from a 1k hps air-cooled + on a light rail III. My question is how violent of a stretcher is c99 and how much of the screen should I let her fill up? I don't want c99 stretching so much she hits the light and burns,

=Soul=> I flower my clones at 12" tall and they end flowering @ 2 ft tall yielding from 1 to 2 ounces dry. You should let the branches grow to 8" above your screen then switch to 12/12. The final height will be less than 2 ft, allowing your lamp enough distance from the plants (the light mover HELPS).

Nexus> I got 4 c99s and 6 Mr. Nices in the screen growing in a drip/NFT custom made system. I am about 1-2 weeks away from flowering depending on c99? Also how powerful of a yielder is c99, I have heard sooooooo

=Soul=>It's easy to be misconstrued as "spam" when a strain is getting valid positive feedback as we've seen in the case of the Cinderella line. It's truly impressive to have combined rapid flowering and hermaphrodite resistance in a potent, tasty, good-yielding, true strain. That's BOUND to earn some glowing reviews. To illustrate the yield I'll simply say that a 12" clone of C99 consistently flowers into a 2-foot tall plant with an average yield of 1.5 ounces, depending on how densely they're arranged. I have found that 40 clones (10 RW slabs @ 4 plants per slab) in a 4'x8' area is about optimal. I grow the plants with single colas, or at most, two main colas. They are supported by using twist-ties to attach each cola to wires running the length of the rows. This increases yield by forcing the garden into a light-efficient profile. When you let the colas "fall all over one another" the final 2 weeks of this abuse takes its toll on bud production. It's best to keep them well supported.

One C99 distinction that helps is the high flower to leaf ratio. When your buds are made up of MOSTLY flowers, it's easier to see when they're getting ready to be harvested and you can stop feeding them with a couple of weeks to go. This is a huge help in terms of preventing overferting and keeping your plants healthy.

Positive feedback as we've seen in flowering and hermaphrodite resistance has led to some glowing reviews. The yield is impressive, with 40 clones yielding about 1-2 ounces per plant. It's a versatile strain that can be grown indoors or outdoors, and it's relatively easy to care for. The high is pleasant and long-lasting, with a slight body high that can help with stress relief and relaxation. Overall, Cinderella is a great choice for anyone looking for a high-yielding and reliable strain.
“Jack Flash does go a bit long in the flowering, it grows in two types one very Sat/Haze influenced, tall 5’-6’ with one lady in a 5 gal pot, she was a Haze dominant and the other type grows very Indica-like, there was one special lady on the Indica high after the first hour and the other one is very fruity with a nice trippy high that gave way to a indica high after the first hour and the indica-dom. takes about 60 days to flower, also very well worth the wait, several connoisseurs said that it was amongst the best Indica they had ever smoked, and the taste cured is fantastic. And the strain is very easy to take care of. It was really nice, and it yields great in both forms. Out of 7-8 different strains grown Romberry and Jack Flash are definite repeats, as they are both in the Veg closet again. There’s really only one place to get Sensi stock (IMO) but the price is OK considering they give ya 16 beans, in that respect there only a/b 5$ each. Sorry for the long post but its a favorite and I wanted to give ya my $.02.” - Budm

However variable, IMO the variations are present, 3 ladies were in pots of BCGA's Super Soil recipe, there were 3 different ladies, one was in a 5 gal pot she was a haze dominated phenotype, she grew out in a “heads on stick” fashion, big huge heads, she was toped once at the 6 node, she grew into 6 big heads, each dried to 20-35 grams she yielded just over 5 oz’s, of great tasting wake and bake, uplifting sativa smoke. Another lady was sort of the runt, she was in a 3 gal pot also pinched at the 6th node, she had more of a indica phenotype, nice tight colas with red pistils, great smoke very fruity, but yield was bad, at about 20 grams. The 3rd lady was awesome, also in a 3 gal pot, pinched at the 6th node, she grew the densest nugs, smelled like lemon, tasted like lemon/hash, and the high was awesome, trippy and thought provoking, but its best attribute was its wonderful taste, she yielded about 1.5 oz. All said I really like this strain. The haze influenced lady was crossed with a Posi Big Bud in hopes of bring down its size (5.5’) and

peppery aftertaste. High is UP with no sleepiness. I was afraid that it would be too similar to my Cinderellas due to their background, but the Jack Flash is very different in taste and high. Jack Flash is lemony and Cindy is like pineapple. one is sweet while the other is sour. The Jack Flash high does also create a slightly paranoia level. The high does also create a slightly discomforting “edge”, but Its mixed in with a lot of laughing (which I like), and creativity (strange but great) I highly recommend this for...
this multiple hybrid of many years

Sensi Seed Bank catalog

for the past couple of years and is

weeks. Very indica predominant. At the other end of the haze predominant. Taller, lighter in color of the haze. Wow, my first real haze predominant buzz. At the other end of the haze. Wow, my first real

very inconsistent strain. Growing jack in a smaller growing setup caused imbalances in finishing times. So in troubleshooting the problem, I had one plant that took 10 weeks to finish. This one was very haze predominant. Taller, lighter in color and scent, but the buzz was strong with the heart pounding sensation of the haze. Wow, my first real strong haze buzz..... So I would have to say that Jack Herer is an excellent but very inconsistent strain. Although all the plants had excellent results when finished, I found that growing jack in a smaller growing setup (less than 10 plants) was sort of frustrating because of the 3-week difference in finishing times. So in conclusion, if you grow jack keep your eyes open for both very early and late finishers. The wait, although

feararm sized) colas. Seemed to

dict from all of the hype. There are many more potent varieties that have a significantly shorter flowering period, IMHO; I don't think I'll do it again. A friend who also grew it had the same opinion. AK47 still has my vote; just over six weeks to finish and

This light forest-green colored bud is made even lighter by its tiny white crystals and long, thick brick-colored hairs that are few but noticeable. The buds seem to be made up of smaller buds and clusters, sort of like grapes. This bio has a mellow, steady, sweet, green smell with just a hint of that skunkiness that we love. Dense buds surround tiny (and tasty) stems. The smoke is tasty, sweet and smooth with just a slight stony, visual, and a bit silly snorty sensation. The high is quick and expands for quite some time with stony, visual, and a bit silly
The bud structure is lent from its Hearer lineage, while the color is most certainly descendent from the Haze. The buds swell oddly like freshly shaven carrots, and are very sticky when broken up. The nodes are coated in white crystals. When smoked, the bud releases thick clouds of sweet, tangy, tasty smoke which expand substantially in the lungs. The high hits quickly and really sends you for a whirl – it is visual and Trippy. This mix surely brings out the best in both.

I have just finished some of Jock’s Posi Jack Herer and have one that keeps on adding to its white, fat cola like the Eveready bunny. It just won’t quit after 11 weeks, although harvesting time is prolly within a week or two. Think you will like it. Nice profile, short internodes, average harvest from 12/12 light set has been around 9 weeks.....typical indica/sativa leaf, excellent calyx/leaf ratio, great high that’s creeper...3 good tokes and you’re good for the night. Doing a seed program and am coveting the seeds on this one.” – Uncle Ben Dejo

I have been expressing my opinion that I haven’t been really impressed with Dutch strains, but Jesus H. Christ, me and the lady smoked some of the Posi Jack Herer last night and were really blown away. I have finished a grow which was for seed production primarily, and have slowly but surely tasting the buds from various strains over a period of a few months, and am still not finished, however.....

The Jack Herer is definitely Wacky Weed. I mean this stuff is like being in Alice of Wonderland! Creeper weed, nice body stone, very potent head stuff which is psychedelic and just plain goofy! We must have laughed and have grown, and this particular plant had 1/2” internodes, huge thick colas (yeah, it’s the one that went a little moldy).

This is just plain fascinating....this lady leaves a distinct taste and feel on the palate that is like a very subtle menthol taste, somewhat piney and having a very earthy taste. It leaves an interesting aftertaste like a fine wine would - very pleasant. Anyone else have this type of palate experience?” – Uncle Ben
6 seedlings are off to the races. Princess was obtained from growing out seeds found in buds of Jack Herer that
was purchased in Amsterdam at the "Sensi-Smile" coffee shop, an authorized outlet of Sensi Seed Bank. Thus, it is considered to be an f2 generation Jack Herer. The seeds were found only in the deepest part of the buds indicating that the father was an unusually early-maturing JH that the growers missed at first.

Princess smells very much like pineapple both during flowering and when dried, but there's this "evil" scent in it (notably the Durban/Thai hybrid "Yellow" of stalked, capitate trichomes like Haze). The high is almost too intense for a lot of people. Dr. atomic actually refused to smoke any on our second meeting, after getting rather "hazed and confused" on the first sampling we did together a couple of weeks before, so he decided to try Shiva Skunk and found that more mellow and to his liking. Two hits of Princess will induce your body to tremble involuntarily and your heart to race and paranoid thoughts...very much like Haze, but not quite as

Princess grows vigorously, and is rapidly maturing...6 to 7 weeks of 12/12. It feeds heavily and requires about 50% stronger nutrient solution than an Indica does. It stays short, for a Sativa-dominant strain, and finishes at 75 to obtain males for the creation of Princess.88. Seeds of the 0.88 generation will be ready by mid-July and should produce excellent plants, albeit not perfectly stable yet...but nearly. He plans to back-cross once more after that to arrive at 0.94 Princess genetics, which should be a

This strain is exactly what most people believe doesn't exist; a Sativa which grows VERY well indoors, stays short, and matures as rapidly as an Indica (faster than many), and has the great KILLER Sativa high/flavor. The yield is fine too. Mr Soul finds that the Indica strains are too leafy/stalky and much goes to waste with them, whereas Princess has an extremely high flower/leaf ratio and therefore almost no waste.

"Current crop is Jack Herer x Unknown (Nickname - Jack's Heir): Seeds - I bought a 2 gram bag of Jack Herer buds (1996 Cannabis Cup winner) in Amsterdam at "Sensi Smile" coffee shop on Achterburghwal straat. The buds were supposed to be sinsemilla, but I was pleasantly surprised to find about a dozen seeds in the bud. I found the high to be cerebral and energetic, but not too long lasting; the buds appeared almost white due to resin coating. Of the 6 seeds I attempted to germinate, every one was successful and I got a 50% male/female ratio. Seedlings - Very consistent and uniform in looks and growth pattern (surprising since Jack Herer is a three-way hybrid itself). Rapid growers. Typical internodal spacing for a hybrid. Appearance shows signs of both Indica and Sativa heritage. Large, broad bladed leaves, but lighter green in color than typical
Mother plants (J1 and J3) - Grow vigorously and bushy. J1 is the hardiest looking of the two females.

Father plants (J2 and J4) - Grow vigorously and bushy. J4 is the hardiest looking of the two males (surprisingly, this J4 grew from a seed I’d characterize as a “runt”, about half the size of his siblings’ seeds). Unfortunately all clones of J4 were lost and I have only a “decent” supply of pollen from his flowers.

Clones - Very quick to root (10 - 14 days) with a success rate of 90 to 100%. Several small, poorly rooted clones eventually came around and flowered nicely. Rooting occurs independent of the method used; RW

Flowering - Once rooted, the RW cube is buried up to it’s top in a 6 inch round pot of 50% perlite 50% Hyponex Professional Soil Mix, fertilized initially with Miracle Grow 15-30-15 at 1/2 tsp. per gal of pH 6.5 water. Once looking well at 12cm tall, flowering is begun with a 12hr light/dark cycle. During the first week they “shoot” up 30 to 50cm with large fan leaves but suddenly look over-fertilized (Miracle Grow has urea-based nitrogen) with curling at the tips of the leaves. They respond virtually overnight to a good, thorough leaching with plain water, then they take on a dark green color and start to “bud out” rather than get taller. After the first week of flowering, feeding is switched to Shultz’s Bloom 10-60-10 at 1/2 tsp. per gal of pH 6.5 water; I soak the pots and wait a couple days until they get lightweight before the next good soaking. Flowers appear Sativa-like and denser, much heavier buds than skunk or similar strain, since the calyx to leaf ratio is so high; the flowers just keep sprouting out in all directions from the bud with only tiny, resin coated leaflets interspersed between flower clusters. The leaves, all but the fan leaves, are covered in stalked resin glands from base to tip. Sample smoking of immature buds which were culled (tried to flower them in RW cubes but they died) after two or three weeks of flowering proved to have a sweet, skunky taste and produced a very “happy” high, not at all paranoia-inducing. The finished product should be excellent.

Currently, I have several healthy, rapidly budding clones that are in their third week of flowering and they may well finish before their eighth week. The lowest four branches of one J1 clone were selectively pollinated using the J4 male’s pollen and should yield roughly 50 seeds. My hope is that these seeds will produce plants with a great variety of fine characteristics. The outstanding gene pool should ensure that, inbreeding concerns aside, I’ll have a great breeding project: trying to select individuals for future crosses which will incorporate the

Rosetta Stone is a fast-flowering plant with heavy resin production and average yield. It clones remarkably well and is generally an easy plant to work with. It was created by pollinating a unique Ginger-Ale female (Ginger-Ale makes the densest nuggets we’ve ever seen) with a male we’ve tracked for a long time as a reliable resin-enhancing father. Rosetta Stone is a super potent, wonderfully sweet, fruity smelling, perfectly balanced Sativa/Indica hybrid. A definite keeper in any connoisseur’s garden. - Bros. Grimm seed catalog

Choose plants that produce big,
Princess has a sister I call "Cafe' Girl", which makes a GREAT production plant. Her flowering time is just under 7 weeks of 12/12. The colas are BIG and DENSE and RESINOUS. Her buds taste like Ginger Ale & the high is quite like the old Colombian Gold we used to smoke in the late 70's...very warm, friendly and non-paranoia. With 40 clones of Cafe' Girl and her plant even @ 1.25 plants per

Original. I found the genetics to be messy plants. however, the mother I used for crystal formation, and it was a great one. the high is very active / cerebral, lightly influenced on the sativa side. the high is like pecans...

Jack Herer is a high light plant. For good bud density you'll need at least 30 watts / sq. foot. I don't know why it's such a bitch, probably the haze presence (Jack Herer = haze x nl #5 x skunk #1 ) makes it a bit of a pain to grow. All in all, recommended. -frank white

Mine does have nutty flavor but with an undertone of catpiss.....good high....good crystals...stretches like crazy but flower time is good....55-60 days. Definitely worth the price if you can grow out several to find a good...
Dutch variety, crossbred with a Thai and Brazilian weed, special for the outdoor grow, but inside also a number

Flower: 8 weeks, 8-10 outdoors
Harvest: Sept. – Positronics seedbank catalog

This variety is a sativa/indica cross (a hybrid of a KC 33 male and a Brazilian female). A superior plant with

There are a few Dutch hybrids that might qualify that smoke up like a sativa and grow like a indica, well sort
of, nothing really grows like a sativa except a sativa. Some of those Dutchies are a great compromise between
a high “high” and something that finishes in months not seasons. Search any of the Dutch seed bank home
pages and zero in on any hybrid with 60% or more sativa in it e.g. kc33, Leda Uno etc. and that should do the
trick. You can grow full-blooded sativas indoors but it takes forever and I mean forever. Leda Uno has leaves
on the thin sativa side, big fat indy type colas, finishes fast (for a sat. dominated type), cheap seed price,
ergetic, talky, happy and a very
something, not just eat
favorite and Ledas mine. Easy to
but the high is what will grab you,
@ Interpolm opposite the train
heard they were out of stock but
those heavy, sleepy, valium type
Colombian marching powder in a
available at several coffeeshops
never tell you where I bought it so if
a sub-standard one! If memory
plant to grow), supposedly lemon
k genes in it (rare for a Dutchie),
excellent for close together, one stalker growing if un-tipped and forced to flower at a short height it will have one big cola (topping seems to reduce yield not increase it unless it is done at a very young age). I hope you get the same genes that I got, you'll be happy. try to do a seed crop (male Leda Uno x fem Leda Uno) and have lots of seeds to play with, give away and breed, I wish I did! (I crossed them with other Dutchies and local sativas trying to get something stronger, bigger and better), it's got that smooth Dutch taste, very cool if Dutch sativa/indica varieties excellent results. You seem to be a bit dazzled by its finishing date as I was, at the time, I had only grown Thai and other south east Asian full blooded sativas, not Dutchies, so a 60 day flowering stage passes like a blink compared to those equatorial types, if I was going on a seed buying trip I'd buy strains like Cali orange and any of the pearls or any strain that is fast and sativa dominated.” - insider

Mango is a 100% Indica variety, a F-1 hybrid of KC-33 and Afghani. High yields and some plants are very high. Specifications: ~ Flower: 6-7 weeks ~ Harvest: end of Sept., 1st week of Oct.” – Positronics catalog
A strong plant (50% Indica, 50% Sativa), easy to grow. Purple Afghan seeds have been crossed in Holland with Indica and Sativa varieties since 1983. The plants are fully adapted to the Dutch climate and have a respectable yield. This variety has calyxes that turn purple, starting at the beginning of flowering. Up to 90% of

Flower: 8 weeks
Harvest: 2nd half of Sept., 1st week of Oct.

Produced from Mexican, Colombian, South Indian and Thai varieties. Incredible resin development. Produces

with medium green leaves, the buds look like pieces of hash, chlorophyll, very plant-y (like fresh food for passing around at a party out of a bong than a joint, or

Dutch Passion catalog
This variety is a hybrid (F1) of Purple #1 and an early Skunk. About 50% of the plants turn purple during the growing season. Very strong and easy to grow purple variety (100% Indica). Very resinous, having a heavy perfumed aroma. The aroma is a little rough, but the variety produces a very strong high. About 50% of the plants turn purple.~ Flower: 6-7 weeks ~ Harvest: 2nd half of Sept., 1st week of Oct.
This is the former variety Purple Skunk. About 50% of the plants turn purple during flowering. The variety is 87.5% Sativa and 12.5% Indica.

Flower: 8-9 weeks  
Harvest: 1st week of Oct.

Another favorite from our collection, developed by our breeders in 1996. A female Oasis/Shiva/Haze crossed

I grew DP Buddah on my last crop and you did not miss much. In fact I wish mine had not germinated so I could have moved on to a strain with more potential. Basically the problem with Buddah was a lack of potency and very little taste with most of the commercial bud in my area being superior. I still have an OZ stored away...
Developed as a tribute to all the Hempsters and the International Hemp Movement. A three way cross between Skunk, Oasis and Haze, it is the combination of the three major varieties. This strain has an

Flower: 9-12 weeks
Harvest: end of Nov.

Taste: The fruitiness of the Indicas with a strong presence of the widow and skunk tastes.
Smell: A rich fragrance of flowers and fruits with the odour of a White Shark.
Visuals: Orange haired fullness of the super skunk that glistened in the crystal rain of its widow father origins.
Touch: The thick, densely crystallized cola are sticky and solid - just like the original parents.
Stone: Seductive high feeling, that has the strength of the jaws of his namegiver.

Family Heritage: A cross between a Super Skunk and a White Widow.

Vegetative Time: For indoors a suggested minimum of 2 – 4 weeks. For outside germinate May or by the end of spring.
Flowering Time: For indoors a suggested time of 8 weeks. For outside, it will be ready early autumn.
A substantial yield will be expected.

Achievements: 2nd - Place - BIO-Award 1997, 2nd - Place - Cannabis Cup

There is something so enchanting about the way the buds have formed on these plants. Like not so little snow cones sitting delicately atop their verdant, leafy bases. Like the plants belong in a Japanese Garden or

Dutch Passion Seedbank
Arjan, Green House Seed Co.
the beginning of flowering has
divine aroma to them; something
lyxes and the subtending leaves.

I plants for sure. More like
ging during the first four weeks of
development to give you a
time flowering was initiated.
plant for double-stemming. I look
at sixty days. It will also be

ed

little space. Very soft taste and
een quality and yield. Strongly

of dark green and contains sparse
out of pine. Not particularly flavorful
ough but expansive in the lungs. The
1/2 “ - Homepage Amsterdam
Daughter of the White Widow plant. This bio is yet another example of Holland's cannabis breeders' next generation of Neder-weed. These medium green, smallish buds are so covered with white crystals that they appear much lighter than really are. Its red hairs are sparse and short. The buds smell a bit mild, citrusy. And sweet—like a powered lemon drink mix. The smoke is expansive in the lungs and has a spicy citrus taste. The

"Sister of White Widow. Short, bushy plant yielding a high THC content." - Homegrown Fantaseeds

"Misty (a supposed sister of WW) is thought by many to be just one of the many different genetic incarnations of WW, It is said to be a much more stable variation of the WW line." - Prince Caspian

"Misty seeds are strong variety. Short leaves, light green, strong bud, big clusters and very resinous... smells sweet, and grows very fast. 4 weeks until flowering, 8-9 weeks for full flowering." - aviyam

"On a smoking excursion to Amsterdam last September I got a chance to sample Misty as well as da Widow, and see both side by side. They look almost exactly the same, side by side, under intense light. One could easily think they came from the same plant. I saw this in person at Positronics as somebody was trying to sell to some Misty (the house special) I had just purchased in the smoke room in back. The Misty is *fairly* strong plant in my opinion, about a 7 on a scale of 1-10. Equivalent to a good Northern Lights in potency. The Widow, maybe a little higher but still not

10 seeds were ordered from Jocks and all but one germinated using the old paper towel. Germinated seeds were then planted in rockwool cubes and all 9 sprouted. Last week when I saw them they were about 3-4" tall under flouros with 2 lagging behind. (They looked healthy I just think they were the late sprouts.) They were all working on their 4th node. I forgot how old but I would guess around 12 days. Even at this short height about 4 oz. per sq.' under a 250!! Tastes like sugar. Connoisseur quality cannabis. Best I've had. Chronic from Serious is great too yields even

"Misty from Homegrown Fantaseeds. It was real easy to grow. Yielded over 2 oz. per sq.' under a 250!!! Tastes sweet like sugar. Connoisseur quality cannabis. Best I've had. Chronic from Serious is great too yields even

...The Misty is really sweet. Chunky thick bright green nugs with little delicate deep orange hairs. Lots of bud mass in the Misty. The Nugs are really fucking green. They're very sticky, and have a taste that is sweet but VERY powerful. This shit knocks you on your ass, and it stinks. The kind of shit you keep smelling in the car when I've got a 1/4 in my backpack in the trunk. Yield is way better than average, but not as good as Chronic. I've seen half once single stalk 3-footers that were flowered at 6"-8". A joint is soaked through with resin..." - Homegrown Fantaseeds
if you're half way into it. Split a modest one with a friend and you'll be in Oz for hours. 2 modest bong hits or one mother load will put you on your back. If you want more info on Misty check out the Homegrown Fantaseeds web site. Misty was the key ingredient in White Widow, and although I've heard that anything in the WW family is probably unstable, of the 7 Misty seeds I started there were no major growth pattern, color, or even size variations. Misty is definitely the better choice unless your #1 concern is yield, and don't get me wrong I'm sure it's easy enough to find new stuff. My number one so far is both KILLER. Both the AK and the...AK-47 from Serious Seeds, and Misty from Homegrown Fantaseeds were both KILLER. Both the AK and the Misty have a great yield, and a knock you on your ass stoned to the bone. I like the sweet taste and sheer A truly beautiful plant misted all over with bulging THC glands. A good producer in terms of yield, fat donkey dick tops, combined with prize-winning quality, gourmet taste and a sweet aroma. This plant has it all.

I recommend Original Misty from Homegrown Fantaseeds. Misty is a stabilized sister of white widow with a bigger harvest potential and a sweet flavor. I saw almost zero variation between plants from this strain than from Chronic, even more powerful stone than the Chronic. I harvested more than a 1/2 oz per SOG style plant after 2 weeks rooting under flo's I veg for 2 weeks under MH and then flower for 8 weeks under HPS."

Afghan X Brazilian & So. Indian. Somewhat a mystery strain. Suffice to say it has 60% Indica to 40% Sativa
This crystal, olive colored bud is sparsely covered in brownish red hairs and resin nodules that stand out proud and bubbly. This bio has a pungent, green scent; some have even said it has sort of a shit smell to it. Very fluffy somewhat dense buds break apart nicely and leave your fingers sticky. Not mouth wateringly tasty, it tastes a bit brown for such a green plant, depicting its Mexican heritage. The smoke expands slightly leaving you coughing a bit. The high is not overly mellow; the head change isn't much to take. This is bong weed, as it does very well through water, eliminating the need to cough altogether. **1/2″ – Homepage Amsterdam

Flowering time is 8-10 weeks respectively. Although the flowers will appear to be ready after 8 weeks, the extra two weeks is to allow THC to spew out of the glands leaving a coat of white on your nugs. You must be patient with this strain unless your wasting your time. **TO EVERYONE WHO GROWS THIS STRAIN I'M BEGGING YOU ALL TO WAIT THE EXTRA TWO WEEKS THAT IS NEEDED FOR THC PRODUCTION!!**" - Ganja-k

"In the case of multiple sclerosis an indica is a good choice, but I don't think it is the best choice. The problem with using a strong indica to ease the pain is that it also fries your brain and leaves you temporarily incapacitated. I would suggest either a 60/40 cross between Sativa/Indica or a pure Sativa. Kali Mist/Western Winds is an excellent pure Sativa and White Rhino is a great 60/40 cross between the two." - Nurse Hawthorne

With the combined power of White Widow and AK-47, this potent plant became an easy winner of the 1997 Cannabis Cup. This bud is mostly sea green (yellowish-green) with patches of darker green, and has clusters of reddish-tan hairs. Very light tan crystals coat the entire bud. The scent is very green and bio with an undertone of skunk. When smoked, the bud tastes sweet and is a bit expansive in the lungs. The high is spacey, stony, a bit forgetful and lasts strongly for 2 hrs or more! We love this bud. One or two

White Russian (Grey area) again very complex high, but tends a little more to the indica side. Great with Very strong hash oil taste, I give it a 9.2. Both WW and White Russian are indica dominant, 70-day plants
flower, very easy to grow .... Germ
field depends... over all I would say
ak47.” - LaBud

te phenotype, but pick the short
have smoked in many years. A
2 a joint: “Too much...waaaay too
very cerebral, extremely potent
about a 3-4 hour consistent
and it over anything I have smoked,
” – Posterboy

of the strength of the crystals - the
you better try it for yourself. Smell:
I whiff ... turning sweet. If a plant
visuals: If you have ever seen a
sort of hairy crystals we all craving
stem then you probably did not
to be believed! Stone: After the first
feel it just under your eyes and
ence: Originally the union came from
and indica ratio. – Green House Seed

ended to grow it for 2 weeks.
the White Widow for 8 weeks, but 10
weeks of the flowering cycle to turn
from regrowth and stresses the
...try it! Achievements: 1st Place -

with THC glands, even on big parts

Vegetative Time: At least 2 to 4 weeks if on Bio. On Hydro it is only recommended to grow it for 2 weeks.
Flowering Time: On both mediums it is suggested to flower (12 hour light) the White Widow for 8 weeks, but 10 weeks will really give you the crystals you are after. We suggest the final 2 weeks of the flowering cycle to turn

Specifications: ~ Flower: 8 weeks ~ Harvest: end of Oct.” – Dutch Passion seedbank catalog

“It is a serious heavy high. Heritage: Originally the union came from a Brazilian and an Indian. Suffice to say the combination is 60% Sativa to 40% Indica. The most rewarded variety of recent years in Holland. The plants are white of THC-glands, even on big parts of the fan leaves. A very soft smoke and great “High”. Very potent.
ponic Cup. A compact, medium height, Indica dominated variety with a sweet 'Skunky' high. Incredibly resinous with profuse white, crystallized flowering period 8-10 weeks for crystals (50-60 days), outside 10-14 weeks.

I reports that I have read state that Ils WW. On my last trip I tried 3 regrown Fantasy (Hydro) and one tent. In all honesty my least have the resin coverage like I was excellent, as was the super ll very much unstable and therefor in a-dam. Someone from Dutch 130.00. This plays a part in the what happens when we inbreed f1 ve of the hybrid and p1 plants as begin to dial in your own original WW. It is considerably ne for other herbs, which seem not one of the more fragrant herbsould do so lousy in hydro, as I find that was super potent but not real a couple times to some thing that . Some of my friends loved it but

bimby Madness a stable sativa (LL#5 x Skunk#1) giving it the

I (only one candidate...maybe not L. head is 20% body, 80% head. drop from the brain when prone to powder mildew on the fan
I'm also growing DP white widow. I have also found the fragrance to be very sweet in a skunky kind of way. This stuff is stony, but the taste leaves much to be desired. There's not much body to the flavor. I still have 3 mothers and can't decide which one is the keeper. Overall, I'm kind of disappointed in white widow, what with all the hype about it. I too have not had the good fortune to get buds that are caked with white frosting, but, hey, I had to see for myself. I, too, have had the problem with the powder mildew (if that is the correct term) on the leaves when it gets close to harvest. I have had to do lots of manicuring. I currently have more WW... 

...Is show said the seed would come excellent. Out of 5 females, 1 was less side branching, 8+ wks. All had very slight taste differences. I intended to keep 1 or 2 but have several chances to evaluate (from Amsterdam) to anyone. Great all around highs, VERY yield Indica for communication

grams each. They had 2 or 3 nice look and the crystals never reached crystally and did spread to most to dry unevenly the way I dry and I process. The WW was just smoked spectacular but a .25 gram joint glued

Determined

a Super Beetle with a Porsche
ed for the lovers of cannabis best. Telling tales of mysteries. A plant harvest time!

grams.” – Paradise Seeds catalog

grown in organics with mostly Guano of (for growth) and so on ... 53 day smell. Large main cola, crystallizing very much leaf, only the crystals

sold in the 80's and it is also 2/3 the seeds directly from Alan Alaska and he said that nobody has means (Mantanuska x Tony's best buddy and provider of great dense yields but not a 9 or 10 row" and that the "peak19 was a
Quite a while. For me it is the
which is where I got turned onto it
as well, and even he said it will

moke to really understand. It's
et smoke" though. Tastes like

me I was in Amsterdam. I wasn’t
ike blackberries but the high wasn't
e it is an indoor variety only it
and some sticky-sweet, but just

Seedbank

famous Chitral-hasj of the
od harvest, nice herbal taste and

den nodes. The crystals are not
ertones that set it off well. Dense
than skunk. However, the smoke
ensive in the lungs and will make
munchies! *** – Homepage
Chronic is the plant to grow when yield and quality are top concerns. Mostly an Indica this plant can produce up to 600 grams per m² while not compromising quality. Chronic has a strong high with a heavy resin content.

Smokers that know and grow choose this plant for both appearance and its sweet scent. Winner of 3rd place hydro division in the 1994 High Times Cannabis Cup, this is chronically the best choice for growers that are tired of losing quality when gaining yield. Indica/Sativa bred with powerful effect and sweet smell in mind.

~ Mostly Indica, Flowering time: 60-67 days, Yield: 400-600 grams/m² – Serious Seeds catalog

I've grown Chronic. I've heard several different ideas about the genetic origin. The first was NLxAfghanxNL. The second was NL x Big Bud x Afghan. I am personally more prone to believe the NLxAfghanxNL. Big Bud has a certain mildly sweet aroma and taste that I didn't notice at all in Chronic. I didn't identify with any Big Bud characteristics other than a giant fucking yield. Chronic has a very slightly spicy scent with an overpowering stone. If you are looking for the best quality and yield combination I would recommend Original Misty from Homegrown Fantaseeds. Misty is a stabilized sister of white widow with a bigger harvest potential and a sweet taste. I've heard that all of the white widow hybrids are very unstable, but I saw almost zero variation between plant growth patterns in my experience with Misty. I got an even larger yield from this strain than from Chronic, but only a very little bit larger. It did however have a sweeter taste and an even more powerful stone than the Chronic. Flowering period for Misty was 8-9 weeks, and I harvested a little more than a 1/2 oz per SOG style planting. After 2 weeks rooting under flo's I veg for 2 weeks under MH and then flower for 8 weeks under HPS.”

Chronic is a strain developed by Cerebral Seeds. After this company split up into Serious seeds & Sagarmatha Seeds, both parties kept the strain. Serious sells it under the Chronic name and Sagarmatha sells it under the name Slyder. Actually Sagarmatha ran into some problems with the germination rate of some of their Slyder seeds. They have stopped carrying it FOR NOW until they get a few new batches going. They assured me personally that the Slyder would return very soon. The origins of this classic Indica strain are “a Northern Lights cross with an Afghani”. Very, Very Heavy/sleepy buzz. Tons of resin, relatively fast maturing with dense bud structure.

And potency seem to have been true; the monster colas (two feet long x four inches thick) are still drying, but the first three plants (which weren't the biggest) gave over 100 grams, which I consider a lot. The last three look like they'll weigh in even more. There is a bit of variance in the strain. I saw two distinct phylotaxies/growth patterns indicative of the Sativa/Indica mix: thick, luscious buds on short plants, and thin, slightly fluffy buds on stretchy tall plants. Nevertheless the result was excellent. The high is half body, half mental and will lock you to your couch for a long time. I'd give it a 7.5 or 8 out of 10.” - KGB

All 10 started with germinated and sprouted. The seed gave up 7 females with 3 males. During veg these plants were similar in appearance but differed somewhat in growth rate under flouros. All of these plants had long leaf stems with leaf blades somewhere between an indica and sativa as far as width and color. The color 1 and 2- These two were practically identical in all aspects so I don't know what the heck. They grew like sativas. They were cut down around 10 weeks and could have gone on longer. All of the chronic were cut down in approximately 10 weeks-68 days. Some were probably ready a few days earlier though. Braided bud look with good size calyxes.
These plants were chopped because of the long flower time. These plants also had the city skyline look to the buds since they were trained so that the 3- Got shaded bad and after a test smoke was chopped since it wasn't as good as the others. It could have

4- This one here was the winner as far as yield goes but since they were all somewhat crowded it's hard to tell if this plant was on the edge of the

yielded the same. These were

elyxes without the braided look;

and for both of them.

pped during flowering like the hand

: plant of the bunch too. It had the

towers as they withered. How this

buzz. It was the first to show pre

ready for harvest so this one is

these parts. The stuff smells like

When the plant was chopped early

visual distortions after smoking it

be thing that could knock some

burn out when the buzz wears off.

plant should have been harvested

now.

the final report since not much

moving to Jr., and because they

any other plant grown from seed in

early Oct. Yield: Average” - Spice of
This cross of two super Shivas, selected for their resin content is mind blowing but nevertheless tasteful and

Paradise Seeds catalog

Type: indica, Flowering time: 50 - 55 days, Yield per m2: 350 - 450 grams

This dragon of Dutch descent is a spectacular plant for indoor growing. High yields with short flowering period. Superb quality along with long sticky colas. Its sweet taste and strong potency makes her the favourite to

- Paradise Seeds catalog

Type: Sativa indica, Flowering time: 50 - 55 days, Yield per m2: 400 – 450.

Early Riser is our first variety especially developed for outdoor production. Several generations of select breeding - choosing individuals with the shortest flowering period combined with the highest density of

- Sagarmatha Seeds

Several generations of select with the highest density of
cannabinoidal resin - have produced a wonderful example of botanical wizardry. This species is truly worthy of supporting the same high quality standard of exceptional cannabis that Sagarmatha has provided for her scrutinizing clientele. The aroma and flavor of Early Riser is sweet with a minty aftertaste. The high is uplifting; release the sunshine in and don't get burnt!

- Type: Indica-Sativa, outdoor. Flower period ends: Mid. September. Average height: 1.5-2 m.

A new variety, mostly Indica with a sweet taste. Somewhat a version of the bubble gum/bubble berry famous

Vegetative Time: For indoors a suggested minimum of two weeks. For outside - germinate May or by the end of spring. Flowering Time: For indoors a suggested time of 9 weeks. For outside it will be ready early autumn. A "El Nino is Haze xSuper Skunk x Brazilian x South Indian. Tastes very earthy with a hint of Haze. Dense, highly

Dutch Passion Seedbank

Green House Seed Co.
resinous buds, but a low yielder. The high could have and should have been better when you look at the

"The strain called "5 in one" was my favorite. Very high calyx to leaf ratio. There was hardly any trimming to do

on these awesome buds!!! It was all bud I swear to ya!!! They reached maturity at about 15 inches and each

stems on these babies were strangely thin, so thin that as they were growing up though and the

smell was awesome, definitely actually could feel the different

seedless to say I am happy with

Seed Bank

5% Northern Light, and 25%

the plants are strong and easy to
divide yields. Some of the plants give very high yields, so select a clone. The plants have a minimum amount of

Not susceptible to spidermites."

Passion Seedbank
One of the first Dutch Outdoor strains, grown in Holland since the early eighties. A heavy Indica variety with:

- Flower: 8 weeks

Developed: inbred 10 plus years
Stabilised hybrid Sativa/Indica: California Sativa crossed with Indica

Appearance: big long clusters, green to goldish at harvest
Smell/taste: sweet smell

Type high/strength: good taste and strong
Height: 3-4m
Yield: very high
Harvest date (Netherlands natural photoperiod): begin Sept. 12hr day exposure harvest (# of weeks): 7-9 indoor / greenhouse / outdoor

I grew KC 36 from KC Brains, it is a very unstable strain, out of 30 seeds I got 2 good plants, I could discern 3 varieties one has very fluffy Buds and small calyxes, this one you can forget. Another one has extreme big calyxes but very few. The "real one" has big calyxes and extremely big buds and is a very good yielder. One of the good plants tends to get Bud rot cause of the massive Buds, the other is not so tight. They start to flower immediately after you turn the lights to 12/12 (about 5 Days). Flowering time app. 50 days. Take care that the

Breeder: Positronics
mothers do not start flowering, give them 20 hours light, my most promising plant just started flowering under 16 hrs light. Resin production is only strong in some plants. The real one should have a honey like smell. Cant I am not sure myself if I should keep them, I got the seeds as a present. I would not buy a strain that is unstable like this myself—cause I might even have been lucky that I got the 2 good plants— you might buy 20 Seeds and it is all crap, and you don't catch the "hybrid vigor" super plant. I suspected from the look and feel of the good ones that they might be Jack Herer stolen from Sensi and being F2 Hybrids from commercial Sensi F1 Seeds they are more unstable than Jack Herer, and J.H. is very unstable. But its just a guess. Yield is very good with these huge fat flowering plants do get resinous but not as much as other varieties. If you choose the Kush you get an Indica, but nice no sativa "thinking in circles" effects. If you decide to try this strain out look out for a mother with these huge fat flowering growths where each flower or calyx is really fat, and the Colas are fat. Leaves do get resinous but not as much as with other varieties like NL or WW. Look for resin production and big calyxes. If you choose the Kush you get a stable strain—but yield is mediocre. The KC 36 high is between Indica and Sativa, but nice no sativa "thinking in circles" effects. Few things are nice very fast start of flowering, explosive bud formation, short flowering period, high

"Like the name suggests this plant is covered with twinkling shiny THC glands. Its flavour and scent, marvelously sweet is a delight to even the most experienced smoker. She is bound to get you into the realm of space. Her buzz is typically transcendental and it is known she takes you far beyond your grasp. When you

Type: indica/sativa, Flowering time: 56 – 62 days Yield per m²: 350 – 450 grams." – Paradise Seeds catalog

"A 1997 upgraded strain. Very early flowering, very productive, a Sativa/Indica cross. Big fat buds. The aroma

Dutch Passion Seedbank

ca cross. Big fat buds. The aroma

Paradise Seeds catalog
Peak 19 was the original western name for Mt. Everest. With similar magnitude and strength as the majestic mountain herself inspires, F1 hybrid Peak 19 will fulfill your cannabis desires. The potency of this plant will take you soaring high above the rigours of daily existence. Thought provoking and physically stimulating, the highs associated with Peak 19 are somewhat trippy in their nature. This smoke should be enjoyed mostly by sure-footed high altitude experienced Sherpas or persons with a high sense of adventure. The matrimony of Stonehedge and Matanuska Tundra is one of Sagarmatha’s most prized and “flavourite” delicacies, providing:

Type: mostly Indica, indoor and outdoor. Start vegetate: shortly after roots show. Flowering time: 60 days. Average height: 1 meter. Yield: 350-375 grams / m² (dried). - Sagarmatha seedbank

Well let me tell ya the most impressive strain since Romberry’s first strain which was Romberry, has really come along nicely, its Peak19, and in both of its phenotypes it’s a real sight, it comes in a Stonehedge and Mat expression, they both start frosting with trichomes early (2 weeks), the Matanuska Tundra would work great when you need a really short plant, the spec at Sag says they are a/b .5-.75 meter, the one MT/P19 girl that Rom has is 18”, after 4 weeks 12/12, they stretch so little, it was forced at 13”, and basically all of its branches are starting to form one whole plant connected cola, it would be great in “Arena” style grows for the rows that need short style plants, or any grow where height is a factor. Also “Magic Crystal” (WWxCalO) from Ingmar is a great strain also, the odor is unmistakably “Orange” at 4 weeks 12/12, and the flowers are twice as fat in diameter as any of the 5 strains in the grow, Ingmar must select against skinny colas, because the “Ingmar’s Punch” (WWxSkunk) was the same really fat colas, I guess 17 years can lead to really fine attributes in strains, that’s a lot of time to grow out lots of generations, and do lots of selecting and crossbreeding.

About the Peak 19s, they were great the F1s have 3 types one that sticks to the Stonehedge sativa phenotype, however in this strain it’s not tall, lanky, and skimpy, it reaches about 3.5’, has tight dense colas that are frostier than many indicas. The next expression sticks to the Matanuska Tundra phenotype, very short and stocky, at maturity, after stretching the gal was just 18”, and she was flowered at 15”, very sweet and stony smoke, then there is a homogenized phenotype, that is between the two, like Tony at Sag says, “its like getting three strains in one pack”. Now the F2s my friend made are turning out as good or better then the F1s, the male used in the pollination, was very impressive, nodes were under one inch, he was very stocky, lush, and stinky at maturity, he pollinated one Stonehedge type gal, and one Mat T type gal. My friend harvested his first Peak 19 F2, and it’s every bit as good as its mom, maybe even tastier, and its
of three F2s, are the taller
one is shorter, and will prolly be

SC)

northern climates. Cold and mold
resist well. The smoke is very strong."

very compact buds. The dense,
It is breathtaking and gets you

grams.» – Paradise Seeds catalog

(fat) and about 1/2 oz of lesser
t high is really physical. Smell
with it actually, even though
me I light a j of SS, I'm surp

most indicas. Grows short, y
grow as many as you can.
Received Sensi Star through HS, 10:10 for germination. All very uniform looking plants. Ended up with 4 females, all short, very vigorous and dense in growth. I put them into bud after 4 weeks under floros when they were about 12-14”. All had minimal stretching under my 1000w hps and using CO2 with temps in 75-85 range. Out of my 4 females, one had a mold problem at 6 weeks and the other 3 are about 2 and a half feet tall buds. I have never seen better.

This hybrid is quicker and sweeter than Shiva Skunk®. Excellent indoor and greenhouse results. Plants exhibit frosted resinous leaf ratio of Early Pearl / Skunk. This 3 way hybrid contains Early Pearl®, Skunk #1® and Northern Lights®. This hybrid is quicker and sweeter than Shiva Skunk®. Excellent indoor and greenhouse results. Plants exhibit frosted resinous character of the Northern Lights #5® and the sweetness and calyx-to-leaf ratio of Early Pearl / Skunk. One of our favourites and in 1994 the winner of the mixed Indica/Sativa category.

Flowering: 45-50 days. Height: 100-125 cm. Yield: up to 100 gr. Finishing date in greenhouse: mid-October.

My Silver Pearl is beyond wonderful! VERY HALLUCINOGENIC tastes sweet like honey, not my favorite flavor but a great accomplishment. I sent away for silver pearl seeds from mike 12 days ago, he says they are on the way so I'm hoping for Friday, then greenthumb at my friends house!” Damion

Silver Pearl hallucinogenic? You bet it is! Never grew it (but have the golden ticket to do so, thanks mike) had it last year grown by a friend (he purchased seed in Adam himself) I'm a heavy toker and ill tell you, 2-3 bong hits to be high as a kite, 6 or more and you'll start seeing what I mean. Share a blunt with friends and

Not. This seems to be right on the grown. The taste of the EP (very sweet with almost minty undertones) seems to be the dominant trait carried by this strain. I love the taste. Favorite "Utility Smokes". Great

"Silver Pearl is a taller plant the stone is more up, while Super Skunk is shorter a bit heavier yield more body stone -haven't grown either since 90 so may have changed but both were nice." -Oldtimer1

"Old timer described the 2 perfectly: Super Skunk will give you that couch potato stone and Silver Pearl is more energetic/hallucinatory. I'd go with the pearl unless your growing for yield.” – DAMIONSIN

Super Skunk is really kind bud,
NYC

"This plant has the power of the ease of growth of Skunk to be one of my favorite head rush. I'm no great fan of stuff." - retro13

performed very well (especially I weed-- very resinous, nice fat node. The high is strong and the Silver Pearl would probably
- Shabang

resinous they stick together), the sativa early pearl. This has to be which is a full-on trippy head rush."

can say: its growth characteristics are quite like incense and toffee. Its 'hangover' after a night on it), sativa, but is characterized by the variability.

the parents), and have decided two main phenotypes, and when characteristics coming through.

normal, easy plant to crop without too crop. It takes cuttings well. If I can have a very nice growth stick out on long stems (an EP

and in light crystals, making the hair, as well as hairs that are up substantially releasing a when smoked is mild, yet sweet and comes on quickly. It's a bit

- Homepage Amsterdam

Light light green, sparsely coated very dense but snap crisply apart, the buds smell piney, skunky, and high is quite spacey, but energetic
Stonehedge is a marijuana of megalithic proportions. This plant has vigorous growth and excellent crystalline structure. By far the largest and densest sativa we have. Her lineage consists of an old style Cambodian type plant with a slight Western Winds influence that enhances the sativa strength and pleasure. The high she possesses is soaring and overwhelming, providing the smoker with a lithographic outlook. Whether taken in the evening or after work her magic is well received. Not recommended for operating heaving equipment. Type: Indica-Sativa, indoor and outdoor. Flowering time: 55 - 60 days. Average height: 1

Tony, an American and owner of the Sagarmatha seed shop in Amsterdam, said that the original seeds had been given to him by some Vietnam vets (so much for the "breeding" efforts). These vets in turn said that they were the result of their breeding a local (Californian) strain with a Cambodian strain they brought home. The Sag site in the last months has added a reference to Special K in Stonehedge description, so perhaps they re-bred it with Special K. In any case, it is supposed to be a "manageable" Sativa-high plant, with a decent yield and remarkable good taste (even when some reports state it has a heavy Indica influence as well). Special K, which may or may not be in there, is Sag's (corrupted) version of Serious AK-47 (Sag and Serious are spin-offs from a previous company called Cerebral Seeds, and it seems to me Serious got to it). I believe that indeed most of Sag strains are not bred or developed by them, but rather heirlooms or private stock given to them by their network of American friends, as it is the case with Stonehedge and Early Riser (Rosa, co-owner of Sag, said that this one was a Cali Orange selection given to them by a friend). Their Matanuska is most likely totally unrelated to the real deal from Alaska (people in Alaska call that name to a number of local strains, adding to the confusion) but rather related to an NCGA experiment (probably involving a NL with some alleged G-13 in it) dating back to the time they (Sag and NCGA) teamed up briefly. They just appropriated the Matanuska name, as it had a mystique, and applied to the "new" breed. I wouldn't at all, but rather is a combination very seedy (hehehe) and the they permanently lost some of their own and boycotts at their seed grow edge is not the original, but a would explain the new reference to of strains reads like a novel.

I grew out ten seeds earlier this year. The plants were quite robust and large. Although you could see some indica influence in the leaves, Stonehedge grows like a sativa with internode spacing on the long end of the spectrum. It needs a lot of light and even then the yield is somewhat exiguous. The buds grow in dense clusters and begin to put on some weight after fifty days of flowering. The aroma of the plant is subtle, an earthy grapefruit bouquet if I were pressed for a description. There is excellent resin production which picks...
The top44 is a cannabis strain developed in Holland some years ago, it's mostly indica crossed with a skunk and something else, there are a lot of speculations what this 'else' might be, but for now it's still unknown. The top44 is an impressive fast flowering plant, I never heard of a strain that was faster, it has an flowering time from only 6 weeks (44 days), but gives big resinous buds in this short time.

At first the Top44 was popular under cash growers in Holland, later on the home growers did find the great ability of the strain too, it's able to switch between vegetative and flowering grow very fast, vegetative grow will mostly stop after one week you put it in flowering. It will go inside and also outside and it's an easy compact growing plant, it is easy to get in one of the many cannabis growshops, this may change because the Dutch law is getting harder for the bigger clone producers. Because it is an compact growing plant, it's very good in a...
SOG setup, it gives one long cola if you grow 4 plants sq./feet like in the closed from the picture beside, there are growing 49 plants on soil, used are 4 liter containers and a 600 watt (Natrium) lamp, total space used in this case is 9 sq./feet, in this setup we normally grow only one week vegetative, this way we are able to get up to 6 crops a year. At the growshow (sample setup in a growshop) from Nederlicht Growshop we could see that the top44 is doing very well if it gets more space and time. On the picture beside you can see one big plant that they did grow three months vegetative (18/6), they used a 600 watt (natrium) lamp and the plant was in a 50 liter container, if you plan to grow bigger plants rule one is, use big containers. This plant has it's own taste and is very euphoric alike and the indica part gives a relaxed feeling overall, smoke it and let float your mind. It has it's own taste and is very sweet, the buds are very smelly and sticky, it has red hairs after 6 weeks. Some growers like to keep them in flowering a bit longer to get an ultimate effect, the top44 adds a lot off resin in those last days, it is easy to recognize that they got as a cutting from the breeder himself...It's been grown out at least 35 strains from the breeder himself...It's been grown out at least 35 strains from the breeder himself...

The seeds are from Paradise, a company without much reputation yet. But they're getting around the net since WeedSeed picked them up. "-shabang

I suspect that plant will do much better if you leave it and the plant is better buzzing 4 or 5 days later but you can harvest at 44 and be satisfied with the buzz without much sacrifice in potency. I've grown it from seed and from cuttings that were supposed to have been from the breeder himself...It didn't mature in 44 days (under lots of light) and it didn't yield enough. I have grown out at least 35 strains but, not top grade nederweed by any stretch. First of all, it didn't finish in 44 days. It took 54 days to reach 90% withered pistils under 45 w/sf of mixed MH/HPS light. They were less than 10% withered at 44 days. Visible trichome production is about 25%.

Secondly, like most strains whose main claim to fame is earliness, Top 44 is autoflowering. Even clones taken before changing to a 12/12 photoperiod began flowering at about 6 biological weeks old. This screams Ruderalis genes to me, but the lack of trichome production.

Indica stone, about a 6 out of 10, 10 being that yet-to-be-smoked perfect bud....

On the plus side, it has textbook "mini-baseball bat" buds with virtually no bud leaves to snip out. Clones grow straight up with no branching, making the strain ideal for SOG, less so for ScrOG. Medium high yielding. These traits no doubt are behind its Dutch rep as a good commercial crop strain.

Bank- This strain did not come from a known bank but rather an unknown (to me at least) breeder in...
Because this strain was sent as a cutting rather than seed I can't say that you will get the same results buying Top 44 seed from any bank that offers them. I do know that Jock is working with some Top 44 seed stock looking for something with the same quality as the clone ma that was sent. The original ma sent to me is the plant I will be talking about. Here are a few things you should know before considering this plant based on

- The plant was approx. 2 months from the day it rooted when put to flower. I think it was about 3 years old genetically. Plant was grown in cc jr.
- Plant had approx. 20 cuts taken at 3 different times prior to induction. The plant was grown in cc jr. (63w hps per sq.' for 10 hours, light balancer, CO2?, GH nutes) (The question mark on the CO2 is because the tank ran out at some point and I can't be sure exactly when it happened so I don't know how long it was off.)
- Plant was grown using a wick system that turned into a water culture deal when the roots grew out of the
- Plant was grown using the Screen of Green method (ScrOG-for those in the dark it's a horizontal trellis used to handle plant training rather than wires making for easier and better training strategies).
- Plant suffered a dry out of the res. which hurt the root system some (it was caught pretty quick.) After this dry out yellowing started. I believe it was due to some root damage but it could just have been because the fast growth rate required more N than I was feeding it. I'll find out next go round. (Because of this I ended up overcompensating with N too long into the flowering stage and ended up with leafier bud than I should have.)
- The first bud was snipped at 37 days with approx. 50% of flowers having turned. Main harvesting took place
- This sucker is fast! I've never seen a plant flower this fast. It sounds just like the Shiskaberry that Shiva raves about. NOW I know why he loves the Shiska and why I will love one soon too ;-) Because of the speed of flowering and the condition of the plant when put to flower I failed miserably trying to fill the area I wanted to on the screen. The plant stopped growing after only 6 days! It's not only a fast flowerer it veg's at a quick pace as well. The plant does well under low light levels. Found this out by letting it spend time under flouros during veg to help keep tight nodes for future cuts. Add this to the fact that buds on the garden edge did very well when compared with those towards the middle of the grow and I don't think you could go wrong with
- Just to give an idea how fast this plant flowers. I still have my NL#5 and put one under the screen just to get one under the screen just to get rid of the constant flowering it does). The Top 44 caught up to the NL in 3 weeks as far as flower growth goes and passed it in 4. It was amazing to watch especially after spending so many years
- Because of my failure with the screen it's impossible to give an accurate grams/sq.' number. Because the plant stopped growing 6 days after induction I ended up with a circle of buds, most small, with a big hole in the middle. (I didn't start the plant in a corner since I put an NxS plant there in case I failed---I hate empty space in a flowering area). Best guess on area covered is somewhere between 1.5 and 2.25 square feet. With that said.. 84 grams, dry was the total harvest weight for quality bud. The small amount of cooking bud was not counted in this figure. (There wouldn't have been much cooking bud at all if I had trained well since big buds were nice and tight with orange to red rust colored hairs when done. Rather than the larger resin glands I see with the N x S the T44 looks like a coat of light snow or heavy dust. Many areas of the buds looked like I imagine WW looks, white ;-) Note: This plant piles on the resin in the last few days, I don't recommend harvesting early and
It was nice to get something that smelled good in the grow to compensate for the smell, which I don't like, of the N x S when it is growing. It smells of citrus, fruity, with the skunk lurking in the background is the best way I can describe it. It isn't overpowering but did require more than a baggy to contain the smell when I cut the bud at 37 days with the 50% withered flowers. I test smoked it with a buddy on a ride. He doesn't smoke as much as I do but he isn't a lightweight by any means, he smokes almost once a day I guess. He missed 6 turns on a familiar ride in 1 hour and 15 minutes. He liked the buzz but was not happy with it for driving since he was spacing out so much. I thought the whole thing was kind of funny myself and I'm sure you know I was all over him on every missed turn. (Little did he know..I wasn't exactly catching them either ;-) I didn't like the buzz from this early bud at first, it was too speedy for me, but it did calm down after a while. The other thing that wasn't too impressive from it was the staying power of the buzz. The buds harvested later were a completely different story. Mature buds have a unique buzz. It's definitely not couch lock weed but you can find comfort in your big buddy if you want to. It starts like a sativa soar, then quickly settles into a body and mind buzz conducive to thought and guess what...you can then don't puff some more. Bottom line - as a head grower I would keep the plant just for the buzz. I like the buzz since couch lock isn't all there and will keep it in case I get back any other comments on the next Flo Sheet." – flick

A beautiful purple variety with high yields and Afghan taste. Heavy buds and high. 100% Indica. ~ Flower: 7-8 weeks ~ Harvest: end of Sept., 1st week of Oct. – Dutch Passion Seeds catalog

Sagarmatha Seeds
This variety is a Cheyenne Indica with a skunky influence, for lovers of fragrant weed with a strong buzz. Her name was derived from her

Type: Indica-Sativa. Start vegetate: 1-1.5 weeks after roots show. Flowering time: 50-60 days. Average

Region: Indo-Asian Strains - Afghanistan, India, Nepal, and Southeast Asia

A pure variety, never hybridized, imported from Afghanistan, grown in Holland. Very broad leaves, 100% Indica. Heavy buds with lots of resin. Some plants turn purple at harvest time. Rather high flower to leaf ratio. Aroma and flavor are heavy, almost medicinal. Very strong, physical, practically narcotic high. Average yields.

Southeast Asia
The Afghani part is a very short Christmas tree-like plant, 100% Indica, very resinous and very consistent. The F1-cross with Skunk #1 gives the variety a bigger yield and better taste. Very good “up” high.

Afghani #1 is basically selected Afghani back crossed with themselves to produce short squat plants with

... is very different. The leaves are huge and the buds look like golf balls. They're a very light green. I don't think they're the way I would have liked. I use bat guano, a touch of cow manure, 5-1-1, and water. They're two weeks into flowering and not nearly as vigorous as the Hindu Kush. In my opinion, the Sensi Afghan is weak and... 

Californian Dream (Afghan #1 x Californian Buddha) is a cross of two adapted northern Californian Indicas, which create a fast growing, hardy, 5 foot bush which produces chunky potent buds covered with sticky, smelly glands. Beautiful colour and excellent cast. A favourite. In middle Europe they mature in late September. In southern Europe they mature September 1. Indoors copious buds mature in resinous nuggets in 50-60 days."
This is an upgraded selection of the former valued Afghan Skunk. A 1997 improvement was made on its yield. The taste is softer than before. The Afghani (Mazar-i-Shariff) part is a very short christmas tree like plant, 100% Indica and very resinous. The F1-cross with Skunk #1 gives the variety a bigger yield and better taste. Very good "up" high. As both parents are very consistent, the offspring is very consistent too.

Flower: 8-9 weeks
Harvest: 1st week of Nov.

Started with 10 seeds and all germinated and sprouted. Two sprouts didn't make it. One just wasn't able to push out real leaves, it wanted to, but couldn't get it done... chop went the blade. The other grew but lagged behind.... chop went the blade. Of the 8 that were left 3 were female and 5 were male. This was nice since news leaves with smoother edges on the blade serrations. Two of the 3 females were somewhat similar in appearance during flower with the other doing it's own thing. They looked pretty much identical during veg growth. Differences showed in bud structure. The oddball had the braided city skyline look. I'll explain later. The other two grew tight compact buds with one of its leaf stems. Weird huh,

This plant suffered from shading of taller plants but did OK considering. It was kept mainly for how well it did through the shading since curiosity was peaked by its performance. This plant got thrown into the mix by accident and wasn't smoked by anyone that knew they were smoking it. It's a mystery plant until grown from seed.

3- This bad boy girl grew a fat top bud and may have been the heaviest of the three if it didn't suffer from some overcrowding vs. the top producer. This bad girl also had the heaviest covering of resin. This has potential to be a producer except for the long flower period, which would need to be dealt with if you're into

Note: All of the plants were harvested in approximately 10 weeks but it could have been done earlier and

Aroma: An earthy spicy thing with a skunk background. Not overpowering would probably require attention when

Buzz Above average. NL x Shiva hates this plant in this neck of the woods and for good reason. Mazar is an up and comer that could become the next couch lock champ when it's old enough to compete. Its that good now.

It was harvested much too late which could have caused this type of buzz. There seemed to be an edge to the buzz lurking so we shall see. If it wasn't because of the late harvest there will be some KOs when others get to

Taste Distorted by feeding. It had a spicy taste to it that isn't bad and could be a good one when given the
Comments: This is looking like one of those plants no one likes to smoke because it ends their day. It’s
harvested on time. Except for 5
now. All and all so far so good

Bank

to grow his own Indica. Hash


Sensi Seed Bank

Dutch Passion Seedbank
A heavy budding plant that produces crystals galore. Good rich smoke, excellent indoors and outdoors.

indoors ~ Flower: 60-70 days ~ Height: 110-150 cm ~ Yield: 300-325 gr/sqM (outdoors) ~ Plant: Jun. 1st ~ Finish: Oct. 1st ~ Height: 5-6’ ~ Yield: 2-4 oz ~

A F1 cross between two different Hindu-kush strains. Yield is high. Excellent taste and strong high. One of our

covered in long hairs that range in color from bright orange to almost white (mostly strawberry-blond). The scent is sweet and citrusy with green bio-y undertones. The taste, however, is surprisingly mild for this fairly strong-scented bud. It almost doesn't even have a taste besides the general burnt bud (brown) taste. It is also non-expansive in the lungs. The high

controlled conditions, outdoors: a rather long finish time (mid-late October) and can grow very tall, even in a 5 gal. pot. Huge plants when the buds are unusually thick and (a guesstimate) The stone is not non-expansive in the lungs. The high

and not a reseller is MasterKush. He grew them in a-dam. He gave me 5 and I’ve had them now for about 6 months when this mature...the plant matches all the photos on the web and is mature...the plant matches all the photos on the web. Unfortunately is way too physical for my liking...even Mike Tyson.... I much rather prefer the high of a sativa dominant or a 50/50 hybrid...I know, I guess I’m just a wooose but I at least like to
It turns out that the Master Kush from Aloha is a very potent strain. It knocks me out but maybe my body chemistry is different from yours! It grows real well and the floral clusters have a delightful aroma to them; like a grape flavour, maybe. Of the ten seeds I grew out, there was a lot of variability in the growing characteristics. One is short-statured and a heavy producer of many small, hard buds. I still cultivate it because I love the hashy smell it releases but as I said, "Produced by Dutch Passion, a cross between the famous Masterkush and KC 33. A very nice outdoor plant. Pure Ruderalis, despite flowering automatically, finishes in no less than 10 weeks if AT ALL. There is absolutely no use for the plant other than setting flower in equatorial varieties. This comes directly from Nevil Ruderalis: real Ruderalis is a single stem plant like a willow whip and x number of weeks after germination..."
will begin flowering irrespective of light hours. Once this is in a strain it never goes away even if all auto
flowerers are weeded out, it will reappear after a generation or two when the genes recombine to the
dominant form its like sickle cell anemia except you cant tell the carriers with Ruderalis. Ruderalis doesn’t
have large colas either. In the early days of wild strain collection, indicas from western Afghanistan were often
mistakenly called Ruderalis they were early flowering with large colas. They also will often initiate flowering
when it simply can’t be stopped and it just makes tiny colas. It’s
diffficult to tell if the (Ruderalis) gene is in a plant by the look. A friend of ours was developing a version of
white widow from a Canadian source extremely potent and resinous after several generations auto flowering
turned up so they destroyed the whole line seed stock and all. Why do you think there might be Ruderalis in
your strain it seems pretty unlikely to me. A couple of Canadian seed banks have used it quite a lot. In
Holland its hardly been used at all, Nevil experimented with it and dropped it. Sensi sell a hybrid version and

Sensi Seed Bank

“Northern or rough outdoor areas.”

It of much work by Nevil with NL and northern or in a place where there’s
resistance (or rather, a lack of resistance) you might lose the

I've grown Sensi's Rud. Skunk. The Indica was (apparently) originally a result of much work by Nevil with NL
in mid 80's. The HUGE and in-surmountable problem with this variety is mold resistance (or rather, a lack of
resistance) you might lose the

I did flower. Ended up with one

breeder
Sensi Seed Bank

excellent male and a nice but low-potency female. The male produced a nice buzz even from the leaves.
About 100 days from seed to harvest under a 24/0 light period.”

This Afghani with its penetrating Indica aroma is one of the better yielders in the collection. Its pleasant taste and above average potency make this an attractive variety for beginners.” – Sensi Seed Bank catalog

The Shiva Shanti I is a 3 way hybrid which consists mostly of an Afghani strain that we call Garlic Bud because of its aroma characteristic. The Shiva Shanti II contains a smaller part of this Garlic Bud and is added with skunk and another Afghani. It is a less stable 4-way hybrid but quality wise very nice. The flowering time will be somewhere between 45 and 55 days. It is also an F1.”- Alan Dronkers, Sensi Seed Bank

Shiva 2 is a quick, crystally below average yielder. It has a very up quality to the high.” – Sensi Seed Bank
Smoked some Cambodian in 67. It was the best we had ever seen at that time. About the size of the later Thai sticks but it was one bud, the length of a fold lock bag, light gold, $15.00 (we thought the guy was nuts, $10.00 for 4 fingers at that time) till it kicked our ass. Haven't seen any since." -Wesos

A 1995 Cannabis Cup winner. This is a very popular sweet plant. 3rd place winner 9th Cannabis Cup. A very potent 50% Indica/50% Sativa cross nicknamed The Killer! Aromatic, sweet tasting producing an incredible debilitating high. Excellent indoor and hydroponic results. This is a truly militant strain! Expect severe cerebral damage. Takes no prisoners! Highly recommended. An absolute must! AK-47 as the name implies will blow you away. Peaceful people that we are, we wanted to convey in a sentence the power of this plant, "A real one hit wonder". AK-47 shot us into 2nd place as a seed company in the 1995 cup, and in '94 it blew away the the overall Cannabis Cup. The are a delicacy to the proud farmer.

0 cm." –Serious Seeds catalog

Nevil went to great expense to obtain seeds, a commitment that is best illustrated by a secret trip to Mazar-i-Sharif in northern Afghanistan. According to the Moslem legend, one of Mohammed's sons died in Mazar-i-Sharif. Consequently, it is a very holy city. It is also known for high quality hashish. Although hash of that country greatly reduced Mazar-i-Sharif were being plane to Pakistan to save the

floor of a car, Nevil made contact between his eyes straight up to his that it had been processed by
machine guns at him, Nevil set
suaded him to send a squad of
boys of healthy Mazari seeds.
sh or opium. Nobody had ever
I tried there trying to explain
out what I wanted, he asked too
d me a bandit, but I had the

987

le those babies mature. My AK-47
smoke I or any of my friends

entering on my part - I was
ince, though I did get a couple of
copped back before flowering.
ng mothers weren' t great yielders,
ent spacing. Although I did get one
won' t be growing her out again.
igh nutrient doses and they do
ther, although you can go
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I have 2 mothers: one mostly
ent than the other that went the
thers with lots of clusters had great
days potency was strong and UP. Better than the indica, solid dense days. The high on this is the I found when I smoke too much high like G13xNL and plan on given the name Uzi... Well hope Dankmaster

I favorite of mine, that is because lar type of stone but much more of high... it makes me unable to - Mike
ger and yields more. But I'd have onic toker as many of us are. It nal high (but still very strong) with o. Too many factors involved AK doesn't smell like blue berry version does] A small extract fan then it fades away so you need

grow than WW. I got the seeds reasonably fast, flowers in about big problem. The ones I grew and the high was excellent.”-

experienced grower. Skunk strains sources. AK-47 is a multi-way la

. Will grow short to medium and depends on what you pick...an cture that packed single blades y smell, very crystally, almost it leggier but seems to be the very dense and much whiter and the high was like taking a d to search for another...you will

eral high. She is tall with large girth rl can satisfy any connoisseurs’

ts throughout. Some buds are een smell that will make your ems to chew on are all the ave plenty of polleny crystals on is expansive in the lungs and a
A bit of a cougher. Overall, the taste is outstanding. Not overly visual, a strongly mellowing high ensues that is conducive to listening to music, watching a movie or maybe hanging out at a Coffeeshop. This bud could get you to open your bag of Oreo’s or order ‘patat’ on your way home. – Homepage Amsterdam

Himalayan alpine flowers with a hint of structure set on a pale green bud. The plant’s flower, so the feeling is a sticky flow of new ideas in a fluid sort of way. – Green House Seed

Vegetative Time: For indoors a suggested minimum of 2 – 4 weeks. For outside germinate - May or by the end of spring. Flowering Time: For indoors a suggested time of 8 - 10 weeks. For outside - it will be ready early autumn. A substantial yield will be expected.

I sampled Himalayan Gold while in ‘Dam last year. It’s an extremely cerebral herb. The kind of high where you can’t control your thoughts well enough to formulate a sentence to explain how you feel!! The taste reminded me of Colombian, kind of tawny and light, it was pale green/gold with yellow/brown pistils. Seeing as how it has the sativa high you could guess that it would also have the sativa growth traits.” – Geronimo

This Southern Indian variety is crossed with Skunk #1 (F1 hybrid). As a whole the plants have a Sativa appearance (87.5% Sativa, 12.5% Indica). The buds have a sweet exotic smell and taste and a very clear effects. – Dutch Passion catalog

Seedbank

While the plants have a Sativa smell and taste and a very clear
This variety produces an almost pure Indica with fantastic mango bouquet and savory taste. She possesses a slight skunk influence and is delightfully fragrant. The stone is long lasting and lethargic. Great for the chillies.

Clip center cola. (dried)” – Sagarmatha

I have crossed a Mullimbimby Madness female to a almost pure indica male. The mother was growing outdoors and took 13 weeks to finish budding and was huge, to big. Lucky for high fences and no nosey neighbors. The buds were sticky long colas with a strange smell, very fruity and very fluffy. The leaves were real lady fingers and it had a extremely high calyx to leaf ratio. The father showed signs of pollen sacs after 5 days and the female of the variety finishes in 50 days. Hopefully when I grow out the seeds I can get a earlier producing type like the mother suitable 4 indoors. Maybe after a few backcrosses who knows. I have tried the mum indoors but is to uncontrollable like a octopus. The Madness gets to big 4 indoors even if you put it in straight on 12 hrs but hopefully crossed with a indica might bring it back a little.

I've heard many conflicting reports as to what actually is the parent makeup for the Mullimbimby. I know 4 sure that there is Thai, Colombian, Mexican, Hawaiian, New Guinean, Indian and Lebanese. In the late sixties and early seventies many a hippy and surfer traveled to those wonderful areas bringing back with them a bit of personal stash. From what I gather after talking to a few of the older guys is that it took them quite awhile to get the finished product. They kept adding strains after guys came back and grew out their seeds. When...
They had a plant that was near perfect. They stopped and started to let it pollinate itself over many years. It's very Sativa apart from the Lebanese but I think for the wait it is well worth it. - Delta9

This Indica plant produces dense, crystallized buds with a strong aroma. Originally developed from seeds obtained in Afghanistan. The strain was crossed with a potent Northern Light to make it possible to be cultivated indoors. This variety is superb for indoor production because of low smell and high yields with punch. She produces a strong lethargic stone that induces an imagined paralysis or weightiness to the feet. Persons often will "slide" their feet instead of lifting them, usually from the television to the kitchen and back again. Smoke another toke, and slide ~ Type: almost pure Indica. Start vegetate: 1 week after roots show. Clip center cola. Flowering time: 55-60 days. Average height: 1 meter. Yield: 300-325 grams / m2 (dried) – Sagarmatha catalog

F-1 hybrid Sativa/Indica: 87.5/12.5. Appearance: like Skunk #1, but more Sativa. Smell/taste: very sweet. Height: 2m. Yield: med. Harvest date (Netherlands natural photoperiod): begin Nov 12hr day exposure. Harvest (# of weeks): 10-12 indoor / greenhouse – Positronics seedbank catalog

Sagarmatha Seeds

Breeder: Sagarmatha Seeds
A Sativa-Indica hybrid that produces a quick stone with a long-lasting cerebral high. She is tall with large girth and giant calyxes. The aroma is spicy with a slight sandalwood taste. This girl can satisfy any connoisseurs' taste. So wake and bake with a bud of Special K." - Sagarmatha seedbank

Specifications ~ Type: Indica-Sativa, indoor. Start vegetate: flower shortly after roots show. Flowering time: 65-75 days. Average height: 1.2-1.5 m. Yield: 325-425 grams / m² (dried)." – Sagarmatha seedbank catalog

Nevil went to great expense to obtain seeds, a commitment that is best illustrated by a secret trip to Mazar-i-Sharif in northern Afghanistan. According to the Moslem legend, one of Mohammed's sons died in Mazar-i-Sharif. Consequently, it is a very holy city. It is also known for high quality hashish. Although hashish from that country greatly reduced exports, the Soviet invasion of that country greatly reduced exports. Althoughhash from the area had been readily available in the late 70's, the Soviet invasion of that country greatly reduced exports. In 1985, an Afghan refugee told Nevil the (cannabis) fields around Mazar-i-Sharif were being destroyed. "That was what I needed to hear," says Nevil, "I caught the next plane to Pakistan to save the seeds."

Nevil made contact with a 30-year old Muslim fanatic who had a throbbing vein that ran from between his eyes straight up to his forehead. The man took a lump of black hash out of his pocket and told Nevil that it had been processed by his uncle, a man known as Mister Hashish. Surrounded by four men pointing machine guns at him, Nevil persuaded him to send a squad of his men 280 miles into Soviet occupied territory and come back with two kilos of healthy Mazari seeds. Nevil added, "He thought I was ridiculous because I didn't want to buy hashish or opium. Nobody had ever come out to buy seeds, and at first he had no idea what I was talking about. I tried there trying to explain genetics to this tribal hash leader in sign language. When he finally figured out what I wanted, he asked too much money. I took a zero off his price and gave him 10% up front. He called me a bandit, but I had the seeds four days later." – Nevil Schoenbottom, High Times Magazine, March 1987

My AK-47 seeds produced two outstanding mothers, each of which are about the best smoke I or any of my friends have ever smoked. My seedlings didn't show a lot of vigor, but that may have been from overwatering on my part - I was completely new at the whole thing. They tend to be pretty sativa in appearance, though I did get a couple slightly indica types. They show preflowers at about six weeks, and do best topped back before flowering. They grow a lot, and stretch if you're not careful with them. My best smoking mothers weren't great yielders, but they were tall. Just not great branching. Best to grow them SOG with tight spacing. Although I did get one mother that branched like crazy, but the buds were stringy and stemmy and I won't be growing her out again. I never had any problems with infestations or nutrients. You can give them high nutrient doses and they do fine. Flowering time tends to be long, between 56-70 days, depending on the mother, although you can go short, but it hurts the yield. Yields in general were not great, but then neither is my growing technique and the high is just plain supreme. Very up, cerebral, but smooth and completely non-paranoid. No racing. My musician friends completely love the stuff. Very compatible with activity, especially creative pastimes. Good for...
AK47 (Blue Bird Coffee shop): “Nice & complex high. Flavorful taste. Elements of both sides of the cannabis

These dark green buds are very resin-y and have bunches of short, red hairs throughout. Some buds are less
green with more hairs. This hydro has a very pungent, sweet, skunky green smell that will make your mouth
water and will put a smile on your face. One or two small, crystally stems to chew on are all the non-smokables
you get. The fluffy, compact buds break up nicely and will leave plenty of polleny crystals on your fingers. The
smooth, skunky smoke tastes sweet and flowery, though it is expansive in the lungs and a bit of a cougher.
Overall, the taste is outstanding. Not overly visual, a strongly mellowing high ensues that is conducive to
listening to music, watching a movie or maybe hanging out at a Coffeeshop. This bud could get you to open

If a sledge hammer to the head is what your looking for then AK is your girl. How it grows yield and buds
depends on which side of sativa/indica spectrum is more dominant. I have 2 mothers: one mostly
indica and shorter nodes large nuggs with a fat top it built buds much different than the other that went the
usual way sorta stacked single blade leaves it didn't decrease in blade numbers with lots of clusters had great
gland production and a killer spicy wood-like smell. It flowered for about 50 days potency was strong and UP.
The mostly sativa grew a bit larger and longer nodes but flowered much better than the indica, solid dense
large nuggs covered in twice as much glands as the other. It flowered for 75 days. The high on this is the
best; the smoke will tear your lungs apart and will smash ya within minutes. I found when I smoke too much
of this one I would get a headache. Guess its very strong but not strong enough like G13xNL and plan on
breeding my AK indica with G13xNL pollen that was I given its already been given the name Uzi... Well hope
the various factors involved picking a general winner, but enough to pinpoint a personal winner for you. AK doesn't smell like blue berry
version does] A small extract fan should keep the house sweet! I'm not that impressed with AK a big initial hit then it fades away so you need
grow more. But I'd have recency toke as many of us are. It will gh (but still very strong) with a

I've grown the AK-47 and in my opinion its a better high and much easier to grow than WW. I got the seeds
from Greenhouse in Amsterdam. I believe it was by Serious Seeds. It grows reasonably fast, flowers in about 7
weeks from 12/12. It tends to flower on its own but not so much as to be a big problem. The ones I grew out
were fairly uniform but there was some variation. The smell was good and the high was excellent.”-
Seriously, IMHO, skunk X big Bud or AK-47 are excellent strains for the experienced grower. Skunk strains are stable, pure strains and very predictable when purchased from reliable sources. AK-47 is a multi-way hybrid. This one is hard to say since its a strain that reflects both sides of spectrum. Will grow short to medium and short to leggy nodes will grow sativa like fans or more indica style. This all depends on what you pick...an indica style had big fat nuggs, a bit airy though with a different budding structure that packed single blades and clusters, not usual way of decreasing fans blades...Very nice strong spicy smell, very crystally, almost white, strong wood-like taste...and strong heavy high...A Sativa will grow a bit leggier but seems to be the better side of the spectrum....it produces hard fat nuggies, not really big but very dense and much whiter than the indica. It also had much stronger smell of spice and woody taste...and the high was like taking a sledge hammer to your head!! That by far is the best one and you don't need to search for another...you will be very...

Super Chrystal is produced by Homegrown Fantaseeds. Super shiva mix. 75% Indica, beautiful and nice.

A follow up on Super Crystal from HGF, the first go around out of three beans only one female resulted, and she was whorled and not very good, medium quality smoke, Super soil, organic ferts 80 watts per sq. ft., of mixed spec light, 2 gal pots no C02. The second set of 3 beans yielded 2 ladies of only slightly better quality, the only bright spot being that they yielded about 40 grams per gallon. Sup Crystal will not be a repeat, I...
"guess it really does go to show, that cup winners mean nothing, the samples can be one thing and the beans sold to the public another. Don't get me wrong, no conspiracy theories or collusion or anything, I just mean very variable outcomes. I'm sure allowed to grow out enough seeds, one can find examples that are like the plants that generated the samples to win the CCup, but they were not in this pack.” – Budm

“This variety grown in Holland is a pure Sativa, selected for short size and early bloom. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large buds full of resin, with typical Thai flavor and aroma. Very strong and energetic “up” high. Very high yields, easy to grow. Large"
and bud sizes vary greatly with Thais I have seen, I guess, due to cross breeding by commercial growers for a quicker turnover (make that the bent Cambodian army generals and Thai gangsters) over the last 25 years. Some Thais have a Xmas tree shape with 2-ft long continuous buds and a main cola and others look like a willow tree with knotty dreadlocks at harvest time. The high can vary greatly also with some Thais or Thai/hybrids going from a hard instant knockout punch to a spacey speedy high but is almost always strong. If you manage to grow a few sensimilla style the high will be better than most Thai commercial, probably more on the spacey surreal side if you grow it to its full potential and pick it just right hmmm although I've tasted some home grown sense Thai that was very heavy and others that were almost trippy, nothing beats a good home sub-tropical grown Thai with that trippy

Dutch Passion Seedbank

Sensimilla Thai, developed from Thai parents in 1997. The Thai parents having grown in Holland for years already. A very strong plant with long thick buds. Has a Thai aroma and a clear, fresh smell. Sativa high, very strong.


Dutch Passion seedbank catalog

Durban is a compact Sativa with a sweet aroma and an up high. One of the most reliable early outdoor varieties, it will produce chunky, solid buds even during the worst season. If you
haven't tried Durban, you are missing out on one of the easiest-to-grow, highest-quality early varieties in the

confined to Natal, but grown widely in experienced growers giving 8 weeks outdoors, 10 weeks

...consistently good sativa plants with flowering period 8 weeks. Also good

I Bank Catalog 1995

this is very sweet/fruity smelling. You stash, but definitely not for liked the high of the Durban. They

...twice and pulled it early due to to mature. The Dutch version?

Seedbank

hybridized, 100% Sativa. Large long bud leaves, buds are also large and long with lots of resin. A sweet licorice or anise flavor. “Up” high produces earlier flowering. A
more accurately, has the most inconsistent or, more accurately, has the most strikingly different varieties of all marijuana originating from a single country… If you come across what is called South African or Durban Poison in the US, quite probably it originated from stock developed in the 1970’s by breeders in the San Francisco Bay area…. The unnamed breeder had two primary concerns—high potency and early flowering—and he succeeded wonderfully with both goals. This stock is perfect for the indoor gardener no matter what the growing conditions. This Durban Poison strain has broad leaf blades almost like Afghani but long internodes like sativas. Stigmas may be pure white, red, pink, or a delicate purple. Branches grow with differing lengths like Thai, and the profile may be from an eight foot ovoid down to a four-foot squat bush. This Durban is fast-growing, hardy, very early to mature, very potent, tastily sweet or spicy, and great high, similar to Thai. One of the earliest maturing original Sativa’s. Very suitable for indoors/outdoors.

I was reading that a certain Durban sold from a breeder is superior to the others sold from other breeders. No, Sensi is not the superior Durban (I think). Ask around, and make sure you buy the best strain of Durban. It is renowned for it’s early flowering characteristic, it can go outdoors or indoors, and it offers the up sativa high in a fast flowerer. It is also very stable, so you can easily breed your own seed.”-Big Bong

I bought some HBC Durban (Dutch Passion) last winter and grew a very nice crop of their Durban 1/2 indoor and i grew them out this summer and harvested about 4 weeks ago. Both company’s Durban grew very similar but the HBC Durban is wayy better. Better taste and buzz anyway. Even the aroma during growth was different. In my opinion, go with Dutch Passion’s version and stay away from Sensi’s on this one. I have nothing at all against Sensi Seed Bank but I and others who have sampled both S.S.B.’s version and Dutch Passion’s version agree that D.P.’s is much much better. Both were grown in the same soil (except for the partial indoor life under 1000k hps along with 500k mh with the D.P. durb.) and all other possible grow conditions differences were eliminated. I.e. I have seven seedbanks in my book but these two are near the top too and maybe the ones that know what I am talking about and hang here will put in their 2 cents worth before someone orders and is disappointed.

The trick is to not allow too much upward growth—on node 7 or 8, pinch out. Take the bottom 2 branches and cut them off. These should form a ‘goblet’ shape. These branches should be cut back further. These new branches will start to flower very rapidly— you should see signs within a week. These will have shot upward from the main plant and you should pinch these main branches at their tips to stop them growing. The final plant should be just over 2 foot from seed or 1.5 foot from cutting. High is totally unbelievable— its like the first time you got stoned, but better- its clean, spacey, cerebral and euphoric. Yield is average, nothing a cash-cropper would be impressed about but for personal use its...

Mel Frank says that he knows the breeder in California that developed Durban Poison, and that it came from Durban, South Africa. Only those two plants were...
worth a damn. What he doesn't say is that there must have been some other plants in the mix; a male, eh?

He notes that genetics among growers in SA were already all jumbled up from the sources they had to draw on, so the claims that Durban is a pure sativa have to be taken with a grain of salt." - SCW

I'm trying some Durban from Aloha out right now in SOG. I've harvested a small test clone from the female and it was good quality so I have a little sea of her going now.. 4 per foot in organics, mostly castings. She stretched more than I wanted or expected under the 1K Agrosun MH, I was aiming for 2 foot high at finish but change the node spacing when windows is about where I'd do it next time, but weight has more to do with it get, and resin weighs alot. She didn't get." - ~shabang~

I did have one plant that was more like a female. Recently I switched to scrog, meaning in a 2 x 2' space with a 220 HPS conversion bulb. The Durban wanted to run a bit, but that was OK with the screen method. What I have now is a number of 4-8" flower spikes about the size of large cigars, and there has been no vertical stretching for a couple of weeks. I think it will mature nicely, which is good, as Durban is our #1 favorite day smoke. A bit spindly, yes, but I can live with that; this is not for production, just personal smoke. The moral may be that Durban can work in some inside environments, or maybe just the right Durban. Like I say, so far, so

It's 1 foot to the scrog screen and that gives me another foot until the tops are too close to the light. I may raise the screen a bit next time, as the longest Durban bud is 8 inches. I let the Durban grow until it nearly filled up the scrog screen (not exactly a scientific process), and that took about 3-4 weeks from the rooted clones. Sorry, I don't keep a log book or anything like that, so I'm guessing to some extent.

From the time the lights went to 12 hours, the Durban looks to finish about 8 weeks. That's sooner than I thought, and I'm basing it on the proportion of white to brown hairs, never actually having Durban go all the way. Outside I had to harvest it early due to mold. I think I'll let it go two more weeks, while I'm away on vacation, to see if it puts on some weight, which will be about 9 weeks from lights out. The sweet indica being one thing about Durban; it's very prone to mold. I recommend denuding all the stalks beneath the screen and using a fan to provide air flow to that area. I lost several stalks to mold before I opened up the dead

Oh, and one last thing. Remember, I tried Durban sog last year, and it sucked. I had to pull them all out and start over. It was just this one Durban that seemed to have the potential to stay small that I saved, and it turns out to be ideally suited to scrog. I can't promise other Durbans will work out." -cha cal

I grew out sensi durban. Potency on a 1 to 10 a solid four. Very pretty plant but not practical to grow. And I've just grown out the durban from sensi....this seed came in original sensi packaging but it was bought when sensi had the buy 1 get 1 free sale going on....I've never grown any other "brand" of durban so I can't compare...potency is the biggest disappointment from what I've had. early maturity was nice, coming in at...I grew Dutch Passion's version. It's not worth paying for. From what I hear, the Sensi isn't much better. That is if you're looking for a pure sativa with an anise flavour. My plants looked like tall indicas. I'm not saying that the plants were absolute crap, just that they were not worth the $11 a seed I paid. Paying $28.50 per
I think the wild bank in Africa would be the best source. With any luck, I’ll have some coming in the mail any day. I saw some pics of traditional Durban leaves at Lyceum. Dutch Passion’s were not close.” - Vic High

“Today I tasted some Durban Poison for the first time. The plant was not mature yet, all pistils still white on day 60 of 12/12. Durban has a very clear energetic high for me with almost no body. About 90% head, 10% body. A fluffier and less size to the colas than many old-timers like it. Not the physical characteristics. It is fun to talk on, go out in public, and energetic. I can see now why many old-timers like it. Personally it is a nightmare in ScrOG/indoors and I would not recommend the physical characteristics. It stretches like crazy, and the buds are very fluffy and airy. The colas also fall over before they finish. The colas continue to stretch well into the 2nd month of bloom. I do not know why it is touted as an early variety. The head is great, but I think a cross to Skunk to increase density and resin is in order.” - Splif Lipsit

Better outdoors than Durban alone, yet a better yield than Mighty Might alone. A classic.

(indoors) ~ Flower: 60-65 days ~ Height: 110-140 cm ~ Yield: 300-325 gr/sqM (outdoors) ~ Plant: Jun. 1st ~ Finish: Sept. 8-15th ~Height: 5-6’ ~ Yield: 3-4 oz” – Heavens Stairway catalog

“Origin: South Africa and California Type: F1 hybrid Composition: 12.5% indica, 87.5% sativa – Positronics

Flowering-Time: 8-10 weeks Environment: Fit for inside, outside, and greenhouse cultivation Appearance: The plant has long, sticky buds and many branches Smell/Taste: High, soft taste Height: Medium tall Yield: Medium tall Yield: Medium tall

Federation Seedbank

None. A classic.

~ qM (outdoors) ~

Positronics Stairway catalog

~ African, 87.5% sativa – Positronics

~ House cultivation Appearance: The Height: Medium tall Yield:
Very simple pedigree: its an F1 cross of two stable strains: durban poison and skunk (probably skunk#1). Its not the most potent strain ever, but it is nice. Durban gives a good flavour to this plant (durban has a slight taste of aniseed, coffee or liquorice), which grows slightly larger than average skunk (but can still be cropped at under 2ft easily), plant tends towards a bush (no single stem shit here), buds are firm, very resinous and pungent. Yield is lower than many indicas, but quite respectable compared to most sativas. The reason for the resultant lower yield than ideal, so tendencies & cutting prob's) have been moderated by crossing to skunk. I wouldn't grow it outside. If I liked skunky weed (purely a matter of personal taste), then this would be a plant I would grow first off, along with Kerala skunk (similar, but from southern

Sativa Seed Club (SSSC)

I recently got my hands on seeds from my FAVOURITE SSSC strain - Durban/Thai. I have 5 healthy seedlings going as we speak (5/7 germed from 11-year-old seeds). I grew a whole room full of these babies about ten years ago and they were SO KILLER, with the kind of SICKLY-SWEET, DANK scent and flavour that makes your mouth water...so resinous that the joint would be BROWN by the time you'd smoked HALF of it. It had this "evil" scent like rotten meat when you broke up a bud. I'm going to be crossing Durban/Thai with a Haze hybrid I'm developing over the course of 1999. I'm really excited about this project!” – MrSoul

The original SSSC Durban/Thai cross is one of my personal favourites that I grew back in the 80s - I know that the mother was the Thai and she came from the fourth generation of selecting individuals which best suited indoor cultivation. This Thai mama was SWEET, I'm sure it's the Thai you remember (circa 1977?) with a head-trip high? I now have a SUPERB female D/T that I flower clones from. I really wish you could see/smoke this plant! In 8-9 weeks of 12/12 she's ripe...a really FAST Sativa because of the Durban influence, the ripening buds smell like foot perspiration...really FUNKY. Thankfully, the weed cures to a delicious licorice scent/flavour and is wickedly cerebral. DTC99 resulted from pollinating THIS female with my

Those are hybrids of Durban/Thai crossed to NL#5/Sk#1 x Hawaiian...the breeder calls the cross Durban Thai Home Hybrid, or DTHH. I had 50 from this generous friend & he even gave me his last 7 original Durban Thai

Breeder calls the cross Durban Thai & the creator his last 7 original Durban Thai
Malawi is the spaciest smoke I've ever had. I used to have this thing that happened a few times as a teenager where I'd get some killer smoke from AFOAF that would literally make me blind for 20 minutes to a half hour within 10 minutes of smoking it, a little too much too quick. Malawi is that kind of smoke. It's like you're still there but vision changes to lights and shadows and sounds become muted. You will see flashes of light and things in your peripheral vision will catch your eyes. The high was fast without all the physical sensations of the indicas. I pulled em at 75 days with 20-30% could have went another month to round out the buzz. I prefer a more mellow type high and this was just what I was looking for. Darkest leaves I've ever seen, almost look black. For me, it's the kind of smoke you'd take out to get a reaction and they figured out how to grow it.

AFOAF grew hers out when Greenthumb first brought them out last year. Leaves were enormous and the buds were huge (70-80% turned). This is definitely a sativa to grow requiring lots of attention. Leaves were gigantic and it is like tripping for me, lots of visual effects. I made the mistake of smoking an indica shortly after coming down from this one and I couldn't move for a couple of hours. Can be a typically unruly sativa to grow requiring lots of attention. Worth the effort if that's what you're looking for. It's the kind of high that is perfect for a special occasion.

Outdoors Summer Report: This baby definitely has Sativa in its genes. 6 feet and will probably add another foot before it's done. Big Christmas tree type plant. Buds are bursting out from every possible node! Even the leaves were enormous and the buds were huge (70-80% turned). This is definitely a sativa to grow requiring lots of attention.

Life Seeds
Power Plant (mostly Sativa) was developed in 1997 from new South African genetics. This strain has been inbred only, never hybridized. Very rich in THC. It is a strain with an enormous grow potential. Indoor as well as in a greenhouse the plants have an enormous yield. Indoors flowering starts already one week after turning the light cycle to 12 hours. Outdoor flowering starts late, but the plants ripen very fast. This variety is very...

July 1st, and finished on Sept. 24 at 15 inches tall. I was quite happy with both the potency and yield. If it had been a tall, full season plant; the yield probably would have been enormous. The plant grew more like an indica then I expected, but had a very good, long lasting sativa up high to it. Unfortunately, I lost all the other seedlings, and failed to regenerate the mother after harvest. I did, however, get a few seeds from crossing her with a Thai male, but that hybrid didn’t turn out well. I wish I had more of it.” – 67ed

And even though it s described as a indoor/ greenhouse stock it can become a big plant very quickly with some plants exhibiting the typical sativa structure. The 1 short female looks like it will produce well even though I only used an 8 in. pot for the plant. The harvest is about 2 weeks away so more detailed info at that time. It is a fairly branchy plant and might do well in a ScrOG set up. If the result is of high quality, I will devote a hydro farm unit to it the next go round to see how the totals compare to the much more indica stock that is most of the room, maybe just as personal stash. Now I will not say that I am beyond mistakes but I had very bad survival rates with the first batch in peat pellets and much better results the second germination round using oasis cubes instead of peat pellets. The seeds are very small and produce very small seedlings that need a little more pampering than more robust seedlings. Of course there are always new things to learn when working with a new stock.” – Rippo

Hermies tendency, not rich in resin, medium in power and shit to grow.” – elman

I had a good experience growing power plant outdoors. I only grew one female so I can't say about uniformity. I was surprised that it appeared mostly indica, but for me, the high was up, visual, and a little bit...
it would.” – 67ed

MO not good for indoor. The high

und.”

pure sativa Appearence: very
go-flower ratioSmell/taste: exotic

flowering, disease resistance, very
Sativa.
40 degrees latitude.” – High

offer a SWAZI strain. The only
for item # M5. It doesn’t exist in
and M6 Indica-creeper hybrid. I then
jil offered a Swazi strain (pure) for
Swazi (pure) is no longer being
9 catalog, HashPlant/NL#1 X

bank

well worth the wait. Exotic taste,
Sweet, earthy taste, rare to find. Resinous large buds with few sucker leaves to cull. - Wild Rose Seeds

days of flowering immediately after
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<td>B-52</td>
<td>Durban Poison X Mighty Might</td>
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<td>Hollandsch Hoop</td>
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<td>Kush X Mighty Mite</td>
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<td>Lady Widow</td>
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Origins

The Origins of Indicas

In the 60’s we brought seed back from Afghanistan and it was a pretty mixed bunch we now call indica type was what was used to make bulk cheap grade hash for export and came from had a finish time 8.5 to 10 weeks and a height of 5 ft to 8 ft but all wide dark leafed. All these were fully seeded and being a wind pollinated plant to some slopes nearer the snow line was the wild indigenous sativa type, which was rubbed to make finger hash for local consumption. All these were fully seeded and being a wind pollinated plant to some slopes nearer the snow line was the wild indigenous sativa type, which was rubbed to make finger hash for local consumption. All these were fully seeded and being a wind pollinated plant to some slopes nearer the snow line was the wild indigenous sativa type, which was rubbed to make finger hash for local consumption.

On Sativas

“What makes a sativa difficult from a commercial point of view is that a typical sativa grows to be 5'-8' tall without much encouragement, well beyond what is desirable for sea of green or mass cut technique. A finished sativa takes up 4 - 8 times the volume of space of a tight compact sativa for the same yield. Thai sativa or a Hawaiian Sativa ounce is worth probably four times more than the compact indica, almost 100% more. It typically takes a fine sativa 10 - 16 weeks of flowering versus 6 - 9 weeks for an indica, almost 100% more. Thus a Golden Triangle Thai sativa or a Hawaiian Sativa ounce is worth probably four times more than the compact indica, almost 100% more. It typically takes a fine sativa 10 - 16 weeks of flowering versus 6 - 9 weeks for an indica, almost 100% more. It typically takes a fine sativa 10 - 16 weeks of flowering versus 6 - 9 weeks for an indica, almost 100% more.

My favorite, with reasonably good yields, is the Hawaiian Sativa, requiring 85 - 90 days of flowering. Both are energy inducing, buzz n’ crackle, kinds of high. Great for activity or jobs requiring mental alertness. Of course, amongst friends, a sativa is very prized because there is no possible way to find this sativa otherwise.

Prior to 1978, what pot was grown in North America was limited to below the 38th parallel, about the tip of Northern California on down south into Mexico, which is still the world’s largest producer of pot by nation, outdoor anyway, and it was all sativa. Once the indicas were brought back by American tourists to their homes in North America, within 7 years, sativas were almost gone from the growing landscape, because in efficiency.

The indica crosses by Federation I favor would be with Mikado (indica, 45 days, powerful, aphrodisiac) and Island Sweet Skunk (Sweet Pink Grapefruit indica crossed Big Skunk#1 from Sensi circa 1992, so its 35% sativa, trippy, alert, cerebral yet strong stone with a very sweet citrusy scent.)” - Marc Emery

Origins of Northern Lights

“Northern Lights is a stabilized Cannabis sativa crossed cannabis Afghani hybrid grown in the 1970’s near Seattle, Washington. The northwest of America was the center of indoor sinsemilla (from the Spanish meaning "without seeds"), this begins the female clone technique that is common in North America. Northern Lights has been highly regarded for many years throughout the world.
and distributed by Dutch Seed companies, starting with Nevil’s Seed Bank then Sensi Seed and S.C.C.C.

The variety was inbred and selected for short early maturing plants with large floral clusters and resembles its cannabis afghanica parentage most closely. Northern Lights has been preserved through inbreeding without any marked improvements other than hybridization with other varieties. Northern Lights is a dark green, fairly short variety with leafy but very resinous floral clusters that require a 12 hour photoperiod to mature completely. Conspicuous about Northern Lights is its little smell.

“Cultivation Tips”

“Northern Lights came from the Seattle area, but I am convinced that the initial genetics came from California. Back in the late 60’s and early 70’s the principle sources of pot on the West Coast was Mexican, with some occasional Thai Stick and Nam weed thrown in for good measure. The Thai and Nam weed was not very good, and the entry of Colombian into the market out here in say, oh, 1972 (first I saw) made us all disenchanted with Mexican. I remember Christmas of 1972 some friends brought up 100 or so pounds of Mexican weed and couldn’t sell it for anything! No one wanted to smoke the crap. I took off for the holidays and came back to find them still squatting in the house trying to move the dope, when they had planned on spending a monied Christmas in the sun. They looked whipped!

Up to that time there was no real point in growing Mex. Oh sure, some tried, I had friends doing it all the time, but you know what they got. I grew two 8 footers in a closet in my flat in the University District. Besides, it was $100-130 per pound! Why go through the effort? The higher quality pots got expensive and scarce as the war was winding down, and Colombian was king at about $400-450 per pound. Well, at that price more and more people started trying to grow. And getting nowhere; huge Christmas tree plants maturing in December, if they were lucky.

So, everyone knows what happened then, someone or some group, unknown to me, got hold of some indica seed and the rest was history. The first crystallized sativa/indica hybrid I saw was from Humboldt in 1976, but I believe the scene had been going on a bit before that. And it was a fricking monster of a plant. I remember being in San Diego visiting a friend and a grower from Humboldt brought some of this stuff down. We were huge pot smokers, I mean huge, but one small joint of this stuff didn’t even get burned down. It went out, to our great embarrassment and shock. This couldn’t be!

Anyway, Northern Lights didn’t just pop up in Seattle. Obviously some seed from the California explosion got up here, and we started messing with it. The problem with Seattle of course is that our falls are too wet to grow outside past September, and the California weed was maturing in late October. The answer was to bring it inside, but then it needed to be short and quick. Some early results of the breeding activities I saw was a basement growing room, about 100 plants in soil buckets under fluorescent lights (and boxes of aluminum foil covering the wall). The plant would be recognizable today as essentially Northern Lights. This group know were connected to the California scene, no question about it, and I would bet my balls they got the seed and plants from there. The time frame is just right, for one of the group was going to college in Humboldt at the time.

But it’s also almost certainly true that this same story didn’t happen only once. Plenty of stoners were growing around here at that time, and never connected with each other, naturally.

I’ve been growing the same plant from seed and from clones ever since, off and on. I have three distinct types, and have replaced the one I was able to get “name” brands from Vancouver. So, for all intents and purposes Northern Lights is, or at least a similar plant. But as to whom actually takes credit and the full lineage of the various types sold today, that is not known to me. I retain no pure strains, because it looks to me that the Dutch seed companies have the real thing, or close.” -SCW
**Strain Notes**

**Colombian & Central American Strains**

“There are surely many types of "red" Colombians, Ecuadorians, Panamanians etc. they have been grown hundreds of years. Its is doubtful that any seedbank would have them because the yield is way too low for growing inside. The Dutch have the best commercial seeds and growing ease as much as for the high. Those sativas have problems indoors because they are naturally predisposed to longer, airier buds and 2. The intensity and spectrum of light indoors have enough ummmphhh. So, the Dutch breed over and over and over again with Afghan #1 to add bulk and reduce flowering time. They want the most bang for the buck high not the supreme or even only importance. That’s why the real connoisseur pot is grown from Dutch seeds. The real Acapulco Golds, Colombian Redbuds, Yucatan Golds, Kenyan Mountaintops, Kona Golds, Maui lime greens etc. all have several things in common: they are grown fairly close to the equator and they are all grown outside. The Sun and the altitude of many of these places just give those outdoors pots a quality of high and power of intensity that even the best indoors just can’t match.” - Will

“In S. Cal in the 70’s (I lived in Whittier from 70-73 and Redondo Beach from 73-77), there were many primo Mex’s that would blow you away. While its true that there were plenty of bad Mex’s too—you would run across a least 1 or 2 Mex’s a month that would turn you slant-eyed—and at only 10 bucks a lid. Starting around 1970, we starting getting the commercial Colombians that you described--brown and tan. Commercial Colombo went for about 200 a pound because guess what happened in 1971? The pot world really started to change in 1971--there became a new designated Colombian connoisseur. These pots cost an unbelievable 50 to 60 dollars a lid --and you would ever pay that much until...I smoked some. Colombian redbud--marijuana that was red like tobacco and an indescribably "red" flavor and taste. The resin from a smoked joint was blood on your lip. And Colombo Goldbud--totally gold pot that had absolutely no brown or green in it---a spicy piney taste and an exhilarating high and Colombo blackbud--more of a purple and having a devastating "creeper"--one of the hallmarks of the Colombian. These pots were the new wave of pots in ’72-'73—the sinsemillas. The Mexicans had been losing market share so they started flooding California with green and brown sinses that could really pack a wallop. Lots of light green skunks and gold/brown sinses that went for 50-60 bucks--just like the connoisseur Colombian. These pots were seed, of course unbelievable and went for up to 100 dollars an oz. (lids out, ounces in). At that same time, a lot of Thaisticks started becoming available--they were 20 bucks a 2.5-gram stick and were worth it. Spacy, powerful, blowaway pot. To round out this smorgasbord was Jamaicans, which briefly were very very good before they started to export crap. Those times were the best time ever for pot. Plenty of primo Mexicans, sinse, Colombo, Thaistick, Jamaican— as the 80’s approached, there were lots of more indica based stoner pots that was super heavy Afghans and skunks but the lighter budded sativas became much less common. My cousin in LA still runs across some primo Mexican and says that there is actually more good Mex coming across again with he claims some red Colombo being available. So getting around to my point and that is: Mexican pot can be might tasty if it is fresh.” - DB Cooper

**Hawaiian Strains**

"Lemme just describe this Hawaiian a bit more for you.. Totally white in appearance, color to the buds, combined with a thick coating of resin, it gives that total white..."
too. There ain't no way I'm trying to break open these nugs with my fingers. scissors leave a clean slice through
the bud like it was one dense mass. Very sweet smoke, has a deep vanilla tone under the fruit punch exterior.
This is definitely an all time fave (right along with this guy’s Blueberry... he's doing “

**Northern Lights Strains**

Because Northern Lights is one of the most widely crossed strains of cannabis, NL crosses with 50% or less NL
heritage are listed under the heading of the cross, i.e. NL x Haze is found under “

**Skunk Strains**

Because Skunk is perhaps the most widely crossed strain of cannabis, Skunk crosses with 50% or less Skunk
heritage are listed under the heading of the cross, i.e. Haze Skunk is found under

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**Chronology of The War On Drugs (Neal Smith)**
1840 - During an attempt at alcohol prohibition, then-attorney Abraham Lincoln stated: "Prohibition makes a crime out of things that are not crimes...A prohibition law strikes a blow at the very principles upon which our government was founded."

1842 - Cannabis makes up about half of all medicines sold in America. No one reports serious problems with use.

1850 - Cannabis prescribed as the prime medicine for more than 100 separate illnesses or diseases in U.S. Pharmacopoeia.

1875 - California, in a blatant act of racism, bans Opium smoking by Chinese. Large, well-run opium houses are replaced by smaller, less reputable houses. Usage increases.

1876 - Turkish Hashish exhibition at Philadelphia's Centennial Exhibition was most popular. Fairgoers encouraged to return again to "enhance" their enjoyment of the fair.

1883 - First Federal law against drugs. Congress heavily taxed smoking Opium to raise revenues. Controlled by Treasury Department.

1884 - Supreme Court decision making corporations artificial persons. Gives corporations 14th amendment protections.

1888 - Using 1883 Opium taxation law as precedent, Federal government banned Chinese from importing Opium at all. Government now surrenders revenue raising in favor of controlling "morality."

1889 - Using 1883 Opium taxation law as precedent, Federal government banned certain types of Opium from being imported, and smoking Cannabis, urges against any prohibition based on "no appreciable physical injury of any kind,...no injurious effects on the mind,...(and) no moral injury whatever."

1894 - Indian Hemp Drugs Commission report released to British. Study done in India. Judged the physical, mental, moral effects of smoking Cannabis, urges against any prohibition based on "no appreciable physical injury of any kind,...(and) no moral injury whatever."

1898 - Spanish American war starts, with William Randolph Hearst's "Yellow Journalism" fueling the fires. Hearst begins his long campaign of racism against Hispanics, Orientals, and Africans, and the things they do in their cultures.

1900 - Eli Lilly and Parke Davis, in a joint venture, develops strain of Cannabis called Cannabis Americana. Strain is a very potent Cannabis Indica, to be used in their medicines. Mellon bank, 6th largest in America, finances very successful oil "gusher" in Spindletop, Texas.

1906 - Pure Food and Drug Act (Wiley Act) passed. Opens door for government intervention into food and medicine production.

1912 - Wiley Act amended, giving government right to determine if a substance is "harmful."
1913 - Pancho Villa, Mexican freedom fighter, recovers 800,000 acres of Sonora, Mexico timberland bought for pennies on the dollar of value by William Randolph Hearst. Villa and his men are great smokers of "Canamo" (Cannabis). Hearst, in retaliation, starts slur campaign against Cannabis, using Mexican slang word "Marihuana," and claims it causes Mexicans to be lazy and thieving. By 1920 Hearst applied Cannabis to Blacks, claiming that after smoking it, Black men were insolent and wanted to rape white women.

1914 - Passage of Harrison Anti-Narcotics act, requiring taxation and permits for doctors who still prescribed Opiates. Six months later, "American Medicine" - risen with sinister consequencesresulting from the character of places addicts needed to go to procure drugs, and the people they had to associate with. The news media of the day continues to mis-report drug issues. The New York Times says Cannabis has "Practically the same effect as morphine and cocaine." WWI starts in Europe, with assassination of Arch-duke Franz Ferdinand of Austria in Sarajevo.

1916 - USDA issues bulletin 404, urging the use of Hemp paper. Department issues dire warning about the dangers of using wood pulp paper: "Our forests are being cut three times as fast as they grow...it is advisable to investigate the paper-making value of the more promising plant materials before a critical situation arises." Since Hemp produces over four times more paper per acre than trees, without the need for hazardous chemicals such as sulfuric acid and dioxins, USDA urges more use of Hemp for paper.

1918 - Alcohol prohibition starts. It's likely that certain interests like duPont lobbied for alcohol bans to prevent production of non-petroleum fuels for the burgeoning automobile industry. duPont begins production of rayon, continues research into synthetics. Secretary of Treasury reports underground drug trafficking flourishing, "dope peddlers" had established a nation-wide organization, smuggling was rampant, and use of forbidden substances was increasing.

1919 - Alcohol prohibition begins, just as Ethanol is about to compete with biomass fuels. Mellon has a hand in it.

1921 - Tobacco cigarettes are banned in 14 states.

1924 - Heroin importation or manufacture was banned, despite its pain killing qualities. Illegal use increases. William J. Burns (of Burns Detective agency), now Bureau Director, in appropriations committee testimony claims the proof is very conclusive...overwhelming that in all strikes in the United States, this radical propaganda enters into the situation. These radicals...take advantage of the ordinary strikes that occur throughout the country and disorder." Racial unrest was consistently, according to Burns, ascribed to alien agitators. Black "social activities," according to Burns, was considered a matter of "a general intelligence nature," along with radical and anarchistic activities. Bureau considered calls for labor organization among unskilled Blacks as especially sinister. Bureau finally reined in from intelligence gathering. New Attorney General Harlan F. Stone voiced fear that "a secret police may become a menace to free government and free institutions because it carries with it the possibility of abuses of power which are not always quickly apprehended or understood." Further says the Bureau is no longer interested in politics or other opinions of individuals, concerned only with their conduct and then only if that conduct violates the law. Hoover, Burns have to go along. Even with Bureau out of radical hunting picture, local and state and private groups take over, keeping red scare alive.

1926 - Herbert Hoover sets up Chemical Advisory Committees with Fraternity member. Irenee duPont speaks publicly about creating a race of supermen
with drugs.

1927 - Enforcement of Wiley act moved from Bureau of Chemistry (USDA) to Food, Drug and Insecticide Administration. Given further powers to ban "harmful additives." No real criteria established as to how to make a legitimate determination of what is harmful and what is not. Government has responsibility to prove substance is harmful.

1928 - duPont contributed major money to get Herbert Hoover elected president over Catholic liberal Al Smith.

1929 - "Great Depression" causes hundreds of suicides over financial losses. Hitler's government supplied Jews and political dissidents for the laborers, who were worked to near death and then murdered. Perhaps the forerunner of the plan to imprison peaceful Marijuana smokers as American prison labor?

1930 - Harry Anslinger, the nephew-in-law of Andrew Mellon, is appointed head of Bureau of Narcotics.

1931 - Siler Commission report on soldier's use of Cannabis in Panama released. Indicating alcohol, not Cannabis causes problems. "Use of the drug (sic) is not widespread and...it's effects on military efficiency and for renewing the penalties formerly exacted." Anslinger attends the first international narcotics conference, strikes up friendship with Baron Von Rheinbaben, head of the German delegation. Von Rheinbaben was Hitler's head of German Intelligence in Lisbon, Portugal during the war. Anslinger kept in touch with him "...Helped us out in several very delicate matters."


1936 - Meetings between duPont and Treasury department. Formulating plans for making Hemp illegal.


1940 - Standard Oil of New Jersey and I.G. Farben of Germany opens the slave labor camp Auschwitz to develop artificial rubber and gasoline from coal. Hitler's government supplied Jews and political dissidents as laborers, who were worked to near death and then murdered. Perhaps the forerunner of the plan to imprison peaceful Marijuana smokers as American prison labor?

1941 - Popular Mechanics issue of December reports Ford Motor Company...
fibers. More durable than steel, lighter weight, and furthers Ford's belief that he can "grow automobiles from the soil."

1944 - New York Mayor LaGuardia issues his report on Cannabis smoking. "does not develop addiction or tolerance...and is not a direct causal factor in sexual or criminal misconduct."

1945 - War ends. Nazi war crimes trials are set up. U.S. Army and Navy set up into American intelligence community. Up to 350 specialists approved by U.S. dependent on scientific knowledge over the Soviets, urges Nazi scientists be turned into prison, starts anti-Soviet espionage unit with his former Nazi aides; assigned Special Study Group." Prior to surrender to Americans, Gehlen buries microfilmed Soviet intelligence in Austrian Alps. Gehlen turns over to interrogation center. Gens. Siebert, Smith, OSS leader Alan Dulles, assigns units. Gehlen, 3 assistants sent to Washington for debriefing. Siebert given control over his own authority."

1949 - Law enforcement crack down on non-prescription barbituates triggers 800% increase in use by 1970.

1956 - U.S. Narcotic Control Act provides death penalty for selling Heroin to minors.


1966 - Syva division of Syntex begins biochemical research to develop urine tests for controlled substances.

1968 - Campaign against Cannabis use by soldiers in Vietnam results in increased laws with the intent of implementing their tried and true Gestapo tactics of surveillance, dispersion and disruption under COINTELPRO. Anti-war, anti-nuclear, pro-environment, pro-Marijuana groups, women, gays, and others now suffer the same treatment as communists and blacks. Author Frank Donner describes it by saying: "The New Left COINTELPRO was an undisguised assault by the self-appointed defenders of the American way of life against an entire milieu..."The government, however, did not count on the dedication and tenacity of what they considered "dirty Hippies." Because of an enlightened attitude among many of the Hippies, the government has only limited success in infiltrating and disrupting most groups. They did, however, target the Students for a Democratic Society (SDS) and it's militant faction, the Weather Underground. As a result of the major riot at the Chicago Democratic National Convention, SDS leaders Abbie Hoffman and others were tried and convicted of inciting to riot. SDS survived for several years, but was severely weakened by the Chicago Streets Act of 1968. This act authorized the federal courts to issue wiretapping warrants at the request of the Attorney General when there is probable cause for belief that an individual is committing, has committed, or is about to commit any one of a long list of crimes. The House Unamerican Affairs Committee (HUAC) is dissolved and replaced with the House Internal Security Committee (HISC). This committee is established to keep an eye on organizations whose goal is to overthrow the government, however, target the Students for a Democratic Society (SDS) and it's militant faction, the Weather Underground. As a result of the major riot at the Chicago Democratic National Convention, SDS leaders Abbie Hoffman and others were tried and convicted of inciting to riot.
presidents since. The Gun Control Act of 1968 passes. It is directly written from Germany's Weapons Control law of 1938.

1969 - New York City increases drug arrests by 9000. No impact on drug availability noted. The Supreme Court rules in the Alderman case that in a criminal proceeding, the court must be notified of evidence overheard through electronic monitoring. If the court rules the evidence was illegally obtained, the defendant has the right to review the evidence to determine if the illegally gathered evidence tainted the entire case. A refusal by the government to reveal the surveillance, or it's extent is ruled as grounds for dismissal of the case.

1971 - Nixon declares drugs "Public Enemy Number One"

1972 - Shafer commission report issued. Finds no reason that Cannabis should be kept illegal. Nixon declares calling for relegalization. Finds no physical, mental, or moral problems with Cannabis. President Nixon, who commissioned report, refuses to accept findings. Nixon calls drugs "America's public enemy #1." Congress passes $1 Billion dollar anti-drug bill. Little effect noted. By 1972 Communists were becoming an endangered species. Bureau of Narcotics and Dangerous Drugs, later Bureau of Alcohol, Tobacco and Firearms, needed new enemies. Started concentrating on "New Left," such as Women's Liberation Movement, Gay movement, Anti-War Movement (though they had been looking at anti war movement for awhile) and Hemp (at that time Marijuana) Movement.

1973 - Nixon declares "We have turned the corner on drug addiction in America." New York. Little effect noted. Nixon's staff, upset by the counter demonstrations at Nixon rallies, puts out the false news story that foreign and communist money financed anti-Nixon efforts. The CIA is still unable to provide any proof, as none existed. Nixon later changes the story to mean "foreign support," a vague statement that, in reality, meant people in other nations did not want the Vietnam war either. Juan Peron briefly seizes power once again in Argentina. He dies in 1974. His return to power is believed to have been mostly financed by his late wife Evita's fortune of Nazi money. Thanks to the Perons, the original Nazis, and now their direct descendants, are firmly entrenched in not only Argentina, but all of South America.

1974 - Rubin, Comitas study "Ganja in Jamaica" released. Finds no long term physical, mental, moral problems from Cannabis smoking. Budget for drug enforcement reaches $292 Million dollars. $462 Million earmarked for demand reduction and treatment. SISS publishes 400 page report claiming Marijuana traffic constitutes an unprecedented threat to nation's security by New Left groups trying to ruin this country's morals. The report, as most are, is full of falsehoods and outright lies about Cannabis. There is no evidence that any foreign government or "communism" has anything to do with Marijuana or drug trafficking.

1976 - F.D.A. powers expanded to control all "medical devices."

1980 - Costa Rica studies released on Cannabis. No distinguishable harm found from use of Cannabis. First Emit Cannabinoid test developed. With aggressive marketing to industry, government, military, Emergent is the fastest growing of the tests, though accuracy is next to nothing.

1981 - U.S. Military begins forced urine testing of military troops. Drug control now costs $1.5 Billion dollars...more precisely, $1,531,000

1984 - Seal unloads a shipment of Cocaine in Nicaragua. He had picked up the load in Columbia and was ordered by the DEA to stop in Nicaragua. Seal had been arrested on drug charges in 1982, and beat the arrest by working with DEA in a sting operation against the Ethiopian drug traffickers.
Medellin Cartel. The CIA had fitted Seal's plane with hidden cameras for the next trip for Cocaine being smuggled, which the Reagan Administration used to try and scare Congress into appropriating money for the Contras.

DEA became upset that the CIA had co-opted its sting operation in favor of providing pro-Contra propaganda. Seal's cover was blown, and he was dropped from favor by both the CIA and DEA. Seal was sent to prison for his drug conviction, but was shortly released on probation. Seal was subsequently killed by "unknown gunmen." The CIA kept Seal's plane, "The Fat Lady" and pressed it into service running guns and drugs between Central and South America and the U.S., much of it coming in through Mena, Arkansas. Pilot Eugene Hasenfus survived the "Fat Lady" being shot down by Sandinistas in Nicaragua, and promptly claimed the protection of President Ronald Reagan.

1985 - Milton, Wisconsin high school students forced to submit to weekly urine tests. Baseball commissioner Peter Uberroth orders all personel, except union players, submit to urine tests. By 1990, even ball players are encouraged by government to begin wholesale drug testing. Many comply.

1987 - Nearly half of all major American industry is now forcibly urine testing employees. By 1990, even ball players are encouraged by government to begin wholesale drug testing. Many comply.

1988 - U.S. Senate adds $2.6 Billion to federal anti-drug efforts. Little effect noted. Senate requires annual "National Drug Control Strategies" be presented, complete with short term and long term goals. The Marijuana Movement, now encompassing the industrial and medical benefits of the plant, reassembles in response to stepped-up prosecution. Drug testers are poorly trained, uncertified. Drug budget reaches $6.7 Billion dollars. By late in the year, drugs reach the top of public opinion polls. President Bush institutes his first drug control strategy, which emphasizes law enforcement.

1989 - Dr. John P. Morgan finds drug testing "...far from reliable...testing companies are poorly trained, uncertified. Drug budget reaches $6.7 Billion dollars. By late in the year, drugs reach the top of public opinion polls. President Bush institutes his first drug control strategy, which emphasizes law enforcement.

1990 - Drug budget for this year is $9.7 Billion dollars...and rising every year.

1991 - NIDA reports drug testing more for surveillance than safety. Drug budget: $8.7 Billion dollars.


1993 - Dr. Joycelyn Elders, U.S. Surgeon General, calls for discussion on relegalizing drugs. President Clinton quickly reins her in. Elders son is arrested and charged with possession of Cocaine. Drug budget for FY 1993: $12.1 Billion dollars.

1994 - Secretary General of Interpol, Raymond Kendall, lends his voice to the growing list of significant persons opposing the "war on drugs," as unwinnable and too costly, proposes what he terms depenalization as being in violation of double jeopardy points in Constitution. Estimates are that Cannabis is America's largest legal crop, a crop, while still illegal. Estimates of the nation's largest legal crop, corn, are $16 billion. Police departments across the country run ads, otherwise encourage citizens to turn in drug users, with an emphasis on Cannabis. There are an estimated 340,000 people in jail or prison for Cannabis related crimes, at a cost of $25,000 to $27,000 dollars a year per prisoner. Greatest effort in the nation's history to ban firearms from citizen possession. Attempt at passing yet another Omnibus Crime Bill fails over the proposed ban on 19 types of "assault" rifles. Would provide money for 100 thousand more police officers, and build still more prisons. At least one sixth of police in the nation are completely unionized. A group of citizens files suit in Federal Court to end the Vietnam war. A group of citizens files suit in Federal Court to end the Vietnam war. A group of citizens files suit in Federal Court to end the Vietnam war. A group of citizens files suit in Federal Court to end the Vietnam war.
nation's prison population are behind bars for Cannabis "crimes," and you are more likely to draw more prison time for involvement with Cannabis than for killing someone. Widespread police use of road blocks looking for drugs begins. Police use intimidation to coerce driver's into consenting to vehicle searches. Police begin to use "Profiling," a method of finding drugs. Drug budget up to $12,184,400,000


1996 - Clinton wins a second term as President. He names retired Army General Command in Panama as his new drug Czar. California passes Proposition 215 which allows a doctor's order. Arizona passes Proposition 200 which allows a doctor to prescribe a variety of currently illegal drugs. California Attorney General Dan Lungren tries every stalling tactic possible until the U.S. Justice Department can intervene and arrest people on Federal charges. Lungren runs for Governor, loses. New California Attorney Lockyer favors the legislation. Some California citizens, with open-minded local governments do get needed medicine. Arizona's legislature overturns the referendum. Arizonans go back to the ballot box in 1997 and vote it back in. Drug budget: $13.4 Billion dollars.

1997 - Nearly 642 thousand arrests are made in 1996 for Marijuana. 545 thousand were for simple possession under a doctor's order. Arizona passes Proposition 200 which allows a doctor to prescribe a variety of currently illegal drugs. Clinton announces doctors who prescribe or recommend Marijuana will be prosecuted and lose their ability to write prescriptions. The DEA demands the names of Arizonans who purchase Marijuana cultivation books. Federal agents seize 331 Marijuana plants and a Marijuana Buyers Club in San Francisco. An Australian study shows the health of long term Marijuana users is virtually no different than that of the general population. "We don't see evidence of high psychological disturbance among long term users" according to study chief investigator David Reilly. "The results are unremarkable; the exceptional thing is that the respondents are unexceptional." In May, Rep. Barney Frank introduces a Medical Marijuana Bill in the House. Bill is virtually ignored. The New England Journal of Medicine calls the U.S. government's opposition to Medical Marijuana "Misguided, heavy-handed and inhumane." They call the Clinton administration's position "Hypocritical," and calls on the government to change Marijuana from Schedule 1 to Schedule 2. A study is released by the U.C.L.A. School of Medicine showing that no long term lung damage is evident in Marijuana smokers. The study is an 8-year long investigation into the study conducted by Dr. Donald Tashkin. "Neither the continuing nor the intermittent Marijuana smokers exhibited any significantly different rates of decline in (lung function) as compared to those who never smoked Marijuana." The conclusion of a comprehensive, long-term study by Kaiser Permanente shows no substantial link between regular Marijuana smoking and death. It does conclude that Marijuana Prohibition causes much greater harm. Researchers found no increase in deaths among the more than 14 thousand patients who reported smoking Marijuana as compared to those who had never smoked.

1998 - Marijuana becomes the nation's fourth largest crop, in spite of being illegal. Nearly 700 hundred thousand arrests for Marijuana were made in 1996. Nearly 2.8 million Marijuana arrests have been made. Yet another study showing very little risk of having an automobile accident after having smoked Marijuana. This one is from Australia. Clinton's tolerance of Marijuana in the Netherlands has had on crime in that country. In America's. In fact, the Netherlands's murder rate is 440% lower than the U.S. It's not the first time McCafferey
New Scientist exposed a conspiracy from the World Health Organization with Marijuana. An unnamed National Institute on Drug Abuse (NIDA) and someone (sic) "warned the WHO that it would play into the hands of groups campaigning for relegalizing for medicine. Most Medical Associations favor an end to Marijuana prohibition. Mississippi legislature by Rep. Bobby Moak (R-Lincoln County) authorizes "The penalties imposed by the court for violations of the Controlled Substances law." Law for Substance Abuse at Columbia University releases a study stating that Marijuana use showed less than one percent of persons who committed crimes were under the influence of only Marijuana when they committed a crime. Further, the study shows only between one and four percent of violent criminals were under the influence of Crack Cocaine or Heroin during the commission of crime. U.S. House of Representatives Speaker Newt Gingrich called for "Greatly increased" activity on the part of government in the War on Drugs. He urges Drug Czar Barry McAfferey to map "A World War II style battle" of drug use in America. America spends on average of $30 billion per year. Gingrich authored a bill calling for the death penalty for anyone caught importing more than 100 dosage units of an illegal substance. That could include anyone carrying more than 50 grams of Marijuana over the border.

A rather dramatic study out of Italy shows that Anadamides, chemicals similar in structure to chemicals contained in Marijuana, causes the body to ease the symptoms of pain. Thus, Marijuana-like chemicals are produced naturally by the human body to combat pain. Researchers at the University of Naples found that Marijuana fared well in 5 of 7 long-term health comparisons. Further, the WHO report states there is no threat of long term lung damage (sic) "warned the WHO that it would play into the hands of groups campaigning for relegalizing for medicine. Most Medical Associations favor an end to Marijuana prohibition. Mississippi legislature by Rep. Bobby Moak (R-Lincoln County) authorizes "The penalties imposed by the court for violations of the Controlled Substances law." Law for Substance Abuse at Columbia University releases a study stating that Marijuana use showed less than one percent of persons who committed crimes were under the influence of only Marijuana when they committed a crime. Further, the study shows only between one and four percent of violent criminals were under the influence of Crack Cocaine or Heroin during the commission of crime. U.S. House of Representatives Speaker Newt Gingrich called for "Greatly increased" activity on the part of government in the War on Drugs. He urges Drug Czar Barry McAfferey to map "A World War II style battle" of drug use in America. America spends on average of $30 billion per year. Gingrich authored a bill calling for the death penalty for anyone caught importing more than 100 dosage units of an illegal substance. That could include anyone carrying more than 50 grams of Marijuana over the border.

1999 - A U.S. Air Force directive in February forbids all personnel from using Hemp products, since they cannot distinguish between legal Hemp products and Marijuana. An unnamed National Institute on Drug Abuse (NIDA) and someone (sic) "warned the WHO that it would play into the hands of groups campaigning for relegalizing for medicine. Most Medical Associations favor an end to Marijuana prohibition. Mississippi legislature by Rep. Bobby Moak (R-Lincoln County) authorizes "The penalties imposed by the court for violations of the Controlled Substances law." Law for Substance Abuse at Columbia University releases a study stating that Marijuana use showed less than one percent of persons who committed crimes were under the influence of only Marijuana when they committed a crime. Further, the study shows only between one and four percent of violent criminals were under the influence of Crack Cocaine or Heroin during the commission of crime. U.S. House of Representatives Speaker Newt Gingrich called for "Greatly increased" activity on the part of government in the War on Drugs. He urges Drug Czar Barry McAfferey to map "A World War II style battle" of drug use in America. America spends on average of $30 billion per year. Gingrich authored a bill calling for the death penalty for anyone caught importing more than 100 dosage units of an illegal substance. That could include anyone carrying more than 50 grams of Marijuana over the border.
study published in the February 4, 1999 issue of the New England Journal of Medicine shows no link between miscarriages and Marijuana use. Further, Marijuana shows "No reliable impact on birth size, length of gestation, or the occurrence of physical abnormalities," according to Dr. John Morgan, of NORML. This year's drug war budget will cost taxpayers $17,886,200,000. This year's drug war budget will cost taxpayers $17.8 Billion dollars more than President Clinton had requested. In December, a conference of the World Trade Organization is held in Seattle. A massive protest of that body that seeks to control the commerce of the entire world ends in bloodshed and some property damage. Police are likely causes of the trouble. Crowd is fired on with rubber bullets and "Flash Bang" grenades, in spite of police denials of such weapons. Several hundred arrests are made. Evidence that police launched cannisters of nerve gas against the crowds exists. Police again deny that they used this weapon. Many of the delegates refuse to agree on trade regulations. The Echelon spy satelite network is finally confirmed by some of America's allies. The system was first put into place shortly after WWII and upgraded several times since. The system is designed to spy on the citizens of several countries, including the United States. 2000 - The annual budget for the War On Some Drugs request is the highest ever: $17.7 Billion dollars...some claim $19 Billion dollars. We now incarcerate 2.5 million people. Of the two million, approximately 61% are in on drug charges. Of that group, approximately 82% are in on Marijuana charges. Of that subset, 65% are for mere possession cases.

**FOREWORD**

What you are about to read is a compilation of history. R. William Davis and I had been independently asking the question: "Why is Marijuana illegal?" Every time we found an answer, it led to several more questions. Randy had been looking into other political activities, mainly concerning the Nazis of Germany. He soon drew a connection between the general attitudes of the Nazis and members of the government and industries of The United States.

Much of politics of the first half of the 20th century centered around oil and the great amount of wealth available to those who transformed decayed plant material into gasoline for the automobile industry, home heating, lubrication and the new idea of synthetics...plastics. Of the big oil families, the Rockefellers were, and still are, at the top of the heap. Those who supported the Rockefellers, specifically the Mellon banking family, also profited greatly. Andrew Mellon, who had invested a great amount of money in Rockefeller, wasn't going to lose the chance of becoming fabulously filthy rich by putting out whatever their cronies said was news. These people had absolutely no concern for the health and well-being of society at large. Indeed, the less the average man knew, the better for the rich man. Strangely enough, it was many of these same people who were responsible for the illegalization of Hemp/Marijuana.

Hemp, the plant that humans have used for several millenia, and the industry for cloth, rope and oil, was on hard times. Hemp, though growing luxuriously throughout America's farmland, was extremely labor-intensive. Until the availability of the Decorticator, Hemp had to be harvested in large part by hand. American industry needed...
more than Hemp could produce in this way.

The Decorticator came on the scene in 1935. Hemp was on its way once again. The petroleum industry saw a problem: Fuel could be made from Hemp that would be more efficient, and with a greater supply than crude petroleum oil. Rudolph Diesel invented an engine intending it to burn vegetable oil, mainly Hemp. Hemp was already well known for its lubricating ability, which was of importance to the young aviation industry. Hemp oil in aircraft engine doesn't break apart chemically at high altitudes like petroleum did. Now with the Decorticator a reality, Hemp was on its way...again.

Hemp, as I'm sure you know, is in the same family as Marijuana...the flowering species of Cannabis Savita L. It was smoked freely, in the form of Hashish, in hash dens that were popular in America's bigger cities. But Blacks and Hispanics were known smokers of the dried flowers and leaves. Jazz musicians of the period were known smokers of "Reefer." Those in Big Oil and their cronies found an excuse to drive Hemp away: Claim all sorts of bad things about distinction between Hemp and Marijuana so the average person won't know what would be taken away. Do this by playing on White America's racism. Scare them that would drive you insane or lead you to more insidious drugs like Heroine and Cocaine. By 1936, "Reefer Madness" was well played. Well played enough to cause Congress to pass the Marihuana Tax Act of 1937. Hemp was crippled. Big oil was safe.

Meanwhile, Adolph Hitler was building Germany into a war machine with the same American industrialists that wanted to ban Hemp! Hitler had no oil. Rockefeller did. With the help of the greedy, Hitler got his oil. We know the rest of the Hitler story.

After World War II, our intelligence community turned its attention to the Soviet Union. They used former Nazi intelligence agents as well as other Nazis against the Russians. Over ten thousand former Nazis, many of them war criminals, were brought into the United States and put into our Central Intelligence Agency. They brought their hatred, their inhuman experiments, and their willingness to subjugate all for the greater good of National Socialism. With the help of America's right wing, they became entrenched. Their policies still rule America today.

The prohibition of Hemp/Marijuana was fallout-part of a much bigger picture. Total control over what we read, see, hear, eat, and smoke. The policies that led to Marijuana prohibition are the same policies that have taken away rights that true Americans hold dear.

This piece is a chronology of the events of the 20th century, into the first days of the 21st century. Because of the "War On (Some) Drugs" Americans now stand to lose all of our freedoms. It is a very complex concept. When you look at the inter-related elements in their historical context, you begin to see how and why the government we have now is not legitimate.

If you wish to replicate or further investigate any of this, and I urge you to do so, I provide the bibliography. Over the past seven years, I have checked and cross checked, researched and confirmed any and all available sources on this information. Some proof is too well protected for anyone to get at right now. Which in and of itself speaks ill for a so-called free society.

Neal Smith 3-12-00
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Multinational Corporations And The War On Drugs
by By Reverend Damuzi (11 Jan, 2000)
http://www.cannabisculture.com/

Free Trade is just another word for banning all your herbs.

The War on Drugs is a trade war being fought by multinational pharmaceuticals, who want to ban all natural herbs and monopolize all synthetic drugs. Their strategy is now being copied by multinationals in other arenas.

The war on drugs has repeatedly been a justification for countries with over-developed corporate sectors, like the United States and England, to impose their will on other nations.
prey upon weaker countries, like those in South America. Sometimes the enemy has been opium, sometimes it has been marijuana, but all have always been cut down alongside the plants and multinational corporations have always benefited as a result. The newest phrase created to describe the benefits multinationals derive from such human suffering is "free trade."

**Historical Drug Wars**

Historically, wars for control of enlightening plants have provided justification for violence and warfare. The same cultural domination and control achieved by Spanish prohibition of morning glory among Amerindians in the 1600's, and by British opium traders to China, is being sought today by multinational corporations, which seek to prohibit natural, unpatentable medicines and replace them with synthetic drugs which are patented and highly profitable.

**Morning Glory**

In South America during the 1600's, Spanish priests branded the psychedelic morning glory plant "evil" and soldiers set forth to burn "Satan" from villages and kill Amerindian shamans. Spanish invaders were apparently only doing what they believed was right and good when they roasted a South American alive for eating morning glory seeds. Dispirited South Indians were rounded up and converted to Catholicism. Destabilized societies were easy prey for further colonial expansion.

Natives were forced to give up ancient traditions and live the way the Europeans did— or be killed. Ancient shamanistic cultures stopped going directly to the earth for what they needed, and started buying from European distributors. Once the old way of acquiring necessary goods was lost, Amerindians became wholly reliant upon European merchandise.

**Opium War**

An almost opposite situation occurred during the 1800's, when China refused to take any more English opium, Britain retaliated by instigating the "Opium War", destroying the Chinese navy and forcing China to accept the imported British opium. There were no English missionaries instilling troops with sermons on the "evils" of drugs during the Opium War, England's moral majority was conspicuously silent.
Both the South American natives and the Chinese were forced to accept aspects of what we presently call "free trade". In 17th century America, an aggressively corporate country displaced the traditional non-corporate pattern of South American trade. A generally free market was eradicated in favour of a market of product control. Products were controlled by English manufacturers because the South American natives lacked the technology to reproduce products like metal kettles and guns.

In 19th century China, national trade restrictions were rolled back by the force of British naval superiority, allowing English drug producers unimpeded access to Asian markets.

A modern definition of "Free trade" would describe it as, essentially, a patent-oriented market of product control without national trade restrictions. The economic effects of the Opium War and the Spaniards' colonization of South America are much the same as the economic effects of free trade on nations today.

**Pharmaceutical Companies Monopolize Drug Trade**

For 100 years after the Opium War, western pharmaceutical companies continued to export shiploads of opium and opium products (like morphine) to the east. While Britain slowed its drug exports to China, Swiss and Dutch pharmaceutical companies took up the slack.

The shipments to China continued even despite the fact that China had reasserted her sovereignty and made opium illegal again in the 1850's. What had begun as military protection of English economic interests had become an embarrassment to most European governments. The drug mentality was not complimentary to their new stance that certain mood-altering drugs were "evil".

Concern over massive amounts of illicit trafficking by western pharmaceutical firms led to the 1924 Geneva Conference, also known as the "Opium Conference". The Chinese member of the Advisory Committee opened talks by pointing out that Germany, Great Britain, Japan, Switzerland, and the United States were all turning out "...morphine by the ton, purchased by the smugglers by the ton."

**IFPMA Takes Over**

As a result of the conference, pharmaceutical companies were encouraged to give up trade in illicit drugs in exchange for a strong international
presence and governing capacity. The convention resulted in a system where countries estimated how much opium they would need for each citizen each year, and only that amount was permitted to enter the country. The International Federation of Pharmaceutical Manufacturers' Associations (IFPMA) was formed to fulfil the regulatory needs.

Thus the "cleaning up" of multinational pharmaceutical companies amounted to nothing less than putting a pharmaceutical monopoly on opium. The pharmaceutical companies had a monopoly, and the competition continues to be "killed or imprisoned. In no other sector of industry has production been so closely controlled.

In a sense, this was the very first example of multinational free trade. Regardless of the country, the pharmaceutical companies followed rules, which were enforced by an international body. Also typical of present-day "free trade", the corporation was given license to monitor itself. Delegates to the IFPMA were appointed solely by the pharmaceutical companies.

Over the following decades, the reaches of the IFPMA continued to expand as it insinuated itself into circles of international power. The IFPMA was admitted as a Non-Governmental Organization to the World Health Organization (WHO) in January of 1971. It was also accepted in a similar capacity to the UN Economic and Social Council (UNESCO) soon after.

**Multinational Corporations Take Over Governments**

The pharmaceutical companies were the first to take advantage of international governmental organizations to further their trade agenda. Their accomplishment of working their way into international institutions of power represented a shift in the paradigm of world trade.

Today, major multinationals have joined to further their own agenda in much the same way that the pharmaceuticals once did. Through the Paris-based Organization for Economic Cooperation and Development (OECD), they are attempting to enact what is known as the Multilateral Agreement on Investment (MAI). MAI would create an atmosphere of "free trade" in all of the OECD countries. Members of the OECD include Canada, the US, Japan, Australia, New Zealand, and most of Europe.

MAI seeks to push back environmental protection laws, national programs, etc in favour of multinational corporate development. If any national law restricts development, a corporation may sue the
for damages, regardless of public reaction. MAI is fundamentally undemocratic. Under the force of world-wide opposition, MAI faltered at recent meetings in the Netherlands in May, and the Dutch, chaired by the Dutch, chair recommended that no country presently sign the document. MAI will likely not be ratified for at least another year as a result.

David Rockefeller, a leading member of the Trilateralists* and president of the Chase Manhattan Bank in New York, commented on the change that has occurred since the 1960's. "Back then business leaders like myself were more or less sitting on the sidelines watching the negotiations unfold. But now we're sitting in the driver's seat and writing many of the documents ourselves."** And the documents they are writing are free-trade agreements.

Unfortunately, the trade will be anything but free. If the present regulatory tyranny of the pharmaceutical companies is any indication, we can look forward to an environment of harsh prohibitions, in which multinationals will be able to compete. Naturally grown products and synthetic alternatives will be increasingly restricted and prohibited. Multi-national corporations will have the capital and political influence to push their synthetic, patentable products through the expensive and arbitrary food and drug approval processes.

**Corporate Wealth vs National Wealth**

Free trade seeks to create multinational, corporate wealth as opposed to the national wealth created by plant-drug production. Free trade seeks to undermine economies based on unpatentable items, like plants and remedies, and create economies based on patents and market control. Free trade seeks to make it even easier for corporations to extract wealth from a country, and does away with national regulations on in-house investment and job creation.

This new paradigm already functions within smaller free trade units like NAFTA (the North American Free Trade Agreement, including Canada, the US and Mexico). Should MAI fail for some reason, it is likely that smaller agreements like NAFTA and the Treaty of Maastricht (the founding of the European Union) will continue to proliferate, to the advantage of multinational corporations.

The laws of individual countries are also directly under attack by groups with free trade agendas. In 1995, The UN commissioned a global investment which found that between 1991 and 1994 there were 374 pieces of legislation introduced world-wide to do away with regulations.
the way corporations conduct their business. 369 of these 374 pieces of legislation were intended to give corporations the capacity to break free of national boundaries, paving the way for multinational free trade.

Laws being rolled back typically include those designed to protect the environment, health, jobs and standards of living.

**The UN, WHO and OECD Are All In Bed Together**

The Paris-based Organization for Economic Cooperation and Development (OECD), the UN and the World Health Organization (WHO) are organizations which exist, theoretically, as autonomous from one another. In practice however, the three organizations meet behind closed doors and plan how to package and distribute the drug war as an international commodity, while promoting free trade as a replacement for drug revenue. Free trade, in particular, is the focus of the OECD. The UN finds its focus in encouraging international support for the war on drugs, through the United Nations Drug Control Program (UNDCP) and the International Narcotics Control Board (INCB), two organizations which cooperate closely in the international war on drugs. The WHO finds its focus in the legitimization of the drug war and free trade, by preparing various “health reports”.

The relationship between WHO and the UNDCP manifests itself as a joint venture called the "UNDCP/WHO Global Initiative on Primary Prevention of Substance Abuse", which promotes the worldwide drug war as being beneficial to world health.

The Economic and Social Council of the United Nations (UNESCO) is dedicated to pimping industrial development worldwide. A 1994 report by the Secretary General of UNESCO partially summarizes their position: "Development is hampered by mounting barriers to market access." Exactly the kind of market barriers which worldwide free trade (in the form of MAI) would tear down.

It should be no surprise that the UN's Economic and Social Council is exclusively responsible for electing the 13 members of the UN Drug Control Program or that the Economic and Social Council administers reports and advisories from and generally cooperates with the International Narcotics Control Board. The Economic and Social Council also cooperates with the OECD, which is responsible for the worldwide free-trade agreement known as MAI.
The public is left to speculate as to whether the relationship between the Economic and Social Council (free trade agenda) and the Drug Control Program (war on drugs agenda) has anything to do with the long-standing role of the International Pharmaceutical Manufacturers' Association as an advising non-governmental organization to the Economic and Social Council. It seems that the multinational pharmaceutical companies have been hiding in the shadows, pushing magic "free-trade" pills to third-world countries.

**WHO Suppresses The Truth About Cannabis**

The UN/OECD/WHO team also justifies its murderous drug-war policies by suppressing truth.

The branch of WHO responsible for determining which substances should be placed under international control is the Expert Committee on Addiction-Producing Drugs. The members of the Expert Committee are appointed by the health ministries of the various countries that fund WHO, including the US and Canada, and they are not appointed as the result of any electoral process.

The Expert Committee has a long history of truth distortion. Back in 1955, in the wake of US drug-war activity, the Expert Committee claimed that cannabis should definitely be defined as an addiction-producing drug, without any real evidence to back up their claims. By 1957, the committee had distinguished between habituation and addiction, and was forced to admit that cannabis was not an addictive drug at all, but no changes were made to international controls of the harmless herb.

More recently, in 1995, WHO suppressed a report comparing cannabis, alcohol and tobacco. The report found that tobacco and alcohol were both far more harmful than marijuana. Sources within WHO leaked the document to mainstream media after being told to bury it. WHO sources also reported that the US National Institute on Drug Abuse and the UN International Drug Control Programme had pressured WHO to suppress the report. The WHO has repeatedly stalled on carrying through with a planned report on the highly successful Swiss harm-reduction experiment.

Because of WHO's manipulations, cannabis has remained prohibited by international treaties, a prime target in the worldwide war on drugs. Further showing the duplicity of their organization, many of the delegates to WHO (and other UN drug war institutions) go on to management positions in multinational pharmaceutical companies.
Former Chief of the WHO Drug Dependence Unit, Hans Halbach, was hired by the Swiss pharmaceutical company Hoffman La Roche. Former UN Division of Narcotic Drugs, Gilbert Yates, became the Director of the Association of British Pharmaceutical Industries. Former Secretary of the International Narcotics Control Board, Adolf Lande, was taken in by the American Pharmaceutical Manufacturers' Association.

**The Prohibitionist Multinational Corporate Agenda**

The war on drugs is a trade war, but it is also more than that. Trade wars are restricted to military or economic aggressions to open up markets. The drug war attacks not only countries and organizations that produce drugs, it also goes after consumers. Millions have been imprisoned or executed because they have no place in the prohibitionist multinational agenda.

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**On Cognitive Liberty (Part I)**

By Richard Glen Boire, Esq.

*Thoughts are free and are subject to no rule.*

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As we frantically race into the third millennium with microprocessors becoming faster, cheaper, and smaller, with surveillance cameras proliferating in public spaces, with the human genome program about to issue its first “working draft” of the human DNA sequence, and with an out-of-control Frankensteinian machine named the War on Drugs, all awhirl in the ocean of modern-day culture, it is imperative that we, as a society, expressly acknowledge the fundamental liberty of thought.
human right to cognitive liberty and immediately begin to define its contours.

Encroachments on cognitive liberty can take various forms. New technologies such as biogenetic modification, human-computer interfacing, brain-scanning, nanotechnology, neural-networking, so-called "neuro-therapy," new pharmaceuticals, raise exciting possibilities for human "evolution." But, if not developed and used responsibly, they and the legislation they spawn, could also pose new threats to cognitive freedom. The trend of technology is to overcome the limitations of the human body. And, the Web has been characterized as a virtual collective consciousness and unconsciousness. What are the implications for mental autonomy when wearable computers become wet-wired to our own minds and memory is augmented by a high-speed wireless connection to the Web? Similarly, advances in biotechnology and drug-design increasingly raise legal and ethical questions related to cognitive liberty, including what rights people will have to access these and other technologies, and what rights we will have to avoid them.

**Calibrating Cognitive Liberty**

Part of elucidating a theory of cognitive liberty is simply recognizing when free cognition is being infringed. Restrictions on physical liberty, for all their pain and terror, at least have the benefit of being relatively easy to recognize and call attention to. During World War
II, the Nazi concentration camps for Jews, the American internment camps for Japanese Americans, were marked by the machinery of physical control: fences, barbed wire, and guard towers. Similarly, from 1961 to 1989, a concrete and barbwire wall overseen by 116 guard towers divided the city of Berlin. Anyone who tried to cross that wall without a “special authorization” risked a bullet in the back of his or her skull.

In contrast to the usual visibility of government restraints on physical liberty, restraints on cognitive liberty are most often difficult to recognize, if not invisible.

Consciousness is so complex and multifaceted that it may never be understood. Unfortunately, the inability to understand consciousness does not equate to an inability for others to control it. How then can we recognize nefarious attempts to control consciousness? In one respect, absolute control of one’s own consciousness is an impossibility. While each of us carries our own brain in our own skull, the process of consciousness itself is interactive. All of our senses continuously feed data into our brains, producing a dance of cognition that perpetually swirls the exterior world with the interior, creating a seamless, edgeless, apperceptive feedback loop. Our minds are continually changing, continually interfacing with “the other.” Cognitive liberty clearly cannot mean cognitive isolation.

Mind control, like most everything else, comes in degrees. A discussion with a friend may make you change your opinion on a topic, it may...
change your life, but does that amount to “mind control”? Was your cognitive liberty violated? Over $US200 billion dollars is spent each year by companies unabashedly striving to manipulate our desires, to literally make us want their product. If you see an advertisement (or many) for a product and that advertisement, replete with imagery of the good life, causes you to purchase the product, have you been the victim of mind control? Has your cognitive liberty been violated?

What if the advertisement is embedded with auditory or visual subliminal messages? What if the advertisement is embedded in prime-time television programs, passing as program content, rather than demarked as a “commercial”? What if you are a 12-year-old placed on Prozac or Ritalin largely because your schoolteacher has “diagnosed” you as depressed or suffering from Attention Deficit Disorder. Has your cognitive liberty been violated?

The answers to the above questions depend on how finely one calibrates cognitive liberty. In some scenarios, some infringements on mental autonomy, are crystal clear and ought to present limit cases where general policies and specific rules emerge in high-definition clarity. Yet, even in so-called limit cases, the US government, including its legal system, has often acted inconsistently.

A (Very) Brief History of US Government Mind Control
In 1969, Justice Marshall wrote, without mincing words, “Our whole constitutional heritage rebels at the thought of giving government the power to control men’s minds.” Yet, contrary to Justice Marshall’s strong pronouncement, the US government has not consistently respected or protected cognitive liberty. Indeed, some government offenses seem to come directly from the pages of a dystopian novel like George Orwell’s Nineteen Eighty-Four.

Imagine, for example, if the government passed a law mandating that all citizens receive monthly injections of time-release sedatives, justifying the law on the “public health” grounds that sedated people are more productive at repetitive tasks, are less violent, and are not a drain on public resources. What if those who did not voluntarily report at the time and place appointed for their injection were rounded up by the police, and forcefully lobotomized? Would anyone doubt that such a law infringed not just on one’s physical freedom but also on one’s cognitive freedom? It’s not exactly an unthinkable scenario. From the 1920s through 1970, pursuant to the laws of at least 32 states, more than 60,000 people were deemed “eugenically unfit.” Many of these people were involuntarily sterilized, in part because of low scores on intelligence tests. When one of these laws was challenged, and the case reached the United States Supreme Court, it was upheld—without Oliver Wendell Holmes smugly proclaiming, “Three generations of imbeciles are enough.”

Until 1973, “homosexuality” was listed as a
psychiatric disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM). People who admitted being homosexual, or ÔaccusedÔ of being gay or lesbian, were subject to involuntary confinement under mental health laws, and subjected to Ôreparative therapyÔ or Ôconversion therapyÔ designed to convert them into heterosexuals. ÔTreatmentÔ in addition to counseling, included penile plethysmography (electronic shock triggered by penile erection), drugging, and hypnosis. Even though homosexuality was deleted from the DSM in 1973, it was not until December 1998 that the American Psychiatric Association finally disapproved of ÔreparativeÔ or ÔconversionÔ therapy.8

In the 1950s, 60s, and early 70s, the US government illegally and unethically drugged unwitting US citizens with psychoactive substances, including LSD, as part of projects bluebird, artichoke, and mkultra, all in an attempt to develop techniques of mind control. Richard Helms, the chief planner of mkultra, wrote in a planning memorandum that the program was designed in part to:

Investigate the development of chemical material which causes a reversible non-toxic aberrant mental state, the specific nature of which can be reasonably well predicted for each individual. This material could potentially aid in discrediting individuals, eliciting information, and implanting suggestions and other forms of mental control.9
While the MKUltra program began with tests in the laboratory on willing volunteers, the CIA quickly saw the need to expand the testing to determine what the effects of drugs such as LSD would be on unsuspecting people. Thus, in 1953, the CIA moved its mind control program into the streets of America and began the “covert testing of materials on unwitting US citizens.”

In subsequent installments of this essay, we will see how the US Government continues to promulgate certain policies that, while cloaked in “public health” or “public safety” justifications, amount to an impermissible government action policing thought and interfering with the mental processes of citizens.

Freedom’s Invisible Landscape

The right to control one’s own consciousness is the quintessence of freedom. If freedom means anything, it must mean that each person has an inviolable right to think for him or herself. It must mean, at a minimum, that each person is free to direct one’s own consciousness; one’s own underlying mental processes, and one’s beliefs, opinions, and worldview. This is self-evident and axiomatic.

In assessing what rights are fundamental and entitled to the most stringent legal protection, the US Supreme Court has stated that, fundamental liberties are those “implicit in the concept of ordered liberty,” such that “neither liberty nor justice would exist if [they] were sacrificed.”
Under another test, fundamental liberties were characterized by the Court as those liberties that are "deeply rooted in this Nation’s history and tradition."12

Slightly over seventy years ago, Justice Brandeis acknowledged in a landmark privacy case that cognitive freedom was one of the principal protections designed into the Constitution:

The makers of our Constitution undertook to secure conditions favorable to the pursuit of happiness. They recognized the significance of man’s spiritual nature, of his feelings and of his intellect. They knew that only a part of the pain, pleasure and satisfactions of life are to be found in material things. They sought to protect Americans in their beliefs, their thoughts, their emotions and their sensations. They conferred, as against the Government, the right to be let alone—"the most comprehensive of rights and the right most valued by civilized man."13

But, while certain justices have, at times, pointedly acknowledged the fundamental nature of cognitive freedom and the nefarious nature of government (or other "outside") interference with the intellect, this important freedom remains only obliquely defined within the US legal system. Ironically, the lack of a comprehensive treatment may be because cognitive freedom is so self-evidently a basic human right. Whatever
reason, without a coherent cognitive liberty jurisprudence, present and future infringements on cognitive liberty risk passing unnoticed or unremedied. In the next installment of this essay, we will begin to dig deep into privacy due process, and First Amendment cases, and attempt to excavate a theoretical scaffolding for cognitive liberty. As I believe the cases will show, cognitive liberty is the invisible landscape from which springs some of our cherished and protected freedoms.

Notes


2 One example of fiction-like technology just over the horizon was recently discussed by MIT-educated futurist Ray Kurzweil, who forecasted the coming of nanobot brain scanners. These nanobots would be blood-cell-sized robots that travel through capillaries in the brain, take high-resolution scans of the neural features. These bots would be tied together on a wireless LAN, and comprise a distributed parallel computer with the same power as the brain was scanned. (ÔThe Story of the 21st CenturyÓ in Technology Review Jan./Feb. 2000, 82-83.)

Kurzweil says that every aspect of this scenario is feasible today Ôexcept for size and cost.Ô See more of KurzweilÔs ideas, see his book The Age of Spiritual Machines: When Computers Exceed Human
3 See ÔBig Brother Puts a New Twist on the Telescreen,Ô [infra, 60].


7 Buck v. Bell (1927) 274 US 200, 207. Eugenic sterilization, including the Norplant contraceptive device, will be further discussed in subsequent installments of this essay.


Alan Turing, one of the founding fathers of artificial intelligence theory, was arrested for violation of British homosexuality statutes in 1952 after he admitted having a homosexual relationship.
affair. Believing that his sexual orientation was a personal matter, neither a sin nor a crime, he presented no defense at his trial, which occurred on 31 March 1952. In lieu of prison, he was ordered to submit to estrogen injections for a year. Following a period of depression, likely the result of the injections, he committed suicide on June 7, 1954.


For more details on the governmentÕs bluebird, artichoke, and mkultra programs (at least those details not lost forever when Richard Helms ordered the destruction of all records related to the projects in January 1973) see A. Scheflin & E. Opton, ÒTampering With The Mind (I) & (II),Ó in The Mind Manipulators, supra, (1978), 106-212.


13 Olmstead v. United States (1928) 277 U.S. 438, 478 (Brandies, J., dissenting).
On Cognitive Liberty (Part 2)

By Richard Glen Boire, Esq.

Éwithout freedom of thought there can be no free society.
--U.S. Supreme Court Justice Felix Frankfurter

An Introductory Note on Banned Books and other Controlled

As you read this sentence you are receiving information. Words are carriers of thought, whether spoken from mouth to ear, digit to paper, or downloaded to your computer, ink and passed on paper across time and space. Because words are vehicles for thoughts, words can change your opinion, give you new ideas, reform your worldview, and foment a revolution.
Attempts to control the written word date from at least AD 325 when the Council of Nicaea ruled that Christ was 100 percent divine and forbade the dissemination of contrary beliefs. Since the invention of the printing press in 1452, governments struggled to control the printed word. Presses were initially licensed and registered. Only certain people were permitted to own or control a printing press and only certain things could be printed or copied. (This was the origin of today's copyright rules.) Works printed without authorization were gathered up and destroyed; the authors and printers imprisoned.

Scholars disagree as to the exact date, but some time around 1560, Pope Paul IV published the Index Librorum Prohibitorum a list of forbidden books (i.e., controlled substances) enforced by the Roman government. The Index was (finally) abandoned in 1966 and listed over 4,000 forbidden books, including works by such people as Galileo, Kant, Pascal, Spinoza and John Locke. The history of censorship has been extensively recorded by others. My point is simply the obvious one that efforts to prohibit heterodox texts and to make criminals out of those who "manufactured" such texts, were not so much interested in controlling ink patterns on paper, as in controlling the ideas encoded in printed words.

I submit that in the same way, the so-called "war on drugs" is not a war on pills, powder, plants, and potions, it is war on mental states — a war on consciousness itself — how much, what sort we are permitted to experience, and who gets to control it. More than an unintentional misnomer, the government-termed "war on drugs" is a strategic decoy label; a slight-of-hand trick.
by the government to redirect attention from what lies at ground zero of the war—each individualÔs fundamental right to control his or her own consciousness.

In George OrwellÔs dystopian novel Nineteen Eighty-Four , the Oceania government diligently worked to establish "Newspeak," a carefully crafted language designed by the government for the purpose of making unapproved "modes of thought impossible." Prior to Newspeak, the people of Oceania communicated with "Oldspeak," an autonomous natural language capable of expressing nuanced emotions and multiple points of view. By controlling language through the imposition of Newspeak — by "eliminating undesirable words" — the government of Oceania was able to control and, in some cases, completely extinguish certain thoughts. As a character in Nineteen Eighty-Four explained to Winston Smith, "DonÔt you see that the whole aim of Newspeak is to narrow the range of thought? Every year fewer and fewer words, and the range of consciousness always a little smaller. Those people raised with Newspeak, I never known the wider-range of Oldspeak might fail to notice, indeed, might be unable to even perceive, that the Government is limiting consciousness.

In 1970, just four years after the Catholic Church finally abandoned the Index Librorum Prohibitorum , the United States government produced its own index of forbidden thought catalysts: the federal schedule of controlled substances. Included on the initial list of Schedule I substances were seventeen substances denoted as "hallucinogens," declared to have "a high potential for..."
"abuse," "no currently accepted medical use in the USA, and "a lack of accepted safety even under medical supervision. Among the list of outlawed "hallucinogens" were psilocybin and psilocin, the active principles of Psilocybe mushrooms; dimethyltryptamine (DMT), the active principle in ayahuasca and many visionary snuffs; ibogaine, mescaline, peyote, and LSD. The experience elicited by these substances in their chemical or natural forms is the par excellence of "Oldspeak"—a cognitive modality dating from pre-history.

Archeological evidence suggests that humans have communed with visionary plants and potions for thousands of years. Peyote, for example, has been used for over 10,000 years. Lysergic acid diethylamide (LSD) was created by Dr. Albert Hofmann, a chemist employed by Sandoz Laboratories in Basel, Switzerland. In 1938, Dr. Hofmann synthesized LSD from a fungus commonly found in rye seeds. Its effect on consciousness remained undiscovered until April 16, 1943, when Dr. Hofmann accidentally ingested a minute amount of the substance and experienced a strange inebriation in which "the external world became changed as in a dream." Several years later, Hofmann discovered that the chemical structure of LSD is nearly identical to that of the sacred entheogen ololiuhqui, prepared from morning glory seeds and used ritually by the Aztecs for thousands of years.

Mushrooms, of the genus Psilocybe, were used to produce visionary states at least as early as 4000 B.C. The Psilocybe mushroom was used in religious ceremonies long before the Aztec civilization. It was named teonan‡catl, meaning "sacred mushroom." In 1957, working with mushrooms obtained by R. Gordon Wasson from the now famous curandera Maria from the USA, and "a lack of accepted medical use in the USA, and "a lack of accepted safety even under medical supervision. Among the list of outlawed "hallucinogens" were psilocybin and psilocin, the active principles of Psilocybe mushrooms; dimethyltryptamine (DMT), the active principle in ayahuasca and many visionary snuffs; ibogaine, mescaline, peyote, and LSD. The experience elicited by these substances in their chemical or natural forms is the par excellence of "Oldspeak"—a cognitive modality dating from pre-history.

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Dr. Hofmann isolated and later synthesized two active substances derived from Psilocybe mushroom. He named these substances psilocybin and psilocin. In 1962, Dr. Hofmann traveled to Mexico and met with Maria Sabina. During a night ceremony, she ingested 30 milligrams of the synthetic psilocybin and later said the effect was indistinguishable from that elicited with the sacred mushrooms themselves.

Another substance placed on the government’s 1970 list of criminalized “hallucinogens” was N,N-dimethyltryptamine (DMT). This substance was first synthesized in 1931, but its entheogenic properties were not discovered until 1956. It was subsequently learned that DMT is the principal active ingredient in numerous snuffs and brews long-used by various South American Indians during religious ceremonies. The DMT containing plant Psychotria viridis is a well-known admixture to the entheogenic brew known as ayahuasca or yaj*, which archeological evidence suggests dates back as many as five thousand years.

Some who ingest visionary plants believe the plants talk to them and open up channels of communication with animals and other entities. Mazatec eaters of Psilocybe mushrooms, for example, are adamant that the mushrooms speak to them:

The Mazatecs say that the mushrooms speak to you. If you ask a shaman where his imagery comes from, he is likely to reply: “I didn’t say it, the mushrooms did.” Éhe who eats these mushrooms, if he is a man of language, becomes endowed with an inspired capacity to speak. The spontaneity they liberate is not only perceptual, but linguistic, the spontaneity of speech, of fervent, lucid
discourse, of the logos in activity. For the shaman it is as if existence were uttering itself through him—words are materializations of consciousness; language is a privileged vehicle of our relation to reality.7

Just as Newspeak was intended to make Old(speak) thoughts literally unthinkable, so the War on Entheogens makes certain cognition and awareness all but inaccessible. Religious scholar Peter Lamborn Wilson aptly framed the War on Entheogens as a battle over the nature of thought itself:

The War on Drugs is a war on cognition itself, about thought itself as the human condition. Is thought this dualist Cartesian reason? Or is cognition this mysterious, complex, organic, magical thing with little mushroom elves dancing around. Which is it to be?8

In Orwell’s vision of 1984, Newspeak’s power to control and limit thought depended, in part, upon the passing of time and the birth of new generations that never knew Oldspeak. As explained by Orwell in the Appendix to Nineteen Eighty-Four, “It was intended that when Newspeak had been adopted once and for all and Oldspeak forgotten, a heretical thought—that is a thought diverging from the principles of Ingsoc—should be literally unthinkable, at least so far as thought dependant on words.”9

Just as Newspeak depended in part upon eradicating knowledge of Oldspeak, the War on Entheogens is sustainable, in part, because the current generation of young adults (those 21 - 30 years old) have never known a time when most entheogens were illicit. Those who have never experienced the mental states that are now prohibited...
realize what the laws are denying them. It is as if nothing is being taken away, at least nothing noticeable, nothing that is missed. As pointed out by the authors of a law review article on how mandatory schooling raises issues of mass-consciousness control: "The more the government regulates formation of beliefs so as to interfere with personal consciousness, the fewer people can conceive dissenting ideas or perceive contradictions between self-interest and government sustained ideological orthodoxy." 10

Because of the personal experiential nature of entheogen-elicited cognition, only those who have been initiated into the modern Mysteries — those who have tasted the forbidden fruit from the visionary plants of knowledge and have not fallen victim to stigmatizing psycho-impact of "being a drug user" — are acutely aware of the gravity of what is being prohibited: powerful modalities for thinking, perceiving, and experiencing.

The very best argument for the potential value of entheogen-elicited mind states is in the entheogenic experience itself; an experience that has, in almost every case, been outlawed. That is the dilemma of entheogen policy reformation. The advocate for entheogenic consciousness is left in an even worse position than the proverbial sighted man who must describe colors to a blind person. With regard to entheogen policy, the position is worse because the "blind" are in power and have declared it a crime to see colors.

Left with the impossible task of saying the unsayable, of describing the indescribable, those who have tasted the forbidden fruit must plead their case on the fundamental philosophical and political level of what
means to be truly free. They must state their appeal on the ground that, with respect to the inner-workings of each person's mind, the values of tolerance and respect are weightier and far more conducive to the principles of democracy, than is the chillingly named "zero-tolerance" policy that is currently in vogue. This brings us, once again, to cognitive liberty as an essential substrate of freedom.

**Free Thought and the First Amendment**

Benjamin Cardozo, one of the most respected and influential American legal scholars of the last century and a former Justice of the U.S. Supreme Court, affirmed cognitive liberty as central to most every other freedom:

...freedom of thought—one may say—is the matrix, the indispensable condition, of nearly every other form of freedom. With rare aberrations a pervasive recognition of that truth can be traced in our history, political and legal. 11

Cognitive liberty jurisprudence must begin, then, with an effort to distill the legal principles that support some of our most cherished and well-established freedoms, and then, over time, crystallize these principles into the foundation for a coherent legal scheme governing issues related to an individual's right to control his or her own consciousness.

Given the importance of the First Amendment to U.S. and even international law, we begin by examining how courts have construed the First Amendment—searching for evidence that the right of each person to autonomy over his or her own mind and thought...
processes is central to First Amendment jurisprudence.

Congress shall make no law respecting an establishment of religion, or prohibiting the free exercise thereof; or abridging the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government for a redress of grievances. (The First Amendment.)

The First Amendment’s guarantees were designed to bar the government from controlling or prohibiting the dissemination of unpopular or dissenting ideas. Central to all five guarantees is the acknowledgement that people must be treated by the government as ends not means; each person free to develop his or her mind and own belief system, and encouraged to express his or her thoughts in the so-called “marketplace of ideas.” As U.S. Supreme Court Justice Felix Frankfurter emphasized in 1949, the freedom of expression guaranteed by the First Amendment guards against “thought becom[ing] checked and atrophied.”

Free speech, free exercise, free association, a free press and the right to assemble, are all moot if the thought that underlies these actions has already been constrained by the government. If the government is permitted to prohibit the experiencing of certain thought processes, or otherwise manipulate consciousness at its very roots—via drug prohibitions, religious indoctrination, monopolizing media, or any number of methods—it need not even worry about controlling the expression of such thoughts. By prohibiting the very formation of minds states by strangling the free mind itself free expression is made meaningless.
Thus, in order to prevent the erosion of the First Amendment’s protection of expression, the Amendment must also provide at least as strong a protection for the underlying consciousness that forms the ideas that are later expressed. Indeed, the First Amendment was infused with the principle that each individual—not the government—ought to have control over his or her own mind, to think what he or she wants to think, and to freely form and express opinions and beliefs based on all the information at his or her disposal. The First Amendment, in other words, embraces cognitive liberty not simply as the desired outcome of the articulated guarantees (i.e., a right to express one’s ideas), but also as a necessary precondition to those guaranteed freedoms (i.e., a right to form one’s own ideas).

Mother May I Control My Own Consciousness?

In (the apropos year of) 1984, the Tenth Circuit Court of Appeal issued an opinion in a case involving a man who was involuntarily drugged with the “antipsychotic drug” thorazine while he was being held for trial on murder charges.15 The threshold issue was whether pretrial detainees have a fundamental right to refuse treatment with anti-psychotic drugs. To answer this question, the Tenth Circuit analogized to a 1982 case in which the U.S. Supreme Court held that “liberty from bodily restraint always has been recognized as the core of the liberty protected by the Due Process Clause from arbitrary governmental action.”16 The Tenth Circuit reasoned that if freedom from bodily restraints is a fundamental right, then individuals must also have a liberty interest in freedom from “mental restraint of the potentially imposed by antipsychotic
Thus, the Tenth Circuit found that freedom from government imposed mental restraints was just as fundamental as freedom from government imposed physical restraints and were protected by the Due Process Clause. Furthermore, the Tenth Circuit found that the First Amendment was also implicated when the government attempts to involuntarily psycho-medicate a person awaiting trial. In unequivocal language, the Tenth Circuit explained "[t]he First Amendment protects communication of ideas, which itself implies protection of the capacity to produce ideas." 18

As professor Laurence Tribe of Harvard Law School has cautioned:

In a society whose "whole constitutional heritage rebels at the thought of giving government the power to control men's minds, the governing institutions, and especially the courts, must not only reject direct attempts to exercise forbidden domination over mental processes; they must strictly examine as well oblique intrusions likely to produce or designed to produce the same result." 19

Prohibiting an otherwise law-abiding person from using entheogens is more than merely an "oblique intrusion" on the right to control one's own mental processes, or a slight trespass on the "protected capacity to produce ideas" — it is a direct frontal attack. Under the recently released National Drug Control Strategy 2000, the federal government will spend just shy of $20 billion ($20,000,000,000) on an all out attempt to keep people from evoking alternative states of consciousness by the use of controlled drugs." 17
As I will show in the next installment of this essay, the government’s War on Unapproved Mental States, besides violating core principles of the First Amendment, also violates the very essence of the right to privacy.

Notes

1 Kovacs v. Cooper (1949) 336 U.S. 77, 97 (concurring opinion of J. Frankfurter)

2 For a fascinating survey of suppressed literature, see the multi-volume set Banned Books, published by Facts on File, which covers literature suppressed on religious, social, sexual, and political grounds.


4 Ibid., 46.

5 The substances initially listed in Schedule I as "hallucinogenic substances" were: (1) 3,4-methylenedioxy amphetamine; (2) 5-methoxy-3,4-methylenedioxy amphetamine; (3) 3,4,5-trimethoxy amphetamine; (4) Bufotenine; (5) Diethyltryptamine; (6) Dimethyltryptamine; (7) 4-methyl-2,5-dimethoxyamphetamine; (8) Ibogaine; (9) Lysergic acid diethylamide; (10) Marihuana; (11) Mescalcone; (12) Peyote; (13) N-ethyl-3-piperidyl nezilate; (14) N-methyl-3-piperidyl benzilate; (15) Psilocybin; (16) Psilocyn; (17) Tetrahydrocannabinols. (PL 91-513, Oct. 27, 1970; 21 U.S.C. sec. 812, subd. (b) (1970).)
The list of Schedule I "hallucinogenic substances" now numbers 31 items. (21 CFR § 1308.11(d) (April 1999)).


Philosopher and ethnobotanist Terence McKenna suggested that early man's ingestion of visionary plants may have been the very catalyst that led to the sudden expansion of human brain size between three and six million years ago, and the event which spawned the subsequent emergence of language itself. (See Terence McKenna, Food of the Gods (New York: Bantam Books, 1993), 25.)


9 George Orwell, Nineteen Eighty Four, supra, Appendix: "The Principles of Newspeak."


12 Although the First Amendment only mentions "Congress," the U.S. Supreme Court has held that the Fourteenth Amendment's Due Process Clause incorporates the First Amendment guarantees and thus makes those guarantees applicable to State governments as well as Congress. (See Gitlow v. New York (1925) 268 U.S. 652, 666; Board of Education v. Pico (1981) 457 U.S. 853, 855, fn. 1.)

13 The concept of a laissez faire marketplace where ideas compete for buyers appears to date from 1919 when U.S. Supreme Court Justice Holmes wrote in Abrams v. United States (1919) 250 U.S. 616, 630 "[T]he ultimate good desired is better reached by free trade in ideas ... the best test of truth is the power of the thought to get itself accepted in the competition of the market") (Holmes, J., dissenting).

Using a "marketplace" analogy for the interaction and acceptance or rejection of ideas is problematic.

Using market mechanisms to determine logic or merit of ideas reduces ideas to commodities. When this happens the circulation of ideas is determined by their sales profiles. The "consumer" is described as voting for the products of the Consciousness Industry [a term coined by Hans Magnus Enzensberger in his 1974 collection of essays of the same name] with his or her dollars (consumer sovereignty). Such metaphors suggest democracy and freedom of choice. They deflect attention away from the tightly controlled decision-making process that actually determine what ideas will gain entry into the commodity system. That is, they render the control system of the capitalistic consciousness industry invisible and thereby permit subterranean censorship...
based upon both market and political considerations. In sum, they permit elite rule but preserve the semiotics of democracy. (Sue Curry Jansen, Censorship: The Knot Binds Power and Knowledge (New York; Oxford University Press, 1988), 134.)

14 Kovacs v. Cooper, supra, at p. 95


17 Bee v. Greaves, supra, at p. 1393.

18 Ibid., 1393-1394; Accord, Rogers v. Okin (D.Mass. 1979) 478 F.Supp. 1342, 1366-1367. Other courts have held that inmates in mental hospitals have a constitutional "liberty interest" in maintaining the autonomy over their own minds in the face of doctors who want to involuntarily medicate them. (See, e.g., United States v. Charters (4th Cir.1988) (en banc) 863 F.2d 302, 305 (antipsychotic drugs intrude sufficiently upon "bodily security" to implicate a "protectable liberty interest"); And, still other courts have held that there is a constitutional "privacy protection" that encompasses "the right to protect one's mental processes from governmental interference." See, e.g., Rennie v. Klein (D.N.J. 1978) 462 F. Supp. 1131, 1144 ("the right of privacy is broad enough to include the right to protect one's mental processes from governmental interference").

For a comprehensive survey of forced mental treatment cases, see Bruce J. Winick, "The Right to Refuse Mental Health Treatment..."
First Amendment Perspective," University of Miami Law Review (September 1989), 44(1) 1-103.


20 The National Drug Control Strategy 20 can be read online via the Alchemind SocietyÕs Drug Law Library at www.cognitiveliberty.org/links.htm [Accessed May 17, 2000.]

Richard Glen Boire, Esq. is the executive director of the Alchemind Society.

Center for Cognitive Liberty and Ethics
Post Office Box 73481
Davis, CA 95617-3481 USA
FAX: 530-686-8265; Toll Free Voice Mail: 1-888-950-MIND (6463)
Disquisition on the Drug War

The Marijuana-Marlboro® Paradox

Comments on FDA v. Brown & Williamson Tobacco

Tobaccos tabu and toboggan's a back seat.
Secret satieties and onymous letters
make the great unwatched as bad as their better

Finnegans Wake

In a landmark drug case decided on March 21, 2000, the United States Supreme Court ruled that the Food and Drug Administration (FDA) does not have jurisdiction over tobacco products and, hence, has no authority to regulate cigarettes, including advertising targeted at minors. The Court's opinion shines a light on the dumbfounding contradictions in our national drug policy, which drastically distinguishes legal drugs such as nicotine and alcohol, from drugs such as marijuana on which we’ve declared “war.”

The Supreme Court's ruling stemmed from
in which the FDA, for the first time, declared nicotine is "drug" and that cigarettes and smokeless tobacco are "drug delivery devices," which it has the power to regulate. According to the 1996 FDA rule, nicotine is a "drug" under the agency's purview because it "exerts psychoactive, or mood-altering effects on the brain" and these effects are "intended" by those who manufacture tobacco products. Thus, the agency, it could regulate tobacco products immediately by limiting promotion, selling of tobacco products to minors. A coalition of tobacco manufacturers, retailers, and advertisers, sued the FDA, asserting that nicotine is not a "drug" and that the FDA, therefore, lacked jurisdiction to regulate tobacco products.

In order to understand the FDA's 1996 rule, it's necessary to know a bit about its tobacco policy up until that time. Prior to 1996, the FDA consistently held that it lacked jurisdiction over tobacco, an understanding affirmed by Congress, which over the years, rejected several bills that explicitly given the FDA jurisdiction over tobacco products. Thus, up until 1996, tobacco products were exclusively regulated by Congress. In example, in 1965, it was Congress, not the FDA, that required all cigarettes packs to carry the warning "Caution: Cigarette Smoking May be Dangerous to Your Health." Similarly, in 1969 it was Congress, not the FDA, that banned all radio and television advertising of cigarettes.

Indeed, prior to its 1996 about-face, the FDA had held that cigarettes were not "drugs" within its purview, unless the manufactures made therapeutic claims—something that not even the tobacco companies were ready to assert. In surprise of many, the FDA reversed itself and declared nicotine is a "drug." To justify its change of position, the FDA extensively documented the dangers associated with tobacco products, noting more than 400,000 people die each year from tobacco-related illnesses, such as cancer, respiratory illness.
heart disease, often suffering long and painful deaths," and that "[t]obacco kills more people each year in the United States than acquired immunodeficiency syndrome (AIDS), car accidents, alcohol, homicides, illegal drugs, suicides, and fires, combined."4

The FDA recognized, however, that it was in a paradoxical position. The FDA's core objective is to ensure that any product within its regulatory power is "safe and effective." Given that it had just documented the dangers associated with tobacco use, how could it possibly declare cigarettes and other tobacco products safe? It seemed that if the FDA claimed jurisdiction over tobacco products it would have no choice but to ban them altogether. Yet, a little known federal law prevents such a ban, largely for economic reasons:

[t]he marketing of tobacco constitutes one of the greatest basic industries of the United States with ramifying activities which directly affect interstate and foreign commerce at every point, and stable conditions therein are necessary to the general welfare. 5

The only way out of the paradox was for cigarettes to be both dangerous "drugs" (thereby giving the FDA jurisdiction over them) yet also "safe" (so that the FDA would not be forced to ban them). The FDA's lawyers rose to the occasion.

The FDA lawyers realized that everything turned on the meaning of "safe." Cigarettes, said the FDA, were "unsafe, as that term is conventionally understood," but were indeed "safe" when the effects of an outright ban were considered.6 According to the Supreme Court:

As summarized by the Supreme Court:
Éthe FDA found that, because of the high addiction among tobacco users, a ban would be "dangerous." É In particular, current tobacco users could suffer from extreme withdrawal, the system and available pharmaceuticals might not be able to meet the treatment demands of those suffering from withdrawal, and a black market offering cigarettes more dangerous than those currently sold likely develop. É The FDA therefore concluded, Œwhile taking cigarettes and smokeless tobacco off the market could prevent some people from becoming addicted and reduce death and disease for others, the record does not establish that such a ban is the appropriate health response under the act.Ó É 8

Thus, in 1996, the FDA ruled that cigarettes and tobacco products, despite being addictive and dangerous, were "safe" when compared to the much greater dangers associated with prohibition. The FDA could have its cake and eat it too; cigarettes were "drugs" within its jurisdiction, yet "safe," so long as they were not prohibited.

On March 21, 2000, in an opinion rich with contradictions when tobacco policy is compared to the national War on Drugs, the Supreme Court ruled that the FDA does not have jurisdiction over nicotine and tobacco. Congress, not the FDA, said the Court, is in charge of regulating tobacco products. The Supreme Court refused to let the FDA escape the paradox. According to the Supreme Court, either cigarettes were unsafe drugs within the FDA's jurisdiction, in which case they must be banned, or they were not prohibited at all. The Supreme Court chose the latter.

As the Supreme Court explained:

Éwere the FDA to regulate cigarettes and smokeless tobacco, the [Food, Drug, and Cosmetic] Act require the agency to ban them. In fact, Éthe FDA itself has taken the position that if tobacco products were within its jurisdiction, Óthey would have...
As a recent examination of national drug policy, the Supreme Court's opinion strips the emperor of his clothes, and the process as well as the result is embarrassing to look at. On the one hand, the government permits adults to use nicotine; on the other hand, it makes them criminals if they smoke marijuana—even for medicinal reasons.

A study by the U.S. Department of Health and Human Services, Public Health Service, in 1983 concluded that cigarette smoking is "the most widespread example of drug dependence in our country," and that smoking "affects the chemistry of the brain and nervous system." Five years later the Surgeon General's Report used even harsher language, concluding that tobacco products "are addicting" and that nicotine is "psychoactive" and "causes physical dependence characterized by a withdrawal symptom" in much the same way as heroin and cocaine.

Marijuana, in stark contrast, causes no physical dependence. In fact, in 1989 the DEA's own administrative law judge, Francis L. Young, declared that marijuana is "one of the safest therapeutically active substances known to man." Yet, any adult can walk down to the corner store and buy a pack of cigarettes, marijuana (even for medical use), remains a Schedule I substance—illegal to possess for any reason under federal law.

Likewise, the cognitive enhancing drug MDMA (ecstasy) is extremely popular right now, yet because the government has declared it illegal, users are forced to purchase it on the black-market. MDMA users never know for sure if the drug they are buying is indeed MDMA, or some other drug or combination of potentially dangerous drugs. Additionally, because MDMA is outlawed, the price of the drug is artificially inflated to the points (according to the government) organized crime was removed from the market because it would be impossible to prove that they were safe for their intended use.
getting involved in its distribution. Prohibiting MDMA and marijuana produces all the same problems that we saw 70 years ago during alcohol ProhibitionÑproblems that are much greater than the problems caused by the drugs themselves.

As discussed earlier, the FDA in 1996 determined that banning cigarettes would actually increase individual and social harm rather than reducing it. The reasoning should be applied to other drugs (such as MDMA and marijuana) that the government has declared full-scale war on.

It's clear to any reasonable person who examines our nation's drug policy, that it is riddled with contradictions and outright hypocrisy. The so-called Drug War conundrum is society-at-large, and legislators in particular need to adopt a more mature view of drugs. Going to "war" on drugs is infantile. A national policy of intolerance (i.e., "zero-tolerance") rather than respect is the root of all our drug problems Ð both legal and illegal. Rather than cower in the shadows of "just say no" propaganda and hypocritically proclaim marijuana a dangerous drug that threatens to destroy our society, while simultaneously employing contortionist reasoning to keep cigarettes on the market, we should acknowledge that people have a natural drive to experience multiple modes of consciousness. The government should accept this as a fact and begin designing drug policy that makes drug use as safe as possible. As Justice Brennan wrote in his dissenting opinion in the tobacco case), tobacco policy should "take into account the realities of human behavior," why should our policy with respect to other drugs be any different?

Adults ought to have the right, after all to control their own bodies and minds Ð and our national drug policy should respect an adult's autonomy over his or her own body and mind. Some may choose to smoke cigarettes, while others will choose to smoke marijuana. Smoking one plant versus another should not be a crime. No one should be made a criminal just for
his or her mind state. All should be permitted as the person does not harm others. Any policy built on intolerance rather than respect is destined to lead to a host of negative social consequences such as: prison overcrowding, unjust sentences, misdirection of funds away from schools in order to build more prisons, property forfeiture, kids dying of adulterated "black market" drugs, organized crime, sick people denied medicine, helicopters hovering overhead, men in black bashing down the doors of decent people, and corrupt cops. These problems are produced not by drugs themselves, but by our immature drug policy. Making an adult a felon for taking a hit of marijuana rather than smoking a Marlboro\textsuperscript{\textregistered} is irrational. The fact of the matter is that millions of people enjoy using psychoactive drugs such as nicotine, alcohol, marijuana and MDMA. The government should be in the business of telling adults what they can put in their mouths, or declaring, under threat of imprisonment, loss of property and heavy fines, that it's okay to operate your mind with the benefit of one plant but not another. What goes on inside any given person's body and mind ought to be nobody's business but that person's.

Let's replace the value of intolerance with one of respect, and instead of demanding that people "just say no," acknowledge that adults have the basic human right to control their own bodies and minds, so long as they do not harm others.

Prohibition is not only passé, it's bad policy.

Notes


3 See Cigarette Labeling and Advertising...
on H.R. 2248 before the House Committee on Interstate and Foreign Commerce, 89th Cong., 1st Sess., 1963; Letter to Directors of Bureaus, Divisions and Directors of Districts, from FDA Bureau of Enforcement (May 24, 1963), in 1972 Hearings 240 ["[T]obacco marketed for chewing or smoking without accompanying therapeutic claims, does not meet the definitions in the Food, Drug, and Cosmetic Act for food, drug, or cosmetic"].


5 7 USC Sec. 1311(a).


7 Ibid., 44412-44413.


9 Ibid.


Greetings growers this is for medical marijuana users and those who can use the information legally. Seedbank ratings are farther down and the links to growing information are near the end. First news and growing tips.

This is a weekly report on which seedbanks are reliable and give good service. I also list the bad ones to stay away from (crooks). Reports from people who have ordered from cannabis seedbanks are welcome. That's what this is based on, reports from people like you. You can send a report or post it to alt.drugs.pot.cultivation. Sometimes posts don't show up on my newsserver. If you send a report please state what bank you ordered from, how long it took and roughly how far away you are from them. I'd like to know if the packaging was stealthy (well hidden) and what method used and if any seeds were crushed. Any other info you think is important will be appreciated. Reports on how the crop turned out are good too. I don't rate companies on price, that's up to you to compare. The more stars, the more reliable. F = faster than average, no letter = average, S = slow. A complete breakdown on the ratings is found at http://www.suresite.com/ca/s/system

I have a system of additional ratings. They are a one (1) for accepting payment by money order or certified check without charging extra for it. A two (2) will be given for free stealth shipping. A three (3) will be given for accepting credit cards. This leaves a paper trail but is quick and easy. A four (4) indicates that they use PGP code for privacy on request. A five (5) indicates they take Western Union. An example of the new rating might be Joe's seeds (***) (1,2) which means three stars and he gives free shipping and takes money orders with no extra charge.

This group I've heard good things about. Those with four stars or more are the most reliable. World wide shipping. Those with 4 stars or more are most reliable.

Amsterdam Aloha: (S***)
Dr. Greenthms (F*****+) (1,2)
Heavens Stairway: (F*****+ (1,2)
Marc Emery Direct (***) (1)
H.D. Seeds (**/1) (1,2,3)
Hempseed Cybershop: (F****1) (4)
Tambu (**/1)
bluenose (**/1) (2)

Seeds Direct (**/1) (1,5)

These ship to a limited area

Dr Hermans (***) (1,3)
High Land: (**)
Seed and Read: (**+)
White Widow Web (**) (2)
Paradise (**)

These are seed breeders and wholesalers primarily. While they have a good reputation,

Bros. Grimm
Dutch Passion: http://www.dutch-passion.nl
Homegrown Fantaseed
BCGA
Sensi Seed: http://www.lycaeum.org/~sky/data/sensi.html

This is the rip-off section. The following seedbanks I’ve heard many bad things about. They are NOT recommended. aka means also known as. X means they seldom or never send the product. N means sending non viable seeds (non sprouting seeds)

A-1 Seedbank (X,N)
Beeoo (X)
Fairlight (X,N)
Gangaland (Bonhommes) (X,M) Software Services aka Cannabis4u aka medical hemp aka Pot a Gold (X)
Richies Seedshack (X)
Weedseed (X)

These seedbanks are not recommended due to excessive complaints. This is a judgement call and some customers have said they were satisfied. The nature of the complaints are as follows: 10 = non delivery, 11 = very poor customer service, 12 = inferior quality or misrepresented seeds, 13 = unethical conduct by seedbank owner.

Bullmall aka Bull-electrical.com (10, 11)
Greater Harmony (10)
Laughing Moon (10, 11)
Seedbank Co.uk (10, 12)
Stinkey's (10,11)

Here are some good websites for cultivation and general info:

This is NP Kaye's site, http://www.lycaeum.org/%7Enpkaye/cultivation.html

These are very good sites as well, check them out. Here are the plans for a home built o
Here is an archive of a recent seedbank update. http://www.overgrow.com/su

For info on how to post anonymously to a newsgroup or to send anonymous mail to someone

Thanks to all who have contributed. Next week, I should have another update for you posted to adpc and other places.

peace

green man

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Cannabis growing guide

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OVERVIEW

There are few things in life as good as your own herb, grown by yourself at home out in the garden and indoors in pots... Oregano, Dill, Basil, Sage and other herbs are all easy to grow.

Most people think of gardens as a seasonal, yearly project, but it's actually less time consuming and more rewarding to keep the garden going year round. If one were to attempt to grow year round, indoor gardening techniques will be needed at least during winter to keep the garden producing. You will have herb fresh at all times, there is no worry of mass storage thru the winter and spring, it requires less space, and once established, requires only minimal attention every week to keep it producing at optimal levels.

The best part of being a gardener is it connects you to the earth. It connects you with nature, and is spiritually enriching. Try giving your plants energy by beaming good thoughts and energy at them every time you visit them. I find this helps me as much as it helps them; my plants seem to respond to it favorably.

GENETICS AND THE PLANT

It's very important to start with good genetics. You should attempt to find seeds from local gardeners that are acclimated and bred for local climate and best floral characteristics. Potency, aroma, fast growth, early maturation, resistance to fungus and pests. All of these factors are considered by the seasoned gardener and you will benefit enormously by finding a friend to get you started on the journey that never ends...

Attempt to find an Indica/Sativa hybrid if possible, as this will have the best high and good characteristics for indoor growth as well. Indica plants have a heavy, stony high that is tiresome, and sativas' are hard to grow indoors due to high light requirements, and late flowering traits, so a hybrid can be bred that will have the energetic, cerebral high of the sativa and the early maturation tendencies of the Indica plant.

The Indica plant is easily recognized by its extremely broad leaves that are very rounded on the sides. The Sativa has very narrow, finger-like leaves. A hybrid will have qualities of both and have leaves that are a cross of these two types, thinner than an Indica, but much broader than a Sativa. It is possible to recognize a good hybrid by the leaves once you know what to look for.

Look for seeds that are dark brown or light grey. Some may have dark lines inset into these colors.
INDOORS & OUTDOORS - CONSTANT HARVEST STRATEGY

One of the best solutions to energy verses output for most home gardeners is to use outdoor light for flowering and indoor light for germination and vegetative growth. This will take advantage of the natural light/dark cycle and cut your energy use in half compared to growing the whole plant indoors. A little intelligence will help create plastic sheets that is innocuous and looks much like a storage shed or tool shed so it's not likely to raise suspicion.

In fact, a large shed of metal or plywood can be modified with a luminous roof of PVC, glass, fiberglass, etc. A window to the sky is not needed to grow well. Such a shed will discourage fly-by sightings and keep your business your own! It also allows you to lock it up. It will also give you an opportunity to actually plant in the ground if you desire, and this will result in bigger harvests.

In winter, indoor space is used to start new seedlings or cuttings to be placed outside in the spring as outdoor/greenhouse harvests per year. If more space is available to constantly be starting indoors, you can use outdoor/greenhouse areas, with a small indoor harvest in the winter as a possibility as well.

The basic strategy of year round production is to understand the plant has two growth cycles. At germination, the plant needs as much sunlight as you can give it. This means there is no dark cycle required. The plant will photosynthesis constantly during dark periods and the plant uses sugars produced to build during the evening. This is not a requirement and the plant will grow faster at this stage with continuous photosynthesis (constant light).

Once the plant is 12-18" tall, weather permitting, it can be forced to start flowering by placing it outside. This will lengthen in the greenhouse to "force" the plants to flower. See FLOWERING chapter.)

Moving the plants to 10-13 hour light periods (moving it outside) with uninterrupted darkness (no bright lights nearby) will force the plant to flower. It will ripen and be 2-3' when ready for harvest. When a plant is moved from continuous indoor light to a 10-13 hour day outside, it will start flowering in anticipation of oncoming winter. Vegetative starts moved outside on May 1 will be ripe by July 1. Starts moved outside Sept 1 will be ripe by Nov 1st. In Winter, operations are moved indoors again.

Keep in mind that the "man" is looking for plants in the Sept./Oct./Nov. time-frame, and may never see plants flowered in May, not October!

PLANTING INDOORS

A small indoor space should be found that can be used to germinate seeds; these vegetative starts may be placed in a closet, a section of a bedroom, a basement area, an attic or unused bathroom. Some people devote entire bedrooms to growing.

The space must be light leak proofed, so that no suspicious light is seen from outside the house. This is done by sealing all cracks around doors and windows, and painting the walls white to reflect light. A round hole cut in the floor and ceilings. Use lots of silicon to damp the fans vibrations, so that the walls do not resonate to the fans' oscillations.

Line the walls with aluminum foil, dull side out to diffuse the light and prevent hot-spots, or paint the walls with aluminum coated aluminum foil. (Water proof aluminum is 25 feet of a 4' wide roll.) Mirrors are not good to use, since the glass eats light!

Line the floor with plastic in case of water spills, etc. Set up a voltage interrupt socket and be sure your electrical wiring will handle the lamps your going to use. Always place ballasts for HID lamps on a shelf, so they are above floor level, in case of water spills. Spacers place on the floor under a ballast will work too.

A shelf above the main grow area can be used to clone cuttings and germinate seedlings. It will also allow you to store food, spray bottles and other gardening supplies. This area stays very warm, and no germination warming pad will be needed, so this arrangement saves you $.

Hang a light proof curtain to separate this shelf from the main area when used for flowering. This curtain can be used to keep the curtain in place and ties can be used to roll it up when tending the garden. Blue
Now you need light. A couple of shop lights will be fine if you just want to start plants inside and then take them outside to grow in a small greenhouse. They can be purchased with bulbs for about $10 each, or without bulbs for around $8. Try to find them on sale. Use one Cool White and one Warm Light type bulb in each to get the best light spectrum possible for plant growth. Do not use expensive Grow Lux type bulbs, as they do not put out as much light, and therefore do not work as well in most situations (go figure). If Cool White is all you can find, or afford, use them. They work fine, and are by far the cheapest. (About $1-2 each.)

**SHELF GROWING**

Shelf gardening with fluorescents may be the trend of the future, since the materials are so inexpensive, and easy to obtain. Fluorescent lamps are great for shelf gardening. In this system, many shelves can be placed, one above the other, and fluorescent lamps are used on each shelf. Some areas are best, perhaps with one other devoted to cloning and germination of seed.

Shelf gardening assumes your going to keep all plants 3' or shorter at maturity, so all shelves are to mature early.

One drawback to a shelf garden like this is that it is very time consuming to adjust the lamp height in the garden. This applies mostly to the vegetative stage, when plants are growing as much as an inch a day.

Normally, the lamps should be kept within 2 inches of the tops of the plants, with the plants arranged such that they get progressively taller as the lamps go up, so that all plants are within this 2" range. This is an ideal however, and if you do go on vacation, adjust the lamps so that your sure the plants will not be able to grow up to the lamps within that length of time. If enough fluorescent lamps are used to completely saturate the shelf with light, the spacing issue is very close to them.

An alternative is to use fluorescent lamps for cloning, germination and early seedling growth on the top shelf of a closet, then switch over to HPS for heavy vegetative growth and/or flowering in the main closet area.

Position the HPS such that it won't need adjustment, at the top most possible point in the closet or room. Attach the lamp to the underside of shelf or ceiling as high as possible, and if you want to get a few plants closer to it, put them on a temporary shelf, box or table to get them closer to the lamp.

A shelf is all that is necessary with this type of setup, preferably at least 18" wide, up to about 24" maximum. This area must be painted a very bright white, or covered with aluminum foil, dull side out to reflect light back to the plants. (Dull side out prevents hot-spots; diffuses light better.) Paint the shelf white too. Or, use aluminized mylar, a space blanket, or any silvery surface material. Do not use mirrors, as the glass soaks up light.

Hang shop lamps from chains and make sure you can adjust them with hooks or some other type of mechanism so they can be kept as close to the plants as possible at all times (1-2”). If the lamps are too far from the plants, the plants could grow long, spindly stems trying to reach the lamp, and will not produce as much bud at maturity. This is due to internode length being much longer. This is the length of stem between each set of leaves. If it is shorter, there can be more internodes, thus more branches, thus a plant that provides more buds in less space at harvest time.

Shelf gardening is sometimes referred to as Sea of Green, because many plants are grown close together, creating a green canopy of tops that are grown and matured quickly, and the next crop is started and growing concurrently in a separate area of continuous light. Clones are raised in a constant light shelf, until they start to grow well vegetatively, then placed on a 12 hour per day shelf to flower.

**LIGHT**

Indoors, 2000 lumens per sq. ft. is about as low as you want to go indoors. If you get under this mark, plant growth will certainly not go as fast as possible, and internode/stem length will increase. Also, light distance to plants will be much more critical. Daily adjustments to the lamps will be necessary, meaning you get no vacations.

2500 lumens psf should be a good target, and 3000 is optimal if you going to inject or enrich CO2 levels (more on that later).

High Intensity Discharge lamps are the best solution for most indoor growers. HID lamps come in three major types: High Pressure Sodium (HPS), Metal Halide (MH) and Mercury Vapor. Metal Halide is an improved spectrum, higher intensity Mercury Vapor design. HPS is a yellowish sort of light, maybe a bit pink or orange. Same as some street lamps.

HPS lamps can be used to grow a crop from start to finish. Tests show that the HPS crop will mature 1 week later than a similar crop under MH, but it will be a bigger yield, so it's better to wait the extra week.
The easiest HID to buy, and least expensive initially are the fluorescent and mercury vapor lamps. They provide about 15k lumens, so HPS is almost twice as efficient. But the color spectrum from MV lamp output is not as good as that of HPS. Halide is rich in blues, needed for the best vegetative growth. Unfortunately, MV lamps provide the lowest lumen output. It is better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better than FL, but a 150 watt HPS puts out 18k lumens, so HPS is almost twice as efficient. But the color spectrum from MV lamp output is not as good as that of HPS. Halide is rich in blues, needed for the best vegetative growth. Unfortunately, MV lamps provide the lowest lumen output. It is better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better than FL, but a 150 watt HPS puts out 18k lumens, so HPS is almost twice as efficient.

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<th>Lamp Type</th>
<th>Watts</th>
<th>Lumens per bulb</th>
<th>Total efficiency</th>
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</tbody>
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Notice the Mercury Vapor lamps are less efficient than the fluorescent (FL), and can not be positioned as close to the plants. The light distribution is not as good either. MV lamps simply are not suitable for indoor gardening. High efficiency, and not very much light for the wattage they use, and are also not recommended, even though they are less expensive at the beginning. There is a new type of HPS lamp called Son Agro, and it is available in a 250, 1000, and 400 watt range. Son Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life. Son Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life.

Metal Halide (MH) is another option, and is available in both a 36k and 40k lumen bulbs for the 400 watt lamp. I think the Super Bulb may last longer; if so, that makes it the way to go. Halide light is much better than HPS. It is possible to purchase conversion bulbs for a MH lamp that convert it to HPS, but the HPS bulb life is much shorter than HPS. The beauty of this bulb is that you do not give up most of the advantages of MH lamps, such as minimal internode spacing, one bulb does it all.

Internodal length of plants grown with the Son Agro are the shortest ever seen with any type of lamp. Metal Halide (MH) bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life. Metal Halide (MH) bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life. Son Agro bulbs however, do not last as long as normal HPS bulbs. There is something like a 25% difference in bulb life.

If you have a MH 36k lumen lamp burning at 400 watts and a 53k lumen HPS burning at 430 watts, which is better efficiency wise? Which will provide a better yield? Obviously, the Son Agro HPS, but of course, the initial cost is higher. Actually, the ballast will add about 10% to these wattage numbers.

The Son Agro bulb will provide much better than the MH for any purpose. The MH bulb does not last as long as the Son Agro bulb. Add $15 for the Son Agro HPS. The HPS bulb life is twice as long. 10k hours vs. 21k hours. This is a very good deal for your energy dollar long term.

Horizontal mounting of any HID is a good idea, as this will boost by 30% the amount of light that a lamp can put out, and this amount is increased even further with a horizontal mounting arrangement.

HPS is much less expensive to operate than any other type of lamp, but comes in the 70 watt size with a 45k lumen output, efficiency, so they might be an alternative to FL for very small operations, like 9 sq. feet or less. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp. If you have room for the larger lamp, buy the 400. If your going pro, a 1080 watt model is available too, but you might find there are advantages to using two of them. 70 watt HPS lamps cost about $40 each, complete. Two lamps would be 140 watts putting out about 12k lumens, so it's better light distribution from two 400's rather than one large lamp. Of course, the two smaller lamps are more expensive to purchase than one large lamp, so most people choose the 400 watt lamp.
Heat buildup in the room is a factor with HID lamps, and just how much light the plants can use is determined by temperature, CO2 levels, nutrient availability, PH, and other factors. Too big of a lamp for a space will make constant venting necessary, and then there is no way to enrich CO2, since it's getting blown out of the room right away.

Bulb Costs: the bulb cost on the 70 watt HPS is $24, the 150 is only $30, and the 400 is only $40. Add that up with the lower resale value on the 70's (practically nothing) and becomes evident that $189 for a 250 HPS lamp, or $219 for a 400, might just be worth the price. 20k lumens more light than the smaller lamp. Not a bad deal!

Here is the breakdown on prices (from memory):

<table>
<thead>
<tr>
<th>Type</th>
<th>Complete Cost</th>
<th>Bulb Cost</th>
<th>Bulb Life</th>
<th>Lumens</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPS 400</td>
<td>$219</td>
<td>$40</td>
<td>18k hours</td>
<td>50k</td>
</tr>
<tr>
<td>MH 400</td>
<td>$175</td>
<td>$37</td>
<td>10k hours</td>
<td>36k</td>
</tr>
<tr>
<td>Son Agro400</td>
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<td>$55</td>
<td>15k hours</td>
<td>53k</td>
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<tr>
<td>Super MH400</td>
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<td>$45</td>
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<td>40k</td>
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<tr>
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<td>$25</td>
<td>??</td>
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</tr>
<tr>
<td>HPS 175</td>
<td>$150</td>
<td>$30</td>
<td>??</td>
<td>17k</td>
</tr>
</tbody>
</table>

If your looking for these types of lamps, look in the Yellow Pages under gardening, nurseries, and lighting for indoor gardening stores in your area.

**SEA OF GREEN**

Sea of Green (SOG) is the theory of harvesting lots of small plants, matured early to get the fastest production of buds available. Instead of growing a few plants for a longer period of time, in the same space many smaller plants are grown that mature faster and in less time. Thus, less time is required between crops. This is important to you when the electricity bill comes each month. One crop can be started while another is maturing, and a continuous harvest, plant per square foot will allow plenty of room for each plant to grow a large top cola, but will not always shaded anyway, and will not grow very well unless given additional light and space. The shade at the bottom to make the extra growing time used worth while. An exception to this rule would be if it is intended that light/shading issue will not be a factor at that point.

The plants, if started at the same time, should create what is called a "green canopy" that traps most of the light at the top level of the plants. The gardener is attempting to concentrate on the top of the plant, and use the light to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as easy to install for plants in the middle and back of the room, where reach is more difficult.

Sea of Green was developed in Holland. Instead of fitting 4 large plants in that small room, fit 12 small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature from germination to ripe buds, and harvesting takes place constantly, since there is both a vegetative and flowering area devoted to each, with harvests every 45-60 days. It's not the size of the plant, but the maturity and quality of the product that counts. Twice as many plants, almost twice as often. Get good at picking early flowering plants, and propagate only those that are of the best quality.

6" square containers will allow for 4 plants per square foot. You may also gauge by the size of your growing tray (for passive hydroponics); I like kitty litter boxes. ($3 each at Target)

Planted 4 per square foot, (for vegetative seedlings) a 12 sq. ft. closet will hold 48 seedlings on one pan. I can get 5 pans onto a 12 sq. ft. closet upper shelf, so that is 60 seedlings on one small shelf!

For flowering indoors, 1 plant per sq. ft. is a good rule of thumb for SOG. If less plants are grown in time will be used to create the same amount of product. If more than one plant p.s.f. is attempted the total harvest may be reduced, so be cautious.
It's good to avoid "topping" your plants if you want them to grow as fast as possible. It's better just to leave them as they are and let them grow a bit larger. Also, "training" plants with twist-ties is a great way to get them to bush out a bit. Just take the top till where you want it to be, and then fix a twist-tie around the top of the plant. This will hold the top in place until the top is bent over 90-180 degrees and then attach this to the main stem lower on the plant. This advantage of the fact that if the top is pulled over, it creates a hormonal condition in the plant that allows it to grow bushier, to fill the grow space and for lower limbs to grow upward and join the green canopy. This technique takes advantage of the fact that if the top is pulled over, it creates a hormonal condition in the plant that makes it bush out at all lower internodes.

Sea of Green entails growing to harvest the main cola (top) of the plant. Bottom branches are trimmed, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regrow clones, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regrow clones, as they are the easiest part of the plant to root. It's also the fastest part of the plant to regrow clones, as they are the easiest part of the plant to root.

GERMINATION

Germinate seeds in sterile soil (for planting outdoors) or a hydroponic medium of rockwool or vermiculite. Informal tests and experience show these peat cubes do not work well and stunt the plants growth. Planting in vermiculite or rockwool cubes give the plants look large 1 week after germination!

Keep them moist at all times, by placing seeds in vermiculite filled 16oz cups with holes in the bottom, and place in a tray of weak nutrient solution, high in P. Rockwool cubes also work extremely well. When the seed sprouts, place the rockwool cubes into larger rockwool cubes. No need to transplant! (RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used a previous season for another plant.

You can germinate seeds in a paper towel. This method is tricky; it's easy to ruin roots if they dry out. Place a paper towel in a bowl, saturated with weak nutrient solution (not too much!), and cover with plastic wrap to keep it from drying out. Put bowl in a warm area; top of the gas stove, water heater closet, or above warm lamps. Cover with black paper to keep out light. Check every 12 hours soon as the root coming out of the seed is 1/16" or longer. Use tweezers, and don't touch the root tip. Once sprouted, transplant as little as possible by germinating in the same container you intend to grow the plant in for a significant period of time. Just plant in vermiculite or rockwool. You will be amazed at the results! 90% germination is common with this method, as compared to 50% or less with Jiffy Cubes. (Your mileage may vary.)

5-55-17 plant food such as Peter's Professional will stimulate root growth of the germinating seed and the new seedlings. Use a very dilute solution, in distilled water, about 1/3 normal strength, and keep temperatures between 72-80 degrees. Warm temperatures are very important. Many growers experience low germination rate if the temperatures are out of this range. A heating pad set to low or medium may be necessary, or a shelf constantly warmed by a light may be necessary and may slow germination. Cover germinating seeds with black paper to keep out light.

Plan on transplanting only once or twice before harvest. Use the biggest containers possible for the first harvest, if you intend to grow hydroponically. Transplant them for a second regeneration harvest. Cut holes in the bottom of containers and fill the last few inches at the top with vermiculite only, to start seeds or accept seedling transplants. Since vermiculite holds water well, wicks dry somewhat, and make sure they are getting enough oxygen.

Use SuperSoil brand potting soil, as it is excellent and sterilized. If you insist on using dirt from the yard, sterilize the containers with a bleach solution, especially if they have been used before. (RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used before. (RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used before. (RECOMMENDED) Sterilize the containers with a bleach solution, especially if they have been used before.

VEGETATIVE GROWTH

Once sprouted, the plant starts vegetative growth. This means the plant will be photosynthesizing and producing new leaves. The grow tip is the part that can be cloned or propagated asexually. They are located at the top of the plant, the bottom of the main cola, and you top each of these, you will have 4 grow tips at the top of the plant. (Since it takes time for the plants and not top them at all. Or grow 2 plants, and "train" them to fill the same space. Most growers

All plants have a vegetative stage where they are growing as fast as possible after the plant first germinates. This is the speed at which they grow by 15-30%. Plants can be grown vegetatively indefinitely. It is up to the gardener to decide when to force the plant to flower. A plant can grow from 12" to 12'.
A solution of 20-20-20 with trace minerals is used for both hydroponic and soil gardening when growing continuously under lights. A high P plant food such as Peter's 5-50-17 food is used for blooming and fruiting plants when beginning 12 hour days. Epsom salts (1tsp) should be used in the solution for magnesium and sulfur minerals. Trace minerals are needed too, if your food does not include them. Miracle Grow Patio includes these trace elements, and is highly recommended.

Keep lights on continuously for sprouts, since they require no darkness period like older plants. You will not need a timer unless you want to keep the lamps off during a certain time each day. Try to light the plants for 18 or more hours, or continuously at this point.

Bend a young plant's stem back and forth to force it to be very thick and strong. Spindly stems can not support heavy flowering growth. An internal oscillating fan will reduce humidity on the leave's stomata and improve the stem strength as well. The importance of internal air circulation can not be stressed enough. It will exercise the plants and make them grow stronger, while reducing many hazards that could ruin your crop.

**HYDROPONIC VEGATATIVE SOLUTION, per gallon:**

- Miracle Grow Patio (contains trace elements) 1 teaspoon
- Epsom salts 1/2 teaspoon
- Human Urine (OPTIONAL - may create odors indoors.) 1/4 cup
- Oxygen Plus Plant Food (OPTIONAL) 1 teaspoon

This mixture will insure your plants are getting all major and minor nutrients in solution, and will also be treating your plants with oxygen for good root growth, and potassium nitrate for good burning qualities. Another good GROWTH PHASE mix is 1/4 tsp Peter's 20/20/20 fertilizer per gallon of water, with trace elements and oxygen added, or fish emulsion. Fish emulsion is great in the green-house or outdoors, where smells are not an issue, but is not recommended indoors.

**FLOWERING**

The the plant will be induced to fruit or flower with dark cycles of 11-13 hours that simulate the oncoming winter in the fall as the days grow shorter. As a consequence, it works out well indoors to have two separate areas; one that is used for the initial vegetative state and one that is used for flowering and fruiting. There is no other requirement other than to keep the dark cycle for flowering very dark with no light interruptions, as this can stall flowering by days or weeks.

Once a plant is big enough to mature (12" or over), dark periods are required for most plants to flower and bear fruit. This will require putting the lamp on a timer, to create regular and strict dark periods of uninterrupted light. In the greenhouse, the same effect can be created in the schedule of covering the plants at 8pm and uncovering them at 8am for 2 weeks will start your plants to flower without reverting back to vegetative growth.

Outdoors, Spring and Fall, the nights are sufficiently long to induce flowering at all times. Merely bring the plants from indoors to the outside at these times, and the plants will flower naturally. In late Summer, with Fall approaching, it may be necessary only to force flowering the first two weeks, then the rapidly lengthening nights will do the rest.

Give flowering plants high P plant food and keep them on a strict light regimen of 12 hours, with no light, or no more than a full moon during the dark cycle. 13 hours light, 11 dark may increase flower size while still allowing the plant to go into the flowering mode. Use longer dark periods to speed maturity toward the end of the flowering cycle if speed is of the essence. (8-10 days) This will however, reduce total yield.

Two shelves can be used, one identical to the other, if strictly indoor gardening is desired. One shelf's lights are set for 12-13 hours, and one is lit continuously. Plants are started in continuous light, and are moved to the other shelf to flower to maturity after several weeks. This shelf should be bigger than the "starting" or "vegetative" shelf, so that it can accommodate larger plants. Or, some plants can be taken outside if there is not enough space on the flowering shelf for all of them near harvesting.

A light tight curtain can be made from black vinyl, or other opaque material, with a reflective material on the other side to reflect light back to the plants. This curtain can be tied with cord when rolled up to work on the garden, and can be velcroed down in place to make sure no light leaks in or out. If the shelf is placed up high, it will not be very noticeable, and will fit in any room. Visitors will never notice it unless you point it out to them, since it is above eye level, and no light is being emitted from it.

Flowering plants like very high P level foods, such as 5-50-17, but 10-20-10 should be adequate. Nutrients should be provided with each watering when first flowering. Trace elements are necessary too; try to find foods that include these, so you don't have to use a separate trace element food.
rich in iron for lawn deficiencies, and these can be adapted for use in cultivating the herb. Prices for hydroponic fertilizers sold in indoor gardening shops, and seem to work just fine.

**HYDROPONIC FLOWERING SOLUTION, per gallon:**

- 1 tspn high P plant food, such as 15-30-15, or 5-50-17, etc.
- 1/2 tspn epsom salts
- 1 tspn Oxygen Plus Plant Food (Optional)
- 1 tspn Trace Element food

I cannot stress enough that during the FLOWERING PHASE, the dark period should not be violated by normal light. If you must work on the plants during this time, allow only as much light as a VERY pale moon can provide for less than 5 minutes. Keep pruning to a minimum during the entire FLOWERING PHASE.

A green light can be used to work on the garden during the dark period with no negative reactions from the plants. These are sold as nursery safety lights, but any green bulb should be OK. It is best to keep the dark hours a time when you would normally not wish to visit the garden. Think of it as a time to relax at night after work and in the morning before work, and all day long, while I'm too busy to worry about it.

Flowering plants should not be sprayed often as this will promote mold and rot. Keep humidity levels down indoors when flowering, as this is the most delicate time for the plants in this regard.

Early flowering is noticed 1-2 weeks after turning back the lights to 12 hour days. Look for 2 white hairs emerging from a small bulbous area at every internode. This is the easiest way to verify females early on. You can not tell a male from a female by height, or bushiness.

3-6 weeks after turning back the lights, your plants will be covered with these white pistils emerging from every growtip on the plant. Some plants will do this indefinately until the lights are turned back again. At the point you feel your ready to see the existing flowers become ripe ( you feel the plant has enought flowers), turn the lights back to 8-10 hours. Now the plant will start to ripen quickly, and should be ready to harvest in 2-3 weeks. The alternative, is to allow the plant to ripen with whatever natural day length is available outside, or keep the plants on a constant 12 hour regimen for the entire flowering process, which may increase yield, but takes longer.

Plants can be flowered in the final stages outdoors, even if the days are too long for normal flowering to occur. Once the plant has almost reached peak floral development, it is too far gone to revert quickly to vegetative growth, and final flowering will occur regardless. This will free up precious indoor space sooner, for the next batch of clones to be flowered.

Look for the white hairs to turn red, orange or brown, and the false seed pods ( you did pull the males, right?) to swell with resins. When most of the pistils have turned color (~80%), the flowers are ripe to harvest.

Don't touch those buds! Touch only the large fan leaves if you want to inspect the buds, as the THC will come off on your fingers and reduce the overall yield if mishandled.

**HYDROPONICS**

Most growers report that a hydroponic system will grow plants faster than a soil medium, given the same genetics and environmental conditions. This may be due to closer attention and more control of nutrients, and more access to oxygen. The plants can breath easier, and therefore, take less time to grow. One report has it that plants started in soil matured after hydroponic plants started 2 weeks later!

Fast growth allows for earlier maturation and shorter total growing time per crop. Also, with soil media, plants tend to become root-bound, which limits growth. Hydroponics provides even, rapid growth with no pauses for transplant shock and eliminates the labor/materials of repotting if rockwool is used. (Highly recommended!)

By far the easiest hydroponic systems to use are the wick and reservoir systems. These are referred to as Passive Hydroponic methods, because they require no water distribution system on an active scale (pump, drain, flow meter and path). The basis of these systems is that water will wick to where you want it if the medium and conditions are correct.

The wick system is more involved than the reservoir system, since the wicks must be cut and placed...
the plants up above the water reservoir below. This can be as simple as two buckets, one fit inside the other, with holes in the bottom of the pots, and add water to the pan. It will be wicked up to the roots and there is no transplanting; just place a starter cube into a rockwool grow cube, and when the plant gets very large, place that cube on a rockwool slab. Since rockwool is easily reused over

and rinse the dust off it, over and over, until most of it is gone. Wet the vermiculite (dangerous dry, wear a mask) and mix into pots. Square pots hold more than round. Vermiculite will settle to bottom after repeated watering from the top, so only water from the top occasionally to let holes in the bottom of the pots, and add water to the pan. It will be wicked up to the roots and the

Planting can be made easier with hydroponic mediums that require little setup such as rockwool. I found rockwool to be a great medium for filling planters for Hydroponics allows you to use smaller containers for the same given size plant, when compared to soil, since nutrients are soon used up and roots become bound in the small container. Some advantages of rockwool are that it is impossible to over water and there is no transplanting. But rockwool has many advantages that are not appreciated until you spend hours repotting; take foam, which crunches and powders easily. Rockwool holds 10 times more water than soil, yet is inert, and adds no PH factors. It’s expensive though, and tends to crumble easily. I’m also not sure it’s very reusable, but it seems to be a popular item at the indoor gardening centers.

One really great hydroponic medium is Oasis floral foam. Stick lots of holes into it to open it up a little, and start plants/clones in it, moving the cube of foam to rockwool later for larger growth stages. Many prefer floral foam, as it is inert, and adds no PH factors. It’s expensive though, and tends to crumble easily. I’m also not sure it’s very reusable, but it seems to be a popular item at the indoor gardening centers.

The reservoir is filled with 1 1/2 - 3 inches of water and allowed to recede between waterings. Watering is much faster over time. If you go away on vacation, simply fill the reservoirs full to the top, and the plants will be watered for 2 weeks at least. The reservoir system needs only a good medium suited to the task, and a pan to sit a pot in. If rockwool slabs are used, a half slab of 12" rockwool fits perfectly into a kitty litter pan. The medium is also reusable, as it is difficult to recapture and sterilize after harvest. Use small size lava, 3/8" pea size, and over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants. Hydroponics reduces worries about mineral buildup in soil, and lack of oxygen to suffocating roots.

Hydroponics should be used indoors or in greenhouses to speed the growth of plants, so you have more bud in less time. Hydroponics allows you to use smaller containers for the same given size plant, when compared to soil, since nutrients are soon used up and roots become bound in the small container. This would be difficult to do in soil, since nutrients are soon used up and roots become bound in the small container.
Plant food is administered with most waterings, and allows the gardener to strictly control what nutrients are available to the plants at the different stages of plant growth. Watering can be automated to some degree with simple and cheap drip system apparatus, so take advantage of this when possible.

Hydroponics will hasten growing time, so it takes less time to harvest after planting. It makes sense to use simple passive hydroponic techniques when possible. Hydroponics may not be desirable if your growing outdoors, unless you have a greenhouse.

CAUTION: it is necessary keep close watch of plants to be sure they are never allowed to dry too much when growing hydroponically, or roots will be damaged. If you will not be able to tend to the garden every day, be sure the pans are filled enough to last until next time you return.

More traditional hydroponic methods (active) are not discussed here. I don't see any point in making it more difficult than it needs to be. It is necessary to change the solution every month if your circulating it with a pump, but the reservoir system does away with this problem. Just rinse the pot or rockwool cube with pure water. Change plant foods often to avoid deficiencies in the plants to lessen chances of any type of deficiency.

Change the solution more often if you notice the PH is going down quickly (too acid). Due to cationic exchange, solution will tend to get too acid over time, and this will cause nutrients to become unavailable to the plants. Check PH of the medium every time you water to be sure no PH issues are occurring.

Algae will tend to grow on the medium with higher humidities in hydroponics. It will turn a slab of rockwool dark green. To prevent this, use the plastic cover the rockwool came in to cover rockwool slab tops, with holes cut for the plants to stick out of it. It's easy to cut a packaged rockwool now have two pieces of slab, each covered with plastic except on the very ends. Now cut 2 or 3 4" squares. Now your ready to treat the rockwool as described above in anticipation of planting.

If growing in pots, a layer of gravel at the top of a pot may help reduce algae growth, since it will dry very quickly. Algae is merely messy and unsightly; it will not actually cause any complications with the plants.

RECYCLING

Use pots made from squarish containers such as plastic water jugs, etc. More plants will fit in less space and have more rooting area if square containers are used. This makes your garden a recycling center, and saves you tons of money.

2-liter soda bottles work great, but are not square. 13 will fit in a kitty litter box, and these will take can grow 52 plants like this vegetatively. Spread them out more for flowering.

Old buckets, plastic 3-5 gallon containers (food and paint industries, try painters' and resturant duty), have all been used successfully by growers.

Do not use paper milk cartons and juice cartons for reservoir hydroponics, since these are difficult to sterilize, and they introduce fungus into your reservoir trays. Inert materials, such as plastic is best.

Be sure to sterilize all containers before each planting with a chlorine bleach solution of 2 tbspn. of in several hours in the solution before rinsing thoroughly.

PLANTING OUTDOORS

Outdoor growing is the best. Outdoor pot by far is the strongest, since it gets more light, it's naturally more robust. No light leak problems. No dark periods that keep you out of your grow room. No electricity bills. Sunlight tends to reach more of the plant, if your growing in the direct sun. Unlike growing indoors, the bottom of the plant will be almost as developed as the top.

Outdoors, outside of a greenhouse, there are many factors that can kill your crop. Deer will try to whip your little buds to pieces if they are exposed to strong storms. For this reason, indoor pot can you something; nothing beats the sun.

Put up a fence and make sure it stays up. Visit your plot at least once every two weeks, and prefer
It's a good idea to use soil if you don't have a greenhouse, since hydroponics will be less reliable outside in the open air, due mostly to evaporation.

Light exposure is all important when locating a site for a greenhouse or outdoor plot. A backyard grower will need to know where the sun shines for the longest period; privacy and other factors will enter in as well. Try to find an innocuous spot that gets full winter sun from mid morning to mid afternoon. This alone can make the difference between an average 5' tall plant, and a 10' monster by harvest time. Growing in the ground will always beat a pot, since the plant is never root bound. Plants grown on the ground will grow much larger, but will need more space for each plant, so plan accordingly, you can't move them once they're in!

Many growers find pots have saved a crop that had to be moved for some unexpected reason (repairman, appraiser, fire, etc.).

You may want to keep outdoor plants in pots so they can be easily moved. A big hole will allow the pot to be placed in it, thus reducing the height of the plant, if fence level is an issue.

A novel idea in this regard is to find high water in the mountains, at altitude, and route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and punch small holes in the bottom, and route it to a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

When growing away from the house, in the wild, water is the biggest determining factor, after security. Water is heavy and this is very hard work. Try to find an area close to a source of water if possible.

A novel idea in this regard is to find high water in the mountains, at altitude, and then route it down a route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and route the can in a river or stream under rocks, so that it is hidden and submerged. Bury the hose coming out of work, and this rig can be used year after year.

**GUERRILLA FARMING**

Guerrilla farming refers to farming away from your own property, or in a remote location of your property where people seldom roam around. It is possible to find locations that for one reason or another are not easily accessible or are privately owned.

Try to grow off your property, on adjacent property, so that if your plot is found, it will not be traceable back to you. You can never tell anyone but a partner where the plants are located. Do not bring visitors to see them, unless it is harvest time, and the plants will be pulled the same or following day.

Disguise your greenhouse as a tool shed, or similar structure, by using only one wall and a roof of shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

It's always best to put a roof over your plants outdoors. When I was a lad, we had plants growing over the fence line in the back yard. We started to build a greenhouse roof for them, and a cop saw us hauling wood, thought we were stealing it (which we were not) and looked over the fence. If we had built a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

When growing away from the house, in the wild, water is the biggest determining factor, after security. Water is heavy and this is very hard work. Try to find an area close to a source of water if possible.

A novel idea in this regard is to find high water in the mountains, at altitude, and route it to a drip system that feeds water to your plants continuously. Take a 5 gallon gas can, and punch small holes in the bottom, and route it to a shed roof instead, there would never have been a problem. Moral of the Story: build the roof BEFORE the plants are sticking over the fence! Or train them to stay well below it. Live and learn...

Light exposure is all important when locating a site for a greenhouse or outdoor plot. A backyard grower will need to know where the sun shines for the longest period; privacy and other factors will enter in as well. Try to find an innocuous spot that gets full winter sun from mid morning to mid afternoon. This alone can make the difference between an average 5' tall plant, and a 10' monster by harvest time. Growing in the ground will always beat a pot, since the plant is never root bound. Plants grown on the ground will grow much larger, but will need more space for each plant, so plan accordingly, you can't move them once they're in!
Planting in the ground is always preferable when growing in soil. The plants can then grow to any size, unlimited by pot size. A minimum of a 3 gallon pot. Remember, square containers have more volume in a square space (like a closet).

Plant size in soil is directly related to pot size. If you want the plant to grow bigger, put it in a bigger pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a

Use P4 water crystals in the soil to give the plants a few days worth of emergency water reserves. This substance swells up with water and holds it like a sponge, so that roots will have a
dog's hair!

Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure and household food waste, leaves, lawn clippings, dog hair and other waste products

nutrients, are too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase it's drainage and aeration.

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few

SOIL GROWING

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few nutrients, are too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase it's drainage and aeration.

Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure, including urine, which is high in nitrogen. Dog hair is not recommended for guerilla gardeners planting off their property where police could find it. DNA tests could prove it was YOUR

One suggestion is to use 3" rockwool cubes to start seedlings in, then put 20 of them in a litter pan, cover it with another pan, and transport this to the grow site. The cubes can be planted
directly into soil. If spotted in route to the grow area, burying a dead cat may be a good excuse for being in the area. Few people would demand to see the rotting corpse!

One outdoor grower we know has given up on seeds. He has several strains he likes to clone, so he starts 200 clones in his closet, then transports them outdoors in boxes to the grow site.

Transporting vegetative starts to the growing area is a most tricky aspect of growing outdoors. Usually, you will want to start plant indoors, or outside in your garden, then transport them
to the grow site once they are firmly established. It may be desirable to first detect and separate males from females so that no effort of transporting/transplanting/watering males is incurred.

When growing away from the house, in the wild, water is the biggest determining factor, after security. The amount you can grow is directly proportional to the water available. If you

Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is nothing around trees to create a strong barrier. Always check it and repair every visit you make to the garden to keep rats away from your plants! Do not use soap to keep dear away, it will attract rats! (The fat in the soap is edible for them.)

Gopher Granola is available for areas such as the N. CA mountains, where wood rats and gophers eat the plants. 200g of Gopher Granola is enough for 1 year. Wood rats and Gophers are attracted to

When growing away from the house, in the wild, water is the biggest determining factor, after security. The amount you can grow is directly proportional to the water available. If you try to grow in a greenhouse shed in your own backyard rather than try to keep the rats out of your garden, you will appear to be merely a hiker, not a grower.

Put up a fence, or the chipmonks, squirrels and deer will nibble on your babies until there is nothing left. Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is nothing around trees to create a strong barrier. Always check it and repair every visit you make to the garden to keep rats away from your plants! Do not use soap to keep deer away, it will attract rats! (The fat in the soap is edible for them.)

Briar and poison oak patches are perfect if you can cut through it. Poison Oak must be washed away immediately after contact. Use Teknu, a special soap solution that will deactivate poison oak before it has time to create a reaction. Apply Teknu immediately after contact and take a shower 30 mins. later.

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Try to plant under trees, next to bushes and keep only a few plants in any one spot. Train or top the most plants left to grow untrained. Tying the top down to the ground will make the plants branch least.

Plants can be grown under trees if the sun comes in at an angle and lights the area for several hours of indirect light. Use shoes that you can dispose of later and cover your foot prints. Use surgical gloves and leave no fingerprints on pots and other items that might ID you to the fuzz...

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Bat Guano, chicken manure, or worm castings can all be used to fertilize organically in soil. Manures can burn, so they should be composted with the soil first, before planting, over several weeks. Sea weed is available to provide a rich trace mineral source that breaks down slowly and constantly feeds the plants.

If growing outdoors in available soil, look around for leaves and other natural sources of nitrogen and work them into the soil, along with some dolomite lime and composted organic fertilizer. Even small amounts of plant food such as Miracle Grow can be added to soil at this time (toxic wastes are produced by commercial fertilizer production.) Mulch can be made from leaves and spread out over the garden area to hold in moisture and keep down weeds near the plants.

SECURITY

It's interesting that pot plants really do blend in with other plants to the point that they are unidentifiable by all but the most observant. I remember a relative of the family on a visit to Texas showed me his corn in the garden and I was standing 3' away from several pot plants before I recognized them for what they were.

Plants started outdoors late in the season never get very big and never attract the least bit of attention when placed next to plants of similar or taller stature. Even tall plants grown among several trees will be almost invisible in their camouflage.

Outdoors the object is to control access to an area, and not to arouse suspicion. Tuck them here and there, never in a recognizable pattern. Space them out, and fit them in to the existing landscape such that they get full sun, but they're hidden or blend in. Fence lines and groups of several trees will be almost invisible in their camouflage.

Visit the plants at night on full moons, and if your visible to neighbors, appear to be pruning a tree or doing something in the yard that makes you invisible.

Dig a hole and put a potted plant in it. The plant's height will be reduced by at least a foot.

Some growers top the plant when it is 12" high, and grow the 2 tops horizontally along a trellis. This type of plant can even be grown in your yard in full view. Many stories abound of having the neighbors over for a BBQ and nobody ever noticed the nice plants over by the fence...

PLANT FOOD AND NUTRIENTS

Plant foods have 3 main ingredients that will be the mainstay of the garden, Nitrogen, Phosphorus, and Potassium. These 3 ingredients are usually listed on the front label of the plant food in the order of N-P-K. A 20-20-20 plant food has a Nitrogen level of 20%.

Secondary nutrients are Calcium, Sulphur and Magnesium. In trace quantities, boron, copper, molybenum, zink, iron, and manganese.

Depending on stage of growth, different nutrients are needed at different times. For rooting and germination, levels of high P nutrients with less N/K are needed. Vegetative growth needs lots of N, and human urine is one of the better sources, (mix 8 ounces to 1 gallon water), although it is not a complete fertilizer unto itself. 20-20-20 with trace elements should do it; I like Miracle Grow Patio food. Watch for calcium, magnesium, sulfur and iron levels too. These are important. One tablespoon of dolomite or hydrated lime is used per gallon of growing medium when a hydroponic medium is first brought on-line, to provide nitrogen, calcium and magnesium.

Tobacco grown with potassium nitrate burns better. Plant foods with PN (P2N3) are foods such as Miracle Grow. This is an excellent fertilizer for vegetative growth, or through the flowering cycle as well. Consider however, potassium nitrate is also known as Salt Peter, and is used in mental institutions. So if certain plants are destined for cooking, you might use Fish Emulsion or some other totally organic fertilizer on these plants, at least in the last weeks of flowering.

Most hydroponic solutions should be in the range of 150-600 parts per million in dissolved solids. 300-400 ppm is optimum. It is possible to test your solution or soil with an electrical conductivity meter if your unsure of what your giving your plants.

Keep in mind most dissolved solids readings are usually on the low side, and actual nutrient levels build up over several feedings, to the point the medium is over saturated in nutrients. Just feed straight water now and again, until you notice the plants are not as green (slightly), then resume normal feeding.

Pumping is when you use more waterings to make the plants grow faster. This is dangerous if you proceed in a reckless manner, due to potential over-watering problems. You must go slowly and watch the plants daily and even hourly at first to be sure your not over-watering the plants. Use weaker plant food mixtures than normal, maybe 25%, and be sure your leaching once a month and running straight water through the plants at least every other time you
Use of light strength Oxygen Plus plant food (or Food Grade Hydrogen Peroxide) allows the roots to breathe better and prevents problems with over-watering. Check soil to be sure there are no pH anomalies that might be due to Hydrogen Peroxide in the solution. (One experienced grower told me this won't be a problem if you're checking pH and correcting for it in watering solutions.)

Be sure your medium has good drainage. At this point, if your watering soil-based plants once a week, you can water every 3-5 days instead if you plant them in a medium with better drainage. Perlite or lava rock will greatly increase the drainage of the medium and make watering easier. The enhanced oxygen to the roots. Make sure the plant medium is almost dry before watering again.

An alternative is to use a standard plant food mixture (stronger) once every 3 waterings. The nutrients will be washed out by 2 straight waterings afterward and there is no salts built up in the soil. (Does not apply to hydroponics.)

Stop all plant food 2 weeks before harvesting, so that the plants don't taste like plant food. (This applies to hydroponics as well.)

**WARNING:** Do not over-fertilize. It will kill your plants. Always read the instructions for the fertilizer you are using and follow the amount for the job and feed in vegetative and early flowering stages. It is not recommended for late flowering, or you will be overdosing your plants.

**PH AND FERTILIZERS**

PH can make or break your nutrient solution. 6.7-6.2 is best to ensure there is no nutrient lock-up and the plant is not stressed by exposing to the plants. Phosphate acid can make the PH go down; lime or potash can take it up. Make sure your not going alkaline or acid over time. Most neutral mediums can use a little vinegar to make them just this side of 7 pH to 6.5 or so.

Most fertilizers cause a pH change in the soil. Adding fertilizer to the soil almost always results in a pH change. As time goes on, the amount of salts produced by the breakdown of fertilizers in the soil causes the soil to become increasingly acidic and eventually the concentration of these salts in the soil builds up over time to higher levels of dissolved solids. Use straight water for one feeding in hydroponics if you are unsure of what your plants can take. Build up slowly to higher concentrations of food over time. Novice soil growers tend to over-fertilize their plants.

**FOLAIR FEEDING**

Foliar feeding seems to be one of the easiest ways of increasing yield, growth speed, and quality in a well-ventilated space, with or without elevated CO2 levels. Just prepare a tea of worm castings, fish emulsion, bat guano, or most any other plant food right for the job and feed in vegetative and early flowering stages. It is not recommended for late flowering, or you will be overdosing your plants.

Best times of day to Foliar feed are 7-10Am and after 5 in the evening. This is because the stomata on the underside of the leaves are open then. Also, the best temperature is about 72 degrees, and over 80, they may not be open at all. So find the cooler part of the day if it's hot, and spray the mixture directly onto the foliage. The leaves absorb the fertilizer into their veins. If sprayed on a hot bulb, the water from beading up, and thereby burning the leaves as they act as small prisms. Make sure the pH is between 7 and 6.2. Use baking soda to neutralize the pH after application of a fertilizer.

Perhaps the best foliar feeding includes using seltzer water and plant food at the same time. This way, CO2 and nutrients are fed directly to the leaves in the same spray.

**WARNING!** It is important to wash leaves that are harvested before they are dried, if you intend to eat them. Since they may have nitrate salts on them.

Foliar feeding is recognized in most of the literature as being a good way to get nutrients to the plant when nutrient lockup problems could start to reduce intake from the roots. Perhaps the best foliar feeding includes using seltzer water and plant food at the same time. This way, CO2 and nutrients are fed directly to the leaves in the same spray.

**NOTE:** One grower who reviewed this document comments: “Fish emulsion smells. Bat guano could be highly unsanitary. Stick to the Rapid-Gro, MgSO4 (epsom salts), hydroponic nutrients, or any other balanced plant food. Fish emulsion has a lot of trace element solution. Nitrate salts (The "N" in NPK) are unhealthy to smoke. Personally, I never smoke.”
Above is a great comment, and there is great wisdom in an organic, non-toxic garden. Personally, I do not seem to be necessary when using hydroponics.

CO2

Elevating carbon dioxide levels can increase growth speed a great deal, perhaps even double it. It seems that the plant evolved in primordial times when natural CO2 levels were many times what they are today. The plant uses CO2 for photosynthesis to create sugars it uses to build plant tissues. Elevating the CO2 level will increase the plant's ability to manufacture these sugars and plant growth rate is enhanced considerably.

CO2 can be a pain to manufacture safely, cheaply, and/or conveniently, and is expensive to set up if you do not want to be a major concern unless you have a sealed greenhouse, closet or bedroom, and wish to increase yield and decrease flowering time.

For a medium sized indoor operation, one approach is to use CO2 canisters from welding supply houses. This is expensive initially, but fairly inexpensive in the long run. These systems are good only if your area is not too big or too small.

The basic CO2 tank system looks like this:

- 20 lb tank $100
- Regulator $159
- Timer or controller $10-125
- Fill up $15-20

Worst case = $395 for CO2 tank setup synced to an exhaust fan with a thermostat.

CO2 is cheaply produced by burning Natural Gas. However, heat and Carbon Monoxide must be vented to the outside air. CO2 can be obtained by buying or leasing cylinders from local welding supply houses. If asked, you can say you have an old mig welder at home and need to patch up the lawnmower (trailer, car, etc.).

For a small closet, one tank could last 2 months, but it depends on how much is released, how often the room is vented, hours of light cycle, room leaks, enrichment levels and dispersion methods. This method may be overkill for your small closet.

It is generally viewed as good to have a small constant flow of CO2 over the plants at all times the lights are on, dispersed directly over the plants during the time exhaust fans are off. Opportunities exist to conserve CO2, but this can cost money. When the light is off you don't need CO2 in your setup to your light timer. When the fan is on for venting, CO2 is shut off as well. This may be up to half the time the light is on, so this will affect the plants' exposure times and amount of gas actually dispensed.

Environmentally, using bottled gas is better, since manufacturing it adds to greenhouse effect, and then recycled. Fermenting, CO2 generators, and baking soda and vinegar methods all generate new CO2.

CO2 generation from fermentation and generators is possible. A simple CO2 generator would be a propane heater. This will work well, as long as the gases can be vented to the grow area, and a fan is used to keep the hot CO2 (that will rise) circulating and available below at the plant level. Fire and exhaust venting of the heat are issues as well. A room that must be vented 50% of the time to rid the environment of heat from a lamp and heater will not receive as much CO2 as a room that can be kept unvented for hours at a time. However, CO2 generators are the only way to go for large operations.

Fermentation or vinegar over baking soda will work if you don't have many vent cycles, but if you do, it becomes impractical. Just pour the vinegar on baking soda and close the door, (you lose your CO2 as soon as you do this and can't regulate automatically, and requires daily attention. It is possible however, to create CO2 by fermenting, but it would be a cost-effective setup for most closet growers, for whom $400 in CO2 equipment is a bit much to swallow.

In fermentation, yeast is constantly killing itself; it takes a lot of space. You need a big bin to contain the process.
VENTING

You have to vent a lot with a HID lamp, less so for fluorescents. Also, humidity build up requires that you vent. The best trick is to find a timer that will do this sort of thing. Not easy to find and not cheap. Once you need to regulate CO2 on and off inversely with the fan, your looking at a $100 climate controller.

Alternatives are a thermostat that turns on a fan when a certain temperature is reached, and turns the light on at the same time. One factor of using seltzer water is it raises humidity levels. Make sure your venting humidity during the dark cycle, or you could risk fungus and increased internode length.

CAUTION: Don't spray too close to a hot bulb! Spray downward only, or turn off the lamp first.

Even though CO2 enrichment can mean 30-100% yield increases, the hassle, expense, space, danger, and time involved can make constant or near constant venting a desirable alternative. Some growers have reported to High Times that high CO2 levels in the grow room near harvest time lower potency. It may be a good idea to turn off CO2 2 weeks before harvesting.

TEMPERATURE

Try sodium bicarbonate mixed with vinegar, 1 tsp: ~30cc- this will gush up all frothy as it releases CO2 is 2 Oz sugar in 2 liters of water in a bottle [sterilized 1st with bleach and water, then supplier. Add a brewing yeast, shake up and keep at 25 deg celsius[~70 F] . Over next 2 weeks or once, starting a new one every 3 days or so. With added CO2 growth is phenomenal!!! I personally demonstrate the fermentation is working.

A variation is to spray seltzer water on the plants twice a day. This is not recommended by some authorities, since it contains less sodium that could clog the plants stomata. Wash your plants with straight water since it contains less sodium that could clog the plants stomata. Wash your plants with straight water. Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plant at the same time. One factor of using seltzer water is it raises humidity levels. Make sure you are not venting too much.

Seltzer is available at most grocery stores (I get it at Lucky's @ .79 for a 2 litter bottle). Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plant at the same time. One factor of using seltzer water is it raises humidity levels. Make sure you are not venting too much.

A good container is a 1 gallon plastic milk jug, with a pin-hole in the cap. Also, the air-lock from a home brewing yeast. Sugar is used quickly this way, and a 10 pound sack will run $3.50 or so and last about 2-3 weeks. A tube out the top going into a jar of water will bubble and demonstrate the amount of CO2 being produced.

Another alternative is to bottle sugar and water in a sterilized bottle, and shake and keep at 25 deg celsius[~70 F] . After next 2 weeks or once, starting a new one every 3 days or so. With added CO2 growth is phenomenal!!! I personally demonstrate the fermentation is working.

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Proper temperature is one highly variable factor. Most books state optimum grow temperature to be 70-80 degrees, but many list extenuating circumstances that allow temperatures to go higher. Assuming genetics is not a factor, plants seem to be able to absorb more light at higher temps, perhaps up to 90 degrees. High light and CO2 levels could make this go as high as 95 degrees for increased growth speed.* An optimum of 95 degrees is new data that assumes very-high light, CO2 enrichment of 1500 ppm and good regular venting to keep humidity down. It is not clear if these temperature will reduce potency in flowers. It may be a good idea to reduce growth speed. But higher temperatures will make plants grow vegetatively much faster, by exciting the plants metabolism, assuming the required levels of CO2 and light are available, and humidity is not allowed to get too high.

With normal levels of CO2, in a well vented space, 90 degrees would seem to be the absolute max, but the room temperature get over 35 C (95 F) as this hurts growth. Optimal temperature is 27-30 C (80-86 F) if you have strong light with no CO2 enrichment. Less than 21 C (70 F) is too cold for good growth.

Low temperatures at night are OK down to about 60 degrees outdoors, then start to effect the growth in a big way. Mid 50's will cause mild shock and 40's will kill your plants with repeated exposure. Keep your plants warm, especially the roots. Elevate pots if you think the ground is too cold.

As temperature goes up, so does the ability of the air to hold water, thus reducing humidity, so a higher average temperature should reduce risk of fungus.

Contrary to many reports, high humidity is not good for plants except during germination and rooting. Lower humidity levels help the plant transpire CO2 and reduce risk of molds during flowering.

Studies indicate the potency of buds goes down as the temperature goes up, so it is important to keep your plants cool.


**PESTS**

You really have to watch pests, or all your efforts could result in little or nothing in return. Mites and aphids are the worst, while whiteflies, caterpillar and fungi are the ones to watch out for long term. Pyrethrum bombs can start you with a clean slate in the room, and then homemade or commercial soap sprays will do most of the rest. When bringing in plants from outside, pyrethrum every broad leaf top and bottom and the soil too. Then watch them closely for a week or two, and soap down any remaining bug life you find from eggs being hatched. This should do the trick for a month or two, long enough it won't be an issue before harvesting.

Fungus is another obstacle in the path of a successful growing season. When the flowers are roughly half developed they become susceptible to a fungus or bud rot. It appears that growing conditions for the fungus are best when temperatures are between 60 and 80 degrees and the humidity is high. The fungus is very destructive and spreads quickly. It is a spore type of fungus that travels to other buds via the wind so it is impossible to prevent or stop if weather conditions permit it to grow. If things should go badly and the fungus starts to attack your plants, you must remove it immediately or it will spread to other areas of the plant or plants. Some growers will remove just the section of the bud that is infected whereas other growers will remove the entire branch. Removal of the entire branch better insures that the fungus is totally removed, and also enables the grower to sample the crop a few weeks ahead of time.

Fungi can wipe your crop quick, so invest in some SAFE fungicide and spray down the plants just before flowering if you think fungus may be a problem. Don't spray the plants if you have never had problems with fungus before. Keep humidity down, circulate air like crazy in the grow space until after flowering, since it's not a good idea to apply the fungicide directly to flowers. Instead, flowers must be cut off when they are infected.

Most fungicides are very nasty, and you won't want to ingest them, so it is necessary to use one that is safe for vegetables. Safer makes a suitable product that is available at most nurseries; it contains only sulfer in solution.

Use soap solution like Safer Insecticidal Soap to get rid of most aphid problems. Use some tobacco juice and chili pepper powder added to this for mites. Dr. Bronnars Soap can be used with some dish detergent in a spray bottle if you want to save money.

Pyrethrum should only be used in extream circumstances directly on plants, but can be used in a week to non-toxic elements, and can be washed from a plant with detergent solutions and then clear water. Flushing young plants up to early flowering. Into later flowering, the tobacco and pepper/soap solution is your best bet, on a daily basis, on the under-sides of all infected leaves.
Spider mites are by far the worst offender in my garden. I have finally learned not to bring plants from outside into the indoor space. They are always infected with pests and threaten to infect the entire indoor grow space. It is much more practical to work WITH the seasons and regenerate plants outdoors in the Summer, rather than bringing them indoors to regenerate under constant light. Start a plant indoors, take it outside in Spring to flower. Take a harvest or two, feed it nitrogen all Summer and it will regenerate naturally, to be flowered again in the Fall.

Once a plant has been taken outside, leave it outside.

**TRANSPLANTING**

There will be little or no shock if you are quick and tender in your handling of the plants. Make sure you are quick and tender in your handling of the plants. Make sure you only need to transplant twice, or better yet, once if possible, through the entire growth cycle. Transplanting slows you down. It takes time, it's tricky, it's hard work, and threatens the plants. Start in as large a container as possible, square is best. 16 ounce plastic cups work OK, and 2 litter soda bottles cut down may be big enough for the first harvest when growing hydroponically. One-gallon plastic milk or water containers (squarish) will work too.

Or start seeds and rooted cuttings in 16oz plastic cups. It's better to have less seedlings than it is to have many seedlings that need constant transplanting. These larger cups take only a little more space, and allow you to transplant only one time before harvesting the first crop. Transplanting regenerates this plant after harvesting, transplant it into a larger pot after it goes into vegetative growth. A 2-3 gallon container would make this plant's 2nd harvest better than the first, given enough vegetative regrowth first.

One more tip:

A Russian study showed that seedlings with at least 4" of soil to grow the tap root were more likely to go female. The source I'm quoting says "This may be why some farmers get female/male ratios as great as 80%/20%.

**EARLY SEXING**

It's possible to tell the sex of a plant early, and thus move male plants out of the main growing area before they reach the light vegetative state. Use a black paper bag or equivalent to allow for air flow while keeping out light. Be sure to set up a regular cycle for these covered branches. If light is allowed to reach them during the dark period, they may not indicate early at all.

Use a magnifying glass to look at the early flowers sex type. A male plant will have a small club (playing card) looking preflower with a small stem under it. A female flower is usually a single or double pistil, white and wispy, emerging from an immature calyx.

Some people like to pre-force plants when they are 8" tall, in order to weed out the males. When growing plants outdoors, just put the plants on a 12 hours light cycle for 2 weeks, separate the females from the males, and harvest the females. Keep in mind, this is a time consuming process and can put the plants back 2 weeks in growth. Don't pre-force plants unless you have lots of time. Just cover one branch per plant with black paper (light tight, breaths air) 12 hours every day under constant light to force pre-flowers and differentiate early.

**REGENERATION**

It is possible to harvest plants and then rejuvenate them vegetatively for a 2nd and even 3rd harvest. If the roots are already formed, the plant can produce a second, even third harvest of buds in a little more time than the first. Leave most healthy fan leaves in the middle of the plant, cutting buds off branches carefully from each branch. These will be the part of the plant that is regenerated. The more buds you leave on the plant, the faster it will regenerate. Feed the plant some Miracle Grow or any high nitrogen plant food immediately after harvest. When you intend to regenerate a plant, make sure your plant will not have enough leaves to live after being harvested.

Harvested plants can come inside for rejuvenation under continuous light or are left outside in Summer growth when regenerating a plant. As stated before, and in contrast to normal growth patterns, leave the plant little vegetatively, then take outside again to reflower. Or keep inside for vegetative cuttings. You will now be harvesting twice as often. As often as every 30 days, since you have new clones flowering too.

Regenerating indoors can create problems if your plants are infected with pests. It may be best to
An alternative to regenerating indoors is to regenerate outdoors in the Summer. Just take a harvest leaving the middle 1/3rd of the plant's leaves at harvest. Feed it nitrogen, and make sure it gets lots of sun. It will regenerate all Summer and be quite large by Fall, when it will start to flower again naturally.

**PRUNING**

Plants that are regenerated, cloned and even grown from seed will need to be pruned at some point. Lowering the lower limbs creates more air-flow under the plants in an indoor situation and creates cuttings for cloning. It also forces the plant’s effort to the top limbs that get the most light, maximizing yields.

Plants that are regenerated need to have minor growth clipped so that the main regenerated growth get the most plant’s energy. This means that once the plant has started to regenerate lots of growth, the lower limbs that will be shaded or are not robust should go. The growth must be thinned on top branches such that only the most robust growth is allowed to remain.

Once nice aspect of regenerating plants is that some small buds left on the plant in anticipation of regeneration will not sprout new growth and may be collected for smoke. The plant may provide much smokable material if it is caught before all the old flowers dry up and die with the new vegetative growth occurring.

Try to trim a regenerated plant twice. Once as it is starting to regenerate, collect any bud that is not sprouting with new growth and smoke it. Then later, prune again to take lower clippings to clone and thin the upper growth so that larger buds will be produced.

If a regenerated plant is not pruned at all, the resulting plant is very stemmy, does not create large buds and the total yield will be significantly reduced.

**HARVESTING AND DRYING**

Harvesting is the reaping of the bounty, and is the most enjoyable time you will spend with your garden. Plants are harvested when the flowers are ripe. Generally, ripeness is defined as when the white pistils start to turn brown, orange, etc. and start to withdraw back into the false seed pod. The seed pods swell with resins usually reserved for seed production, and we have ripe sinse buds. It is interesting that the time of harvest controls the “high” of the buds. If harvested “early” with only a few of the pistils turned color, the buds will have a more pure THC content and will have less THC that has turned to CBD and CBN's. The lessor psychoactive substances will create the bouquet of the pot, and control the amount of stoneyness and stupidness associated with the high. A pure THC content is very cerebral, while high THC, high CBD, CBN content will make the plants more of a stupid, or hazy buzz. Buds taken later, when fully ripened will normally have these higher CBN, CBD levels and may not be what you prefer once you try different samples picked at different times. Don’t listen to the experts, decide yourself based on what you come to like yourself.

Keep in mind, a bud weighs more when fully ripe. It is what most growers like to sell, but take some buds early for yourself, every week until you harvest, and decide how you like it for yourself. Grow the rest to full maturity if you plan to sell it.

Most new growers want to pick early, because they are impatient. That's OK! Just take buds from the middle of the plant or the top. Allow the rest to keep maturing. Often, the tops of the plants will be ripe first. Harvest them and let the rest of the plant continue to ripen. You will notice more light available to the bottom portion of the plant now, the plant yields more this way over time, the plant plants are harvested.

Use a magnifier and try to see the capitated stalked trichomes (little THC crystals on the buds). If they are mostly turning brownish in color, the THC levels are dropping and the flower is past optimum potency, declining with light and wind exposure rapidly.

Don’t harvest too late! It’s easy to be too careful and harvest late enough potency has declined. Watch the plants and learn to spot peak floral potency.

Do not cure pot in the sun, it reduces potency. Slow cure hanging buds upside down in a ventilated space. That is all that is needed to have great sensi. Drying in a paper bag works too, and may be much more convenient. Bud tastes great when slow dried over the course of a week or two.

If your in a hurry, it’s OK to dry a small amount in-between paper sheets or a paper bag in a microwave oven. Go slow and check it, don’t burn it. Use the defrost power setting for a slower, better drying. It will be harsh smoking this way though.

A food dehydrator or food preserver will dry your pot in a few hours, but it will not taste the same as slow-dried. Very close though. And this will speed your harvest time (which can be nerve-wracking, with all this pot hanging around drying.)
Dry buds until the stems are brittle enough to snap, then cure them in a sealed tupperware container.

Once experienced grower told me to dry in an uninsulated area of the house (like the garage) so that as if it were still alive, it will use some of it's chlorophyll while it is drying, and the smoke will be less harsh.

CLONING

Cloning is asexual reproduction. Cuttings are taken from a mother plant in vegetative growth, and the offspring will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very important determining factor.

Cloning will open you to the risk of a fungus or pests wiping out the whole crop, so it's important to pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel devoted to being a mother. I killed off a sacred strain accidentally this way; my harvested plants failed to regenerate and the strain would have died completely had not previously given it to friends to grow it as well. I was in luck, and a buddy set me up with another clone of this strain to grow as a mother plant for a new crop of clones.

After two months, any marijuana plant can be cloned. Flowering plants can be cloned, but the plants that have been harvested. A single regenerated/harvested plant can generate hundreds of cutting that are identical to the parent plant.

Cloning goes quickest with the liquid rooting solutions, in a warmed, aerated tray, with subdued lighting and high humidity. Placing cuttings into 1" rockwool cubes in a covered tray as high a success rate.

If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favorite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The psychoactive, almost hallucinogenic properties of some Indica/Sativa hybrids, you never want to smoke a pure Indica again. Indica is however, great medicinally, so I like to grow a few pure strains too.

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I found only one liquid rooting hormone solution that was not over $10. (Olivia's Gel was $12 for a 1.6 ounce bottle). I considered myself lucky, and got a tray and clear cover for $7. A clear tray cover or greenhouse encloser is needed to bring up humidity to 90% (greenhouse levels) in a double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks.

Mix a weak cloning solution of high P plant food (such as Peter's 5-50-17), trace elements, and epsom salts. The mix syup has been reported to supplement the sugars needed by the plant during cloning, since it contains some plant sugars.
Use a powder fungicide too, like RootoneF to be sure you don't spoil the clones with fungus. This is important, since clones and fungus like the conditions you will be creating for good rooting:

mild light, 72-80 degrees, high humidity

In rockwool, there is no need for airating the solution, just keep the cubes in 1/4" of solution so they wick and stay moist at all times. Try to keep clones evenly spaced, and spray them with water once a day to keep them moist and fresh. Pull out clones if they are diseased and dying.

Another method is to float cuttings in a tray full of solution on polystyrene disposable plates, or styrene sheets (shipping/packing material) with holes punched, so the tops and leaves are out of the water. Take off all large leaves, leaving only smaller top leaves to reduce demand on the new rooting stalk. Aerate the tray solution with an air pump and bubble stone. Keep solution at 72-80 degrees for best results. Change the solution daily if not using an air stone and pump, to prevent leaves from cuttings to reduce water demands as the cuttings start to root.

Buy a tray with a clear cover made for rooting at an indoor gardening supply house. You must keep the cuttings even, and a light shining down if you don't want to pay for the grow tray and cover.

It's also possible to directly place a dipped cutting in a moist block of floral foam with holes punched in it, or vermiculite in a cup; be sure to root cuttings in a constantly moist medium. Jiffy peat cubes are not recommended, as published reports indicate results were not good for rooting clones. Pull out clones if they are diseased and dying, to keep them away from healthy starts.

One grower writes us:

I have had virtually all attempted clones root with the following scheme:

0. Prep cutting by removing large leaves on tip to be cut, allow to heal.

1. While holding underwater, take final diagonal cut on stem to be rooted.

2. Dip in Rootone, then spear stem about 2" deep in 16 oz. cups of 1/2 vermiculite, 1/2 perlite, with gentle soln.

4. Cover top of cooler with Saran Wrap, then punch holes for ventilation.

5. Keep cooler in relatively mild temps, low light, and spray cuttings daily.

6. Cuttings should root in about 3 weeks.

Cloning is not as easy as starting from seed. With seeds, you can have 18" tall plants in 6 weeks or less. Seeds are easily twice as fast if you have empty indoor space being wasted that needs to be put to use, the time, you could get wiped out, and have nothing but your seeds left to start over.

Cloning in rockwool seems to work great, and no airpump is needed. I paid $9 for 98 rockwool starter cubes. A plastic tray is available ($.95) that holds 77 cubes in pockets allowing the cubes to be held in a tray of nutrient solution. They are easily removed and placed in a larger rockwool growing cube when rooted.

**BREEDING**

It is possible to breed and select cuttings from plants that grow, flower, and mature faster. Some plants are more potent than others, or even plants themselves. Select the most potent plants to clone or breed, but the fastest growing/flowering plants as well. Find your fastest flowering strains. Clone your fastest, best high plant for the quickest monocrop garden possible. Over time, your garden will have more and more plants at the same stage of growth.

When a male is starting to flower (2-4 weeks before the females) it should be removed from the females. This is called the "clone" stage, it will receive few hours of light per day will be adequate, including close to a window in a separate room in the house.
Keep a male alive indefinitely by bending it’s top severely and putting it in mild shock that delays its maturity. Or take the tops as they mature and put the branches in water, over a piece of plate glass. Shake the branches every morning to release pollen onto the glass and then scrape it with a razor blade to collect it. A male pruned in this fashion stays alive indefinitely and will continue to produce flowers if it gets suitable dark periods. This is much better than putting pollen in the freezer! Fresh pollen is always best.

Save pollen in an air tight bag in the freezer. It will be good for about a month. It may be several more weeks before the females are ready to pollinate. Put a paper towel in the bag with it to act as a desiccant.

A plant is ready to pollinate 2 weeks after the clusters of female flowers first appear. If you pollinate too early, it may not work. Wait until the female flowers are well established, but still all while hairs are showing.

Turn off all fans. Use a paper bag to pollinate a branch of a female plant. Use different pollen from two males on separate branches. Wrap the bag around the branch and seal it at the opening to the branch. Shake the branch vigorously. Wet the paper bag after a few minutes with a sprayer and carefully remove it. Large plastic zip-lock bags also. Slip the bag over the male branch and shake the pollen loose. Carefully remove the bag and zip it up. It should be very dusty with pollen. To pollinate, place it over a single branch of the female, zipping it up sideways around the stem so no pollen leaks out. Shake the bag and the stem at the same time. Allow to settle for an hour or two and shake it again. Remove it a few hours later. Your branch is now well pollinated and should show signs of visible seed production in 2 weeks, with ripe seeds, so it should not be necessary to pollinate more than one or two branches in many cases.

When crossing two different varieties, a third variety of plant will be created. If you know what characteristics you are looking for in a new strain, you will need several plants to choose from in order to have the best chance of finding all the qualities desired. Sometimes, if the two plants bred had dominant genes for certain characteristics, it will be impossible to get the plant you want from one single cross. In this case, it is necessary to interbreed two plants from the same batch of resultant seeds from the initial cross. In this fashion, recessive genes will become available, and the plant character you desire may only be possible in this manner.

Usually, it is desirable only to cross two strains that are very different. In this manner, one usually created by taking two very different strains and mating them. Less robust plants may be the result. Hybrid offspring will all be very different from each other. Each plant grown from the same batch of seeds will be different. Slip the plant separately and decide it’s individual merits for yourself. If you find one that seems to be healthier or taller than the others, it is then necessary to try each plant separately and decide it’s individual merits for yourself.

SINSE SEEDS

It is possible to cross your favorite two female plants to create a new strain of seeds that will produce all female plants since there will be no chance of male chromosomes from female parents.

Use Gibberellic Acid on one branch of a female plant to induce male flowers. Gibberellic Acid is sold by nursery supply houses for plant breeding and hybridizing. Spray the plant once every day for 10 days with 100 ppm gibberellic acid. When the male flowers form, pollinate the flowers of your other target female plant you have selected. Just pollinate one branch unless you want lots of seeds!

Once the branch has male flowers, cut the branch and root it in water, with glass under it to catch the pollen. Collect the pollen with a plastic bag over the branch and shake it. Use a razor blade to scrap up the pollen and add it to the bag too.

It is also possible to pollinate the flowers of the plant you create the male flowers on, crossing it with a different variety.
preserve the plants characteristics, but will not allow you to store seeds for use later. Crossing a plant with itself can lead to inbreeding problems, so it may not be the optimum solution in many cases.

I once tried using Gibberellic Acid, sprayed on a healthy female, every day for over a week. No male flowers appeared on the plant. Your mileage may vary.

ODORS AND NEGATIVE IONS

Negative ion generators have been used for years now to cut down on odors in a grow room, but no true evidence to support this, however it does make sense, due to the fact that people and animals seem to be altered in a positive way by negative ions in the air, so plants may "feel" better too. Try putting one in the grow room. You may notice the buds don't have as much scent when picked, but that may be desirable in some cases.

A negative ion generator can be purchased for $15 to $100 depending on the type and power involved to use grounded aluminum foil on the wall and shelf where the ionizer sits, to collect these particles. If you don't cover the wall and shelf with paper or foil, the wall will turn dark with dust.

OXYGEN

O2 to the roots is a big concern, since the plant requires this for nutrients to be available, and to rid itself of toxins, etc. One of the easiest things to do is use food grade hydrogen peroxide in the water to increase the availability of oxygen in the water. H2O2 has an extra oxygen atom that contains 25% hydrogen peroxide and is perfect for this use.

Using a planting medium that allows for plenty of aeration is also really important. Be sure you have good drainage by using Perlite, sand, or gravel in your mix and at the bottom of pots. Don't use a medium that holds too much water, or you may significantly reduce the oxygen available.

Aerating the water before watering is also a good idea. In the case of soil potted plants, use an airpump to aerate the water overnight before watering your plants, or put the water in a container with a cap and shake it up real good before giving to the plants.

SAFETY AND PRIVACY

Utility companies can tell your bill is way off from the same time last year, and police are finding growers this way. More than 500 watts in the family home running constantly will show up as a regular monthly increase in electricity use. You can claim space heaters, more people living in your home, etc. If the police knock and ask you about it, don't let them in, and move your plants to another location during the wee hours in a vehicle not your own.

Upon moving into a new place, it may be desirable to immediately establish high electricity use, so that your electrical use history won't reveal your activities in the future...

Light leaks, open windows, heat expelled from rooms that would normally be cool, and rip-offs are all serious issues to be concerned about. Don't use a burglar alarm on when you're away from the house. People are busted this way when the kids try to rip off the garden and the police come. Lock the house up well, and let them take it if they need it so bad. It's not worth getting busted for a burglary...

Think ahead to any situation that will require outsiders to visit sensitive areas of the house. Repairmen, solicitors, meter readers, neighbors, appraisers, and pets should all be considered and contingency plans made in advance.

DISTILLED WATER

Some growers report purified or distilled water helps their plants grow faster. Perhaps due to sodium and heavy metals found in hard water that are not present in purified water. Hard water tends to build up alkaline salt deposits in soil that lockup trace minerals, and cause iron, copper and zinc deficiencies. There are several types of purified water, but many are not free of minerals that could be causing salt buildup over an extended period of time.

Tap water comes in two flavors. Hot and cold. The cold pipe has less calcium and sodium buildup than the hot pipe, and should be freer of sediment once the water has been turned on and allowed to flow for 30 seconds. Hot water will have rust, lead deposits, and lots of sodium and calcium, so make sure your water the correct temperature (70-80 F). Tap water filtered through a carbon (charcoal) filter will be free of chlorine and most large particles, but will still contain dissolved solids such as sodium and heavy metals (lead, arsenic, nickel, etc.).

Purified bottled water will be either Reverse Osmosis or some form of carbon/sediment filtered water.
buying it. It could still have the same dissolved solids and heavy metals your tap water has.

**BIRTH CONTROL PILLS**

A solution of one pill to one gallon of water has been reported to cause increased growth speed in plants before flowering and one administered a few weeks before harvesting might help the plant mature faster.

One grower told a story of the same type of plants, one administered the estrogen grew to 20 feet, while the other was 7 feet. This may be purely anecdotal, but it may work. Try it and report back to us on results.

**SEED AND BUD STORAGE**

Use a seal-a-meal to hermetically seal the bag with no air inside. Freeze or refrigerate, and bud and seed can be kept for years this way.

Rap seeds in a paper towel to absorb moisture. Keep them in the freezer, and pull out only as many as you need, then pop them back in the freezer quickly.

**A FINAL COMMENT**

Good results can be had even in what appear to be rather marginal situations. (i.e.: a four inch pot in a room with a skylight.) With the minimum of: well drained medium, good light with ventilation, regular application of a complete fertilizer, pest control, and avoidance of detection, anyone can take a viable seed to maturity. I strongly recommend buying several complete grow guides. Please only use this limited information for a basic understanding of gardening. Some excellent books are available including "Marijuana Botany" "Marijuana Growers Guide( Inside guide and Outdoor)" "Marijuana Chemistry". These are all excellent lores of wisdom.

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**THE MARIJUANA GROWER'S GUIDE**

by Mel Frank and Ed Rosenthal
Typed by Ben Dawson
Revised 1992

NOTE:- Footnotes have been placed in double brackets {{}}. Numbers throughout refer to bibliography and are sometimes in brackets, sometimes they aren't. All dates are for northern hemisphere only. Comments on pictures are in curly brackets {}. Please distribute this widely so we can all smoke better marijuana. Legalise marijuana.

4-Oct-96

Copying this book was a megamission that took about 3 weeks in the September of 1993. Everything in the book has been copied - even the bibliography. The
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Marijuana, or cannabis as it is known internationally, is a plant whose presence is almost universal in our world today. Conservative international reports estimate that there are now 300 million cannabis users. Recent reports indicate that 10 percent of the adult population in the United States are regular users, a figure which is probably similar for many
countries in Europe. Its use is also widespread in Africa, Asia, many Arab nations, parts of South America and the Caribbean, as well as Australia and New Zealand. In 1978, more than 5.2 million kilograms (12 million pounds) of cannabis were seized by police worldwide. Authorities estimated that this did not exceed 10 percent of the total traffic.

What has been the response of officials around the world to the use of this plant by its citizens? Regrettably, the climate has been one of almost universal repression, hostility and open violence. Despite gains made in the United States and Europe throughout the 1970's, a new wave of ignorance regarding the use of this plant seems to be sweeping the world. Predictably, the United States has sought to export this "neo-Reefer Madness" to other countries. A United Nations sub-commission of drug enforcement officials in the Far East released a report some time ago extremely critical of the efforts of some countries to decriminalize (i.e. remove criminal penalties for possession of a small amount) cannabis. The sub-commission stated that any such reduction of penalties would vastly increase use, and strongly urged that all countries continue to keep strict laws on the books even for possession of cannabis. Others requested that publicity campaign be conducted in the media against cannabis, and that more funding be given to scientific work to prove that cannabis was harmful.

US officials, alarmed by reports of cannabis use among adolescents (which, although undesirably high, is in fact leveling off), and by political pressure from reactionary elements, have attempted to depict cannabis as the greatest threat since the atomic bomb. The results of this new hysteria have been great confusion among the public and a slowdown in the progress of cannabis law reform. The results have been predictable: in 1979, over 448,000 people were arrested in the USA for cannabis possession, 80 percent for simple possession. The estimated direct arrests cost to our increasingly debt-ridden government was over $600 million. But no one has ever attempted to account for the total cost of the immense law enforcement efforts against cannabis: for the salaries of Drug Enforcement Administration agents and federal and state narcotics agents and support personnel, the cost of incarcerating the thousands of people sentenced to jail (estimated at 10 percent of the total arrests, or 48,000 people), the costs of the anti-cannabis media campaign, the secret grants from NSA/CIA for cannabis eradictions, and the economic cost to society created by turning law-abiding citizens into criminals. When these factors are taken into consideration, the cost goes into the billions. By contrast, in the eleven states which have enacted decriminalization since 1972, millions of dollars and hundreds of thousands of court, police and administrative work-hours have been saved.

What can the concerned cannabis consumer do to end this climate of hysteria and ignorance? First, we must stress that cannabis legalisation would entail adult use only, and that social and legal restrictions on the use of cannabis would curtail, not increase, use by adolescents. Second, we must educate the public about the genuine effects of cannabis and stress moderate responsible use. This is what we stress about the user of society's legal drugs - alcohol, nicotine and caffeine, and we should take the same approach toward cannabis. Third, the public should be educated about the limits of the law and the rights of citizens; we should not seek to regulate private behaviour through the use of the criminal sanction. Laws protecting public
safety, such as driving while under the influence of any substance, would still be kept on the books.

However, as consumers we have an additional responsibility: we must begin to address the problems of supply and demand. It is essential that we take upon ourselves the task of proposing viable solutions to the current unworkable prohibition.

With this in mind, numerous cannabis reform organizations around the world have begun exploring models for the legalization of cannabis. Under the auspices of the International Cannabis Alliance for Reform (ICAR), an international organization of cannabis law-reform groups, many of these organizations met in Amsterdam, Holland in February, 1980, at the first International Cannabis Legalization Conference to discuss legalization plans and proposals. The many plans presented reflected the various backgrounds and interests of the countries they represented some called for a totally open-market system run by cooperatives, others employed elaborate organizational systems with varying degrees of governmental control, and still others called for total control by the private sector. Emphasis was placed on the need for all groups to develop legalization models suited to their own particular climate and country and that a single, monolithic legalization plan was neither feasible nor desirable.

However, virtually all the plans had one important element in common: every person would have the right to grow cannabis for his or her own personal use. This is the very minimum requirement upon which all legalisation models are based, for this would allow the consumer the chance to remove himself or herself from the black market, whether it be licit or illicit.

This is an essential aspect of cannabis reform: to convince consumers to diversify their sources of supply by growing their own cannabis. Growing cannabis enables one to reduce drastically the costs and at the same time establish a closer relationship with the plant itself. Its amazing adaptability, acquired through centuries of travel to all four corners of the earth, users that it can grow and thrive anywhere there is sunlight and water. By learning the relatively simple techniques involved in cannabis horticulture, the consumer can avoid the illicit market with all its attendant problems, and concentrate on growing the plant itself, on producing and consuming the product of one's own labor, a product which is pure and can be produced at a cost of pennies per ounce.

We must take this step, for just as the nations of the world are seeking energy, self-sufficiency, so now must we seek cannabis self-sufficiency.

The willingness of consumers greatly to diversify their sources has caused tremendous changes in the manner in which cannabis is grown and marketed. Plagued by ridiculously high prices, dangers in purchasing, wild fluctuations in quantity and quality, impurities, and continual police harassment, consumers all over the world are discovering that anyone can grow good cannabis just about anywhere.

In Central and South America, production has increased so rapidly in the last few years that large quantities are now being exported to Europe. Arab countries, traditionally dependent on Lebanon and Syria, are now reporting
increasing domestic cultivation attempts. Many countries of Europe, especially the southern countries of Spain, Italy, Portugal and Greece, are reporting cultivation. India noted that both its legal (in the states of West Bengal, Orissa and Madhya Pradesh) and illegal (all other states) under a similar scheme. In the Near and Middle East, notably Nepal, Pakistan and Afghanistan, the people are continuing their traditional production of cannabis for local and export use.

Australia, a country whose huge size (roughly that of the US) and relatively sparse population make it virtually ideal for cultivation, reported widespread cultivation and seizures of over 70,000 kilos of cannabis, 2,500 kilos of hashish, and 850,000 plants uprooted in a two-year period between 1977 and 1978. Many people living on Pacific islands such as New Zealand, New Caledonia, Fiji, the Cook Islands and elsewhere have discovered that cannabis will grow very well in their environment; Jamaica and other islands in the Caribbean are also experiencing an increase in cultivation. Recent newspaper reports from that country indicate that as many as 1/2 million Jamaican farmers out of a total population of 2 million may be producing cannabis to satisfy domestic and export demand. The total gross income from the Jamaican cannabis business is estimated to exceed $200 million a year3.

Virtually every country in South America reported at least some cannabis cultivations. In addition to increased production in Colombia, whose 1978 crop was estimated to be worth between $1.5 and $2 billion, other countries are experiencing an increase in cultivation. Over 50,000 acres of cannabis were discovered under cultivation in western Venezuela in 1978. In 1976 in Brazil, 271 kilos of cannabis were reported seized, but the next year increased to 91,207 kilos, and by 1978, authorities seized over 276,000 kilos. Cultivation was also reported in Argentina, Ecuador, Guyana, Surinam and Uruguay. Soviet officials go to inordinate lengths to deny that cannabis-use exists in their country though Russia is known to be a large cannabis producer, and not just for commercial purposes. (Soviet officials reported to the United Nations that they seized only 227 grams of cannabis in the entire country4 in 1978; the few offender were immediately sent to psychiatric hospitals.) In several Eastern European countries the best hashish is known as “Tashkenti,” named for the major city in south-central Russia. Tashkent is ethnically dominated by Turkic tribesmen and shares the Hindu Kush mountain range with Afghanistan.

The key to stability in the cannabis market is clearly domestic production, which offers many economic and social advantages over continued importation.

Domestic varieties offer ease of access and supply, and help to diversify the overall market by offering new products which compete in quality and price with the imported varieties. In addition, they serve to stimulate the local concentrating bulk of the profits in the region in which they were produced. This is a noticeable reversal of the previous consumer-producer relationship, where most of the profits were realized by exporters and middlepersons who operated outside the source country. Expanded domestic production would decrease the influence of these middlepersons and greatly strengthen the overall market.

This book was written to make the consumer aware of how easy (and important) it is to cultivate cannabis. In a clear and simply style, Mel Frank and Ed
Rosenthal describe everything you need to know about growing cannabis. By employing some of these simple methods you can greatly reduce your dependence on foreign products and at the same time gain a greater understanding of a plant whose relationship with humanity dates to prehistoric times.

Be fruitful, and multiply...

Bob Pisani Coordinator, International Cannabis Alliance for Reform (ICAR) Philadelphia, PA

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Preface

The purpose of this book is to show you how to grow enough marijuana to supply all your family's needs. It doesn't matter where you live, or even if you are growing your first plant, because all the information needed to become a master marijuana farmer in your own home, or in the field, is provided in these pages.

The world has seen an enormous increase in marijuana use in the past ten years. Consequently, many governments have sponsored research in order to understand the nature of the plant as well as its psychoactive compounds - substances that are being smoked or ingested by more than 400 million people all over the world. Before the recent interest, marijuanaphiles had only research papers (mostly on hemp varieties) to glean for information about the plants and their cultivation. Now there are thousands of papers dealing directly with the plants and their use as marijuana. This doesn't mean all is known about marijuana. In fact, much of what is discussed deals with unknown aspects of these ancient and mysterious plants. The mysteries, however, are beginning to unravel.

Our information resources include our personal experience with growing and the experience and knowledge shared with us by marijuana growers all across the country. We also rely on the professional research of many scientists (see the Bibliographic Notes). For the experienced growers, we've included the latest research on increasing potency, some ideas for improving yield and controlling flowering (time of harvest), and also procedures for breeding quality strains suited to a particular growing situation.

Some of the best grass in the world is grown right here in the United States (that is our very own stoned opinion of homegrown gratefully sampled from Hawaii to Maine). You can do it too - it's not magic, and it's not difficult to do. Highly potent plants can be grown indoors, as well as in gardens, fields, and the wilds. Indoor growers must create an environment, whereas outdoor gardeners work within the environment. Following these two approaches to cultivation, this book is divided into separate, parallel parts on indoor and outdoor sections, preceded by some background information on marijuana plants, and followed by general procedures for breeding, harvesting, etc., that are independent of the type of growing site.

Cultivation is not a complicated process, and we hope we don't make it
appear difficult. But even if you're a novice when you first sow your seeds, your questions on the plants and their cultivation will become more complex as you gain experience and insight. We hope we have anticipated your questions with solid and clearly stated answers; we intend this book to serve as a guide long after your first reading and harvest.

There are probably as many ways to grow marijuana as there are marijuana farmers. We hope to impart an understanding of the plants and their cultivation, so that you can adapt the knowledge to fit your particular situation - where you live, the land or space available, and the time, energy, and funds at your disposal.

Modest indoor gardens are quite simple to set up and care for. All the materials you'll need are available at nurseries, garden shops, and hardware and lighting stores, or they may be found around the house or streets. The cost will depend on how large and elaborate you make the garden and on whether you buy or scavenge your materials. With a little ingenuity, the cost can be negligible.

It takes about an hour every three or four days to water and tend to a medium-sized indoor garden.

Outdoors, a small patch in your summer garden can supply all your smoking needs with little or no expense. Generally, marijuana requires less care than most other crops, because of its natural tenacity and ability to compete with indigenous weeds. Hardy Cannabis resists mild frost, extreme heat, deluge, and drought. In this country, few diseases attack marijuana; once the plants are growing, they develop their own natural protection against most insects.

In some areas of the country, such as parts of the Midwest and East, the plants may require no more attention than sowing the seeds in spring and harvesting the plants in autumn. But if you're like most growers, you'll find yourself spending more and more time in your garden, watching the tiny sprouts emerge, then following their development into large, lush, and finally resinous, flowering plants.

Nurturing and watching these beautiful plants as they respond can be a humanising experience. Marijuana farmers know their plants as vital living organisms. If you already are a plant grower, you may understand. If not, read through this book, imagining the various decisions you, as grower, would be making to help your plants reach a full and potent maturity. Then make your plans and get started. There's just no reason to pay $50 an ounce for superior smoke when it grows for free. Free, grass, free yourself.

This book is the result of the efforts of many people, each of whom contributed uniquely to its final form and content. First there are the many growers who opened their hearts and gardens to us. Our love and thanks to our friends in California (Calistoga, Calavaras, Humbolt, Orange counties, and the Bay Area), the Umpqua Valley, Oregon, Eastern Colorado, Central Florida, Eastern Massachusetts, Upstate New York, New York City, Atlanta, Hawaii, and Port Antonio, Jamaica. We would also like to thank everyone who wrote and shared their growing experiences with us.
Specifically, we would like to acknowledge the contributions of the following: Editors; Aiden Kelly, Peter Beren, Ron Lichty, and Sayre Can Young. Preparation of the manuscript; Carlene Schnabel, Ron Lichty, Aiden Kelly, Marina La Palma. Index by Sayre Van Young. Layout and Design; Bonnie Smetts. Graphics; maps and charts by E.N. Lainca; illustration by Oliver Williams; and molecules by Marlyn Amann. Special Services; Gorden Brownell, Al Karger, Michael Starks, Peter Webster, and special thanks to Sandy Weinstein for help with the photography. Also thank you M.T., A.P., and C.T. Special thanks; Sebastian Orfila and John Orfali.

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Chapter One
History and Taxonomy of Cannabis

1.2 CANNABIS AND ANCIENT HISTORY

The ancestors of Cannabis originated in Asia, possibly on the more gentle slopes of the Himalayas or the Altai Mountains to the north. The exact origin, obscured by Stone Age trails the cross the continent, is not known.

We don't know when Cannabis and humanity first met. Given the growth habit of the plant and the curiosity of humanity, such a meeting was inevitable. In the plant world, Cannabis is a coloniser. It establishes new territory when running water or seed-eating animals carry seed to cleared and fertile soil open to the sun. Fertile soil, clear of competing plants, is rare and short-lived in nature, and is commonly caused by catastrophe such as flood or earthslide. Natural dissemination is slow and the plants tend to grow in thick stands by dropping seed about the spread of their branches.

During the Neolithic era, some 10,000 years ago nomadic groups scavenged, hunted, fished, and gathered plants in an unending search for food. The search ended when they learned to plant the native grains (grasses) and developed agriculture. Agriculture requires a commitment to the land and grants a steady food supply which enables people to form permanent settlements. Cannabis and Neolithic bands probably came in contact often as the plants invaded the fertile clearings - the campsites, roadsides, fields and garbage heaps - that occur wherever people live.

In 1926 the Russian botanist Vavilov summarised the observations of his comrade, Sinkaia, on the domestication of hemp by peasants of the Altai Mountains: "1. wild hemp; 2. spreading of hemp from wild centers of distribution into populated areas (formation of weedy hemp); 3. utilisation of weedy hemp by the population; 4. cultivation of hemp."24

The plants which people learn to use help define aspects of their way of life, including perceptions of the world, health, and the directions their technologies and economies flow. The plants you are about to grow are
descended from one of the ancient plants that made the transition to
civilisation possible.

The earliest cultural evidence of Cannabis comes from the oldest known
Neolithic culture in China, the Yang-shao, which appeared along the Yellow
River valley about 6,500 years ago (*Cannabis is known to have been used in
the Bylony culture of Central Europe (about 7,000 years ago).184). The
clothes the people wore, the nets they fished and hunted with, and the ropes
they used in the earliest machines were all made of the long, strong, and
durable fibre, hemp. This valuable fibre separates from the stem of Cannabis
when the stem decays (rets).

In the early classics of the Chou dynasty, written over 3,000 years ago,
mention is often made of "a prehistoric culture based on fishing and
hunting, a culture without written language but which kept records by tying
knots in ropes. Nets were used for fishing and hunting and the weaving of
nets eventually developed into clothmaking."8 These references may well be
to the Yang-shao people.

As their culture advanced, these prehistoric people replaced their animal
skins with hemp cloth. At first, hemp cloth was worn only by the more
prosperous, but when silk became available, hemp clothed the masses.

People in China relied on Cannabis for many more products than fibre.
Cannabis seeds were one of the grains of early China along with river
barley, millet, and soybeans. The seeds were ground into a meal, or roasted
whole, or cooked in porridge. The ancient tombs of China had sacrificial
vessels filled with hemp seed and other grains for the afterlife. From
prehistoric times there is a continuous record of the importance of hemp seed
for food until the first to second century BC when the seed had been
replaced by more palatable cereal grains.7 (an interesting note from the
Tung-kuan archives (28 AD) records that after a war-caused famine the people
subsisted on "wild" Cannabis and soybean.8)

The effects of Cannabis' resinous leaves and flowers did not go unnoticed.
The Oen-ts-ao Ching, the oldest pharmacopoeia known, states that the fruits
(flowering tops) of hemp, "if taken in excess will produce hallucinations"
(literally "seeing devils"). The ancient medical work also says, "If taken
over a long term, it makes one communicate with spirits and lightens one's
body."9 Marijuana, with a powerful effect on the psyche, must have been
considered a magical herb at a time when medical concepts were just being
formed. The P[e hat\]n-ts'ao Ching, speaking for the legendary Emperor Sh[e
hat\]n-nung of about 2000 BC, prescribes marijuana preparations for "malaria,
beriberi, constipation, rheumatic pains, absent-mindedness, and female
disorders."15 Even the Cannabis root found its place in early medicine.
Ground to form a paste, it was applied to relieve the pain of broken bones
and surgery.

New uses were discovered for Cannabis as Chinese civilisation progressed and
developed new technologies. The ancient Chinese leaned to mill, heat, and
then wedge-press Cannabis seeds to extract the valuable oil, a technique
still used in the western world in the twentieth century. Pressed seeds
yielded almost 20 percent oil by weight. Cannabis oil, much like linseed
oil, could be used for cooking, to fuel lamps, for lubrication, and as the
base in paint, varnish, and soap making. After oil extraction, the residue or "hemp cake" still contained about 10 percent oil and 30 percent protein, a nutritious feed for domesticated animals.

Another advancement came with the Chinese invention of paper. Hemp fibres recycled from old rags and fish nets made a paper so durable that some was recently found in graves in the Shense province that predates 100 BC (9). Hemp paper is known for its longevity and resistance to tearing, and is presently used for paper money (Canada) and for fine Bibles.

The ancient Chinese learned to use virtually every part of the Cannabis plant: the root for medicine; the stem for textiles, rope and paper making; the leaves and flowers for intoxication and medicine; and the seeds for food and oil. Some of the products fell into disuse only to be rediscovered by other people at other times.

While the Chinese were building their hemp culture, the cotton cultures of India and the linen (flax) cultures of the Mediterranean began to learn of Cannabis through expanding trade and from wandering tribes of Aryans, Mongols, and Scythians who had bordered China since Neolithic times.

The Aryans (Indo-Persians) brought Cannabis culture to India nearly 4,000 years ago. They worshipped the spirits of plants and animals, and marijuana played an active role in their rituals. In China, with the strong influence of philosophic and moralistic religions, use of marijuana all but disappeared. But in India, the Aryan religion grew through oral tradition, until it was recorded in the four Vedas, compiled between 1400 and 1000 BC. In that tradition, unlike the Chinese, marijuana was sacred, and the bhangas spirit was appealed to "for freedom of distress" and as a "reliever of anxiety" (from the Atharva Veda). A gift from the gods, according to Indian mythology, the magical Cannabis "lowered fevers, fostered sleep, relieved dysentery, and cured sundry other ills; it also stimulated the appetite, prolonged life, quickened the mind, and improved the judgement." (15)

The Scythians brought Cannabis to Europe via a northern route where remnants of their campsites, from the Altai Mountains to Germany, date back 2,800 years. Seafaring Europe never smoked marijuana extensively, but hemp fibre became a major crop in the history of almost every European country. Pollen analysis dates the cultivation of Cannabis to 400 BC in Norway, although it is believed the plant was cultivated in the British Isles several centuries earlier. The Greeks and Romans used hemp for rope and sail but imported the fibre from Sicily and Gaul. And it has been said the "Caesar invaded Gaul in order to tie up the Roman Empire," an allusion to the Romans' need for hemp.

Marijuana, from its stronghold in India, moved westward through Persia, Assyria and Arabs by 500 AD. With the rising power if Islam, marijuana flourished in a popular form as hashish. In 1378, the Emir Soudon Sheikhouni tried to end the use of Indian hashish by destroying all such plants, and imprisoning all users (first removing their teeth for good measure). Yet in a few years marijuana consumption had increased.1

Islam had a strong influence on the use of marijuana in Africa. However, its use is so ingrained in some ancient cultures of the Zambezi Valley that its appearance clearly predated Islam. Tribes from the Congo, East Africa, Lake
Victoria, and South Africa smoke marijuana in ritual and leisure. The ancient Riamba cult is still practiced in the Congo. According to the Riamba beliefs, marijuana is a god, protector from physical and spiritual harm. Throughout Africa treaties and business transactions are sealed with a puff of smoke from a yard-long pipe.(15)

With increased travel and trade, Cannabis seed was brought to all parts of the known world by ships and caravans rigged with the fibre of its kind. And when the first settlers came to the Americas, they brought the seed with them.

1.3 CANNABIS AND AMERICAN HISTORY

Like their European forbears, Americans cultivated Cannabis primarily for hemp fibre. Hemp seed was planted in Chile in 1545,(64) Canada in 1606, Virginia in 1611, and in the Puritan settlements in Massachusetts in the 1630s.(15). Hemp-fibre production was especially important to the embryonic colonies for homespun cloth and for ship rigging. In 1637, the General Court at Hartford ordered that "every family within this plantation shall procure and plant this present year one spoonful of English hemp seed in some soyle."(12)

Hemp growing was encouraged by the British parliament to meet the need for fibre to rig the British fleets. Partly to dissuade the colonists from growing only tobacco, bounties were paid for hemp and manuals on hemp cultivation were distributed. In 1762, that state of Virginia rewarded hemp growers and "imposed penalties upon those that did not produce it."(2)

The hemp industry started in Kentucky in 1775 and in Missouri some 50 years later. By 1860, hemp production in Kentucky alone exceeded 40,000 tons and the industry was second only to cotton in the South. The Civil War disrupted production and the industry never recovered, despite several attempts by the United States Department of Agriculture to stimulate cultivation by importing Chinese and Italian hemp seed to Illinois, Nebraska, and California. Competition from imported jute and "hemp" (Musa textiles) kept domestic production under 10,000 tons per year. In the early 1900s, a last effort by the USDA failed to offset the economic difficulties of a labour shortage and the lack of development of modern machinery for the hemp industry (64). However, it was legal force that would bring an end to US hemp production.

For thousands of years marijuana had been valued and respected for its medicinal and euphoric properties. The Encyclopaedia Brittanica of 1894 estimated that 300 million people, mostly from Eastern countries, were regular marijuana users. Millions more in both the East and the West received prescription marijuana for such wide-ranging ills as hydrophobia and tetanus.

By the turn of the century, many doctors had dropped marijuana from the pharmacopoeias: drugs such as aspirin, though less safe (marijuana has never kill anyone), were more convenient, more predictable, and more specific to the condition being treated. Pill-popping would become an American institution.
Marijuana was not a legal issue in the United States until the turn of the twentieth century. Few Americans smoked marijuana, and those that did were mostly minority groups. According to author Michael Aldrich, (1) "The illegalisation of Cannabis came about because of who was using it" - Mexican labourers, southern blacks, and the newly subjugated Filipinos.

In states where there were large non-white populations, racist politicians created the myths that marijuana caused insanity, lust, violence and crime. One joint and you were addicted, and marijuana led the way to the use of equivalent drugs - cocaine, opium and heroin. These myths were promoted by ignorant politicians and journalists, who had neither experience nor knowledge of Cannabis, and grew into an anti-marijuana hysteria by the next generation.

For example, the first states to pass restriction on marijuana use were in the Southwest, where there were large populations of migrant workers from Mexico. One of the first states to act was California, which, "with its huge Chicano population and opium smoking Chinatowns, labelled marijuana 'poison' in 1907, prohibited its possession unless prescribed by a physician in 1915, and included it among hard narcotics, morphine and cocaine in 1929." (1)

In marijuana, the mainstream society found a defenceless scapegoat to cover the ills of poverty, racism, and cultural prejudice. San Franciscans "were frightened by the 'large influx of Hindoos ... demanding Cannabis indica' who were initiating 'the whites into their habit.'" (11) Editorialists heightened public fears with nightmarish headlines of the "marijuana menace" and "killer weed," and fear of Cannabis gradually spread through the West. By 1929, 16 western states had passed punitive restrictions governing marijuana use.

Marijuana was not singled out by anti-drug campaigners. During this time, Congress not only banned "hard" narcotics, but also had prohibited alcohol and considered the prohibition of medical pain killers and even caffeine.

The Federal Bureau of Narcotics was established in 1930 with Harry Anslinger as its first commissioner. During the first few years of operation, the bureau minimised the marijuana problem, limited mostly to the Southwest and...
certain ghettos in the big cities of the East. However, the bureau was besieged with pleas from local police and sheriffs to help with marijuana problems. The FBN continued to resist this pressure, because Commissioner Anslinger had serious doubts as to whether federal law restricting marijuana use could be sustained as constitutional. Further, FBN reports indicate that the bureau did not believe that the marijuana problem was as great as its public reputation. Control of the drug would also prove extremely difficult, for as Anslinger pointed out, the plant grew "like dandelions." (11)

The joblessness and misery of the depression added impetus to the anti-marijuana campaign. This came about indirectly, by way of focusing public sentiment against migrant and minority workers who were blamed for taking "American" jobs. Much of this sentiment grew out of cultural and racial prejudice and was supported by groups such as Key Men of America and the American Coalition. The goal of these groups was to "Keep America American."

However, by 1935 almost every state had restricted marijuana use, and local police and influential politicians had managed to pressure the FBN to seek a federal marijuana law. The constitutional question could be circumvented by cleverly tying restrictions to a transfer tax, effectively giving the federal government legal control of marijuana.

With this new tack, the FBN prepared for congressional hearings on the Marijuana Tax Act so that passage of the bill would be assured. Anslinger and politicians seeking to gain from this highly emotional issue railroaded the Marijuana Tax Act through the 1937 Congress. Anslinger made sure that the only information that they (the congressmen) had was what we would give them at the hearings. (11) No users were allowed to testify in pot's defence, and doctors and scientists were ridiculed for raising contrary views (16). The new federal law made both raising and use of the plant illegal without the purchase of a hard-to-acquire federal stamp. The FBN immediately intensified the propaganda campaign against marijuana and for the next generation, the propaganda continued unchallenged.

The marijuana hysteria also ended any hopes for a recovery of the hemp industry. What had been needed was a machine that would solve the age-old problem of separating the fibre from the plant stem, an effort which required considerable skilled labour. The machine that could have revolutionised hemp production was introduced to the American public in the February 1938 edition of Popular Mechanics. But the Marijuana Tax Act has been passed four months earlier, and the official attitude toward all
Cannabis is best illustrated by this quote from Harry J. Anslinger, commissioner of the Federal Bureau of Narcotics: "Now this (hemp) is the finest fibre known to man-kind, my God, if you ever have a shirt made of it, your grandchildren would never wear it out. You take Polish families. We'd go in and start to tear it up and the man came out with his shotgun yelling, 'These are my clothes for next winter!'" (2)

During the war years, after the Japanese had cut off America's supply of manila hemp, worried officials supplied hemp seed and growing information to Midwestern farmers. In Minnesota, Iowa, Illinois, and Wisconsin, hemp farmers showed their wartime spirit by producing over 63,000 tons of hemp fibre in 1943.

Unlike many of our ancient domesticated plants, Cannabis never lost its colonising tendencies or ability to survive without human help. Cannabis readily "escapes" cultivated fields and may flourish long after its cultivation is abandoned. However, Cannabis always keeps in contact by flourishing in our waste areas - our vacant fields and lots, along roads and drainage ditches, and in our rubbish and garbage heaps. Perhaps it awaits discovery by future generations. The cycle has been repeated many times.

States that once supported hemp industry are now dotted with stands of escaped weedy hemp. Weedy hemp grows across the country, except in the Southwest and parts of the Southeast. Distribution is centered heavily in the Midwest. Most of these plants are descended from Chinese and European hemp strains that were bred in Kentucky and the grown in Midwestern stated during World War II. But some weed patches, such as in Kentucky and Missouri, go back perhaps to revolutionary times.

The Anslinger crusades that continued through the sixties are a fine example of government propaganda and control of individual lives and beliefs. We still feel the ramifications in our present laws and in the fear-response to marijuana harboured by many people who grew up with Anslingian concepts. Poor Cannabis, portrayed as a dangerous narcotic that would bring purgatory upon anyone who took a toke - violence, addiction, lust, insanity - you name it, and marijuana caused it. All it ever did to us was get us stoned ... things slowed down a bit ... enough to stop and look around.

{Figure 6. A weedy hemp stand in Nebraska.}

Hopefully, we are living in the last years of the era of illegal marijuana and the persecution of this plant. Cannabis is truly wondrous, having served human needs for, perhaps, 10,000 years. It deserves renewed attention not only for its chemical properties, but also as an ecologically sensible alternative for synthetic fibres in general and especially wood-pulp paper. May Cannabis be vindicated.

1.4 Cannabis: Species or Varieties

The 10,000-year co-evolution of Cannabis and humanity has had a profound impact on both plant and humans. Cannabis has affected our cultural evolution; we have affected the plant's biological evolution.

From small populations of ancient progenitors, hundreds of varieties or
strains of Cannabis have evolved. These variations can be traced to human acts, both planned and accidental.

Ancient farmers, knowing that like begets like, selected Cannabis for certain characteristics to better suit their needs. With the need for fibre, seeds from plants with longer stems and better fibres were cultivated. Gradually, their descendants became taller, straight-stemmed, and had a minimum of branches. Some farmers were interested in seed and oil. They developed large-seeded, bushy plants that could bear an abundance of seeds. Marijuana farmers interested in potency selected plants that flowered profusely with heavy resin and strong psychoactive properties.

The subsequent variations in Cannabis are striking. In Italy, where hemp fibre supports a major textile and paper industry, some fibre varieties grow 35 feet in a single season. Other Italian varieties may reach only five or six feet in height, but have slender, straight stems that yield a fibre of very fine quality. In Southeast Asia, some marijuana plants grow only four feet or less, yet these are densely foliated and heavy with resin. Other varieties of marijuana grow 15 to 20 feet in a season and yield over a pound of grass per plant.

Breeding plants is a conscious act. The plant's evolution, however, has also been affected by its introduction to lands and climates different from its original home. Whether plants are cultivated or weeds, they must adapt to their environment. Each new country and growing situation presented Cannabis with new circumstances and problems for survival. The plants have been so successful at adapting and harmonising with new environments that they are now considered the most widely distributed of cultivated plants. (45)

In French, Cannabis is sometimes called "Le Chanvre troumper" or "tricky hemp," a name coined to described its highly adaptable nature. The word adaptable actually has two meanings. The first refers to how a population of plants (the generic pool) adjusts to the local environment over a period of generations. (The population is, in practice, each batch of seeds you heave, or each existing stand or field.) For instance, a garden with some plants that flower late in the season will not have time to seed in the north. The next year's crop will come only from any early seeding plants. Most of them will be like their parents and will set seed early. (See section 18.)

Adaptable is a term that also applies to the individual living plant (phenotype) and, in practical terms, means that Cannabis is tenacious and hardy -- a survivor among plants. It thrives under a variety of environmental conditions, whether at 10,000 feet in the Himalayas, the tropical valleys of Colombia, or the cool and rainy New England coast.

Through breeding and natural selection, Cannabis has evolved in many direction. Botanically and historically, the genus is so diverse that many growers are confused by the mythology, exotic names, and seeming contradictions that surround the plants. Many inconsistencies are explained by understanding how variable Cannabis is. There are hundreds of wild, weedy, and cultivated varieties. Cultivated varieties may be useful for only hemp, oil, or marijuana. "Strains," "varieties," "cultivars," "chemovars," or "ecotypes" differ widely in almost every apparent characteristic. Varieties range from two to 35 feet tall; branching patterns run from dense
to quite loose, long (five or six feet) or short (a few inches). Various branching patterns form the plant into shapes ranging from cylindrical, to conical, to ovoid, to very sparse and gangly. The shape and colour of leaves and stems, seeds, and flowering clusters are all variable characteristics that differ among varieties. Life cycles may be as short as three months, or the plants may hang on to life for several years. Most importantly, different varieties provide great variations in the quality and quantity of resin they produce, and hence in their psychoactive properties and value as marijuana.

The taxonomy (ordering and naming) of Cannabis has never been adequately carried out. Early research placed the genus Cannabis within the Families of either the Moraceae (mulberry) or the Urticaceae (nettle). Now there is general agreement that the plant belongs in a separate family, the Cannabaceae, along with one other genus, Humulus, the hops plant. (See section on Grafting in section 18.)

A modern Scheme for the phylogeny of Cannabis would be:

- **Subdivision** Angiospermae (flowering plants)
- **Class** Dicotyledoneae (dicots)
- **Order** Urticales (nettle order)
- **Family** Cannabaceae (hemp family)
- **Genus** Cannabis (hemp plant)

Below the genus level, there is no general agreement on how many species should be recognised within Cannabis. The Cannabis lineage has not been possible to trace after thousands of years of human intervention.

Most research refers to Cannabis as a single species - Cannabis sativa L. (The word Cannabis comes from ancient vernacular names for hemp, such as the Greek Kannabis; sativa means "cultivated" in Latin; L. stands for Linnaeus, the botanical author of the name.) But some botanists who are studying Cannabis believe there are more than one species within the genus.

Richard Schultes, for example, describes three separate species (see Box A) based on variations in characteristics believed not to be selected for by humans (natural variations) such as seed colour and abscission layer (scar tissue on the seed which indicates how it was attached to the stalk).

**BOX A**

Schultes' Key as it appears in Harvard Botanical Museum Leaflets (45)

**Cannabis Sativa**
1. Plants usually tall (five to 18 feet), laxly branched; akenes ((Akenene (or Achene) is the botanical name for the fruit of Cannabis. In Cannabis, the fruit is essentially the seed.)) smooth, usually lacking marbled pattern on outer coat, firmly attached to stalk and without definite articulation.

**Cannabis Indica**
1A. Plant usually small (four feet or less), not laxly branched; akenes usually strongly marbled on outer coat, with a definite
abscission layer, dropping off at maturity.
2. Plants very densely branched, more or less conical, usually four feet tall or less; abscission layer a simple articulation at base of akene.

Cannabis ruderalis ((Limited to parts of Asia.))
2A. Plants not branched or very sparsely so, usually one to two feet at maturity. Abscission layer forms a fleshly carbuncle-like growth at base of akene.

Ideally, the classification of living things follows a natural order, reflecting relationships as they occur in nature. Species are groups of organisms that are evolving as distinct units. Biologically, the evolutionary unit is the population, a population being a group of freely inbreeding organisms. Living things don't always fit neatly into scientific categories. And the meaning of species changes with our understanding of life and the evolutionary processes. Often, the definition of species will depend on the particular being studied.

A traditional way of defining separate species is that off-spring that result cannot reproduce successfully. As far as is known, all Cannabis plants can cross freely, resulting in fully fertile hybrids (107). But growth habit and actual gene exchange are important considerations in plant taxonomy. If different populations never come in contact, then there is no pressure for them to develop biological processes to prevent them mixing. Cannabis is pollinated by the wind. Although wind may carry pollen grains hundreds of miles, almost all pollen falls within a few feet of the parent plant. The chance of a pollen grain fertilising a tiny female flower more than 100 yards away is extremely small (201). Hence, separate stands or fields of Cannabis (populations) are quite naturally isolated. For Cannabis, the fact that populations are isolated by distance is not sufficient grounds for labelling them separate species, nor is successful hybridisation reason enough to group all populations as one species.

The species question and Cannabis mythology are complicated by the plant's ability to rapidly change form and growth habits. These changes can be measured in years and decades, rather than centuries or millennia.

The fact that a pollen grain does occasionally fertilise a distant flowers leads to a process called introgression. Introgression means that new genes (new variations and possible variations) are incorporated into the population via the foreign pollen. This crossing between populations leads to an increase in variation within the population, but a decrease in the differences between the populations. Although introgression confuses the species question, it also adds to the plant's adaptable nature by providing a resource for adaptive variations. In other words, Cannabis has been around. The plants have a rich and varied history of experience, which is reflected in their variety and adaptive nature.

If breeding barriers do not exist, species are often delimited by natural differences in morphology (structure or appearance). The natural variations on which Schultes' key is based are actually affected by contact with farmers. For instance, seeds which drop freely from the plant are less likely to be collected and sown by the farmer, so that cultivated Cannabis
may eventually develop a different type of abscission layer than when wild or weedy.

Seed colour and pattern are affected naturally by the need for camouflage. Under cultivation this natural selection pressure would not be the same. Many farmers select seeds by colour, believing the darkest are the best developed. In other words, there are serious problems with this limited approach to categorising species in Cannabis. This does not go unrecognised by Dr. Schultes, and the key represents a starting point. However, species should represent distinct groups within a genus, and populations with intermediate characteristics should be the exception. When you grow marijuana, you'll find that most varieties do not fit into any of these categories, but lie somewhere between. The majority of the marijuana from the Western Hemisphere would follow this description: plants tall (eight to 18 feet); well-branched; akenes usually strongly marbled; base of the seed sometimes slightly articulated.

Other characteristics, such as variations on wood anatomy (17) and leaf form (28), have been suggested for delimiting Cannabis species. However, wood anatomy, like stem anatomy, can be seriously affected by selection for hemp in particular, but also by selection for marijuana and seed. Wood anatomy also depends on the portion of the stem examined and on the arrangement of leaves (phyllotaxy), which, in turn, is influenced by light levels, photoperiod, and the physiological development of the plant.

Most Cannabis plants have compound leaves with seven to nine blades or leaflets per leaf. Occasionally, varieties are seen where all the leaves have only one to three blades (monophyllous). Such plants sometimes arise from varieties with compound leaves. The factor is genetic, but carries little weight for the separation of species.

Human selection for particular traits can powerfully alter plants. Sex vegetables - cabbage, cauliflower, brussel sprouts, broccoli, kale, and kohlrabi - are all descended from a single wild species of mustard herb, Brassica oleracea (216). Human preference for particular parts of the plant led to their development. All six are still considered one species.

Any classification of species in Cannabis, based solely on morphological grounds, will prove difficult to justify with our present knowledge of the plant. At this time it seems that all Cannabis should be considered one species, Cannabis sativa L.

{Figure 7. Common marijuana leaf with seven blades (Colombian)}
{Figure 8. Four leaf types from Colombian marijuana varieties}
{Figure 9. Leaf blades from Figure 8.}

The debate on whether there is more than one species has been intense, for the issue has legal implications. Many laws specifically prohibit only Cannabis sativa. Presumably other species would not be prohibited. However, in the United States, this argument was recently dismissed when tested in a California court. The court upheld the argument that the law's intent is clear, although it may be questionable botanically: under law all Cannabis are regarded alike.
Luckily, the controversy over the number of species is of no more than academic interest to the marijuana grower. The most important characteristic to enthusiasts is the quality or potency of the grass they'll grow.

Potency is mostly a factor of heredity. The quality of the grass you grow depends on how good its parents were, so choose seeds from the grass you like best.

The environment has an impact, too, but it can only work on what is contained in the seed. A potent harvest depends on an environment which encourages the seed to develop to a full and potent maturity. The way to begin is to find the most potent grass you can; then you will have taken the first step.

CHAPTER 2
CANNABINOIDS: THE ACTIVE INGREDIENTS OF MARIJUANA

Cannabis is unique in many ways. Of all plants, it is the only genus known to produce chemical substances known as cannabinoids. The cannabinoids are the psychoactive ingredients of marijuana; they are what get you high. By 1974, 37 naturally occurring cannabinoids had been discovered. Most of the cannabinoids appear in very small amounts (less than .01 percent of total cannabinoids) and are not considered psychoactive, or else not important to the high. Many are simply homologues or analogues (similar structure or function) to the few major cannabinoids which are listed.

1. (-)-{triangle}9-trans-tetrahydrocannabinol ((There are several numbering systems used for cannabinoids. The system in this book is most common in American publications and is based on formal chemical rules for numbering pyran compounds. Another common system is used more by Europeans and is based on a monoterpenoid system which is more useful considering the biogenesis of the compound.)) This (delta-9 THC) is the main psychotomimetic (mindbending) ingredient of marijuana. Estimates state that 70 to 100 percent (121) of the marijuana high results from the delta-9 THC present. It occurs in almost all Cannabis in concentration that vary from traces to about 95 percent of all the cannabinoids in the sample. In very potent varieties, carefully prepared marijuana can have up to 12 percent delta-9 THC by dry weight of the sample (seeds and stems removed from flowering buds). ("Buds" of commercial marijuana is the popular name given to masses of female flowers that form distinct clusters.)

Delta-8 THC - This substance is reported in low concentration, less than one percent of the delta-9 THC present. Its activity is slightly less than that of delta-9 THC. It may be an artefact of the extraction/analysis process. Here we refer to delta-9 THC and delta-8 THC as THC.

2. Cannabidiol - CBD also occurs in almost all varieties. Concentration range from nil (119,138), to about 95 percent of the total cannabinoids present. THC and CBD are the two most abundant
naturally occurring cannabinoids. CBD is not psychotomimetic in the pure form (192), although it does have sedative, analgesic, and antibiotic properties. In order for CBD to affect the high, THC must be present in quantities ordinarily psychoactive. CBD can contribute to the high by interacting with THC to potentiate (enhance) or antagonise (interfere or lessen) certain qualities of the high. CBD appears to potentiate the depressant effects of THC and antagonise is excitatory effects (186). CBD also delays the onset of the high (183) but can make it last considerably longer (as much as twice as long). (The grass takes a while to come on but keeps coming on.) Opinions are conflicting as to whether it increases or decreases the intensity of the high, "intensity" and high" being difficult to define. Terms such as knock-out or sleepy, dreamlike, or melancholic are often used to describe the high from grass with sizeable proportions of CBD and THC. When only small amounts of THC are present with high proportions of CBD, the high is more of a buzz, and the mind feels dull and the body de-energised. {See Figure 11 to 16 for chemical structure in monochrome bitmap format.}

3. Cannabinol - CBN is not produced by the plant per se. It is the degradation (oxidative) product of THC. Fresh samples of marijuana contain very little CBN but curing, poor storage, or processing such as when making hashish, can cause much of the THC to be oxidised to CBN. Pure forms of CBN have at most 10 percent of the psychoactivity of THC (192). Like CBD, it is suspected of potentiating certain aspects of the high, although so far these affects appear to be slight (183,185). CBN seems to potentiate THC's disorienting qualities. One may feel more dizzy or drugged or generally untogether but not necessarily higher. In fact, with a high proportion of CBN, the high may start well but feels as if it never quite reaches its peak, and when coming down one feels tired or sleepy. High CBN in homegrown grass is not desirable since it represents a loss of 90 percent of the psychoactivity of its precursor THC.

4. Tetrahydrocannabivarin - THCV is the propyl homologue of THC. In the aromatic ring the usual five-carbon pentyl is replaced by a short three-carbon propyl chain. The propyl cannabinoids have so far been found in some varieties originating from Southeast and Central Asia and parts of Africa. What are considered some very potent marijuana varieties contain propyl cannabinoids. In one study, THCV made up to 48.23 percent (Afghanistan strain) and 53.69 percent (South Africa) of the cannabinoids found (136). We've seen no reports on its activity in humans. From animal studies it appears to be much faster in onset and quicker to dissipate than THC (181). It may be the constituent of one- or two-toke grass, but its activity appears to be somewhat less than that of THC.

The propyl cannabinoids are a series corresponding to the usual pentyl cannabinoids. The counterpart of CBD is CBDV; and of CBN, CBV. There are no reports on their activity and for now we can only speculate that they are similar to CBD and CBN. Unless noted
otherwise, in this book THC refers collectively to delta-9 THC, delta-8 THC, and THCV.

5. Cannabichromene - CBC is another major cannabinoid, although it is found in smaller concentrations than CBD and THC. It was previously believed that it was a minor constituent, but more exacting analysis showed that the compound often reported as CBD may actually be CBC (119, 137). However, relative to THC and CBD, its concentration in the plants is low, probably not exceeding 20 percent of total cannabinoids. CBC is believed not to be psychotomimetic in humans (121); however, its presence in plants is purportedly very potent has led to the suspicion that it may be interacting with THC to enhance the high (137). Cannabicyclol (CBL) is a degradative product like CBN and CBV (123). During extraction, light converts CBC to CBL. There are no reports on its activity in humans, and it is found in small amounts, if at all, in fresh plant material.

2.2 Cannabinoids and the High

The marijuana high is a complex experience. It involves a wide range of psychical, physical, and emotional responses. The high is a subjective experience based in the individual - one's personality, mood, disposition, and experience with the drug. Given the person, the intensity of the high depends primarily on the amount of THC present in the marijuana. Delta-9 THC is the main ingredient of marijuana and must be present in sufficient quantities for a good marijuana high. People who smoke grass that has very little cannabinoids other then delta-9 THC usually report that the high is very intense. Most people will get high from a joint having delta-9 THC of .5 percent concentration to material. Grass having a THC concentration of three percent would be considered excellent quality by anyone's standards. In this book, for brevity, we use potency to mean the sum effects of the cannabinoids and the overall high induced.

Marijuana (plant material) is sometimes rated more potent that the content of delta-9 THC alone would suggest. It also elicits qualitatively different highs. The reasons for this have not been sorted out. Few clinical studies with known combinations of several cannabinoids have been undertaken with human subjects. This field is still in its infancy. So far, different highs and possibly higher potency seem to be due to the interaction of delta-9 THC and other cannabinoids (THCV, CBD, CBN, and possibly CBC). Except for THCV, in the pure form, these other cannabinoids do not have much psychoactivity.

Another possibility for higher potency is that homologues of delta-9 THC with longer side chains at C-3 (and higher activity) might be found in certain marijuana varieties. Compounds with longer side chains have been made in laboratories and their activity is sometimes much higher, with estimates over 500 times that of natural delta-9 THC (55, 113, 191). Compounds besides THCV with shorter chains (methyl (139) and butyl (118)) in this position have been found in small amounts in some marijuana samples, indicating that variations do exist. However, this is not a very likely explanation. More likely, THCV is more prevalent in marijuana than supposed
and probably had additive or synergistic effects with delta-9 THC.

The possibility that there are non-cannabinoids that are psychoactive or interacting with the cannabinoids has not been investigated in detail. Non-cannabinoids with biological activity have been isolated from the plants, but only in very small quantities (181). None are known to be psychotomimetic. However, they may contribute to the overall experience in non-mental ways, such as the stimulation of the appetite.

Different blends of cannabinoids account for high of different qualities. The intensity of the high depends primarily on the amount of delta-9 THC present and on the method of ingestion. A complex drug such as marijuana affects the mind and body in many ways. Sorting out what accounts for what response can become quite complex. The methodology to isolate and test the different cannabinoids now exists. The National Institute of Mental Health (NIMH) is funding research on the pharmacology of marijuana. However, such research is paltry, considering that over 30 million people in the United States use the crude drug. Much more research is needed before definite understanding of the cannabinoids and the high is attained.

When the legal restriction are removed, marijuana will probably be sold by particular blends of cannabinoids and standard amounts of delta-9 THC. Synthetic marijuana will probably be made with homologues of delta-9 THC that have much higher activity than the natural form. For now, without access to a lab, you must be satisfied with your own smoking evaluation (for research purposes only), ultimately the most important criterion any way.

2.3 Resin and Resin Glands

Many people consider potency and resin concentration synonymous. People hear of plants oozing or gushing with copious resin, and the image is of resin flowing in the plant like the latex of a rubber tree or the sap of a maple tree. But these visions are just pipe dreams.

It is quite possible to have a resinous plant with little potency or a plant with little apparent resin which is very potent. Potency depends primarily on the concentration of THC in the plant material. Many more substances besides the cannabinoids make up the crude resin of Cannabis. Preparations such as ghanja or hashish are roughly about one-third by weight non-psychoactive water-soluble substances and cellular debris. Another third is non-psychoactive resins such as phenoloiic and terpenoid polymers, glycerides, and triterpenes. Only one-fourth to one-third is the cannabinoids. In many Cannabis plants, THC may be only a very small percentage of the total cannabinoids. ((These figures are very approximate. Actual percentages depend on sample material, processing, and extraction procedures. See Table 8 and 9 for percentages of THC in hashish.)) The remainder (5 to 10 percent) of the resin will be essential oils, sterols, fatty acids, and various hydrocarbons common to plants.

Table 8 - Seized Hashish (a)

<table>
<thead>
<tr>
<th>COUNTRY IN WHICH SEIZED</th>
<th>THC</th>
<th>CBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>1 - 15.8</td>
<td>1.4 - 11.1</td>
</tr>
</tbody>
</table>
Nepal                    1.5 - 10.9  8.8 - 15.1
Afghanistan              1.7 - 15    1.8 - 10.3
Pakistan                 2.3 - 8.7   6.8(b)

a Figures compiled from many sources.
b Only one figure reported

Table 9 - Relative Percentages of Major Cannabinoids from Hashish and Resin Preparations.

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>THC</th>
<th>CBD</th>
<th>CBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>52</td>
<td>36</td>
<td>12</td>
</tr>
<tr>
<td>Burma</td>
<td>15.7</td>
<td>16.3</td>
<td>68</td>
</tr>
<tr>
<td>Jamaica</td>
<td>77.5</td>
<td>9.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Lebanon</td>
<td>32.2</td>
<td>62.5</td>
<td>5.3</td>
</tr>
<tr>
<td>Morocco</td>
<td>55</td>
<td>34.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Nigeria</td>
<td>53.7</td>
<td>9.3</td>
<td>37</td>
</tr>
<tr>
<td>Pakistan</td>
<td>35.7</td>
<td>48.3</td>
<td>16.1</td>
</tr>
<tr>
<td>South Africa</td>
<td>75.6</td>
<td>8.4</td>
<td>16</td>
</tr>
</tbody>
</table>

a Each row sums to 100%

The cannabinoids basically do not flow in the plant, nor are they the plant's sap. About 80 to 90 percent of the cannabinoids are synthesised and stored in microscopic resin glands that appear on the outer surfaces of all plant parts except the root and seed. The arrangement and number (concentration) of resin glands vary somewhat with the particular strain examined. Marijuana varieties generally have more resin glands, and they are larger than resin glands on non-drug varieties.

Although resin glands are structurally diverse, they are of three basic types. The bulbous type is the smallest (15-30 um (um is the symbol for a micrometer (or micron), equal to 1/1,000,000 of a meter, or approximately 1/25,000 of an inch.) or about .0006 to .0012 inches). From one to four cells make up the "foot" and "stalk," and one to four cells make up the head of the gland (25). Head cells secrete a resin - presumably cannabinoid - oils, and related compounds which accumulate between the head cells and the outer membrane (cuticle). When the gland matures, a nipple-like outpocket may form on the membrane from the pressure of the accumulating resin. The bulbous glands are found scattered about the surfaces of the above-ground plant parts.

The second type of gland is much larger and more numerous than the bulbous glands. They are called "capitate," which means having a globular-shaped head. On immature plants, the heads lie flush or appear not to have a stalk and are called "capitate sessile." They actually have a stalk that is one cell high, although it may not be visible beneath the globular head. The head is composed of usually eight, but up to 16 cells, that form a convex rosette. These cells secrete a cannabinoid-rich resin which accumulates between the rosette and its outer membrane. This gives it a spherical shape, and the gland measures from 25 to 100 um across. In fresh plant material about 80 to 90 percent of their contents will be cannabinoids, the rest primarily essential oils (146).
During flowering the capitate glands that appear on the newly formed plant parts take on a third form. Some of the glands are raised to a height of 150 to 500 um when their talks elongate, possibly due to their greater activity. The stalk is composed mostly of adjacent epidermal tissue. These capitate-stalked glands appear during flowering and form their densest cover on the female flower bracts. They are also highly concentrated on the small leaves that accompany the flowers of fine marijuana varieties. Highest concentration is along the veins of the lower leaf surface, although the glands may also be found on the upper leaf surface on some varieties. The male flowers have stalked glands on the sepals, but they are smaller and less concentrated than on the female bracts. Male flowers form a row of very large capitate glands along the opposite sides of anthers.

Capitate-stalked resin glands are the only ones visible without a microscope. To the naked eye, this covering of glands on the female flower bracts looks like talcum or dew sprinkled on a fuzzy surface. With a strong hand lens, the heads and stalks are distinct. Resin glands also can be seen on the anthers of the male flowers and on the undersides of the small leaves the intersperse the flower clusters.

{Figure 17. Upper surface of a small leaf, showing stalked glands.}
{Figure 18. Resin glands on a stem lie close to the surface beneath the cystolith hairs. Hairs always point in direction of growing shoots.}

Resin glands are not visible until flowers form. The more obvious covering of white hairs seen on stems, petioles, and leaves are not resin glands. They are cystolith hairs of carbonate and silicate which are common to many plants. These sharp-pointed hairs afford the plant some protection from insects and make it less palatable to larger, plant-eating animals.

In India, to make the finest quality hashish (nup), dried plants are thrashed over screens. Gland heads, stalks and trichomes collect in a white to golden powder which is then compressed into hashish (for hashmaking search section 21 for "hash").

Resin rarely accumulates in the copious quantities people would lead you to believe. Actually, the plants form a cover of resin glands rather than a coating of resin. Usually this is no more apparent than for the female flowers to glisten with pin-points of light and for the leaves and stems to feel a bit sticky when you run your fingers over them.

On some fine marijuana strains, resin may become obvious by the end of flowering and seed set. Resins occasionally secrete through pores in the membrane of gland heads. Usually secretion occurs many weeks after the stalked glands appear. The glands seem to empty their contents, leaving hollow spaces (vacuoles) in the stalk and head cells. After secretion, the glands cease to function and begin to degenerate. Gland heads, stalks, and trichomes become clumped together, and the whole flowering surface becomes a sticky mass. For reasons we'll go into later, this is not necessarily desirable. (see sections 20,21.)

Small quantities of cannabinoids are present in the internal tissues of the plant. The bulk is found in small single cells (non-articulated laticifers)
that elongate to form small, individual resin canals. The resin canals ramify the developing shoots, and penetrate the plant's conducting tissue (phloem). Minute clumps of resin found in the phloem are probably deposited by these resin canals. Other plant cells contain insignificant amounts of cannabinoids and probably a good 90 percent of the cannabinoids are localised in the resin glands.

Cannabinoid synthesis seems to occur primarily in the head and apex of the stalk cells of the resin glands (26). Lacticifers and possibly other plant cells probably contribute by synthesising the simpler molecules that will eventually make up the cannabinoids. Biosynthesis (the way the plant makes the molecules) of the cannabinoids is believed to follow a scheme originally outlined by A.R. Todd in his paper "Hashish," published in 1946 (see Figure 19). In the 1960s the pathway was worked out by Raphael Mechoulam, and confirmed in 1975 by Dr. Shimomura and his associates.

{Figure 19. Possible biosynthesis of cannabinoids.}

Notice that all the cannabinoids are their acid forms with a (COOH) carboxyl group at C-2 in the aromatic ring. This group may also appear at C-4 and the compounds are called, for example, THC acid "A" and THC acid "B", respectively. The position of the carboxyl group does not affect the potency, but, in fact, in their acid forms the cannabinoids are not psychoactive. In fresh plant material, cannabinoids are almost entirely in their acid forms. The normal procedure of curing and smoking the grass (heat) removes the carboxyl group, forming the gas CO2 and the psychoactive neutral cannabinoids. Removing the CO2 in important only if you plan to eat the marijuana. It is then necessary to apply heat (baking in brownies, for example) for the cannabinoids to become psychoactive. Ten minutes of baking marijuana at 200F is enough to convert the THC acids to neutral THC.

The formation of CBG acid, from which all the other cannabinoids are formed, is initially made from much simpler compounds containing terpene units. The example here is olivetolic acid condensing with a terpene moiety called geranyl pyrophosphate. It is not known whether these are the actual or only precursors to CBG in the living plant.

Terpenes and related substances are quite light and some of them can be extracted by steam distillation to yield the "essential oil" of the plant (from essence - giving the flavour, aroma, character). Over 30 of these related oily substances have been identified from Cannabis (143). On exposure to light and air, some of the polymerise, forming resins and tars.

The cannabinoids are odourless; most of the sweet, distinctive, pleasant minty fragrance and taste of fresh marijuana comes from only five substances which make up only 5 to 10 percent of the essential oils: the mono- and sesqui-terpenes alpha- and beta-pinene, limonene, myrcene, and beta-phalendrene (144). These oily substances are volatile and enter the air quickly, dissipating with time. Subsequently, the marijuana loses much of its sweetness and minty bouquet.

The essential oils constitute about .1 to .3 percent of the dry weight of a fresh marijuana sample, or on the order of 10 percent of the weight of the cannabinoids. Essential oils are found within the heads of the resin glands
and make up about 10 to 20 percent of their contents in fresh material (146). They have also been detected in the resin canals (laticifers) (31).

Different samples of Cannabis have essential oils of different composition. This is not surprising given the variability of the plant. Since substances found in the essential oils are, or are related to, substances that are the precursors of the cannabinoids, there is some chance that a relationship exists between a particular bouquet and cannabinoids content. No such relationship is yet known, but it has only been studied superficially. When connoisseurs sample the bouquet of a grass sample, they are basically determining whether it is fresh. Fresh grass mean fresh cannabinoids and less of these are likely to have been degraded to non-psychoactive products.

2.4 Production of Cannabinoids by Cannabis

Why Cannabis produces cannabinoids and resins is a question probably every grower has wondered about. Supposedly, if you know, you could stimulate an environmental factor to increase cannabinoids production. Unfortunately, it does not follow that increasing a particular selective pressure will affect a plant's (phenotype) cannabinoids production. However, over a period of generations, it is possible that environmental manipulations can increase the overall cannabinoids concentrations in a population of plants. But even this procedure would work slowly compared to direct breeding by the farmer.

From the microstructure of the resin glands and the complexity of the resin, it is apparent that Cannabis invests considerable energy in making and storing the cannabinoids. Obviously, the cannabinoids are not a simple by-product or excretory product. No doubt the cannabinoids and resins serve the plant in many ways, but probably they have more to do with biotic factors (other living things) rather than abiotic factors (non-living environment such as sunlight, moisture, etc.).

The cannabinoids, resins, and related substances make up a complex and biologically highly active group of chemicals, a virtual chemical arsenal from which the plant draws its means for dealing with other organisms. This would apply especially to herbivores, pathogens, and competing plants. In the case of humans, the cannabinoids are an attractant. Some possible advantages to the plant are listed below, but no direct studies have been done on this question. Indeed, it is surprising that botanists have shown so little interest in this question; they have even gone out of their way to state their lack of interest.

Possible Advantages of Cannabinoid Production

1. Obviously the cannabinoids are psychoactive and physiologically active in many animals. This may dissuade plant-eating animals from eating the plant, especially the reproductive parts. Many birds enjoy Cannabis seeds. But in nature, birds will not bother young seeds, probably because they are encased in the cannabinoids-rich bracts. In wild or weedy plants, when the seed is mature it "shells out" and falls to the ground. Birds will eat the naked seeds. However, matured seeds are quite hard. Many will not be cracked and eventually will be dropped elsewhere, helping the plant to propagate. Bees and other insects are attracted to
the pollen. The cannabinoids and resins may deter insects from feeding on pollen and developing seeds. Resin glands reach their largest size on the anthers (which hold pollen) and bracts (which contain the seed). (See plates 6, 7, 10 and 11.) 2. Terpenoid and phenolic resins are known to inhibit germination of some seeds. Cannabis resins may help Cannabis seedlings compete with other seedlings by inhibiting their germination. 3. Many of the cannabinoids (CBD, CBG, CBC and their acids) are highly active antibiotics against a wide range of bacteria (almost all are gram +) (36,130,184). Crude resin extracts have been shown to be nematocidal (36). (However, fungicidal activity is low.)

Most of the explanations you've probably heard for resin production from both lore and scientists have to do with physical factors such as sunlight, heat, and dryness. Presumably the resin coats the plant, protecting it from drying out under physical extremes. These explanations make little sense in light of the resins' chemistry.

The physical qualities of the glands and resins probably aid the plant in some ways. The sticky nature of resin may help pollen grains to adhere to the flowering mass and stigmas, or simply make the plant parts less palatable. And gland heads do absorb and reflect considerable sunlight, and so possibly protect the developing seed. For instance, gland heads are at first colourless (i.e., they absorb ultraviolet light). This screening of ultraviolet light, a known mutagen, may lower possible deleterious mutations. But physical properties seem to be secondary to the resins' chemical properties as functional compounds to the plant.

2.5 Cannabis Chemotypes

All Cannabis plants produce some cannabinoids. Each strain produces characteristic amounts of particular cannabinoids. Strains differ in the total amounts they contain. Usually they average about three percent cannabinoids to dry weight, but concentrations range from about one to 12 percent cannabinoids in a cleaned (seeds and stems removed), dried bud. Strains also differ in which cannabinoids they produce. Based on which cannabinoids, Cannabis strains can be divided into five broad chemical groups.((Chemical classification based on work by Small et al (51)) The general trend is for plants to have either THC or CBD as the main cannabinoid.

Type I

Strains are high in THC and low in CBD. This type represents some of the finest marijuana strains. They usually originate from tropical zones below 30 degrees latitude, which in the north runs through Houston and New Orleans to Morocco, North India, and Shanghai, and in the south through Rio de Janeiro, South Africa, and Australia. Most of the high-quality marijuana from Mexico, Jamaica, and Colombia sols in this country is this type; most of you will grow this type. As with all five chemical types, type I comes in different sizes and shapes. Most common are plant about 10 to 12 feet tall (outdoors), quite bushy, with branches that grow outward to form the plant into a cone (Christmas tree shape).
Other tall varieties (to 18 feet) have branches that grow upward (poplar-tree shaped - some Mexican, Southeast and Central Asian varieties). A less common short variety (up to eight feet) develops several main stems and the plants appear to sprawl (Mexico, India).

Type II

This is an intermediate group, with high CBD and moderate to high THC. They usually originate from countries bordering 30 degrees latitude, such as Morocco, Afghanistan and Pakistan. In this country, this type of grass usually comes from Afghani and Colombian varieties. Type II plants are quite variable in the intensity and quality of the high they produce, depending on the relative amounts of THC and CBD in the variety. Probably because of their high CBD and overall resin content, these plants are often sued to prepare hashish and other concentrated forms of marijuana. The most common varieties grow to about eight to 12 feet and assume a poplar-tree shape with long branches that grow upward from the stem base and much shorter branches toward the top. They usually come from Turkey, Greece, and Central or Southeast Asia and occasionally from Colombia and Mexico. Some varieties are shorter, about four to eight feet at maturity, and very bushy with a luxuriant covering of leaves. These usually originate from Nepal, northern India, and other parts of Central Asia as well as North Africa. Other varieties appear remarkably like short (five to seven feet) hemp plants, with straight, slender stems and small, weakly developed branches (Vietnam). A common short variety, less than four feet tall (Lebanon, N. Africa), forms a continuous dense cluster of buds along its short stem. They appear remarkably like the upper half of more common marijuana plants.

{Figure 20. Left: This Pakistani variety ("indica") reaches a height of five feet (large leaves removed). Right: Flowering top two months later.}

Type III

Plants are high in CBD and low in THC. These are often cultivated for hemp fibre or oil seed. Usually they originate from countries north of 30 degrees latitude. As marijuana they yield a low-potency grass and are considered non-drug varieties. If you choose your seeds from potent grass, it will not be this type. An example of these plants are Midwestern weedy hemps which are often collected and sold for low-grade domestic grass. The high CBD content can make you feel drowsy with a mild headache long before you feel high. These plants are very diverse morphologically even when categorised by cultivated types. Hemp plants are usually tall (eight to 20 feet) with an emphasis on stem development and minimal branching. Starting from the base, long, even internodes (stem portion from one set of leaves to the next pair) and opposite phyllotaxy (see 3.2) cover a good portion of the stem. Some varieties form long, sparse branches only on the upper portion of the stem (many Midwest weeds). Other varieties
(Kentucky hemp) are the familiar Christmas-tree shape.

Seed varieties are usually short (two to eight feet) and very bushy. Branches on some are short, grow outward and are all of approximately the same length, giving the plant a cylindrical shape. Some of the shorter (two to three feet) seed varieties have undeveloped branches, and almost all of the seeds collect in a massive cluster along the top portion of the stalk. Seed plants are often the most unusual-appearing of Cannabis plants, and you won't find them in the United States.

As expected, the figures for average THC in Midwestern weeds are quite low. this is consistent with their reputation for low potency. But the range of THC goes up to 2.37 percent in the Illinois study. This is comparable with some of the higher-quality imported marijuana and is consistent with some people's claims that Midwestern weeds provided them with great highs.

Type IV

Varieties that produce propyl cannabinoids in significant amounts (over five percent of total cannabinoids) form a fourth group from both type I and II plants. Testing for the propyl cannabinoids has been limited and most reports do not include them. They have been found in plants from South Africa, Nigeria, Afghanistan, India, Pakistan, and Nepal with THCV as high as 53.69 percent of total cannabinoids (136). They usually have moderate to high levels of both THC and CBD and hence have a complex cannabinoid chemistry. Type IV plants represent some of the world's more exotic marijuana varieties.

A fifth type, based on the production of CBGM, which is not psychoactive, is found in northeastern Asia, including Japan, Korea and China. This type is not relevant to us and will not be mentioned again.

There are many different techniques for sampling, extraction, and estimation of cannabinoids in plant material. To minimise differences among research groups, the above data (except for Midwestern weedy hemps) are taken from studies at the University of Mississippi at Oxford (66,119,136).

Unfortunately, some of the best Colombian, Mexican and Thai varieties are not included in the data. Many of these have not been tested until recently, and the figures are not yet published. Under the system for testing at the University of Mississippi, the highest THC variety reached six to eight percent THC in a bud. These seeds originated from Mexico.

{See Table 01 to 10.}

These five chemical types are not distinct entities; that is, each type contains several quite different-appearing varieties. Actually, varieties of different types may look more similar than varieties from the same type. But the ability to produce characteristic amounts of particular cannabinoids is genetically based. This means the each type contains certain genes and gene combinations in common, and in biological terms, the plants are called
chemical genotypes.

These types may be from virtually any country simply because of the plant's past and ongoing history of movement. The first three can be found in most countries where Cannabis is heavily cultivated, although marijuana plants (types I, II, IV) usually originate from lower latitudes nearer the equator. This may be simply explained in terms of cultural practices. Marijuana traditionally has been cultivated in southerly cultures such as India, Southeast and Central Asia, Africa; and in the West in Mexico, Colombia, Jamaica, and Central American countries. On the other hand, useful characteristics must exist before cultures can put them to use after selection. And the characteristic (drug or fibre) must maintain itself within the local environment (see 18.4).

Non-drug types (type III) usually originate at higher latitudes with shorter growing seasons. A definite gradation exists for non-drug to drug types, starting in temperate zones and moving toward the equator. The same gradation may be found for the appearance of propyl cannabinoids toward the equator. This doesn't mean that the quality of the grass you grow depends on whether you live in the north or south, but that over a period of years and decades, a group of plants may drift toward either the drug or the non-drug type (either rich in THC or rich in CBD).

The majority of the marijuana sold in the United States has less than one percent THC; and the bulk of this comes from Mexican and domestic sources. The highest percentages of THC in marijuana that we've seen are: Colombian (9.7), Mexican (13.2), Hawaiian (7.8), and Thai sticks (20.2; however, this is believed to be adulterated with hash oil). The percentages of THC reported vary greatly, because they depend on the particular method of sampling and estimation used.

Five samples of Colombian Golds, bought in New York City and San Francisco for from $30 to $50 (1976) an ounce, averaged 2.59 percent THC and 1.27 percent CBN. The CBN represents an average of about one-third of the THC originally present in the fresh plant by the time it reaches American streets. This is one advantage that homegrowers have, since their marijuana is fresh. In fresh plant material, less than 10 percent of the THC will have been converted to CBN, as long as the material is properly harvested, cured, and stored.

By the time hashish reaches the American market, THC content is usually at the low end of the ranges given here, usually between 1.5 and 4 percent THC. The darker outer layer of hashish is caused by deterioration. The inner part will contain the highest concentration of THC.

The average range for hash oil and red oil is 12 to 25 percent when it is fresh. It is not uncommon for illicit hash oil to have more than 60 percent THC. However, light, as well as air, very rapidly decomposes THC in the oil form (see the section on "Storage" in section 21). You can't tell whether the oil will be wondrous or worthless unless you smoke it.

The preparations listed in Tables 9 and 10 are relatively fresh compared to hashish on the American market. Total cannabinoids make up roughly 25 to 35 percent by weight of hashish and resin preparations. Note that the data in
these tables are relative concentrations.

Table 10 - Relative Percentages of Major Cannabinoids in Hashish from Nepal

<table>
<thead>
<tr>
<th>Percentage(a) of THC</th>
<th>HASHISH THC</th>
<th>CBD</th>
<th>CBN</th>
<th>THCV</th>
<th>CBDV</th>
<th>CBV</th>
<th>LOST(b)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample 1</td>
<td>66</td>
<td>11.5</td>
<td>35.9</td>
<td>22.1</td>
<td>5.7</td>
<td>12.5</td>
<td>12.3</td>
</tr>
<tr>
<td>Sample 2</td>
<td>88</td>
<td>3.4</td>
<td>41.1</td>
<td>24.8</td>
<td>3</td>
<td>11.9</td>
<td>15.8</td>
</tr>
<tr>
<td>Sample 3</td>
<td>85</td>
<td>5.5</td>
<td>41.2</td>
<td>30.3</td>
<td>2.3</td>
<td>9.1</td>
<td>11.6</td>
</tr>
</tbody>
</table>

Each row in these columns sums to 100%

b Percentage of original THC lost as CBN

The very high figures for CBN in hashish indicate that much of the THC is converted to CBN because of processing and aging. During hashmaking many of the gland heads are broken and the THC is exposed to light and air. The figures in these tables are typical of what to expect for relative concentrations of THC in hashish on the American market. Actual concentrations are roughly one-fourth to one-third of these figures.

Obviously, THC percentages for hashish and tinctures are not that high compared to fine marijuana. Hashish in the United States seldom lives up to its reputation. The best buy in terms of the amount of THC for the money is hash oil when it is high quality and fresh. More often a fine homegrown sinsemilla or sometimes a lightly seeded Colombian is the best investment. (Of course, the best value is always what you grow yourself.)

Chapter Three
BEFORE CULTIVATION BEGINS

3.2 Choosing Seeds

Popular Market names of different grades of grass, such as Colombian commercial and Mexican regular, are familiar to growers, but each grade actually may encompass many different varieties. For example, there are Colombian Golds that are similar in most respects, but some varieties grow no taller than six feet. The more common types grow 12 to 15 feet under the same conditions. Some Oaxacan Cannabis forms several strong upright branches by maturity, and at a glance may seem to have several stems, yet more often, Oaxacan is conical-shaped and grows about 12 feet.

Most of the fine marijuana sold in this country comes from type I plants with THC as the predominant cannabinoid. Type II plants are less common. You might recognise type II plants by the high. The grass takes longer before its effects are felt, but the high lasts much longer than with other marijuana. Type IV plants are the least common; this marijuana seldom reaches the general American market. This type will get you high after only a few tokes. Type III plants are considered non-drug varieties because they are predominantly CBD with little THC. The effects of CBD are not felt unless it is accompanied by a sizeable concentration of THC, such as in type II plants. However, a lot of marijuana from these plants is sold in the United States. Some Mexican and Jamaican regular and much of the low-grade domestic is harvested from type III plants.

You may not be able to tell what type plant you're smoking, but you can tell what you like. Seeds from high-quality marijuana will grow into high-quality marijuana plants. If you like the grass you're smoking, you'll like the
The name of your grass has little to do with potency and may have originated in the mind of some enterprising dealer. Always choose your seeds from what you consider to be the best grass. Don't be swayed by exotic names. If you are not familiar with grass of connoisseur quality, ask someone whose experience you respect for seeds. Smokers tend to save seeds from exceptional grass even if they never plan to plant them.

The origin of your grass even if you knew it for certain, has little to do with whether it will be dynamite or worthless smoke. In both India and Brazil, hemp is grown which is worthless for marijuana. Likewise, extremely potent marijuana plants grow which are useless for hemp fibre. These plants are sometimes found growing in adjacent fields. Most of the fine-quality marijuana varieties develop in those countries nearer to the equator. How much this had to do with environmental conditions or cultural practices is unknown. In either case, marijuana traffic has been so heavy that fine varieties now grow all over the world. For example, in the United States thousands of people now grow varieties from Mexico. These fine varieties originated in Asia and Africa, and many were brought to Mexican farmers by American dealers during the 1960s. As more farmers grew these new varieties, the quality of Mexican grass imported to the United States improved. Already people are speaking of varieties such as Maui Wowie and Kona Gold.

The colour of the grass does not determine its potency. Marijuana plants are almost always green, the upper surface of the leaves a dark, luxuriant green, and the undersurface a lighter, paler green. Some varieties develop reds and purples along stems and leaf petioles. Occasionally, even the leaves turn red/purple during the last stages of growth (plate 6). Grasses termed "Red" more often get their colour from the stigmas of the female flowers, which can turn from white to a rust or red colour, giving the marijuana buds a distinct reddish tinge. The golds and browns of commercial grasses are determined by the condition of the plant when it was harvested - whether it was healthy (green) or dying (autumn colours). How the plants are harvested, cured, and stored also has a serious effect on colour. Commercial grasses from Colombia, Mexico, and Jamaica are often poorly cured and packed. Too much moisture is left in the grass, encouraging microbial decomposition; with warm temperatures, whatever green was left disappears, leaving the more familiar browns and golds. By the time they reach the United States, commercial grasses lose about five to 20 percent of their weight in water loss and often smell mouldy or musty.

Colour also depends on origin - varieties adapted to tropical or high-altitude areas have less chlorophyll and more accessory pigments, giving the plant their autumn colours (accessory pigments protect the plant from excessive sunlight). Varieties adapted to northern climates, where sunlight is less intense, have more chlorophyll and less accessory pigments. The dying leaves often turn light yellow, grey, or rust. Variations in pigment concentrations are also influenced by local light particularly the soil conditions under which the plants are grown.

The taste of the smoke - its flavour, aroma, and harshness - also depends more on when the marijuana was harvested and how it was handled after it was grown than on the variety or environmental influences.
You can detect subtle differences in the overall bouquet between freshly picked varieties. The environment probably influences bouquet too, but with most commercial grass the harvesting/storing procedures for outweigh these other, more subtle factors. A musty, harsh-smoking Colombian marijuana can give the mildest, sweetest, homegrown smoke when properly prepared. Don't be influenced by the marijuana's superficial characteristics. Choose seeds from the most potent grass.

Grasses of comparable potency can yield plants of different potencies. This is because fine sinsemilla (homegrown, Hawaiians, Thai weeds, and some Mexicans) are carefully tended and harvested at about peak potency. They are also cured and packed well; so they are fresh when they are distributed in the American market. When you smoke them you are experiencing the at about its peak potency. The seeds you plant from this grass will produce plants, at best, of about equal potency. Sometimes they are slightly less simply because of differences in growing conditions. Colombian grasses are not usually harvested at their peak potency. A significant amount (20 percent and up) of the active cannabinoids (THC,CBD) are converted to much less active cannabinoids (CBN,CBS) or inactive ingredients (polymers-tars, resins, oils, etc.). This is also true of many Mexican and Jamaican grasses that are heavily seeded and poorly handled. Homegrown from this grass can produce plants of higher potency than the original, simply because the homegrown is fresh, and is harvested and cured well so that the THC content is at its peak.

When choosing seeds you might consider the following Broad Generalisations. Mexican, Jamaican (if you can find goof Jamaican anymore), and homegrowns, including Hawaiians, often develop quickly and have a better chance of fully maturing in the shorter growing seasons over most of the north and central states. Colombian, African, and Southeast Asian varieties, such as Vietnam and Thai sticks (from Thailand and Japan), more often need a longer season to fully develop/ Under natural conditions they seldom flower in the short growing season that covers the northern United States.

For indoor growers, the growing season is all year; so it doesn't matter if plants need longer to develop. Mexican and Jamaican plants usually reach full potency in about six months. Colombian and Southeast Asian varieties may need eight or nine months until they reach their maximum THC or general resin content under indoor conditions.

The grass you choose should have a good stock of mature seeds. Thai weed and fine homegrowns (sinsemillas, which are by definition female flowers buds without seeds) may have no seeds at all but more often have a few viable seeds. Most Colombian and Mexican grasses contain between one and two thousand seeds per ounce bag or lid of grass. This may sound like an exaggerated figure, but it's not. Look at the photos in Figure 21 showing the yield from some Michoacan buds. The yield is 40 percent grass (1.22 grams, about three joints), 50 percent seeds (1.56 grams or 120 seeds), and 10 percent stems (0.3 grams).

Relative to smoking material, seeds are heavy. Colombian grasses average about 50 percent seeds by weight. A film canister holds about 1,200 Colombian seeds. {Figure 21, Seeded buds often contain more weight in seeds
Depending on the variety, healthy mature seeds (which are botanically achene nots) vary in size between 1/12 and 1/4 inches in length. From any variety, choose seeds that are plump and well-formed with well-developed colour. Seed colours range from a buff through a dark brown, and from light grey to almost black colours. Often seeds are mottled with brown or black spots, bars, or lines on a lighter field (plate 11). Green or whitish seeds are usually immature and will germinate feebly if at all. Fresh seeds have a waxy glimmer and a hard, intact shell. Shiny, very dark brown or black seeds often mean the contents are fermented and the embryo is dead. Fermented seeds crush easily with finger pressure and are hollow or dust inside. Seeds that are bruised or crushed are also not viable. This happens to some seeds when grass is compressed or bricked.

Fresh, fully matured Cannabis seeds have a high rate of germination; 90 percent or better is typical. It is sometimes helpful to have an idea of how many seeds to expect to germinate. You can tell simply by placing a sample number between wet paper towels which are kept moist. Most of the seeds that germinate do so within a few days of each other. After a week or two, count how many of the original seeds germinated. This gives you a rough idea of what to expect from the seeds when planted.

The viability of seeds gradually declines with time; left in the ground, only 40 percent may germinate next season. Seeds are an ideal prey for many fungi, which are responsible for most of their deterioration. In a warm (70°F or over) and humid atmosphere, fungi rapidly destroy seeds. If kept cool and dry in an airtight container, seeds stored in this way and left in the buds also maintain high viability for over two years.

3.3 CANNABIS LIFE CYCLE

Marijuana plants may belong to any one of a number of varieties which follow somewhat different growth patterns. The following outline describes the more common form of growth. Differences between varieties can be thought of as variations on this standard theme.

Cannabis is an annual plant. A single season completes a generation, leaving all hope for the future to the seeds. The normal life cycle follows the general pattern described below.

Germination

With winter past, the moisture and warmth of spring stir activity in the embryo. Water is absorbed and the embryo's tissues swell and grow, splitting the seed along its suture. The radical or embryonic root appears first. Once clear of the seed, the root directs growth downward in response to gravity. Meanwhile, the seed is being lifted upward by growing cells which form the seedling's stem. Now anchored by the roots, and receiving water and nutrients, the embryonic leaves (cotyledons) unfold. They are a pair of small, somewhat oval, simple leaves, now green with chlorophyll to absorb the life-giving light. Germination is complete. The embryo has been reborn and is now a seedling living on the food it produces through photosynthesis. The process of germination is usually completed in three to 10 days.
Seedling

The second pair of leaves begins the seedling stage. They are set opposite each other and usually have a single blade. They differ from the embryonic leaves by their larger size, spearhead shape, and serrated margins. With the next pair of leaves that appears, usually each leaf has three blades and is larger still. A basic pattern has been set. Each new set of leaves will be larger, with a higher number of blades per leaf until, depending on variety, they reach their maximum number, often nine or 11. The seedling stage is completed within four to six weeks.

Vegetative Growth

This is the period of maximum growth. The plant can grow no faster than the rate that its leaves can produce energy for new growth. Each day more leaf tissue is created, increasing the overall capacity for growth. With excellent growing conditions, Cannabis has been known to grow six inches a day, although the rate is more commonly one to two inches. The number of blades on each leaf begins to decline during the middle of the vegetative stage. Then the arrangement of the leaves on the stem (phyllotaxy) changes from the usual opposite to alternate. The internodes (stem space from one pair of leaves to the next, which had been increasing in length) begin to decrease, and the growth appears to be thicker. Branches which appeared in the axils of each set of leaves grow and shape the plant to its characteristic form. The vegetative stage is usually completed in the third to fifth months of growth.

Preflowering

This is a quiescent period of one to two weeks during which growth slows considerably. The plant is beginning a new program of growth as encoded in its genes. The old system is turned off and the new program begins with the appearance of the first flowers.

Flowering

Cannabis is dioecious: each plant produces either male or female flowers, and is considered either a male or female plant. Male plants usually start to flowers about one month before the female; however, there is sufficient overlap to ensure pollination. First the upper internodes elongate; in a few days the male flowers appear. The male flowers are quite small, about 1/4 inch, and are pale green, yellow, or red/purple. They develop in dense, drooping clusters (cymes) capable of releasing clouds of pollen dust. Once pollen falls, males lose vigour and soon die.

The female flowers consists of two small (1/4 to 1/2 inch long), fuzzy white stigmas raised in a V sign and attached at the base to an ovule which is contained in a tiny green pod. The pod is formed from modified leaves (bracts and bracteoles) which envelop the developing seed. The female flowers develop tightly together to form dense clusters (racemes) or buds, cones, or colas (in this book, buds). The bloom continues until pollen reaches the flowers, fertilising them and beginning the formation of seeds. Flowering usually lasts about one or two months, but may continue longer
when the plants are not pollinated and there is no killing frost.

Seed Set

A fertilised female flower develops a single seed wrapped in the bracts. In thick clusters, they form the seed-filled buds that make up most fine imported marijuana. After pollination, mature, viable seeds take from 10 days to five weeks to develop. When seeds are desired, the plant is harvested when enough seeds have reached full colour. For a fully-seeded plant this often takes place when the plant has stopped growth and is, in fact, dying. During flowering and seed set, various colours may appear. All the plant's energy goes to reproduction and the continuance of its kind. Minerals and nutrients flow from the leaves to the seeds, and the chlorophylls that give the plant its green colour disintegrate. The golds, browns, and reds which appear are from accessory pigments that formerly had been masked by chlorophyll.

Figure 30 THC potency through various growth stages in the male and female plant

About Plants Generally

Plants use a fundamentally different "life strategy" from animals. Animals are more or less self-contained units that grow and develop to predetermined forms. They use movement and choice of behaviour to deal with the changing environments. Plants are organised more as open systems - the simple physical characteristics of the environment, such as sunlight, water, and temperature, directly control their growth, form, and life cycles. Once the seed sprouts, the plant is rooted in place and time. Since growth is regulated by the environment, development is on accordance with the plant's immediate surroundings. When a balance is struck, the strategy is a success and life flourishes.

Behaviour of a plant is not a matter of choice; it is a fixed response. On a visible level the response more often than not is growth, either a new form of growth, or specialised growth. By directly responding, plant in effect know, for example, when to sprout, flower, or drop leaves to prepare for winter.

Everyone has seen how a plant turns toward light or can bend upward if it its stem is bent down. The plant turns by growing cells of different length on opposite sides of the stem. This effect turns or right the plant. The stimulus in the first case is light, in the second gravity, but essentially the plant responds by specialised growth. It is the same with almost all facets of a plant's live - growth is modified and controlled by the immediate environment. The influence of light, wind, rainfall, etc., interacts with the plant (its genetic make-up or genotype) to produce the individual plant (phenotype).

The life cycle of Cannabis is usually complete in four to nine months. The actual time depends on variety, but it is regulated by local growing conditions, specifically the photoperiod (length of day vs night). Cannabis is a long-night (or short-day) plant. When exposed to a period of two weeks of long nights - that is, 13 or more hours of continuous darkness each night
allows the grower to control the life cycle of the plant and adapt it to local growing conditions or unique situations. Since you can control flowering, you control maturation and, hence, the age of the plants at harvest.

3.4 PHOTOPERIOD AND FLOWERING

For the marijuana grower the most important plant/environment interaction to understand is the influence of the photoperiod. The photoperiod is the daily number of hours of day (light) vs. night (dark). In nature, long nights signal the plant that winter is coming and that it is time to flowers and produce seeds. As long as the day-length is long, the plants continue vegetative growth. If female flowers do appear, there will only be a few. These flowers will not form the characteristic large clusters or buds. If the days are too short, the plants flowers too soon, and remain small and underdeveloped.

The plant "senses" the longer nights by a direct interaction with light. A flowering hormone is present during all stages of growth. This hormone is sensitive to light and is rendered inactive by even low levels of light. When the dark periods are long enough, the hormones increase to a critical level that triggers the reproductive cycle. Vegetative growth ends and flowering begins.

The natural photoperiod changes with the passing of seasons. In the Northern Hemisphere, the length of daylight is longest on June 21. Day-length gradually decreases until it reaches its shortest duration on December 22. The duration of daylight then begins to increase until the cycle is completed the following June 21. Because the Earth is tilted on its axis to the sun, day-length also depends on position (or latitude) on Earth. As one moves closer to the equator, changes in the photoperiod are less drastic over the course of a year. At the equator (0 degrees altitude) day length lasts about 12.5 hours on June 21 and 11.5 hours on December 22. In Maine (about 45 degrees north), day-length varies between about 16 and nine hours. Near the Arctic Circe on June 21 there is no night. On December 22 the whole day is dark. The longer day-length toward the north prevents marijuana from flowering until later in the season. Over most of the northern half of the country, flowering is often so late that development cannot be completed before the onset of cold weather and heavy frosts.

The actual length of day largely depends on local conditions, such as cloud cover, altitude, and terrain. On a flat Midwest plain, the effective length of day is about 30 minutes longer than sunrise to sunset. In practical terms, it is little help to calculate the photoperiod, but it is important to realise how it affects the plants and how you can use it to you advantage.

Cannabis generally needs about two weeks of successive long nights before the first flowers appear. The photoperiod necessary for flowering will vary slight with (1) the variety, (2) the age of the plant, (3) its sex, and (4) growing conditions.

1. Cannabis varieties originating from more northerly climes
(short growing seasons) react to as little as nine hours of night. Most of these are hemp and seed varieties that are acclimated to short growing seasons, such as the weedy hems of Minnesota or southern Canada. Varieties from more southerly latitudes need longer nights with 11 to 13 hours of darkness. Since most marijuana plants are acclimated to southerly latitudes, they need the longer nights to flower. To be on the safe side, if you give Cannabis plant dark periods of 13 or more hours, each night for two weeks, this should be enough to trigger flowering. 2. The older a plant (the more physiologically developed), the quicker it responds to long nights. Plants five or six months old sometimes form visible flowers after only four long nights. Young marijuana plants (a month or so of age) can take up to four weeks to respond to long nights of 16 hours. 3. Both male and female Cannabis are long-night plants. Both will flower when given about two weeks of long nights. The male plant, however, will often flower fully under very long days (18 hours) and short nights (six hours). Males often flowers at about the same time they would if they were growing in their original environment. For most marijuana plants this occurs during the third to fifth month. 4. Growing conditions affect flowering in many ways (see Chapter 12). Cool temperatures (about 50F) slow down the flowering response. Cool temperatures or generally poor growing conditions affect flowering indirectly. Flower development is slower, and more time is needed to reach full bloom. Under adverse conditions, female buds will not develop to full size.

Applications of Photoperiod

The photoperiod is used to manipulate the plants in two basic ways:

1. By giving long dark periods, you can force plants to flower. 2. By preventing long nights, using artificial light to interrupt the dark period, you can force the plants to continue vegetative growth.

Outdoors

Most marijuana plants cultivated in the United States begin to flower by late August to early October and the plants are harvested from October to November. For farmers in the South, parts of the Midwest, and West Coast, this presents no problem and no special techniques are needed for normal flowering.

In much of the North and high-altitude areas, many varieties will not have time to complete flowering before fall frosts. To force the plants to flower earlier, give them longer night periods. If the plants are in containers, you can simply move them into a darkened area each evening. Plants growing in the ground can be covered with an opaque tarpaulin, black sheet plastic, or double or triple-layers black plastic trash bags. Take advantage of any natural shading because direct sunlight is difficult to screen completely. For instance, if the plants are naturally shaded in the morning hours, cover the plants each evening or night. The next morning you uncover the plants at about eight to nine o'clock. Continue the treatment each day until all the
plants are showing flowers. This usually takes two weeks at most, is the plants are well developed (about four months old). For this reason, where the season starts late, it is best to start the plants indoors or in cold frames and transplant outdoors when the weather is mild. This in effect lengthens the local growing season and gives the plants another month or two to develop. By the end of August the plants are physiologically ready to flower; they sometimes do with no manipulation of the photoperiod. More often female plants show a few flowers, but the day-length prevents rapid development to large clusters. The plants seem in limbo - caught between vegetative growth and flowering. The natural day-length at this time of year will not be long enough to reverse the process, so you can discontinue the treatment when you see that the new growth is predominantly flowers.

In areas where frosts are likely to occur by early October, long-night treatments may be the only way you can harvest good-sized flower clusters. These clusters, or buds, are the most potent plant parts and make up the desired harvest. Forcing the plants to flowers early also means development while the weather is warm and the sun is shining strongly. The flower buds will form much faster, larger and reach their peak potency. A good time to start the treatments is early to middle August. This allows the plants at least four weeks of flowering while the weather is mild.

Another reason you may want to do this is to synchronise the life cycle of the plants with the indigenous vegetation. In the northeast and central states, the growing season ends quite early and much of the local vegetation dies back and changes colour. Any marijuana plants stick out like green thumbs, and the crop may get ripped off or busted. Plants treated with long nights during late July will be ready to harvest in September.

Outdoors, growers should always plant several varieties, because some may naturally flower early, even in the northern-most parts of the country. These early-maturing varieties usually come from Mexican, Central Asian, and homegrown sources. By planting several varieties, many of you will be able to find or develop an early-maturing variety after a season or two. This, of course, is an important point, because it eliminates the need for long-night treatments.

Preventing Flowers

Manipulation of the photoperiod can also prevent the plants from flowering until a desired time. For example, in Hawaii the weather is mild enough to grow winter crops. The normal summer crop is harvested anytime from September to mid-November. The winter crop is generally planted from October to December. Because the winter days are so short, the plants flower almost immediately, usually within two month. The plants are harvested in their third or fourth month and yield about 1/4 the yield of summer plants. A large Hawaiian female can yield a pound of buds. Most of the plant's overall size is reached while it is vegetatively growing. By interrupting the night period with light, you can keep these plants vegetatively growing for another month, yielding plants of about twice the size.

The amount of light needed to prevent flowering is quite small (about .03 foot candles95 - on a clear night the full moon is about .01 foot candles). However, each plant must be illuminated fully, with the light shining over
the whole plant. This might be accomplished with either electric light or a strong flashlight. The easiest way is to string incandescent bulbs, keeping them on a timer. The lights need be turned on for only a flash at any time during the night period, from about 9:00 pm to about 3:00 am. The interrupts the long night period to less then nine hours. Start these night treatments each night or two, until you want the plants to flower.

Indoors

Natural Light

Indoors, the growing season lasts all year. The night period is much easier to control. Sometimes people grow plants in their windows for more than a year without any female flowers ever forming. This is because household lamps are turned on sometime at night, illuminating the plants. Under natural light exclusively, indoor plants flower at about the same time they would outdoors (sometime a bit sooner because it is warmer indoors or the plants may be shaded). When plants are well developed and you want them to flower, make sure that no household lamps or nearby street lamps are shining on them. During late fall and winter, the natural day-length is short enough for the plants to flower naturally, if you simply keep off any lights at night that are in the same room as the plants. If you must use light, use the lowest wattage possible, such as a six-watt bulb. (The hormone is also least sensitive to blue light.) Shield the light away from the plants. Or shield the plants from any household light with aluminium foil curtains. Once the flowers are forming clusters, you can discontinue the dark treatments, especially if it is more convenient. However, if it is too soon (when you see only a few random flowers), household lights can reverse the process.

By using natural light, you can grow indoor crops all year. The winter light is weak and the days are short, so it is best to use artificial lights to supplement daylight, as well as to extend the photoperiod. The extra light will increase the growth rate of the plants and hence size and yield. You should allow winter crops to flower during late January or February, using the natural photoperiod to trigger flowering. If you wait until spring, the natural light period will be too long and may prevent flowering.

Artificial Lights

Under artificial light the photoperiod is, of course, any length you wish. The most popular way to grow with artificial lights is the harvest system. Start the plants under long light periods of from 16 to 18 hours daily. After the plants have reached a good size, usually between three and six months, shorten the light cycle to about 12 hours to force flowering.

To decide exactly when to force the plants to flower, let their growth be the determinant. If male plants are showing their flowers, then the females are physiologically ready to flower. Most of the plant's overall height is achieved during vegetative growth. Some varieties, of course, are smaller and grow more slowly than others. Wait until the plants are nearing the limits of the height of the garden or are at least five feet tall. This is large enough to support good flower development and return a good yield. If you turn down the light cycle when the plants are young and small, you'll
harvest much less grass because the plants simply can't sustain a large number of flowers.

Some leaf growers prefer a continuous growth system, emphasising leaf growth and a continuous supply of grass. The light cycle is set for 18 to 24 hours a day. This prevents flowering and the plants continue their rapid vegetative growth. Growing shoots and leaves are harvested as used, and plants are removed whenever they lose their vigour and growth has noticeably slowed. New plants are started in their place. In this way, there will be plants at different growth stages, some of which will be in their rapid vegetative growth stage and will be quite potent. Male plants and some females eventually will form flowers, but the females will not form large clusters. People often use this system when the lights are permanently fixed. Small plants are raised up to the lights on tables or boxes. This garden never shuts down and yields a continuous supply of grass.

3.5 INHERENT VARIATIONS IN POTENCY

The potency of a particular marijuana sample will vary because of many factors other then the variety. Many of these have to do with the natural development of the plants and their resin glands. Environmental factors do affect potency but there are large differences in any variety. These inherent factors must be explained before we can talk of factors outside the plant that affect relative potency. Strictly environmental effects are discussed in Chapter 19.

Variations in Potency Within Varieties

There are noticeable differences in THC concentrations between plants of the same variety. Differences are large enough so that you can tell (by smoking) that certain plants are better. This is no news to homegrowers, who often find a particular plant to be outstanding. Five-fold differences in THC concentration have also shown up in research. However, when you consider a whole group of plants of the same variety, they're relatively similar in cannabinoid concentrations. Type II plants are the most variable, with individual plants much higher than other in certain cannbininoids.

Variations by Plant Part

The concentration of cannabinoids depends on the plant part, or more specifically, the concentration and development of resin glands to plant part. The female flower bracts have the highest concentration of resin glands and are usually the most potent plant parts. Seeds and roots have no resin glands. These shoe no more than traces of cannbininoids. Smoke seeds will give you a headache before you can get high. If you got high on seeds, then there were probably enough bracts adhering to the seeds to get you high. {Figure 29 The highest concentration of stalked resin glands forms a cover on the female flower bracts Resin glands beneath cystolith hairs on a leaf petiole}

Here are the potencies, in descending order, of the various plant parts:

1. Female flowering clusters. In practice you don't separate hundreds of tiny bracts to make a joint. The whole flowering mass (seeds removed),
along with small accompanying leaves, forms the material.

2. Male flower clusters. These vary more in relative potency depending on the strain (see "Potency by Sex," below).

3. Growing shoots. Before the plants flower, the vegetative shoots (tips) of the main stem and branches are the most potent plant parts.

4. Leaves (a) that accompany flowers (small);
   (b) along branches (medium);
   (c) along main stem (large).

   Generally, the smaller the leaf is, the more potent it can be.

5. Petioles (leaf stalks). Same order as leaves.

6. Stems. Same order as leaves. The smaller the stem (twig), the higher the possible concentration of cannabinoids. Stems over 1/16" in diameter contain only traces of cannabinoids and are not worth smoking. The small stems that bear the flowers can be quite potent.

7. Seeds and Roots. Contain only traces (less then .01 percent) and are not worth smoking or extracting.

This order is fairly consistent. The exceptions can be the small leaves that accompany male flowers, which are sometimes more potent than the flowers themselves. The growing shoots are sometimes more potent than the mature female flowers.

Samples of pollen show varying amounts of cannabinoids. Resin glands are found inside the anthers, alongside the developing pollen grains, and form two rows on opposite sides of each anther. Pollen grains are smaller than the heads of large resin glands (see Plate 7), and range from 21 to 69 micrometres in diameter. A small amount of resin contaminates the pollen when glands rupture, but most of the THC in pollen samples comes from gland heads that fall with pollen when the flowers are shaken to collect it. One study, using pollen for the sample, found concentrations of up to 0.96 percent THC, more than enough to get you high.

Potency by Position on Plant

The potency of marijuana on any plant increases toward the top of the plant, the topmost bud being the most potent. The bottommost leaves on the main stem are the least potent of the useable material. Along branches there is a less steep THC gradient increasing to the growing tip.

The ratios in Table 11 are representative of high-quality marijuana varieties. Plant no. 2 is an exception, with four percent THC in its lower leaves, a figure comparable to high-quality Colombian and Mexican buds in commercial grass.

Table 11 - Relationship of THC Content to Leaf Position (68)

<table>
<thead>
<tr>
<th>Plant</th>
<th>No. 1 (SP-5)</th>
<th>No. 2 (SP-5)</th>
<th>No. 3 (UNC-335)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>6.1</td>
<td>6.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Middle</td>
<td>3</td>
<td>5.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Bottom</td>
<td>0.8</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Ratio (gradient)</td>
<td>8:4:1</td>
<td>1.7:1.4:1</td>
<td>3:2:1</td>
</tr>
</tbody>
</table>
Notice the large difference in the gradients of Plants no. 1 and 2, which are from the same variety (SP-5). Like almost all characteristics of these plants, considerable variation occurs even among sibling. Our experience is that generally the better the quality of the variety, the steeper the gradient: in other words, the bigger the difference between top and bottom leaves. For example, the plants given here are high-quality type I varieties. Plant no. 1 is more typical, with its steep gradient, than no.2, where the gradient is much less pronounced. Lower-quality varieties generally do not have as steep a gradient and the ratios would look more like that of Plant no. 2.

Potency by Sex

Although marijuana lore claimed the female to be the more potent, scientists disclaimed this. But there is some truth to both sides. In fine marijuana varieties, male and female leaves average about the same in cannabinoid concentrations. Either a male or a female individual may have the highest concentration in any particular case. The largest variation is in comparing the flowers. Male flowers may be comparable to the females, or they may not even get you high. It seems that the higher the quality of the grass, the better the male flowers will be. In fine type I plants, male flowering clusters usually approach the potency of the female. In low-quality type III varieties females are usually more potent (20 to 30 percent) than the males.

Type II plants are the most variable, with large differences among individual plants. But the trend is for the females to average about 20 percent high in potency of leaves and flowers.

Table 12 - Relative Potencies of Male and Female Plants (66)

<table>
<thead>
<tr>
<th>COUNTRY OF ORIGIN</th>
<th>SEX (a)</th>
<th>THC</th>
<th>CBD (C)</th>
<th>TYPE PLANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>M</td>
<td>3.7</td>
<td>0.86</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.7</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>4.3</td>
<td>0.12</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.78</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>M</td>
<td>3.2</td>
<td>0.08</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.2</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>0.81</td>
<td>2.1</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.3</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>M</td>
<td>1.37</td>
<td>1.24</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.71</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>M</td>
<td>0.84</td>
<td>2.11</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.92</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>0.15</td>
<td>2.2</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.12</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>M</td>
<td>0.04</td>
<td>0.97</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.06</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

a) M, male (staminate); F, female (pistillate). (b) Of flowering mass with accompanying leaves. (c) Includes CBC.

Potency by Age
In general, the longer the life cycle of the plant, the more the concentration of cannabinoids increases, as long as the plant stays health and vigorous. Actually, it is the development of the plant, rather than chronological age, that determines this difference in potency. A plant that is more developed or more mature is generally more potent.

Because you decide when to plant and/or can control the photoperiod, you also control when the plants flowers and, hence, the overall age at maturity. A six-month-old plant will generally be better than a four-month-old plant, both of which are flowering. Plants eight months old will usually be more potent than six-month-old plants. Most indoor growers plan their gardens to be about five to eight months old at harvest. Healthy plants can be extended to about 10 months. Plants older than 10 months often develop abnormally. There is usually a decline in vigour and a loss in potency. But some growers have decorative plants several years old.

Outdoor growers more often simply allow the plants to develop according to the local growing conditions which will govern their development and flowering time. Where the growing season is short, some growers start the plants indoors and transplant when the local growing season begins. This gives the plants a longer growing season.

One reason female plants are considered more potent is because of age. Males often flower in four to five months and die, while the females may continue to a ripe old age of eight or nine months, especially when they are not pollinated.

Potency by Growth Stage

Although the general trend is for the cannabinoid concentration to increase with age, this is not a matter of the simple addition or accumulation of cannabinoids. The concentration of cannabinoids changes with the general metabolic rate of the plant, and can be related to the plant's growth pattern or life cycle. Figure 30 shows a hypothetical curve following the concentration of THC from the upper leaves and growing tips of a male and female plant.

Notice that THC increases immediately with germination and establishment of the seedling, and continues to rise until the plant enters its vegetative stage. At this point, the plant is well-formed, with a sturdy stem, and no longer looks fragile. As the plant's rate of growth increases, there is a corresponding rise in THC that continues throughout the vegetative stage until a plateau is reached. Before the plateau is reached the arrangement of leaves on the stem (phyllotaxy) changes from opposite to alternate. The plateau is maintained until the plant's rapid growth all but stops and the plant has entered preflowering. By this time, the branches have formed the plant to its characteristic shape. Preflowering lasts about one to two weeks, during which THC concentration falls until the appearance of the first flowers.

For the male plant, preflowering ends with renewed growth. This lengthens the uppermost internodes and the first male flower buds appear. THC immediately increases with the development of the male flower clusters, and reaches its peak when most of the flowers are fully formed and a few are
beginning to release pollen. After pollen release, the male normally loses vigour and THC content slowly declining until the plant is cured and stored.

Female plants reach their maximum THC when the plants are in full bloom. Full bloom is when the plant has filled out with well-formed flower clusters, but flowers are still slowly forming. Most of the stigmas will still be white and healthy.

Flowering lasts anywhere from two to 10 weeks, depending on whether the plants are pollinated or not, as well as on variety and the environment. (See Chapter 20 for details.) THC content declines as the formation of new flowers slows and the majority of the stigmas begin to brown. The only changes you may see in the plants are the maturation of the seeds and the loss of green colour in the leaves and flowers. In some cases the plant's apparent resin (its look and feel) increases during the last few weeks of life while the THC concentration is still declining.

You may feel that you should only pick marijuana when the plants are in full bloom, but this is not the case. Think of the garden as a continuous supply of grass. You can never be sure of the fate of your plants. The biggest problem with outdoor growing is that there is a good chance that the plants will be ripped off before you plan to harvest. It is much better to harvest grass during the course of a season, assuring yourself a return for your efforts. For example, during the third month of growth, you could cut back the growing tips, which should be quite potent, often more potent than Figure 30 suggests. This doesn't mean there will be less to harvest at season's end. In fact, the plant will be forced to develop its branches, possible yielding a larger plant.

Common sense tells you that it is always best to test one sample before you harvest. By taking one tip, curing and smoking, you'll know whether it's worthwhile to harvest more at that time or to wait longer. When a tip is about equal to its parents' potency, then definitely harvest more growing tips. This peak high often occurs during the middle to late rapid, vegetative-growth stage.

The reader should keep in mind that Figure 30 serves only as an example. Chronological age is not as important as the physiological age of the plant. In this graph, the life of the plants is about six months. But the life cycle depends on the particular variety and the growing conditions, which strongly influence the rate of development. (For details on how to use the graph, see Chapter 20.) The important facts that the reader should get from the graph are that the potency of the grass can decrease as well as increase during the plant's life cycle. Actual studies of the cyclic variations in potency over the course of a season have shown much more complicated rhythms, with many more peaks and valleys than here. Most varieties will more or less follow a growth pattern as described. Changes in the plant’s development, such as phyllotaxy and growth rate, are cues to changes in THC concentration. Secondly, the growing tips of the main stem and branches can be very potent. Growers do not have to wait until flowers form to harvest top-quality smoke.

3.6 Cultivation: Indoors or Outdoors?
The basic elements of the environment (light, water, air, and soil) provide plants with their fundamental needs. These environmental factors affect the growth rates of plants, as well as their life cycles. If one factor is deficient, growth rate and vigour will wane regardless of the other three. For instance, with low light, the growth will be limited no matter how fertile and moist the soil is. In the same sense, if soil minerals are scarce, the growth rate will be limited no matter how you increase the light.

Photosynthesis

Cannabis, like all green plants, manufactures its food through the process photosynthesis. Unlike animals, which depend on pre-formed food for survival, plants can use energy from light to form food (carbohydrates) from simple inorganic molecules absorbed from the air and soil.

Plants absorb light energy through pigments that are concentrated in the leaf cells. These pigments are also found in most of the aboveground parts of the plant. The most abundant pigment is chlorophyll, which gives the plants their green colour. The energy absorbed is stored in chemical compounds such as ATP and NADPH2. (ATP, adenosine-triphosphate; NADPH2, nicotinamide-adenine-dinucleotide-phosphate.) These are storage/transfer compounds that function to transfer energy and matter in the living system. ATP transfers energy that fuels the reactions for the making of carbohydrates as well as most other metabolic functions. NADPH2 transfers electrons, usually as hydrogen, for the synthesis of carbohydrates as well as other compounds.

The raw material for the synthesis of carbohydrates (CH2O)n comes from carbon dioxide (CO2) and water (H2O). Carbon dioxide is absorbed primarily from the air, but can also be absorbed from the soil and secondarily from the air.

\[
\text{Photosynthesis is summarised as follow:} \\
\text{light energy} \quad \text{------} \quad \text{ATP + NADPH2} \\
\text{CO}_2 + \text{H}_2\text{O} \quad \text{------} \quad (\text{CH}_2\text{O})_n + \text{O}_2
\]

For more complex bio-molecules such as amino acids and proteins, the plant absorbs minerals (including nitrogen, phosphorus, and sulfur) from the soil. Carbohydrates provide food energy for the plant using processes similar to those that occur in humans. They also form the basic building blocks for plant tissues. For example, the sugar glucose (CH2O)6 is strung and bonded to farm long chains of cellulose, the most abundant organic compound on earth. About 80 percent of the structure of the plant's cells is made from cellulose.

The plant is a living thing existing in a holistic world; a myriad of factors affect its life. However, good cultivation techniques require attention to only four basic growth factors. With this accomplished, the plants will do the rest.

As grower, your strategy is to bring out the plant's natural qualities. The cannabinoids are natural to the plants. Seeds from potent marijuana grow into potent marijuana plants when they are nurtured to a full and healthy
maturity.

Since most marijuana plants are adapted to tropical or semitropical climates, it is up to the grower to make the transition to local growing conditions harmonious. The requires sensible gardening techniques and, in some cases, manipulation of the photoperiod. There is no magic button to push or secret fertiliser to sue. The secret of potency lies within the embryo. The environment can and does affect potency, as it does most aspects of the plant's life. However, environmental factors are secondary to the plant's heritage (genetic potential).

Indoors vs. Outdoors

At this point the book divides into separate indoor and outdoor cultivation sections, and you may wonder whether it is better to grow the plant indoors or outdoors. Each alternative has advantages and disadvantages. It is usually better to grow the plants outdoors if possible, because the plants can grow much larger and faster than indoors. Indoors presents space and light limitations. It is possible to grow a 15-foot bush indoors, but this is unrealistic in most home. There simply isn't enough room or light for such a large plant. Outdoor gardens return a much higher yield for the effort and expense. most indoor gardeners buy soil and may have to buy electric lights. So there is an initial investment of anywhere from $10 on up.

On the other hand, outdoor plants are more likely to be seen. Many gardens get ripped off, and busts are a constant threat. Indoor gardens are much less likely to be discovered. Gardening indoors allows the grower closer contact with the plants. The plants can be grown all year long; it is an easy matter to control their growth cycles and flowering. Probably the biggest attraction of indoor gardens is that they are beautiful to watch and easy to set up anywhere.

One popular compromise is to construct a simple greenhouse. Use plastic to either enclose part of a porch or to cover a frame built against the house.

The potency of the plants doesn't depend on whether they are grown indoors or outdoors. As long as you grow healthy plants that reach maturity and complete their life cycle, the grass can be as good as any you've ever smoked.

PART 2: INDOOR GARDENING

Chapter Four
INTRODUCTION

Marijuana adapts well to indoor conditions. You can grow it in sunny rooms or with artificial light. The factor limiting the rate of growth indoors is often the amount of light, since it is less a problem to supply the plants with plenty of water, nutrients, and air.

Natural light is free. If feasible to use, natural light eliminates the most expensive components for indoor gardeners: artificial lights and the electricity they use. Window light is the easiest way to grow plants for
decorative purposes or for a small crop. On the other hand, a greenhouse, sunporch, or particularly sunny room can support larger plants than most artificial light systems. A sunny porch or roof area enclosed in sheet plastic to form a greenhouse is a simple, inexpensive way to grow pounds of grass.

Cannabis grows into a fully formed bush when it receives a minimum of five hours of sunlight a day. But you can grow good-sized plants of excellent quality with as little as two hours of daily sunlight provided windows are unobstructed by buildings or trees and allow full daylight. Windows facing south usually get the most light, followed by windows facing east and west (north-facing windows seldom get any sun). Use the location with the longest period of sunlight. The corner of a room or alcoves with windows facing in two or three directions are often very bright. Skylights are another good source of bright, unobstructed light.

Some growers supplement natural light with artificial light from incandescent or fluorescent fixtures. This is essential during the winter, when sunlight is weaker than the summer, and in spaces where the plants get little direct sunlight. Artificial lights can also be used to lengthen the natural photoperiod in order to grow plants all year.

The best time to plant using natural light is in late March or April, when the sun's intensity and the number of hours of daylight are increasing. Cleaning windows dramatically increases the amount of light, especially in cities where grime collects quickly. Paint walls adjacent to windows a flat white or cover them and the floor with aluminium foil to reflect light to the plants. Place young plants on shelves, blocks, or tables to bring them up to the light. Position the plants as close to the windows as possible. Insulate germinating plants from freezing winter drafts by stapling clear sheets of polyethylene film to the window frame.

The main problem with marijuana in windows is that it may be seen by unfriendly people. This won't be a problem at first, but when the plants grow larger, they are easily recognised. You could cover the windows with mesh curtains, rice paper, polyethylene plastic or other translucent materials to obscure the plants. A strip covering the lower part of the window may be enough to conceal the plants from outsiders.

Most of you will want the garden completely hidden. Some gardeners opt for closets, basements, attics - even under loft beds. They cover the windows if the garden is visible and grow the plants entirely with artificial light.

The amount of light you provide is what determine the garden's size - the amount of soil, number and eventual size of the plants, and the overall yield. Since light is the factor on which you base the planning of your garden, let's begin with artificial light.

{A picture of a self-contained mini-horizontal (150 or 175 watt HID) is perfect for a personal small garden.}
ARTIFICIAL LIGHT

5.2 Fixtures

Florescent light is the most effective and efficient source of artificial light readily available to the home grower. Florescent lamps are the long tubes typical of institutional lighting. They require a fixture which contains the lamp sockets and a ballast (transformer) which works on ordinary house current.

Tubes and their fixtures come in length from four inches to 12 feet. The most common and suitable are four- and eight-foot lengths. Smaller tubes emit too little light for vigorous growth; longer tubes are unwieldy and hard to find. The growing area must be large enough to accommodate one or more of these fixtures through a height of at least six feet as the plants grow. Fixtures may hold from one to six tubes and may include a reflector, used for directing more light to the plants. Some fixtures are built with holes in the reflectors in order for heat to escape. They are helpful in areas where heat builds up quickly. You can make reflectors with household materials for fixtures not equipped with reflectors. Try to get fixtures that have tubes spaced apart rather than close together. See 5.5 for further suggestions.

The tubes and their appropriate fixtures are available at several different wattage or outputs. Standard or regular output tubes use about 10 watts for each foot of their length - a four-foot tube has about 40 watts and an eight-foot tube about 80 watts.

High Output (HO) tubes use about 50 percent more watts per length than regular output tubes and emit about 40 percent more light. An eight-foot (HO) runs on 112 to 118 watts. Very High Output (VHO) or Super High Output (SHO) tubes emit about two-and-a-half times the light and use nearly three times the electricity (212 to 218 watts per eight-foot tube).

The amount of light you supply and the length of the tube determine the size of the garden. Marijuana will grow with as little as 10 watts per square foot of growing area, but the more light you give the plants, the faster and larger they will grow. We recommend at least 20 watts per square foot. The minimum-size garden contains a four-foot fixture with two 40-watt tubes, which use a total of 80 watts. Dividing total watts by 20 (watts per square foot) gives 80w divided by 20w/sq. ft= four sq.ft. (an area one by four feet). A four-tube (80 watts each) eight-foot fixture would give: 320w divided by 20w/sq. ft. = 16 sq. ft. or an area the length of the tube and about two feet wide.

VHO and HO tubes in practice don't illuminate as wide an area when the plants are young, because the light source is one or two tubes rather than a bank. Once the plants are growing well and the light system is raised higher, they will illuminate a wider area. Figure about 25 w/(ft*ft) for HO and 35 w/(ft*ft (or foot squared)) for VHO to determine garden size. A two-tube, eight-foot VHO fixture will light an area the length of the tube and one-and-a-half feet wide.

The more light you give the plants, the faster they will grow. Near 50w/sq.
a point of diminishing returns is reached, and the yield of the garden is then limited by the space the plants have to grow. For maximum use of electricity and space, about 40w/sq. ft. is the highest advisable. Under this much light the growth rate is incredible. More than one grower has said they can hear the plants growing - the leaves rustle as growth changes their position. In our experience, standard-output tubes can work as well as or better than VHO's if four or more eight-food tubes are used in the garden.

The yield of the garden is difficult to compute because of all the variable that determine growth rate. A conservative estimate for a well-run garden is one ounce of grass (pure smoking material) per square foot of garden every six months.

In commercial grass, the seeds and stems actually make up more of the bulk weight than the useable marijuana.

The grass will be of several grades depending on when and what plant part you harvest. The rough breakdown might be 1/3 equal to Mexican regular, 1/3 considered real good smoke, and the rest prime quality. With good technique, the overall yield and the yield of prime quality can be increased several fold.

5.3 Sources

When sunlight is refracted by raindrops, the light is separated according to wavelengths with the characteristic colours forming a rainbow. Similarly, the white light of electric lights consists of all the colours of the visible spectrum. Electric lights differ in the amount of light they generate in each of the colour bands. This gives them their characteristic colour tone or degree of whiteness.

Plants appear green because they absorb more light near the ends of the visible spectrum (red and blue) and reflect and transmit more light in the middle of the spectrum (green and yellow). The light energy absorbed is used to fuel photosynthesis. Almost any electric light will produce some growth, but for normal development the plants require a combination of red and blue light.

Sunlight has such a high intensity that it can saturate the plants in the blue and red bands, though most of the sun's energy is in the middle of the spectrum. Artificial lights operate at lower intensities; so the best lights for plant growth emit much of their light in the blue and red bands.

Fluorescent Tubes

Several lighting manufacturers make tubes (gro-tubes) the produce much of their light in the critical red and blue bans. (Plant-gro (GE), Gro-Lux (Sylvania), Agro-Lite (Westinghouse), and gro-lum (Norelco) are examples, and they look purple or pink. Vita-lite and Optima (Duro-test) produce a white light with a natural spectrum very similar to daylight. Duro-test blubs are more expensive than other tubes but they last twice as long. {See spectrum for “The action spectra of chlorosynthesis and photosynthesis compared to that of human vision. Adapted from IES Lighting Handbook237”}
Theoretically, these tubes should work better for growing plants than standard lighting tubes. However, some standard or regular fluorescent tubes used for lighting actually work better for growing plants than more expensive natural-spectrum tubes and gro-tubes specifically manufactured for plant growth. The reason is that regular fluorescent produce more light (lumens), and overall lumen output is more important for growth rate than a specific light spectrum. To compensate for their spectrums, use them in combinations of one "blue" fluorescent to each one or two "red" fluorescent (Box B).

Manufacturers use standardised names such as Daylight and Sofwhite to designate a tube that has a certain degree of whiteness. Each name corresponds to a tube that emits light in a particular combination of colour bands. For example, Cool White emits more blue light than other colours and appears blue-white. By combining tubes that emit more blue light with tubes that emit more red light, the tubes complement each other and produce a more natural spectrum for healthy plant growth. More "red light" than "blue light" sources are needed to foster healthy growth, so use two red tubes to each blue tube.

The best combinations are either Warm White or Soft White (red) tubes used with either Cool White or Daylight (blue) tubes. These four tube types are common, much cheaper, and when used in combination, will give you a better return than any of the more expensive gro-tubes or natural-spectrum tubes. Any hardware store carries these common lighting tubes, and the cost may be less than a dollar each.

Do not use tubes with "deluxe" in their designation. They have a more natural spectrum but emit considerably less light. Preferably, buy "Cool White" since it emits 50 percent more light than "Cool White Deluxe."

Incandescents and Flood Lights

The common screw-in incandescent bulb produces light mainly in the longer wavelengths: far-red, red, orange, and yellow. Higher-wattage bulbs produce a broader spectrum of light than lower-wattage bulbs. Incandescents can be used alone to grow marijuana, but the plants will grow slowly and look scraggly and yellow. Incandescents combined with fluorescent work well, but fluorescent are a better source of red light. Fluorescent tubes generate slightly less heat per watt. With incandescents, heat is concentrated in the small bulb area, rather than the length of the tube, and can burn the plants. In addition, incandescents have less than one-third the efficiency of fluorescent in terms of electricity used. If you decide to use incandescents in combination with fluorescent, use two times the wattage of incandescents to blue source fluorescent, that is, two 40-watt Daylight tubes to about three 60-watt incandescents, evenly spacing the red and blue sources.

The common floodlight has a spectrum similar to but somewhat broader than incandescents. Because they cast their light in one direction and operate at higher intensities, these lights work better than incandescents, both as a single source and to supplement natural or fluorescent light. {Figure 33. Supplement natural light with floodlights. Use foil curtains for reflectors.}
The best application for floodlights and incandescents is to supplement natural and fluorescent light, especially when the plants get larger and during flowering. Incandescents and floodlights require no special fixtures, although reflectors increase the amount of light the plants receive. These lights are easy to hang or place around the sides of any light system, and their strong red band promotes more growth and good flower development. Some of their energy is in the far-red band. Most purple gro-tubes and white fluorescent are deficient in this band, and addition of a few incandescents make them more effective. Agro-lite and W/S Gro-Lux emit adequate far-red light and need no addition of incandescents.

Several companies make screw-in spotlights specifically for plant growth. Two brand names are Duro-Test and Gro n'Sho. Although they are an improvement over incandescents as a single source, these lights don't perform nearly as well as fluorescent. A 150-watt bulb would grow one plant perhaps four feet tall. Two eight-foot fluorescent tubes (160 watts) will easily grow eight six-foot plants. For supplemental lighting, the incandescents and floodlight work as well and are cheaper.

HID Lamps. Metal Halide (MH) and Sodium-Vapour Lamps (HPS)

HID's (High-Intensity-Discharge) are the lamps of choice for serious indoor gardeners. HID lamps commonly illuminate streets, parking lots, and sports stadiums, and they emit very intense light and produce more light, more efficiently than fluorescent. All HID's require specific ballasts and fixtures to operate, so purchase complete systems (fixture, ballast, reflector) along with the lamp. High Times and Sinsemilla Tips magazines (p. 332) feature numerous ads by retailers of horticultural HID systems. Contact the advertisers, and they'll send you brochures with enough information to make an informed choice.

Ordinary metal-halides (MH's and HP's) may emit dangerous UV and particle radiation of the bulb envelop breaks, cracks, or develops a small hole. Broken MH bulbs may continue to operate apparently normally, and exposure may cause serious eye or skin injury. Make sure to purchase MH bulbs designed with a safety feature (such as GE Sat-T-Gard or Sylvania Safeline) that causes the bulb to burn out immediately if the outer envelope ruptures. OR purchase fixtures that shield the bulb in protective tempered glass.

HID's come in many sizes, but generally, use only 400 and 1,000 watt sized lamps. The largest size (1,500 watts) is not recommended because of its relatively short bulb life. Sizes less than 400 watts do not return as much marijuana considering set-up costs and ease of operation. The only exceptions are certain "self-contained" mini-units of 150 and 175 watts (see 4.1). These mini-self-contained units have a horizontal fixture and built-in ballast, which is easy to set up. The horizontal fixture directs up to 45 percent more light to the plants than conventional, vertically positioned lamps with reflectors. The intense light encourages excellent growth and bud formation with modest electrical consumption. They are the best overall light system for small, personal gardens such as closet set-ups.

Position 400 watt HID lamps 18 to 30 inches above plant tops, and 1,000 watt lamps 30 to 42 inches above the tops. During flowering, flowers may "run"
rather than form in compact buds if lamps are positioned too close to the plant tops, particularly when using HPS's.

Heat is the main problem with HID's, and the room must be well-ventilated. Use exhaust fans to draw heat out of the room. The fan doesn't need to be large, just active enough to create a strong, ventilating draft.

Light Balancers

Sophisticated gardeners use light balancers which employ a small motor to move reflectors and HID lamps held on tracks or mechanical arms slowly across a garden in either a linear or circular pattern {(see p. 88 Figure 38b)}. Light balances save considerable power and bulb costs because they dramatically increase the effectively illuminated garden size, while using less the 24 watts per balancer. With the lights moving on a balancer, all of the garden becomes equally illuminated for modest running costs. Instead of adding another 1,000 watt HID, a light balancer increases the garden size without measurably increasing power consumption, an important consideration when electricity consumption or costs are of concern.

With multi-bulb HID gardens, use one MH to each HPS lamp on a light balancer, and hang the lamps about one foot closer to the plant tops than usual. MH's favour blue light, and HPS's produce more orange-red light. By combining the two, the spectrum is more balanced, and you'll get a better return of well-formed buds.

Low Cost HID Systems

By far, the most efficient and effective set-up for a modest artificial light garden is to use fluorescent lamps set on a long photoperiod for germination, growing seedlings or to raise clones; use another room, or part of the room separated by a light-tight curtain or barrier, for flowering with (HPS) lamps in horizontal reflectors kept on a short photoperiod to induce and promote flowering.

For example, separate and average sized room into two growing areas by hanging an opaque curtain to block light between the two sections. In the smaller area, grow seedling or clones (see 18.5) for two to six weeks under fluorescent set on a constant light. In the larger section, keep HPS lamp(s) on a 12-hour light cycle for flowering. Move larger seedlings under the HPS lamp(s) for about 9 to 15 weeks to initiate and complete flowering. Meanwhile, start more seedling under fluorescent. It's easy to maintain both sections of the room be constantly replenishing either area with new plants. This setup is very productive for a modest investment in both costs and labour - no time or costly light and electricity is wasted on empty space, and you'll find yourself continuously harvesting mature buds.

{A no frills setup with an HID. Notice that the ballast is insulated from the floor with pieces of wood; the fixture is supported by rope and not the electric cord; plastic protects the floor; there is a timer, a reflector, and a fan.}

{Figure 34 and 35 for light-output from two and four 40 watt white fluorescent and comparing effectiveness in footcandles.}
Using this setup, the initial long photoperiod and small area necessary for seedlings or clones is illuminated cheaply by fluorescent. Seedlings grow, and cuttings root, better under fluorescent than HPS's. The larger, more costly flowering section is kept under a short photoperiod of 12 hours of daily light and the strong red light is necessary for good flowering.

For example, the whole operation could draw less then 650 watts: 160 watts by four, four-foot fluorescent set on constant light to start the seedlings; one 400 watt HPS set on 12 hours daily light for flowering; two timers and a venting fan for automating the lights and controlling heat. It's possible to harvest four to six, fully mature crops each year, or continuously harvest. (See Mel Frank's new Marijuana Grower's Insider Guide by RED EYE PRESS for much more information on efficient, low cost, indoor systems and greenhouse gardening.)

5.4 Setting up the Garden

Under artificial light, marijuana grows from three to six feet in three months, so the height of the light must be easy to adjust. Fixtures can be hung from the ceiling, shelves, walls, or from a simple frame constructed for the purpose. If you are hanging the lights from the walls or ceiling, screw hooks directly into a stud. Studs are located in every room corner and are spaced 16, 18 or 24 inches apart. Light can be supported from lathing using wingbolts, but plaster is too weak to hold a fixture unless a wooden strip held by several wingbolts is attached to the walls or ceiling first to distribute the pressure. Then hang the fixture from a hook in the strip. Closets have hooks and shelves or clothes rungs that are usually sturdy enough to support the fixture. People have gardens under loft beds.

Chains are the easiest means of raising and lowering fixtures. Two chains can be suspended from a solid support from above, and attached to an "S" hook at each end of the fixture. Raise the fixture by inching the hooks to higher links on the chain. Or tie rope to the fixture, pass through an eye hook or pulley in the ceiling or frame, and tie-off at a hook or boat cleat anchored in the wall or frame.

You can also hang the lights permanently and lower plants on a shelf or plywood. The shelf could be suspended or lowered by supporting the shelf with progressively smaller block. This arrangement is often used in "growing factories" where plants are rotated to larger gardens and grow for only a few weeks in each space. One garden may have fluorescent for starting plants and another garden for maturing plants under HID's. With HID's and skylights, lowering the plants may be your best option. Use lightweight soil components or hydroponics rather than heavier soil, and the operation is easier.

If you plan to use six or more fluorescent, remove end sockets and ballasts from fixtures. Mount end sockets and tubes on a frame of one-by-twos or plywood. Space sockets so tubes cover the garden evenly (see Figure 37 and 38). This arrangement illuminates the garden more evenly and drastically reduces the suspended weight since ballasts make up most of a fixture's weight. Keep ballasts off floors and away from water. Mount the ballasts on a nearby wall or on a wooden box. Wet ballasts could actually explode, and at best, are electrically dangerous when wet.
Always buy fixtures with reflectors. For HID's, companies make their own reflectors, but the best reflectors are for horizontally positioned lights no matter which company. Horizontal reflectors focus much more useable light than either parabolic or cone reflectors. HPS's can work in any position, but MH lamps are made to work in either a horizontal or vertical position, and you must buy bulbs that correspond with the fixtures.

For fluorescents, you can make an overhead reflector from the cardboard cartons in which tubes and fixtures are packaged. Cut off the end flaps and form the cardboard into a "U". Face inner side with aluminium foil or paint them white. Leave enough space so the foil or cardboard does not contact end sockets. Staple or tape the reflector behind the tubes to the fixture or from to reflect light toward the plants.

Surround all garden with reflective surfaces, but not so tightly that air can't freely circulate. Even in window gardens, reflective sheets set adjacent to the plants make a marked difference in growth. When artificial lights are high, reflectors from the floor on up keep lower branches actively growing. Mylar, with its mirror-finish, is popular for facing walls. A flat white paint (super or decorator white) reflects better than glossy white or aluminium foil. Flat white has about three percent more reflecting capacity than aluminium foil, and reflects light more uniformly. The difference is slight, so use whatever means is most convenient. Paint walls that border the garden a flat white or cover them with aluminium, mylar, or white plasterboard. {Figure 36. Reflectors can be made from sturdy paper faced with aluminium foil. Make them with staples, tape, or tacks. Figure 37.}

Natural-light gardens also benefit from reflectors. Make them out of cardboard painted white or faced with aluminium foil. Once the plants are past the seedling stage, surround them with reflectors; otherwise only one side of the plants will be fully illuminated.

Covering the floor with a plastic dropcloth (about $1 at any hardware store) will protect your flor and your neighbour's ceiling from possible water damage.

Marijuana grows well in a dry atmosphere, but heated or air-conditioned homes are sometimes too dry during germination and early growth. Enclosing the garden in reflectors will contain some of the moisture and insure a healthy humidity. White sheet plastic is available to enclose open gardens. Do not completely enclose the garden. Leave some open spaces at the bottom, top and ends of the garden to allow air to circulate. Air circulation will become more important as the plants grow larger.

Don't rely on training your pets to stay out of the garden. The garden will attract them, and they can easily destroy young plants by chewing on leaves and stems. Soil is more natural to their instincts than the sidewalk or kitty litter. Protect the garden from pets and toddlers; surround it with white plastic or chicken wire. Large plants are more sturdy and animals can do them little harm. The jungle ambience and an occasional leaf are irresistible to most cats, and they'll spend hours in the garden.
5.5 Electricity

For most growers, the amount of electricity used is of little concern. A four-tube, regular-output, eight-foot fixture draws about 320 watts per hour or about the same as a colour TV. The cost increase to your electric bill will be about two to six dollars a month, depending on local rates.

Farmers who devote entire basements or attics to their gardens are sometime restricted by the amount of current they can draw. Older homes or apartments may have only one 15-ampere circuit but more often have two, for 30 amperes total. Newer homes have either 60 or 100 amperes available through four to six circuits. One 15-ampere circuit can safely accommodate three, two-tube VHO fixtures or six tubes for 1,290 watts, or 16 regular-output, eight-foot tubes for about 1,280 watts total. This allows for a 20 percent safety margin of circuit capacity, which is necessary considering heat loss, starting voltages, etc.

In kitchen and basements the circuits may be rated higher, at either 20 or 30 amperes. You can find out the amperage of the circuit by looking at the fuse rating on the face of the fuse. Determine what room or rooms each circuit is feeding by removing the fuse and seeing which outlets are not working. The wattage capacity of any circuit is found by multiplying volts time amps. Standard United States voltage is 110 to 120 volts.

Fluorescent light fixtures are sometimes sold unwired or without a line cord, and the job is left to you. Follow the diagram on the ballast which shows the wires marked by their colour. Simply attach the wires to the sockets as diagrammed. New sockets have small holes which automatically make contact when the bare end of the wire is pushed into them. Older fixtures have sockets with conventional screw terminals.

Indoor gardens may have aluminium foil, chains, reflectors, and wet floors, all of which are good electrical conductors. Coupled with hanging lights, these conditions could lead to dangerous electrical shocks. Never touch a reflector, fixture, or ballast while watering or standing on a damp floor. Eliminate the chance of serious shocks altogether by turning off the lights whenever you work in the garden. An HID ballast on a damp floor is very dangerous. Raise HID ballasts on wood blocks off the floor.

Reduce the risk of dangerous shocks by using fixtures grounded to the power source. A fixture with a three-pronged plug connected to a three-wire outlet is grounded in a properly wired house. You can also ground a fixture by connecting a #12 or #14 gauge wire to any bare metal screw (not an electric terminal) on the fixture housing to the screw that holds the cover plate on the electrical outlet your using.

{With two prong outlets, connect an adaptor plug with a terminal (top left) or third wire (top right) from the plug to the screw that holds the cover plate. This converts two-wire outlets to three wire grounded systems when a three-wire electric cord is used, an important electrical safeguard which grounds the light system.}

Chapter Six
SOIL AND CONTAINERS FOR IT
6.2 Pots and Other Containers

In its natural state, marijuana may grow an extensive root system - a fibrous network of fine, lateral roots that branch off a main, carrot-shaped tap root. In dry areas, the tap root can grow more than six feet deep in its search for water. In moist areas with fertile soil (such as in potting mixtures), the lateral roots are able to supply water and nutritive needs and the tap root remains small, often only three or four inches long on a seven-foot-tall mature plant.

The purpose of the growing medium is to provide adequate water and nutrients in addition to anchoring the roots, which hold the plant upright. By watering and fertilising as needed, you could grow a six-foot plant in a four-inch ((Pots are measured by diameter across the top.)) pot or in a three-foot layer of soil over your whole garden; but neither of these extreme procedures is very practical.

Most growers use containers that will hold between two and five gallons of soil. These are a good compromise in terms of weight, space, cost, and labour. They can be moved easily and hold an adequate reservoir of water and nutrients to support a large mature plant.

Some growers use a single large box or several long troughs that hold a six- to 12-inch layer of soil. These have the advantage of minimal restriction of roots and less frequent waterings, but they require more soil and make rotating or moving the plants impractical.

Determine the right size pot to use in your garden by the amount of light per square foot. For a moderately lighted garden (15 to 25 watts per square foot and most window gardens), use one- to three-gallon containers. For gardens with more light energy - over 25 watts per square foot or one-half day or more of sunlight - use three- to eight-gallon containers. The smallest pot we recommend for a full-grown plant is eight inches or one gallon. This is also a good size for starting plants to be transplanted after two months.

Practically any container that can withstand repeated waterings and has a top at least as wide as its base will do. Each pot must have several holes in the bottom to assure drainage. Growers use flower pots, institutional-sized cans and plastic buckets, baskets and small trash cans, milk crates and wooden boxes.

Plastic trash bags are sometimes used when other large containers can't be found. They must be handled carefully, since shifting the soil damages the fragile lateral roots. They are also more difficult to work with when transplanting. However, a roll of trash bags is an available and inexpensive substitute for other large containers. Plastic bags should be double or triple bagged. Small holes should be punched in the bottom to drain excess water. Use masking tape to patch any unwanted tears. The capacity of the bag should be no more than twice as many gallons as the amount of soil used. For example, with four gallons of soil, the bag should be of a five-gallon, but not more than eight-gallon size. Otherwise, it will not form a cylinder, and the bag will remain a shapeless mass.
Use as many pots as can fit in the lighted area to make the most efficient use of space. Many growers prefer to start the plants in smaller pots, transplanting into larger pots when the plants are larger. There are definite advantages to this method in terms of the yield in the garden, given its space and light energy. Seedlings and small plants take up much less space than they will at maturity, so they can be placed closer together. As the plants grow and begin to crowd each other, remove the less vigorous (to smoke, of course) and transplant the rest into larger pots. Start plants which will be transplanted later in four- to eight-inch flower pots, or one-quart to one-gallon tin cans or milk containers. Peat pots or planting pots are made of compressed plant fibre for the purpose of starting young plants. They are available at garden shops and come in several sizes. Use at least a four-inch pot so that the roots are not restricted in early growth. Peat pots are supposed to break down in the soil, but marijuana's delicate lateral roots may not be able to penetrate unless you score or break away the sides while transplanting. Wax paper cup (six to eight ounces), filled with a soil mixture, work as well as peat pots and are cheaper.

**BOX C**

Finding Large Containers

Use your ingenuity in finding large containers. Large clay flower pots do not work any better than the large metal and plastic containers discarded by restaurants and food stores. Various milk containers are good starting pots. Many garden shops sell used pots for a few cents each. Wholesalers sell plastic pots by the carton at a discount. Large plastic pots and pails can sometimes be picked up inexpensively at flea markets or variety stores. Any vessel that holds an adequate amount of soil and does not disintegrate from repeated waterings is a satisfactory container.

6.3 Properties of Soil

The soil or growing medium serves as a source and reservoir for water, air, and nutrients, and to anchor the roots. Since marijuana grows extremely fast, it has higher water and nutritive needs than most plants grown indoors. The success of your garden depends on supplying the plant with a medium that meets its needs without creating toxic conditions in the process.

There is no such thing as the perfect soil for Cannabis. Each variety can grow within a range of soil conditions. For healthy, full, growth, marijuana prefers a medium with good drainage, high in available nutrients, and near a neutral pH (7.0). These conditions result from a complex set of physical, chemical and biological factors. We will refer to them simply as: (1) texture; (2) nutrients; (3) pH.

Most indoor growers prepare the growing medium using commercial potting mixes. These mixes are usually sterilised or pasteurised and have good general soil properties. Since they seldom list the contents, nutrients, or pH, do some simple test of your basic soil whether you buy or dig for it. Then you can adjust the soil to meet the basic requirements of the plant.
Texture

The texture of the medium determines its water-holding and draining properties. Marijuana must have a well-drained medium for healthy growth. Soils that hold too much water or hold it unevenly can drown the roots, leading to poor growth or death of the plant. In a well-drained soil the roots are in contact with air as well as water. Soils that have too much clay, or are overly rich in compost or other organic matter, tend to hold too much water and not enough air. This condition worsens in time. This is especially true of the soil in pots.

You can determine the texture of your soil from its appearance and feel. Dry soil should never cake or form crusts. Dry or slightly moist soil that feels light-weight, airy, or spongy when squeezed, and has a lot of fibrous material, will hold a lot of water. Mix it with materials which decrease its water-holding capacity, such as sand, perlite, or even kitty litter.

Wet soil should remain spongy or loose and never sticky. A wetted ball of soil should crumble or separate easily when poked.

Soil that feels heavy and looks dense with fine particulate matter, or is sandy or gritty, will benefit by being loosened and lightened with fibrous materials such as vermiculite, Jiffy Mix, or sometimes sphagnum moss.

Soil Conditioners to Improve Texture

Perlite (expanded sand or volcanic glass) is a practically weightless horticultural substitute for sand. Sand and perlite contribute no nutrients of their own and are near neutral in pH. They hold water, air, and nutrients from the medium on their irregular surfaces and are particularly good at aerating the soil.

Vermiculture (a micaceous material) and sphagnum moss contribute small amounts of their own nutrients and are near neutral in pH. They hold water, air, and nutrients in their fibre and improve the texture of sandy or fast-draining soils. Jiffy Mix, Ortho Mix, or similar mixes are made of ground vermiculite and sphagnum moss, and are fortified with a small amount of all the necessary nutrients. They are available at neutral pH, are good soil conditioners, and are also useful for germinating seeds.

Sphagnum and Peat Moss (certain fibrous plant matter) are sometimes used by growers to improve water holding and texture. Both work well in small amounts (10 to 15 percent of soil mixture). In excess, they tend to make the medium too acidic after a few months of watering. Use vermiculite or Jiffy Mix in preference to sphagnum or peat moss.

Nutrients

Nutrients are essential minerals necessary for plant growth. The major nutrients are nitrogen (N), phosphorus (P), and potassium (K), which correspond to the three numbers, in that order, the appear on fertiliser and manure packages, and that give the percentage of each nutrient in the mix (see section 9).
Marijuana prefers a medium that is high in nitrogen, and mid-range in phosphorus and potassium. Generally, the darker the soil, the more available nutrients it contains. Commercial soils usually contain a good balance of all nutrients and will support healthy growth for a month or two, even in smaller (one gallon) containers. Many growers prefer to enrich their soil by adding sterilised manures, composts, or humus. All of these provide a good balance of the three major nutrients. They also retain water in their fibre. In excess they cause drainage problems, make the medium too acidic, and attract insects and other pests. A good mixture is one part compost or manure to five to eight parts of soil medium. In large pots (four or five gallons), these mixtures might provide all the nutrients the plant will ever need. {Table 13.}

The many prepared organic and chemical fertilisers that can be mixed with the soil vary considerably in available nutrients and concentrations. Used in small amounts, they do not appreciably effect the soil texture. Many prepared fertilisers are deficient in one or more of the major nutrients (see Table 14). Mix them together so there is some of each nutrient, or use them with manures, which are complete (contain some of all three major nutrients). When adding fertilisers, remember that organic materials break down at different rates. It is better to use combinations which complement each other, such as poultry manure and cow manure, than to use either fertiliser alone. (See Table 22 in section 13 for a complete list of organic fertilisers.

Table 14 - Prepared Organic Fertilisers

<table>
<thead>
<tr>
<th>Type of fertiliser</th>
<th>Percentage by weight of N</th>
<th>Percentage by weight of P2O5</th>
<th>Percentage by weight of K2O</th>
<th>Availability to Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood meal</td>
<td>13</td>
<td>0</td>
<td>0</td>
<td>Rapid/medium</td>
</tr>
<tr>
<td>Bone meal</td>
<td>0.5</td>
<td>15</td>
<td>0</td>
<td>Medium/slow</td>
</tr>
<tr>
<td>Blood/bone meal</td>
<td>6</td>
<td>7</td>
<td>0</td>
<td>Medium/slow</td>
</tr>
<tr>
<td>Cottonseed meal</td>
<td>6</td>
<td>2</td>
<td>1</td>
<td>Slow/medium</td>
</tr>
<tr>
<td>Fish meal</td>
<td>8</td>
<td>2</td>
<td>0</td>
<td>Slow/medium</td>
</tr>
<tr>
<td>Hoof and bone meal</td>
<td>10</td>
<td>2</td>
<td>0</td>
<td>Slow</td>
</tr>
<tr>
<td>Rock phosphate</td>
<td>6</td>
<td>24</td>
<td>0</td>
<td>Slow</td>
</tr>
<tr>
<td>Wood ash</td>
<td>0</td>
<td>1.5</td>
<td>3-7</td>
<td>Rapid</td>
</tr>
<tr>
<td>Greensand</td>
<td>0</td>
<td>0</td>
<td>2-8</td>
<td>Medium/slow</td>
</tr>
</tbody>
</table>

Chemical fertilisers are made in about every conceivable combination and concentration. Pick one that is complete and where the first number (N) is at least equal if not higher than both P and K. For example, rose foods may be 12-12-12 or 20-20-20, and work very well for marijuana. Others are: Vigoro 18-4-5 and Ortho 12-6-6. The higher the number, the more concentrated the mix is, and consequently, the more nutrients are available.

Don't use fertilisers which come in pellets or capsules, or that are labelled "timed" or "slow release." They do not work as well indoors as do standard organic and chemical fertilisers. Chemical fertilisers seldom list the amount to mix per pot. You can get some idea by the instructions for application per square foot. Use that amount of each one-half cubic foot of soil mixture.
Many growers add no nutrients at this time but rely on watering with soluble fertilisers when they water. These fertilisers and their application are discussed in section 9.

pH

The pH is a convenient measure of the acidity or alkalinity of the soil medium. It is another way of expressing whether the soil is bitter (alkaline) or sour (acid). The pH is measured on a scale of 0 to 14, with 7.0 assigned neutral; below 7.0 is acid and above is alkaline.

You can think of the pH as a measure of the overall chemical charge of the medium. It affects whether nutrients dissolve to forms available to the plant or to forms the plant can't absorb, remaining locked in the soil medium.

Marijuana responds best to a neutral (7.0 pH) medium, although in a fertile, well-drained soil, it will grow well in a range of 6.0 to 8.5. The simplest way to check the pH is with a soil-test kit from a garden shop or nursery. Test kits are chemicals or treated papers - for example, litmus papers or Nitrazine tape - that change colour when mixed with a wet soil sample. The colour is then matched to a colour chart listing the corresponding pH. Nitrazine tape is available, inexpensively, in drug stores. Some meters measure pH, but these are expensive. Agricultural agents, agricultural schools, and local offices of Cooperative Extension will test a soil sample for pH and nutrient content. Occasionally, a garden-shop person will check pH for you or will know the pH of the soils they sell.

Highly alkaline soils are characteristically poor soils that form cakes, crusts, and hardpan. Soil manufacturers don't use them, nor should they be dug for indoor gardens. Alkaline soils are treated with sulphur compounds (e.g., iron sulphate) to lower the pH.

We have never seen commercial soils that were too alkaline for healthy growth, but they are sometimes too acidic. The pH of acid soil is raised by adding lime (calcium-containing) compounds. Liming compounds come in many forms and grades. Some are hydrated lime, limestone, marl, or oyster shells, graded by their particle size or fineness. Use the finest grade available, since it will have more of a neutralising potential than a coarse grade. You need to use less and are more interested in immediate results than long-term soil improvement. For indoor gardens, use hydrated lime (available in any hardware store) or wood ashes to raise the pH. Hydrated lime is rated over 90 percent for its neutralising potential. Wood ashes will neutralise soil acids roughly one-half as well as hydrated lime. However, they also contain some nutrients (potassium, phosphorus, magnesium, and micronutrients) and are handy and free.

There is no exact formula we can give you for raising the pH. The pH does not have to be exact; it's an approximation. At low pH it takes less lime to raise the pH one point than it does when the pH is near neutral. Sandy soils need less lime to raise the pH one point than soils high in clay or organic matter. In general, add three cups of hydrated lime or six cups of fine wood ash to every bag (50 pounds or a cubic foot) of soil to raise the
pH one point. For soils that test slightly acid (about 6.5), add two cups of lime or four cups of wood ash.

Soil that tested below 6.0 should be retested in about two weeks, after thoroughly mixing and wetting the soil. Repeat the application until the pH is in an acceptable range. Check the pH of plain water to see if it is influencing the tests. Distilled water is neutral, but tap water sometimes has minerals that can change the pH. Hard water is alkaline. Sulphurous water and highly chlorinated water are acidic.

If you have already added lime to a soil that now tests from 6.5 to 7.0, don't add more lime trying to reach exactly 7.0. Too much lime will interfere with nutrient uptake, notably of potassium, phosphorus, and magnesium.

General Soil Characteristics

The texture, pH, and available nutrients of the soil are all related. The most important single factor is texture (good drainage). When soil drains poorly, it creates anaerobic (without air) pockets in the soil. Bacteria or microbes that live without air will begin to multiply and displace beneficial microbes that need air to survive. The anaerobic microbes break down organic matter to a finer consistency, and release CO2 and organic acids to the medium. Drainage worsens, the acids lower the pH, and nutrients, even though present, become unavailable to the plant.

The result can be a four-month-old marijuana plant that is only three inches tall, especially if you use high concentrations of manures and composts, peat and sphagnum moss. If your soil lists manures or composts as additives, add no more than 10 percent of these on your own.

Drainage problems sometimes develop after several months of healthy growth. It is a good idea to add about 20 percent sand or perlite to even a well-drained soil. You can never add too much of these; they can only improve drainage. They dilute the nutritive value of the soil, but you can always water with soluble fertilisers.

Mixtures using many components in combination seem to work particularly well. This may be because, at a micro-level each component presents a slightly different set of physical, chemical and biological factors. What the plant can't take up at one point may be readily available at another.

6.4 Preparing Commercial Soils and Mixes

Garden soils (or loams) and potting mixes are actually two different groups of products, although they are frequently mislabelled. Some companies sell soil in large bags and a potting mixture in smaller bags, while labelling them the same. Soils and potting mixtures are usually manufactured locally, since transportation costs are prohibitive; so they differ in each area.

Texture and Nutrients

Soils and loams are usually topsoil blended with humus or compost for use as a top dressing in gardens, for planting large outdoor containers, or for the
soil part of a potting mixture. They may have a tendency to compact under indoor conditions and will benefit from the addition of perlite or vermiculite. Soils and loams usually contain a good supply of nutrients and may support a full-grown plant in a large container. Commercial soils that are heavy generally work better than lightweight soils. Heavy soils usually contain topsoil, in which marijuana grows very well. Lightness indicates more fibrous content.

For example of possible soil mixtures, see Box D.

**Box D** Examples of Soil Mixtures

1. 5 parts soil 2. 8 parts soil 2 parts perlite 3 parts sand 1 part cow manure 1/4 part 10-10-10 chemical fertiliser
2. 5 parts soil 4. 4 parts soil 2 parts perlite 1 part sand 2 parts humus 1 part vermiculite 1/2 part cottonseed meal 2 parts humus 1/2 part poultry manure 5. 3 parts soil 6. 6 parts soil 1 part perlite 2 parts perlite 1 part sand 2 parts vermiculite 2 parts Jiffy Mix 1/2 part poultry manure 1/2 part blood/bone meal 1/2 part cow manure 1/2 part wood ash 1 part wood ash

*Almost all fertilisers are acidic, and need to be neutralised by lime. For the above mixtures, or any similar ones, mix in one cup of lime for each five pounds of manure, cottonseed meal, or chemical fertiliser in order to adjust the pH.

Potting mixes are intended to support an average-size house plant in a relatively small pot. They are sometimes manufactured entirely from wood and bark fibre, composts, and soil conditioners. These mixes are made to hold a lot of water and slowly release nutrients over a period of time, which is what most house plants require. For marijuana, these mixes seldom contain enough nutrients to support healthy growth for more than a couple of months. (Their N is usually low, P adequate, and K usually very high.) They work best when sand or perlite is added to improve drainage, and fertilisers are added to offset their low nutrient content.

**The pH**

Most commercial mixes and soils are between 6.0 and 7.0 in pH, a healthy range for marijuana. If you buy your soil, it will not be too alkaline for healthy growth, but it might be too acidic. You can minimise the chances of getting and acid soil by avoiding soils with "peat" or "sphagnum" in their names. Avoid soils that are prescribed for acid-loving plants such as African violets or azaleas, or for use in terrariums. With common sense, you can buy a soil, add two cups of lime to each large bag, and not have to worry about the pH. However, the surest procedure is to test the pH yourself.

Probably the best way to find the right soil for your garden is to ask long-term growers. They can relate their past experiences with various mixes and blends. Most long-term growers with whom we have talked have tried many of the mixes available in their areas. A reliable, enlightened nurseryperson or plant-shop operator may also be able to give you some advice.

**6.5 Buying Soil Components**

All the materials discussed here are available at farm and garden stores or nurseries. Many suburban supermarkets sell large bags of soil and humus.
Always buy your materials in the largest units possible to reduce the cost.

Large bags of soil and humus come in either 50-pound bags or one- to four-cubic-foot bags. A 50-pound bag fills about six gallons. There are eight gallons to a cubic foot. Perlite is sold in four-cubic-foot bags (thirty-two gallons). Jiffy Mix and vermiculite are sold in four-cubic-foot bags and in 16 pound bags (about 18 gallons). Sand, perlite and vermiculite come in coarse, medium, and fine grades. All grades work well, but if you have a choice, choose coarse. Sand (not beach sand) is an excellent soil conditioner. The only disadvantage is its heavy weight. Buy sand from lumber yards or hardware stores where it is sold for cement work. It will cost from 1/50 to one-half the cost of garden or horticultural sand. Sand from piles at construction sites works very well.

Calculating the Amount of Soil

The maximum amount of soil mixture for any garden can be found by multiplying the capacity of the largest pot you plan to use by the number of pots that you can fit in the garden. In many cases, the actual amount of the mixture used will be somewhat less. Two illustrations follow.

1. A small garden with a two-tube, eight-foot fixture (160W). Using 20 watts per square foot for fast growth gives 160W divided by 20W/sq.ft. + eight sq.ft. The largest pot needed for this system is three gallons, but two gallons would work. You can fit about 10 three gallon pots in eight square feet; so 3 * 10 + 30 gallons of soil mixture are needed (see Box E).

BOX E
Examples Showing How Much Soil Material to Buy to Fill a Known Number of Unit-Volume Containers

Example 1. For a garden eight square feet in size,
Buy Component Which amounts to
3 50-lb (6 gal. ea.) bags of soil 18 gallons
1 cubic foot of perlite 8 gallons
30 lbs of humus 3 gallons
10 lbs of chicken manure 2 gallons
TOTAL 31 gallons

Example 2. For a garden 24 square feet in size,
Buy Component Which amounts to
4 1-cu. ft. bags of soil 32 gallons
2 1-cu. ft. bags of perlite 16 gallons
1 1-cu. ft. bag of vermiculite 8 gallons
20 pounds of cow manure 3 gallons
1 cottonseed meal 2 gallons
20 wood ash 2 gallons
TOTAL 63 gallons

2. A large garden with two two-tube, eight-foot VHO fixtures (four times 215 watts or 860 total watts) illuminating a garden three by eight feet, or 24 square feet.
860 watts divided by 24 sq. ft. = about 36W/sq. ft.

The largest pot size for this system is about five gallons. About 16 five-gallon containers can fit in 24 square feet; so 16 * 5 + 80 gal. of mixture are needed. But you could start many more plants in smaller containers and transplant when they are root-bound. You do not use more soil by starting in smaller pots, since all soil is reused. In many cases, you actually use much less soil.

In this system you could start and fit about 40 plants in one-gallon pots in 24 square feet. When the plants begin to crowd each other, some are harvested, making room for the others, which are transplanted to larger pots. In practice, a high-energy system such as this one (36W/sq. ft.) will grow large plants whose size is limited mainly by the space available. Twelve large female plants are about the most you would want in the system during flowering and for final harvest. Sixty gallons of mixture is all that is needed for the seedlings and the mature crop. This is one-fourth less than the original estimate of 80 gallons, and you actually will harvest a lot more grass (see Box E).

Mixing and Potting

Mix your soil in a large basin, barrel, or bathtub. Individual pots are filled with mixtures by using a smaller container to measure out by part or volume.

Perlite, sand, and dry soil can give off clouds of dust. When mixing large amounts of these, wear a breathing mask or handkerchief over your nose and mouth.

To pot any of the mixtures, first cover any large drainage holes with a square of window screen or newspaper to prevent the mixture from running out. Place a layer of sand, perlite, or gravel about one inch deep to insure drainage. Fill the pots with soil mixture to within three-fourths of an inch from the top of the pot. If your mixture contains manures or composts, cover the last inch or two in each pot with the mixture minus the manure and compost. This will prevent flies, gnats, moulds, and other pests from being attracted to the garden. Press spongy soils firmly (not tightly) to allow for more soil in each pot; otherwise, after a period of watering, the soil will settle and the pot will no longer be full.

Some growers add a few brads or nails to each pot to supply the plant with iron, one of the necessary nutrients. Water the pots and allow them to stand for a day or two before planting. As the soil becomes evenly moist, beneficial bacteria begin to grow and nutrients start to dissolve. {Figure 40.}

6.6 Digging Soil

Most growers prefer to buy their soil, while some prefer to dig it. Marijuana cannot tolerate heavy clays, mucks, or soils that dry to crusts. Choose a soil from a healthy garden or field, or from an area that supports a lush growth of annual weeds.
Fields that support a good crop of alfalfa, corn or other grains will support a good crop of marijuana. Fields with beets, carrots, and sugar cane indicate a well-drained soil, with near neutral pH. Red clover, sweet clover, and bluegrass have soil requirements similar to those of marijuana. Garden soils are usually fertile and well-drained, but often need lime to counteract soil acidity.

Take the topsoil layer that starts about two inches below the surface debris. Good soil will look dark, feel moist, and smell clean and earthy. Use all of the topsoil layer that maintains its dark colour and is interlaced with roots. Your hands should be able to easily penetrate the underlying topsoil if the soil is in good condition. When the soil changes colour, or roots no longer apparent, then you are past the fertile topsoil layer. Abundant worm, millipedes, and other small lifeforms are a good indication that the soil is healthy. A rich layer of topsoil collects by walls, fences, and hedges where leaves and debris collect and decay to a rich humus. Sift the soil to remove stones and root clods. Also, shake out the root clods, which are rich in nutrients.

Soil that is dug should be tested the same way as already prescribed. It should be adjusted with at least 30 percent sand or perlite (vermiculite for very sandy soils), since potting will affect the drainage of even well-drained soils. Never use manures or composts that are not completely degraded to a clean-smelling humus.

Soil that is dug must be sterilised to kill weed seeds, insect eggs, and harmful moulds and fungi. Some chemical treatments (e.g. formaldehyde) are mixed with water and poured over the soil to sterilise it. Soil can be sterilised in a pressure cooker at 15 pounds pressure for 15 minutes, or by baking wet soil in a large pot at 200 degrees for 30 to 40 minutes. Be advised that baking soil will release some formidable odours.

6.7 Growing Methods

As we said before, there are probably as many growing methods as there are marijuana growers. These methods are personal preferences or adaptations to fit particular situations; one method is not necessarily better than any other. However, the value of a garden is often based on the amount of high-quality grass it yields. Since indoor gardens are limited in size, you want the plants to quickly fill the garden with lush growth in order to use the garden efficiently. Otherwise, for the first couple of months, the lights are shining on empty space.

Secondly, the possession of small quantities of marijuana will probably be decriminalised nationally within the next few years. Decriminalisation for personal possession will open the way for decriminalisation for cultivation for personal possession. But small quantities are more difficult to define for cultivation than for simple possession, which is done by weight. Several possible ways to limit the amount for cultivation have been raised: by the number of plants, by the area cultivated, or by the number of plants at a particular stage of development. The outcome may determine whether you try to grow the largest plants possible or the most plants possible in a given area.
There are several ways to increase your garden's yield.

1. Pinch or cut back the growing shoots when the plants are young. This forces each plant to develop several strong growing shoots and generally yield large robust plants.
2. Plant a number of plant in each pot.
3. Start many plants in small pots and transplant the best plants to larger pots when the plants crowd each other.
4. Use different light systems to grow plants at different growth stages.

Here are some examples of how to carry out each of these four methods.

1. Fill the growing area with large containers (about five gallons each). Start several plants in each pot but thin the seedlings over a period of six weeks to two months, until one plant is left in each pot. During the fourth or fifth week of growth, pinch back the plants to about equal heights. Cut the growing shoot at about the fourth internode. Each plant will develop a sturdy stem which will support four to eight growing stems and will quickly fill any empty space in the garden. The whole garden is the treated like a hedge. After another month or two, you cut back the growing shoots again to have plants of equal heights. Remove the male plants as soon as they begin to release pollen (or before any male flowers open for sinsemilla). This will leave more space and light for the females to develop. By the time females flower, they've been cut back two or three times or more, and form a dense growth of growing shoots that fill the garden with a cubic layer of flowers. Some growers maintain the plants for up to a year before the final harvest.

{Figure 41. Plant clipped at fourth internode.}

2. This method also requires large pots. Instead of thinning the seedlings to leave one per pot, leave at least three. After a few months of growth, remove any plants that lag far behind or any plants that show male flowers. The value of this method is that the odds are at least seven to one that any pot will have at least one female plant.

Most of the plants you'll grow will fill out with branches by four months at the latest. Often the branches develop young seedlings. The plants may begin to look like small Christmas trees by the second to third months of growth.

Generally, you don't want to have more than three or four plants in a five-gallon container, because growth will be limited by competition for light and space.

{Figure 42. Basement growing factory in Atlanta.}

Some varieties never do fill out. The branches remain small, only two to three inches long, and yield very little grass. We've seen...
plants like this grown from grass from Vietnam, Thailand, Afghanistan, and Africa. These plants are also quite short, being four to six feet tall fully grown. With varieties like this, it is better not to pinch tops, and to start about six plants per square foot of garden space. At harvest, the garden will be crowded with top stems that are laden with flower clusters.

Of course, you don't know what varieties will look like until you've seen them grow. For most varieties, each plant will need at least one square foot or space at maturity. It is much less common to find varieties that naturally grow small or especially thin, and, therefore, are those of which you would want to plant more than a few per large pot.

3. Another popular way to grow is to start plants in a large number of small pots. As the plants crowd each other, some are removed and the rest transplanted to larger pots.

4. To get the most for your investment requires conservation of light and soil. When the plants are young, a large number fit into a small place. Some growers take advantage of this fact by having several light systems, each with plants at different growth stages. The plants are rotated into larger gardens and pots. This method conserves space, materials, and electricity, and yields a harvest every two months. Using this method, "growing factories" turn out a steady supply of potent grass. {Table 15.}

Chapter Seven
MAINTAINING THE CORRECT ENVIRONMENT

7.2 Requirements for Germination

Before the seed fell, almost all of its water was sapped to prepare the seed for winter. With only the tiny drop that it holds, the embryo lives a life so slow as to be outside of time as we know it. Cannabis seeds need only water to germinate or sprout. The seeds germinate without light and at temperatures low enough to form ice. Higher temperatures hasten germination. Fresh, homegrown Oaxacan seeds germinated in three days at 70F and in eight days at 33F. Temperatures 70 to 90F are best for germination.

Fresh, mature seeds have a high rate of germination (about 90 to 100 percent) and sprout quickly. Usually sprouts appear three to seven days after planting. Older seeds (over a year, depending on storage) have a lower rate of germination and respond slower. They may take up to three weeks to sprout. To get an idea of what to expect from the seeds follow the procedure in 3.1.

Seeds that do sprout will grow normally, no matter how old they are or how long they take to sprout. From any batch of seeds, most of the ones that sprout will do so within two or three days of each other. A few will continue to come up as many as six months later, but the garden should consist of plants that are basically the same age and size. This makes the
Choosing Seeds

Different varieties grow at different rates and attain different sizes and shapes. Under artificial lights, gardens plants from one batch of grass require the least attention, because the plants sprout and grow uniformly and can all be tended at the same time. When several varieties are grown together, some plants are taller than others; you must adjust the height of the plants to keep the marijuana equally illuminated. You may also have to water and fertilise the plants on an individual basis. Some growers start at different varieties under separate light systems. On the other hand, planting several varieties offers you a comparison in potency and yield, and a source for hybrids if you want to develop seed. The next time you plant you'll know which seeds gave the best results and what growing methods will work best for you. {Figure 43. Within each seed lies an embryo.}

There is no strict correlation between the form and height of the plants and seed size, colour, or pattern. However, some large-seeded varieties grow too tall, with long spaces between leaves. Under artificial lights they yield more stems than leaves. If you have a choice between two equally potent grasses, and one has particularly large seeds (3/16 to 1/4 inch), choose the smaller-seeded variety.

Sowing

The easiest way to start the plants is to sow the seeds directly into the soil. First, wet the soil with a moderate amount of water, enough to wet the soil with a moderate amount of water, enough to get the soil evenly moist without water running out the bottom. This takes about one-half quart of water for one-gallon containers, and about one quart for three-gallon containers. Plant the seeds a quarter- to half-inch deep. The germination rate is lower when they are planted deeper; and if seeds are planted less than one-quarter inch deep, the sprouts may have difficulty anchoring their roots. Plant about six seeds per pot to assure some sprouts in each pot. Gently press each seed into the soil. Cover the seeds with soil and sprinkle lightly with water. Each day, sprinkle or spray the surface with enough water to thoroughly wet the top half-inch of soil, since the seed must be kept moist for germination.

For most people, germinating the seed is easy. Problems with germination come from either too much or too little water. If you saturate the pots with water, and especially if you continue to saturate the pots after the seeds have sprouted, the seedlings may develop stem rot or root problems. When stem rot develops, the base turns brown, and the seedlings fall over, ending the garden. This can also happen if you keep seedlings in germination boxes or terrariums where the humidity is very high. When the humidity is low, the soil surface dries out quickly and the seeds won't germinate. Sprouts that may come up shrivel and dry at the base of the stem and die.

The key to germination is to keep the soil surface moist after first having moistened the whole pot; then, after the first sprouts have been up for a few days, let the surface of the soil dry between waterings. Don't spray the surface any more. Water with medium amounts of water when the soil in the
top couple of inches feels dry. For small pots, water seedlings about twice a week. For larger pots, once each week or two may be enough.

Some growers prefer to plant only seeds they know will sprout, especially when planting seeds which have a low viability. Start the seeds in wet towels or a glass of water. Add one teaspoon of liquid bleach (a three-percent solution) to each cup of water. This will prevent fungus from attacking the seeds, which happens when they are soaked for more than three days. Check the seeds each day. Plant when the radical or roots begins to come out from the pointed end of the seed. Cannabis seed is quite small and has only enough stored food for the embryo to anchor its root and raise its cotyledons. The more developed the root is when planted, the less energy it has to anchor itself in the soil. The sprout may die or growth be delayed until the root is established (transplant shock). In Figure 44, the seeds in a circle are all ready to plant. The centre seed will not survive transplanting. \{Figure 44. Seeds in a circle are ready to plant. Centre sprout will not survive planting\}

Some growers prefer to start the plants in a germination box. This extra hassle is not necessary. Transplanting seedlings from one medium to another often causes transplant shock. It is best to plant the seeds directly into the soil.

If you use Soilless mixtures, your seedlings should be started in paper cups, peat pots, or other small pots filled with a soil mixture (see Transplanting in Chapter 8 {8.3}). This procedure is also helpful if you have the difficulty starting the plants in large containers. Expandable peat pellets also work very well.

The position of the seed in the soil has a slight effect on germination. The root directs its growth in response to gravity, as shown in Figure 45. However, germination is a little faster when the seeds are planted with the pointed end up. The difference is small, and it's not really necessary to position the seeds in the soil.

If a dry atmosphere presents problems, you can create the moist atmosphere of a germination box and still plant directly in the pot. Cover the seeds with transparent plastic cups or glasses, or cover the pot with plastic kitchen wrap. This creates a greenhouse effect and keeps the soil surface moist without watering. Remove all the covers as soon as you see the first sprouts begin to appear; the sprouts will die if the cover is left on. \{Figure 45. The root directs its growth toward gravity. Seeds are germinated between glass and cotton, and held vertically. Four seeds to left have pointed end up. Two middle seeds are horizontal. Sex seeds on right have pointed end down.\} \{Figure 46. During germination soil can be kept moist by using plastic covers to create a greenhouse effect.\}

7.3 Light Cycle and Distance of Lights from Plants

The seed doesn't need light to germinate. The sprout does need light as soon as it breaks through the soil. Most growers turn the light on when they sow the seeds, though, to warm the soil and encourage germination. Lights may
also dray the surface of the soil, especially in large pots or with VHO fixtures. If this is a problem during germination, leave the lights off until you see the first sprout breaking through the soil; or hang the lights about 18 inches above the soil, and lower them to six inches as soon as the sprouts appear.

It is important for normal development that the plants receive a regulated day/night cycle. We emphatically recommend that you use an automatic electric timer (about $8). A timer makes gardening much easier, since you don't have to turn the lights on or off each day. The plants won't suffer from irregular hours or your weekend vacations. Set the timer so that the plants get about 16 to 18 hours of light a day, and leave it on this setting until the plants are well grown (three to six months) and you decide to trigger flowering.

During the seedling and vegetative stages of growth, the plants may be subjected to light during their night period. During flowering, however, the night period must be completely dark.

The plants grow more slowly with less than 16 hours of artificial light a day, and they may flowers prematurely. Some growers leave the lights on up to 24 hours. A cycle longer than 18 hours, may increase the growth rate, especially if the plants are not saturated with light. A longer cycle is helpful in small gardens, such as under standard four-foot fixtures.

No matter what the light source, place the lights as close to the tops as possible without burning the plants. Pay no attention to the manufacturer's instructions for the distance of the plants from the lights; these instructions don't apply to a high-energy plant such as Cannabis. With standard-wattage tubes, keep the lights from two to six inches above the plant tops. With VHO tubes, allow four to eight inches. Maintain the lights at these distances throughout the life of the garden. In most cases you will have to raise the lights once or twice a week as the plants grow.

Standard fluorescents don't get hot enough to burn the plants unless they are in direct contact with leaves for several hours. VHO tubes will burn leaves before they touch them. But you do want to keep the lights as close to the plants as possible. This encourages stocky, robust growth. Incandescents and floodlights get very hot; place them at a greater distance from the plants. Test the distance by feeling for heat with your hands. Place the bulb at the distance where you begin to feel its heat. For a 75-watt incandescent lamp, this is about eight inches.

7.4 Water

Water, the fluid of life, makes up more than 80 percent of the weight of the living plant. Within the cells, life processes take place in a water solution. Water also dissolves nutrients in the soil, and this solution is absorbed by the roots. About 99 percent of the water absorbed passes from the roots into the conduits (xylem) of the stem, where it is distributed to the leaves via the xylem of the leaf veins. Transpiration is the evaporation of water from the leaves. The flow of water from the soil, through the plant to the air, is called the transpiration stream. Less than one percent of the water absorbed is broken down to provide electrons (usually in the form of
hydrogen) which, along with carbon dioxide, are used to form carbohydrates during photosynthesis. The rest of the water is transpired to the air.

Watering

Water provides hydrogen for plant growth, and also carries nutrients throughout the plant in the transpiration stream. However, it is not true that the more water given a plant, the faster it will grow. Certainly, if a plant is consistently under-watered, its growth rate slows. However, lack of water does not limit photosynthesis until the soil in the pot is dry and the plant is wilting.

The amount of water, and how often to water, varies with the size of the plants and pots, soil composition, and the temperature, humidity, and circulation of the air, to name a few variables. But watering is pretty much a matter of common sense.

During germination, keep the soil surface moist. But once the seedling are established, let the top layer of soil dry out before watering again. This will eliminate any chance of stem rot. Water around the stems rather than on them. Seedlings are likely to fall over if watered roughly; use a hand sprinkler.

In general, when the soil about two inches deep feels dry, water so that the soil is evenly moist but not so much that water runs out the drainage holes and carries away the soil's nutrients. After a few trials, you will know approximately how much water the pots can hold. Marijuana cannot tolerate a soggy or saturated soil. Plants grown in constantly wet soil are slower-growing, usually less potent, and prone to attack from stem rot.

Over-watering as a common problem; it develops from consistently watering too often. When the plants are small, they transpire much less water. Seedlings in large pots need to be watered much less often than when the plants are large or are in small pots. A large pot that was saturated during germination may hold enough water for the first three weeks of growth. On the other hand, a six-foot plant in a six-inch pot may have to be watered every day. Always water enough to moisten all the soil. Don't just wet the surface layer.

Under-watering is less of a problem, since it is easily recognised. When the soil becomes too dry, the plant wilts. Plant cells are kept rigid by the pressure of their cell contents, which are mostly water. With the water gone, they collapse. First the bottom leaves droop, and the condition quickly works its way up the plant until the top lops over. If this happens, water immediately. Recovery is so fast, you can follow the movement of water up the stem as it fills and brings turgor to the leaves. A plant may survive a wilted condition of several days, but at the very least some leaves will drop.

Don't keep the pots constantly wet, and don't wait until the plant wilts. Let the soil go through a wet and dry cycle, which will aerate the soil and aid nutrient uptake. Most growers find that they need to water about once or twice a week.
When some soils get particularly dry, the water is not absorbed and runs down the sides and out the bottom of the pot. This may be a problem the first time you water the soil, or if you allow the soil to get very dry. To remedy, add a couple of drops of liquid detergent to a gallon of water. Detergent acts as a wetting agent and the water is absorbed more readily. First water each pot with about one cup of the solution. Allow the pots to stand for 15 minutes, then finish watering with the usual amount of pure water.

Use tepid water; it soaks into the soil more easily and will not shock the roots. Try to water during the plant's morning hours. Water from the top of the pot. If you do want to water from the bottom with trays (not recommended), place a layer of pebbles or gravel in the trays to insure drainage. Don't leaves the pots sitting in water until the pot is heavily saturated. The water displaces the soil's oxygen, and the plants grow poorly.

Tap water in some areas highly chlorinated, which does not seem to harm Cannabis; and many fine crops are raised with water straight from the tap. But chlorine could possibly affect the plants indirectly, by killing some beneficial micro-organisms in the soil. Chlorine also makes the water slightly acidic. However, neither effect is likely to be serious. Some growers have asked whether they should use pet-shop preparations that are sold to remove chlorine from water in fish tanks. These preparations generally add sodium, which removes the chlorine by forming sodium chloride (table salt). This solution does not harm the plants, although repeated use may make the soil too saline. Probably the best procedure is to simply allow the water to sit in an open container for a few days. The chlorine is introduced to water as the gas Cl2, which dissipates to the air. The water temperature also reaches a comfortable level for the plants.

Hard (alkaline) water contains a number of minerals (e.g., Ca++, Mg++, K+) which are essentially nutrients to the plants. Water softeners remove these minerals by replacing them with sodium, which forms slightly salty water. It is much better to water with hard water, because artificially softened water may prove harmful after some time. Occasionally, water may be acidic (sulphurous). Counteract this by mixing one teaspoon of hydrated lime per quart water and watering with the solution once a month.

Water and Potency

We've seen no studies that have evaluated potency in relation to water. A few studies have mentioned the fact that plants that received less water were slightly more potent. Water stress has been practiced by several marijuana-growing cultures. In parts of India, watering is kept to a minimum during flowering.

To limit watering, water with the usual amounts but as infrequently as possible. To encourage good growth, yet keep watering to a minimum, wait until the plants are a few months old before you curtail watering. Give the plants their normal water and note the number of days before they begin to wilt. As the plants get larger, the water needs increase, but this generally stabilises by the time of flowering.
The properties of the air seldom present any problems for indoor gardeners. The plants grow well under the ordinary conditions that are found in most homes and can withstand extremes that are rarely found indoors. The plants can survive, in fact thrive, in an atmosphere many house plants can't tolerate. For plant growth, the most important properties of the air are temperature, humidity, and composition.

Temperature and Growth Rate

Temperature control should be no problem. The plants can withstand temperatures from freezing to over 100F. Plant growth is closely related to temperature. Marijuana varieties are, in general adapted to warm if not hot climates. Different varieties will reach their maximum rate of photosynthesis at different temperatures. For almost all marijuana varieties, the rate of photosynthesis will increase sharply with increases in temperatures up to about 70F. Some strains reach their peak rate of growth at about 68F. Others, especially from areas near the equator, such as Colombia, may not reach their peak rate until the temperature is about 90F. However, for all varieties, increases in the growth rate will be slight with increased temperatures over 75F. The average temperature for maximum is about 75 to 80F. In other words, normal household temperatures are fine for growing marijuana and no special temperature control is necessary for most gardens.

Don't set up the garden right next to, or in contact with, a heat source such as a radiator or furnace. If the garden is nearby, the plants should do quite well. The plants are most susceptible to cool temperatures during germination and the first few weeks of growth. In basement gardens, the floor temperature is often lower than the air. It is a good idea to raise the pots off the floor with pallets or boxes. The seeds will germinate quicker, and the plants will get off to a faster start.

If heating is necessary, propane catalytic heaters work well, are safe and clean, and increase the carbon-dioxide content of the air. Electric and natural gas heaters also work well. Do not use kerosene or gasoline heaters. They do not burn cleanly, and the pollutants they produce may harm the plants. Any heater that burns a fuel must be clean and in good working order. Otherwise, it may release carbon monoxide, which is more dangerous to you than to the plants.

Temperature and Potency

Since marijuana varieties are most often grown in semi-tropical and tropical areas, the idea that high temperatures are necessary for potent marijuana is firmly entrenched in marijuana lore. This myth, like many others, is slowly disappearing as marijuana farmers and researchers accumulate more experience and knowledge. There are only a few published papers on the effects of temperature on potency. The best study we've seen grew four different varieties in a controlled environment under artificial lights on a 15-hour day-length. Two temperature regimes were used: a "warm" regime, with temperatures of about 73F during the day and 61F at night (about average for most homes); and a "hot" regime, set at 90F daytime and 73F at night. In all
four varieties, the concentration of THC and of total cannabinoids was higher under the "warm" regime. For instance, a Nepalese strain was 3.4 times higher in concentration of total cannabinoids, and 4.4 times higher in THC, when grown under the "warm" regime than the same strain grown under the hot regime. Although we agree with the findings in principle, these figures are higher than our experience tells us.

Interpretation of the data does show one point clearly. In all four varieties, the amount of THC lost as CBN was higher under the "hot" regime (see Table 16 - currently excluded from this guide), even though the concentration of THC was higher under the "warm" regime.

Another research group in France has looked at the relationship of potency to temperature. The most recent paper 79 compared four temperature regimes, given in descending order of potencies found: 75F day, 75F night (highest potency); 72F day, 54F night; 81F day, 81F night; and 90F day, 54F night (lowest concentration of THC). In each, the day period was 16 hours and the night period eight hours.

Interestingly, this same research group in an earlier paper 20 reported that the concentration of THC was higher for male plants grown at 90-72F then for those grown at 72-54F. For the female plants, the differences in THC concentration were small. The variety used was a propyl variety (type IV) containing about half as much THCV as THC. For both the male and female plants, the concentration of THCV were high under the 90-72F regime.

The simplest interpretation of all these results is that mild temperatures seem to be optimum for potency. Temperatures over 90F or below 60F seem to decrease the concentration of THC and total cannabinoids. Also, at higher temperatures, much more THC will be lost as CBN. And last, propyl varieties may produce less THCV under a cool regime. Bear in mind that none of these papers accounted for all of the many variables that could have affected the findings. For instance, the concentration of THC was 18 times higher at 75-75F than at 90-54F. We've never seen differences of this magnitude, and sampling error undoubtedly influenced the findings.

In terms of growth rate and potency, daily temperatures of about 75F, give or take a few degrees, are roughly optimum. Normal household temperatures are in the low 70's during daytime and the low 60's at night. The heat from a light system will raise the garden's temperature a few degrees. In most gardens temperatures will be near 75F during the day. Night-time temperatures drop about 10 to 15 degrees. When night-time temperatures drop into the 50's or below, set the light cycle to turn on during the early morning, when the temperature will be lowest. In a small room, the light system will generate enough heat to warm the garden without any need for a heater. Whenever you wish to raise the temperature by, say, five or 10 degrees, it is better to add more lights than a heater. The plants will benefit from the additional light, as well as from the heat they generate. And an electric heater, watt for watt, doesn't generate much more heat than a lamp and its fixture.

Composition of the Air

Air provides two essential ingredients for the living plant: oxygen and
carbon dioxide. The plant uses oxygen for respiration in the same way we do. The oxygen is used to burn carbohydrates (CH2O) and other food, yielding energy (ATP; see section 4) for the organism, and releasing carbon dioxide and water into the environment.

During photosynthesis, CO2 is used to form carbohydrates. As part of photosynthesis, light energy is used to split water molecules, releasing oxygen into the environment. In plants, the net result from respiration and photosynthesis is that much more oxygen is released than consumed, and more carbon dioxide is consumed than released. The oxygen in the Earth’s atmosphere is formed by photosynthetic organisms.

The similarity between plant and animal respiration ends at a cellular level. Plants don't have lungs to move the air. The passage of gases, whether oxygen or carbon dioxide, is primarily a passive process. The gases diffuse through microscopic pores called stomata, found in Cannabis on the undersides of the leaves. The plants can open and close their stomata, allowing moderate control of the flow of air. However, for good exchange of gases, the plants require adequate ventilation for air circulation.

Cannabis is not particularly susceptible to a stuffy or stagnant atmosphere. A garden in the corner of a room that is open to the house will be adequately ventilated. Ventilation is not a problem unless the garden is large and fills a quarter or more of the space in a room. Gardens in small, confined spaces such as closets, must be opened daily, preferably for the duration of the light period. Plants growing in a closed closet may do quite well for the first month, but they'll need the door opened as the plants begin to fill the space. The larger the plants get, the greater the need for freely circulating air.

When the weather is mild, an open, but screened, window is the best solution for ventilation. In large indoor gardens where there isn't much air circulation, a small fan is helpful. After germination, make spaces in the surrounding reflectors to allow air to circulate freely. Leave the spaces at the bottom, ends, and the tops of the garden. The higher the temperature or the humidity, the more the plants need good ventilation.

CO2

CO2 is a natural, non-poisonous gas present in the atmosphere, which plants absorb and use during photosynthesis to synthesise sugars and organic compounds for energy and growth. Plants can effectively use CO2 up to about .15 percent concentration, about five times the concentration (.03) naturally present in the atmosphere. Increasing the CO2 dramatically increases the growth rate, often up to twice the rate of growth in plants in a natural atmosphere. Supplemental CO2 systems are an inexpensive way serious gardeners dramatically increase a garden's yield. (And decrease fire risk.) {Picture Common emitter systems are safe, inexpensive, easy to setup, and may double the rate of growth in a garden.}

There are two good ways to increase the concentration of CO2. Greenhouse growers use CO2 generators which produce CO2 by burning a clean-burning fuel such as propane or butane. The problems with CO2 generators are that they
require a fuel, operate with an open flame, and produce a lot of heat. These are not necessarily problems if the grow room needs to be heated, and if the room is constantly monitored.

For home-growers, the emitter system is more efficient, relatively cheap, safe, and easy to use. Many suppliers who advertise in High Times and Sinsemilla Tips offer complete emitter systems that come with a regulator, solenoid valve, flow-meter, timer, (sometimes distribution tubing), and detailed, yet simple instructions. You must rent compressed CO2 gas tanks from a local compressed gas supplier or beverage company. The setup is not complicated or expensive, and a walk through the Yellow Pages should show several suppliers.

Since the CO2 in the atmosphere is about .03 percent, and the maximum CO2 concentration that your plants use is about .15 to .2 percent, set your emitter system to regulate a concentration of .12 to .17 percent CO2 in the room. Don't worry if you don't understand. All systems are easy to install and come with easily understood instructions.

7.6 Humidity

Marijuana flourishes through a wide range of relative humidity. It can grow in an atmosphere as dry as a desert or as moist as a jungle. Under ordinary household conditions, the humidity will rarely be too extreme for healthy growth. The effects of the humidity on plant growth are closely tied to temperature, wind speed, and the moisture of the soil.

The relative humidity affects the rate of the plant's transpiration. With high humidity, water evaporates from the leaves more slowly; transpiration slows, and growth slows also. With low humidity, water evaporates rapidly; the plant may not be able to absorb water fast enough to maintain an equilibrium and will protect itself from dehydration by closing its stomata. This slows the transpiration rate and growth also slows. There is a noticeable slowing of growth because of humidity only when the humidity stays at an extreme (less than 20 percent or over 90 percent).

Cannabis seems to respond best through a range of 40 to 80 percent relative humidity. You should protect the plants from the direct outflow of a heater or air conditioner, both of which give off very dry air. During the first few weeks of growth, the plants are especially susceptible to a dry atmosphere. If this is a problem, loosely enclose the garden with aluminum foil, white sheet plastic, or other materials. This will trap some of the transpired moisture and raise the humidity in the garden. Once the seedlings are growing well, the drier household atmosphere is preferred.

Where the humidity is consistently over 80 percent, the plants may develop stem rot or grow more slowly. Good air circulation from open windows or a small fan is the best solution.

As long as the air is freely circulating, the plants will grow well at higher humidities. Dehumidifiers are expensive (over $100) and an extravagance.

Humidity and Potency
As far as we know, there has been little work done correlating the relative humidity with potency. In the two related cases we've seen, neither study was intended to examine the effects of relative humidity and potency. However, a lower humidity (50 to 70 percent) produced slightly more potent plants than a higher relative humidity (80 percent and over).

A dry atmosphere seems to produce more potent plants. When the humidity is about 50 percent or less, plant development is more compact, and the leaves have thinner blades. When the atmosphere is humid, growth is taller and the leaves luxuriant with wider blades. The advantage to the plant is that wider blades have more surface and hence can transpire more water. The converse is that thinner blades help conserve water. Higher potency may simply be due to less leaf tissue for a given amount of cannabinoids and resin glands.

The temperature also influences the form and size of the leaves. At higher temperatures, the leaves grow closer together; under a cool regime, the leaves are larger, have wider blades, and are spaced farther apart. Possibly, cool temperatures yield slightly lower potency for much the same reason that a moist atmosphere does.

However, differences in potency caused by any of the growth factors (light, nutrients, water, temperature, humidity, etc.) are small compared to differences caused by the variety (heredity) and full maturation (expression of heredity). For example, the humidity in Jamaica, Colombia, Thailand, and many other countries associated with fine marijuana is relatively high and averages about 80 percent.

However, try to keep the atmosphere dry. The atmosphere in heated or air-conditioned homes is already dry (usually 15 to 40 percent). For this reason, many growers sow so that the plants mature during the winter if the home is heated or in mid-summer if it is air-conditioned. As we mentioned, there should be no need to use dehumidifiers. Good air circulation and raising the temperature to 75 to 80°F are the simplest means of dealing with high humidity.

Chapter Eight
GARDENING TECHNIQUES

8.2 Thinning

Depending on the viability of the seeds, there should be several plants growing in each pot. Most growers thin to one plant per pot, but the plants don't have to be thinned until they crowd each other and have filled the garden with foliage. The longer you let them grow, the more potent they'll be.

It is virtually impossible to tell the gender of the plants when they are young. The normal ratio of males to females in Cannabis is one to one. Some farmers end up with more male plants because of their thinning practices. When the plants are less than a month old, the male plants often appear taller and better developed than the females. The male seedling uses more of
its energy to develop its aboveground parts than the female. The female devotes more energy to establishing a strong root system. During the first few weeks, don't thin the plants by leaving only the tallest, or you'll wind up with a higher ratio of males. Try to leave seedling that are healthy and vigorous and that are roughly at the same point of development.

To thin your garden, remove any plants with yellow, white, or distorted leaves. Remove the less vigorous and those that lag far behind in development. Cut the unwanted plants near the base; the root system can remain in the pot.

These harvested seedlings will be your first taste of homegrown grass. Usually they produce a mild buzz, but if you separate the growing tips from the large leaves, they may be more potent.

8.3 Transplanting

However you transplant, try to disturb and expose the roots as little as possible. If you transplant carefully, the plants will not exhibit delayed or slowed growth due to transplant shock.

Transplanting Seedlings

When the plants are a week to two weeks old, transplant to any pot that has no plants. First, moisten the soil in the pot from which you will remove the transplant and let is sit for a few minutes. Take a spade or a large spoon, and insert it between the transplant and the plant that will be left to grow. Try to leave at least one inch of space from spoon to stem. Lever the spoon toward the side of the pot, in order to take up a good-size wedge of soil. Place the transplant in a prepared hole at the same depth that it was growing before. Replace the soil in both pots and moisten lightly again to bond the new soil with the original. If you are careful, a wedge of soil can be removed intact. The root system will not be disturbed and the plant will survive with little or no transplant shock. Do not fertilise a transplant for two weeks.

To prevent possible drop-off and wilting from shock, you may want to use Rootone or Transplantone. These safe powders, available at nurseries, contain root-growth hormones and fungicides. They won't be necessary if you transplant carefully.

Transplanting to Large Pots

Transplanting from smaller to larger pots is a simple procedure. The marijuana root system quickly fills small pots. To transplant, moisten the soil and let it sit to become evenly moist. Pick the potted plant up, and, while holding the base of the stem, rap the pot sharply against something solid. You might cover the soil surface with a piece of newspaper or aluminium foil, which makes the job cleaner. When it is done at the right time, the root system, with all the soil adhering, will pop out of the pot intact.

An approximate time guide for transplanting is shown in Table 17 (currently excluded from this guide). At these times, give or take a week, the plants
should be root-bound and all the soil will adhere to the roots, making the transplanting clean and easy.

If the root system has not filled the pots by this time, wait a few weeks and the process will be easier. If the root system comes out in a small ball and much of the soil is empty of roots, then soil conditions are poor (usually poor drainage and over-watering) or you are transplanting much too seen.

If the root system doesn't easily pop out, run a knife around the sides of the pot. Sometimes the roots stick to the sides, particularly is paper and clay containers. Check to see if the drainage holes are plugged. Plugged holes stop air from displacing the soil, and the vacuum pressure prevents the soil from sliding out of the pot.

<table>
<thead>
<tr>
<th>Table 17</th>
<th>Guide for Transplanting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transplant</td>
<td>During</td>
</tr>
<tr>
<td>Six-ounce cups</td>
<td>Second to third week</td>
</tr>
<tr>
<td>Four-inch pots</td>
<td>Third to fourth week</td>
</tr>
<tr>
<td>Six-inch pots (half gallon)</td>
<td>Fourth to fifth week</td>
</tr>
<tr>
<td>Eight-inch pots (one gallon)</td>
<td>Seventh to eighth week</td>
</tr>
<tr>
<td>Two-gallon containers</td>
<td>About the tenth week</td>
</tr>
</tbody>
</table>

Transplant into a soil mixture that is the same as (or is very like) the one in the original pots. Otherwise, the soils may have different osmotic properties, and the water may not disperse evenly. (This doesn't apply to small pots that are used for germination and are filled with vermiculture, Jiffy Mix, or other mediums.) Don't bury the stem. Keep the stem base at the same depth that it was growing. {Figure 47. Transplant when the plant is root-bound.}

Transplanting in Plastic Bags

To transplant plants that are in plastic bags, place the old bag into the larger-size bag. Put some soil mixture underneath, to bring the base of the stem to where the new soil surface will be. Cut the old plastic bag away and fill the side spaces with soil mixture. Two people make the job easier.

8.4 Supports for Plants

Under natural conditions, stems undergo stress from wind, rain, and animals. These stresses, which indoor plants do not ordinarily face, strengthen the stem. Indoor stems grow sturdy enough to support their own weight and not much more. Plant energy is used to produce more light-gathering leaf tissue, rather than wind-resistant stem tissue. Stems remain slender, usually about one-half to three-quarter inches at maturity. Since you are growing the plants for their leaves and flowers, this does not present a problem.

Healthy plants do not ordinarily need support. If many of your plants have weak or spindly stems, there is a deficiency in either light or nutrients (notably potassium). Simply not having enough light will cause the plants to elongate, with sparse foliage and weak growth. Too much red light will cause
elongation, too, so make sure you include a strong blue light, if you are using incandescent or floodlights.

Hanging the lights higher than the recommended distances will cause the plants to elongate by rapidly growing up to the lights. Unlike sunlight, the intensity of artificial light diminishes dramatically with the distance from the lights. The plants respond by growing toward the light, seeking the higher intensity.

Under artificial light, some plants may need support during the seedling stage or because of accident. Depending on plant size, use straws, pencils, dowels, or standard plant stakes such as cane sticks. Set them in the soil and affix the stem with string, masking tape, or wire twists such as those that come with plastic trash bags. Do not tie string or wire tightly around the stem; make a loose loop. The stem will grow in girth and can be injured by a tight loop.

Probably the simplest method of support is to take a rigid piece of wire, form a "C" at one end and bend it to a right angle to the stem. Set the straight end in the soil and place the stem inside the "C." Pipe cleaners are ideal for seedlings. With larger plants, straighten a coat hanger and use the same method.

A common practice in greenhouses where tree seedlings are raised is to shake each plant once or twice daily. This practice simulates natural vibrations from the wind, and the plant reacts by increasing the growth around the stem. The stem grows thicker and stronger, and the tree can better fend once it is transplanted. It works the same way with marijuana. A fan blowing on the plants will also work. These practices are useful if you plan to move your plants outdoors. Otherwise, healthy indoor plants that will remain indoors need no special stem strengthening.

8.5 Uniform Growth

The light intensity from artificial lights drops dramatically as the distance from the light source increases. When the plants are not of equal height, the shorter ones receive less light and consequently grow slower than the taller ones. This compounds the situation and, left to themselves, the shorter plants will stop growing and eventually die from lack of light.

It is important to keep all of the plants close to the lights. (Figure 48. Hang the fixture at an angle corresponding to that of the tops of the plants.) This encourages stocky, full growth and can make the difference between harvesting stems and harvesting smoking material.

One way to deal with uneven height is to line the plants up to the line of the plant tops. As the plants grow, move them to different spots in the garden to accommodate their different sizes. Or raise the shorter plants up to the lights by placing them on milk crates, tin cans, bricks, etc.

The quality and quantity of light emitted by a fluorescent is strongest in the middle and weaker toward the ends of the tube. Female plants require more light than males. Once the genders of the plants become clear, move the males to the ends of the system, thus leaving the stronger middle light for
the females.

8.6 Pruning

Probably the easiest way to deal with uneven growth is to cut back the taller plants to the average height. You may find this emotionally difficult, but pruning will not harm the plant. Cutting off the growing shoot forces the plant to develop its branches. Some growers cut back all of their plants when they are three to four weeks old. Any horizontal space is quickly filled with growing branches and the plants grow full and robust.

The growing shoots are the most potent plant parts until the flowers appear. Generally, the potency increases with growth. By three months' age, most shoots will be high-quality smoke. You can cut shoots at any time; just don't overdo it. Give the plant a chance to grow and fill out to a good size. Severe pruning will slow growth. New growth may be distorted and abnormal, with a drop in potency.

Each time you cut a growing shoot, whether it is the stem tip or a branch tip, two shoots begin to grow from the nearest leaf axils. However, don't think that cutting all the growing shoots of a plant twenty times over the course of a season will yield a plant bearing over a million new shoots, or even that the plants will double their size if pruned. Pruning simply allows the plant to develop its branches earlier. The branches present more area to gather light and, hence, can grow to fill a larger space. However, the plant's size is basically determined by the seed's potential within the limitations of the environment.

Cutting the growing shoots or removing some leaves does not harm the plants. Plants are well adapted to the loss of parts to predators, wind, etc., in the natural world. When leaves are damaged or lost, the plant plugs the wound. The leaf isn't replaced or repaired, but new leaves are continually being formed from the growing shoots. The stem, since it connects all parts of the plant, is more important to the plant as a whole. When the stem breaks or creases, it is capable of repair. You can help the plant repair its stem by splinting the wound or somehow propping the stem up straight. Stems take about four or five days to heal.

When you cut the stem or leaves, you may see the plant's sap momentarily spurt before the wound is plugged. The sap contains primarily the products of photosynthesis, in the form of sucrose (table sugar). Smaller amounts of materials associated with the living organism such as minerals, amino acids, and enzymes are also present. In marijuana, the sap is usually colourless, although a bright red colour - it looks like blood - is not uncommon in later life. The red colour is due to haematin compounds and anthocyanin pigments that naturally build up in some varieties. The red colour may also indicate a nutrient deficiency, notably of nitrogen, phosphorus, potassium, or magnesium.

8.7 Training

Plants grow from the tips of their stems and branches. The growing tip (apical meristem) of the plant contains a hormone that acts as a growth inhibitor. This prevents the branches (lateral buds) from growing. The
further a branch is from the growing tip, the less effect of the inhibitor. This is why some species of plants form a cone or Christmas-tree shape with the longest branches toward the bottom of the stem. This is also why the branches grow from the top of the plant when the tip is removed. Once the growing tip is removed, the next highest growing shoot(s) becomes the source of the inhibitor. Under artificial light, the bottom branches may not receive enough light to grow even though they are far away from the inhibitor. Usually the longest branches are toward the middle of the plant.

Some growers hate to cut the growing shoots on the main stem, since it forms the largest and most potent buds by harvest. But you can neutralise the effects of the inhibitor, without cutting the growing shoot, by bending the tip. This allows you to control the height of the plants, and forces them to branch. The top two to six inches of the stem are flexible. Bend it in an arc and secure it to the stem with a wire twist or string. Remove the wire twist in a few days so that the growing tip does not break itself as it twists up to the light. Don't bend the stem too far down. Keep it in the strong light or else it will stop growing. If you accidentally break the tip, you can splint it with matchsticks or ice-cream sticks secured with wire twists or tape until it heals. {Figure 49. The flexible tip is held in place with a wire twist.}

To develop large, full plants with well-developed branches, secure the growing tip once or twice for a few days while the plants are young (one to three months).

It is possible to train the tip so that the stem will form a series of “S” shapes or even circles. During flowering, train the tips so that they grow horizontally. This method encourages thick, dense growth. The branch tips can also be trained. Keep bending any tips that grow above the others. This creates a garden filled with a cubic layer of vigorous flower clusters rather than a lot of stems.

We want to emphasise that when you get the knack of training the tips, you can more than double the yield of the most potent plant parts. {Figure 50. Stem trained in an “S” shape.} {Figure 51. Tops trained horizontally during flowering.}

Chapter Nine
NUTRIENTS AND FERTILISING

9.2 Nutrients

There are about 15 elements known to be essential to plant life. Carbon, hydrogen, and oxygen are absorbed from air and water. The remaining 12 elements are absorbed primarily from the soil, in mineral (inorganic) forms such as NO3- and K+. They constitute a natural part of soil that becomes available to the plant as organic matter decays and soil particles such as sand and clay dissolve.

Soil elements that are necessary for normal growth are called nutrients. The elements nitrogen (N), phosphorous (P), and potassium (K) are considered
major nutrients. The three numbers that appear on all fertiliser packages give the available percentage of these three nutrients that the fertiliser contains; and always in the order N-P-K. For example, 10-2-0 means 10 percent N, 2 percent P (actually, 2 percent P2O5), and no K (actually, no K2O). Fertility is often measured by the amounts of major nutrients a soil contains. Relatively large amount of N-P=K are needed for lush growth.

Three other elements - calcium (Ca), sulphur (S), and magnesium (Mg) - are called secondary nutrients. Plants require less of these nutrients, and most cultivable soils contain adequate amounts for good growth.

Six remaining elements are called trace elements or micronutrients. As their name implies, they are needed in very small amounts. Commercial soils contain enough trace elements to sustain normal growth. The trace elements are also present in manures, humus, ash, and limestone.

Nitrogen

The amount of nitrogen a soil can supply is the best indication of its fertility. Nitrogen, more than any other soil nutrient, is inextricably linked with the living ecosystem. Nitrogen is continually cycled through living systems: from soil to plants and back to the soil, primarily by the activity of soil microorganisms. Nitrogen is essential to all life. Nitrogen is a key element in the structure of amino acids, the molecules which make up proteins. These, and all other biomolecules, are synthesised by the plant. Chlorophyll, genetic material (for example, DNA), and numerous enzymes and plant hormones contain nitrogen. Hence, N is necessary for many of the plant's life processes.

Cannabis is a nitrophile, a lover of nitrogen. Given ample N, Cannabis will outgrow practically and plant. Ample nitrogen is associated with fast, lush growth, and the plant requires a steady supply of nitrogen throughout its life. Marijuana's requirements for N are highest during the vegetative growth stages.

Phosphorous

P is a constituent of energy-transfer compounds such as NADP and ATP, and molecular complexes such as the genes. The energy compounds are necessary for photosynthesis, respiration, and synthesis of biomolecules. Cannabis takes up large amounts of P during germination and seedling stages. During flowering and seed set, Cannabis' need for phosphorous is also high.

Potassium

K influences many plant processes, including photosynthesis and respiration, protein synthesis, and the uptake of nutrients. Just as with P, K uptake is highest during the earliest growth stages. K is associated with sturdy stems and resistance to disease in plants.

Calcium

Ca functions as a coenzyme in the synthesis of fatty compounds and cell membranes, and is necessary for normal mitosis (replication of cells).
Plants take up much more Ca than the small amount necessary for normal growth. Ca is not added to soil as a nutrient; it is added to adjust the soil's chemistry or pH.

Sulfur

S is a constituent of certain amino acids and proteins. It is an important part of plant vitamins, such as biotin and thiamine, which are necessary for normal respiration and metabolism. (Plants synthesise all vitamins they need.) Most soils suitable for growing marijuana contain plenty of S.

Magnesium

Mg is involved in protein synthesis and metabolism of carbohydrates. Mg is the central element in the structure of chlorophyll molecules and hence has an important role in photosynthesis. Most mineral soils and commercial soils have a good supply of Mg.

Trace Elements

The trace elements (Fe, Mn, Mb, B, Cu, Zn) are particularly important in the coenzymes and catalysts of the plant's biochemistry. Many life processes, particularly the synthesis and degradation of molecules, energy transfer, and transport of compounds within the plant, depend on trace elements. Trace elements are not used in large quantities to spur growth, but are necessary in minute amounts for normal growth. Indoor soils rarely require an addition of trace elements.

All the nutrients are needed for normal growth. However, most of them are supplied by the potting soil. Ca, S, and the trace elements rarely present any problems. For most growers, fertilising will simply require periodic watering with a complete fertiliser, one that contains N, P, and K.

9.3 Application: Fertilising

To grow to a large size, marijuana requires a steady supply of nutrients. These can be added to the soil before planting or anytime during growth. Bulk fertilisers are added while the soil is mixed, as described in section 6. These include manures, composts, humus, and concentrated fertilisers, such as rose food. Once the plants are growing, never condition or mulch indoor soils with bulk fertilisers. they promote moulds and fungi and attract other pests to the garden. Concentrated fertilisers can damage the plants if they come in direct contact with the stem or roots.

While the plants are growing, nutrients are given in solution; they are dissolved in water, and the plants are watered as usual. Soluble fertilisers can be either organic or inorganic (chemical), and come in a wide range of concentrations and proportions of nutrients. Two organic fertilisers are liquid manure (about 1.5-1.0-1.5) and fish emulsion ((Some fish emulsion may contain whale by-products.)) (about 5-1-1). Chemical fertilisers commonly may have 20-20-20 or 5-10-5, or may contain only one nutrient, such as 16-0-0.

A 10-5-5 fertiliser is 20 percent soluble nutrients and 80 percent inert
ingredients. A 30-10-10 has 50 percent available nutrients and 50 percent inert ingredients. There is approximately the same amount of N in one tsp. of 30-10-10 as in three tsps. of 10-5-5.

Actually, you can almost use any fertiliser, but the nitrogen content should be proportionately high, and there should be some P and K also present. For example, a 20-20-20 would work fine, as would a 12-6-6 or a 3-4-3, but not a 2-10-10 or a 5-10-0.

How much fertiliser to use and how often to fertilise depend primarily on the fertility of the soil and the size of the container relative to the size of the plant. Small plants in large pots usually do not need to be fertilised. Even in small pots, most plants do not need to be fertilised for at least the first month.

As the plants grow, they take nutrients from the soil, and these must be replaced to maintain vigorous growth. During the vegetative stage, even plants in large pots generally require some fertilising, particularly with N.

The rate of growth of indoor plants is usually limited by the amount of light and space, once adequate nutrients are supplied. At this point, an increase in nutrients will not increase growth. Your goal is to supply the plants with their nutritional needs without overfertilising and thus toxifying the soil.

Most fertilisers are designed for home use and have instructions for fertilising houseplants. Marijuana is not a houseplant, and it requires more nutrients than houseplants. The extra nutrients that it needs may be supplied by the use of large pots and a fertile soil mixture. In many cases, you will need to fertilise only in the dosages recommended on fertiliser packages for houseplants. For instance, Rapid-Gro (23-19-17) is popular among marijuana growers; use one tablespoon per gallon of water every two weeks.

A typical program for fertilising might be to fertilise during the fifth week of growth and every two weeks thereafter until flowering. Then discontinue fertilising (or give at one-half concentration) unless the plants show a definite need for nutrients. It is better to fertilise with a more diluted solution more often than to give concentrated doses at longer intervals. (For instance, if instructions call for one tablespoon of fertiliser per gallon once a month, use one-quarter tablespoon per gallon once a week.)

Make sure that a fertiliser is completely dissolved in the water before you apply it. Put the recommended amount of fertiliser in a clear glass bottle and mix with about one cup of water. Shake vigorously and then allow it to settle. If any particles of fertiliser are not dissolved, shake again before adding the rest of the water. If you have difficulty getting all the fertiliser to dissolve, first add hot tap water. If the fertiliser still does not completely dissolve, you should use another fertiliser.

Never fertilise a dry soil or dry Soilless medium. If the medium is dry, first water with about one-half quart of plain water per pot. Let the pots
sit for about 15 minutes so that the water is evenly dispersed in the pot. Then fertilise as usual.

It is difficult to give instruction for fertilising that will cover all garden situations. You want to supply the plant with its nutritive needs, but overfertilising can toxify the soil. Fertilising according to instructions for houseplants (both in frequency and concentration) should not toxify the soil. However, the plants may sometimes require more frequent or more concentrated fertilising. A good way to judge the plant's needs is not to fertilise one plant, double the fertiliser of another plant, and give the rest of the plants their normal dose. If the unfertilised plant grows more slowly, or shows symptoms of deficiencies, then probably all the plant are depending on soluble fertilisers and must be fertilised regularly. If the plants receiving the double dose grows faster than the other plants, increase the other plants' supply also. On the other hand, if there is little difference among the plants, then the soil is providing the plants with enough nutrients, and they either should not be fertilised or should be fertilised with a less-concentrated solution.

Because they are grown in a relatively small area, it is easy to overfertilise indoor plants. When plants are vigorous, look healthy, and are growing steadily, don't be anxious to fertilise, particularly if you have already fertilised several times with soluble fertilisers. Slow growth or symptoms of deficiencies clearly indicate the need for fertilising.

Overfertilising

In an effort to do the best for their plants, some people actually do the worst. Overfertilising puts excessive amounts of nutrients in the soil, causing toxic soil conditions. Excessive amounts of one nutrient can interfere with the uptake of another nutrient, or change normal plant-soil relations. Since it takes time for a build-up to occur high concentrations of nutrients generally encourage excellent growth until the toxic level is reached.

It takes less N than other nutrients to toxify the soil; hence there is less margin for error when using N. Too much N changes the osmotic balance between plant and soil. Instead of water being drawn into the plant, water is drawn away and the plant dehydrates. The leaves feel limp even though the plant is well watered. The plant will soon die. This tips of the leaves die first and very rapidly the leaves change colour, usually to gold, but sometimes to a brown or green-grey. This change in the plants is faster, more dramatic, and more serious than for any kind of nutrient deficiency.

You can save the plants by immediately leaching the pots as soon as the condition is recognised. Place the pots outdoors or in a sink or bathtub. Discard the top inch or two of loose dirt. Run lukewarm water through the soil until a gallon of water for each two gallons of soil has passed through each pot. The leaves recover turgor in one or two days if the treatment works.

Foliar Feeding

Foliar feeding ((Nitrogen fertilisers are usually NO3 (nitrate) or NO2
nitrite), substances which are also used to preserve food. They have been shown to undergo reactions to form carcinogenic substances (nitrosamines). As with eating food treated with nitrates and nitrites (hot dogs, sandwich meats, etc.), there is a possibility that such substances might be ingested by eating or smoking foliar-fed plants.) (spraying the leaves with fertiliser) is a good way to give the plants nutrients without building up the amount of soluble substances in the soil. After the first month, foliar feed the plants with, for example, fish emulsion or a chemical fertiliser. Use any fertiliser that states it can be used for foliar feeding even if it says "not recommended for foliar feeding houseplants." Use a fine-mist sprayer, such as a clean Windex or Fantastik bottle. Dilute the fertiliser according to directions (fish emulsion at one tablespoon per gallon) and spray both sides of the leaves. When foliar feeding, you should spray the plants with plain water the next day, to dissolve unabsorbed nutrients and clean the plants.

Foliar spraying is also a good way to treat plants suffering from nutrient deficiencies. Some nutrient deficiencies actually are caused by the soil's chemistry, rather than by the absence of the nutrient in the soil. Addition of the necessary nutrient to the soil may not cure the plants' problem, because the nutrient becomes locked in the soil, or its uptake may be limited by high concentrations of other elements present in the soil. Foliar feeding is direct, and if the plant's deficiency symptoms do not begin to clear up, then the diagnosis is probably incorrect.

9.4 Nutrient Deficiencies

Before Diagnosing

Before you assume the plant has a nutrient deficiency, make sure the problem is not due to other causes. Examine the plant leaves, and along the stem and in the soil.

Even under the best conditions, not all leaves form perfectly or remain perfectly green. Small leaves that grew on the young seedling normally die within a month or two. Under artificial lights, bottom leaves may be shielded from the light, or be too far away from the light to carry on chlorosynthesis. These leaves will gradually turn pale or yellow, and may form brown areas as they die. However, healthy large leaves should remain green at least three to four feet below the plant tops, even on those plants under small light systems. Under low light, the lower-growing shoots as well as the large leaves on the main stem are affected. Some symptoms of nutrient deficiencies begin first at the bottom of the plant, but these symptoms generally affect the lower leaves on the main stem first, and the progress to the leaves on the branches.

Although some deficiency symptoms start on the lower, older leaves, others start at the growing shoots or at the top of the plants. This difference depends on whether or not the nutrient is mobile and can move from the older leaves to the active growing shoot. Deficiency symptoms of mobile nutrients start at the bottom of the plant. Conversely, deficiency symptoms of immobile nutrients first appear on the younger leaves or growing shoots at the top of the plant. N, P, K, Mg, B, and Mb are mobile in the plant. Mn and Zn are less mobile, and Ca, S, Fe, and Cu are generally immobile.
A dry atmosphere or wet soil may cause the blade tips to turn brown. Brown leaf tips also may indicate a nutrient deficiency, but in this case, more tissue will turn brown than just the end tips.

Chlorosis and necrosis are two terms which describe symptoms of disease in plants. Chlorosis means lacking green (chlorophyll). Chlorotic leaves are pale green to yellow or white. Chlorotic leaves often show some recovery after the necessary nutrient is supplied. Necrosis means that the tissue is dead. Dead tissue can be gold, rust, brown, or grey. It is dry and crumbles when squeezed. Necrotic tissue cannot recover.

Symptoms of deficiencies of either N, P, or K have the following in common: all involve some yellowing and necrosis of the lower leaves, and all are accompanied by red/purple colour in stems and petioles. The simplest way to remedy these deficiencies is to fertilise with a complete fertiliser containing nearly equal proportions of three nutrients.

Nitrogen

N is the most common deficiency of Cannabis indoors or out. Nitrogen deficiencies may be quite subtle, particularly outdoors, where the soil may continuously provide a small amount of nitrogen. In this case the opt of the plant will appear healthy, and the plant will grow steadily, but at a slow pace. The deficiency becomes more apparent with growth, as more and more of the lower leaves yellow and fall. The first sign is a gradual, uniform yellowing of the large, lower leaves. Once the leaf yellow, necrotic tips and areas form as the leaves dry to a gold or rust colour. In small pots, the whole plant may appear pale (or lime colour) before many bottom leaves are affected to the point that they yellow or die. Symptoms that accompany N deficiency include red stems and petioles, smaller leaves, slow growth, and a smaller, sparse profile. Usually there is a rapid yellowing and loss of the lower leaves that progresses quickly to the top of the plant unless nitrogen is soon added.

Remedy by fertilising with any soluble N fertiliser or with a complete fertiliser that is high in N. If your diagnosis is correct, some recovery should be visible in three or four days. Pale leaves will regain some colour but not increase in size. New growth will be much more vigorous and new stems and petioles will have normal green colour.

Indoors, you should expect plants to need N fertilisation a few times during growth. Once a plant shows N deficiency, you should fertilise regularly to maintain healthy and vigorous growth. Fertilise at about one-half the concentration recommended for Soilless mixtures. Increase the treatment only if the plants show symptoms again. Once the plants are flowering, you may choose not to fertilise if the plants are vigorous. They will have enough N to complete flowering and you don't want to chance toxifying the soil at this late date.

Phosphorous

P deficiency is not common indoors, but may appear outdoors, particularly in dry, alkaline soils or in depleted soils, or during cool weather. Phosphorus
deficiency is characterised by slow and sometimes stunted growth. Leaves overall are smaller and dark green; red colour appears in petioles and stems. The leaves may also develop red or purple colour starting on the veins of the underside of the leaf. Generally the tips of most of the leaf blades on the lower portion of the plant die before the leaves lose colour. Lower leaves slowly turn yellow before they die. Remedy with any soluble P-containing fertiliser. Affected leaves do not show much recovery, but the plant should perk up, and the symptoms do not progress.

Potassium

K deficiencies sometimes show on indoor plants even when there is apparently enough supplied for normal growth. Often, potassium-deficient plants are the tallest (Potassium is associated with apical dominance in some plant species.) and appear to be the most vigorous. Starting on the large lower leaves, the tips of the blades brown and die. Necrotic areas or spots form on the blades, particularly along the margins. Sometimes the leaves are spattered with chlorotic tissue before necrosis develops, and the leaves look pale or yellow. Symptoms may appear on indoor plants grown in a soil rich in organic material. This may be due to high salinity (Na) of some manures or composts used in the soil. Red stems and petioles accompany potassium deficiencies. K deficiencies that could seriously affect your crop rarely occur with indoor soils. However, mild symptoms are quite common. Usually the plants grow very well except for some necrotic spotting or areas on the older leaves. (This condition is primarily an aesthetic problem, and you may choose not to fertilise. See 19.3.)

K deficiencies can be treated with any fertiliser that contains potassium. Wood ashes dissolved in water are a handy source of potassium. Recovery is slow. New growth will not have the red colour, and leaves will stop spotting after a couple of weeks. In a K-deficient soil, much of the added potassium is absorbed by the soil until a chemical balance is reached. Then additional potassium becomes readily available to the plant.

Calcium

Ca deficiencies are rare and do not occur if you have added any lime compound or wood ash. But calcium is added primarily to regulate soil chemistry and pH. Make sure that you add lime to soil mixtures when adding manures, cottonseed meal, or other acidic bulk fertilisers. An excess of acidic soil additives may create magnesium or iron deficiencies, or very slow, stunted growth. Remedy by adding one teaspoon of dolomitic lime per quart of water until the plants show marked improvement. Periodically fertilise with a complete fertiliser. Foliar feeding is most beneficial until the soil's chemistry reaches a new balance.

Sulfur

S is plentiful in both organic and mineral soils. Liming and good aeration increases S availability. Hence S deficiencies should not occur in soils that are suitable for growing marijuana. However, sulfur deficiencies sometimes can be confused with N deficiencies and may also occur because of an excess of other nutrients in the soil solution. Sulfur-deficiency symptoms usually start at the top of the plant. There is a general yellowing
of the new leaves. In pots, the whole plant may lose some green colour. Both sulfur and Mg deficiencies can be treated with the same compound, epsom salts (MgSO4). Epsom salts, or bathing salts are inexpensive and available at drug stores.

Magnesium

Mg deficiencies are fairly common. They frequently occur in Soilless mixtures, since many otherwise all-purpose fertilisers do not contain Mg. Magnesium deficiencies also occur in mixtures that contain very large amounts of Ca or Cl. Symptoms of Mg deficiency occur first on the lower leaves. There is chlorosis of tissue between the veins, which remain green, and starting from the tips the blades die and usually curl upward. Purple colour builds up on stems and petioles.

A plant in a pot may lose much of its colour in a matter of weeks. You may first notice Mg symptoms at the top of the plant. The leaves in the growing shoot are lime-coloured. In extreme cases, all the leaves turn practically white, with green veins. Iron deficiency looks much the same, but a sure indication of Mg deficiency is that a good portion of the leaf blades die and curl. Treat Mg symptoms with one-half teaspoon of epsom salts to each quart of water, and water as usual. The top leaves recover their green colour within four days, and all but the most damaged should recover gradually. Continue to fertilise with epsom salts as needed until the plants are flowering well. If you are using soilless mixtures, include epsom salts regularly with the complete mixture. Because Mg deficiencies may indicate interference from other nutrients, foliar-spray with Mg to check your diagnosis if the plants are not obviously recovering.

Iron

Fe deficiency rarely occurs with indoor mixtures. Iron is naturally plentiful in most soils, and is most likely to be deficient when the soil is very acid or alkaline. Under these conditions, which sometimes occur in moist eastern soil outdoors, the iron becomes insoluble. Remedies include adjusting the Ph before planting; addition of rusty water; or driving a nail into the stem. Commercial Fe preparations are also available. If the soil is acidic, use chelated iron, which is available to the plants under acidic conditions.

Symptoms of iron deficiency are usually distinct. Symptoms appear first on the new growing shoots. The leaves are chlorotic between the veins, which remain dark green and stand out as a green network. To distinguish between Mg and Fe deficiencies, check the lower leaves for symptoms. Iron symptoms are usually most prominent on the growing shoots. Mg deficiencies will also show in the lower leaves. If many of the lower leaves have been spotting or dying, the deficiency is probably Mg. Mg deficiencies are much more common than iron deficiencies in marijuana.

Other Trace Elements

The following deficiencies are quite rare. Trace elements are needed in extremely small amounts, and often enough of them are present as impurities in fertilisers and water to allow normal growth. Many houseplant fertilisers
contain trace elements. Trace-element deficiencies are more often caused by an extreme pH than by inadequate quantities in the soil. If a deficiency is suspected, foliar-spray with the trace element to remedy deficiencies. Our experience has been that trace-element deficiencies rarely occur indoors. We advise you not to add trace elements to indoor soils, which usually contain large amounts of trace elements already because of the addition of organic matter and liming compounds. It is easy to create toxic conditions by adding trace elements. Manufacturers also recommend using amounts of trace elements that may be too high for indoor gardens; so use them at about one-fourth of the manufacturer's recommended dose if an addition is found to be necessary.

Manganese

Mn deficiency appears as chlorotic and the necrotic spots of leaf tissue between the veins. They generally appear on the younger leaves, although spots may appear over the whole plant. Manganese deficiencies are not common. Manganese is present in many all-purpose fertilisers. Mn deficiencies may occur if large amounts of Mg are present.

Boron

B deficiency may occasionally occur in outdoor soils. The symptoms appear first at the growing shoots, which die and turn brown or grey. The shoots may appear "burned," and if the condition occurs indoors, you might think the lights have burned the plant. A sure sign of boron deficiency is that, once the growing tip dies, the lateral buds will start to grow but will also die. B deficiency can be corrected by application of boric acid, which is sold as an eyewash in any drugstore. Use one-fourth teaspoon per quart of water. Recovery occurs in a few days with healthy growth of new shoots.

Molybdenum

Mb deficiency occurs in outdoor soils, but rarely indoors. Mb is readily available at neutral or alkaline pH. Mb is essential for nitrogen metabolism in the plant, and symptoms can be masked for a while when N fertilisers are being used. Usually there is a yellowing of the leaves at the middle of the plant. Fertilising with nitrogen may remedy some of the yellowing. However, Mb symptoms generally progress to the growing shoots and new leaves often are distorted or twisted. Mb is included in many all-purpose fertilisers.

Zinc

Zn-deficiency symptoms include chlorosis of leaf tissue between the veins. Chlorosis or white areas start at the leaf margins and tips. More definite symptoms are very small, new leaves which may also be twisted or curled radially. Zn deficiencies may occur in alkaline western soils. Galvanised nails can be buried or pushed into the stem. Commercial preparations of zinc are also available.

Copper

Cu deficiencies are rare; be careful not to confuse their symptoms with the symptoms of overfertilisation. The symptoms appear first on the younger leaves, which become necrotic at the tips and margins. Leaves will appear
somewhat limp, and in extreme cases the whole plant will wilt. Treat by foliar-spraying with a commercial fungicide such as CuSO₄.

9.5 Soilless Mixtures

Soilless mixtures are an alternative to using large quantities of soil. Their main advantage is complete control over the nutrients that your plants receive. Soilless mixtures are also inexpensive and easy to prepare. They have a near-neutral pH and require no pH adjustment.

Soilless mixtures are made from soil components such as vermiculite, sand, or perlite. Soilless mixtures should be blended in such a way that they hold adequate water, but also drain well and do not become soggy. A good general formula is two parts vermiculite to one part perlite. About 10 percent coarse sand or gravel can be added to give weight and stability to the pots. Instead of vermiculite, you can use Jiffy-Mix, Metro-Mix, Ortho-Mix, Pro-Mix and other commercial soilless mixtures, which are fortified with a small amount of necessary nutrients, including trace elements. You can also substitute coarse sand for perlite.

Potting

It is best to use solid containers with soilless mixtures rather than plastic bags. Grow the plants in one- to three-gallon containers. There won't be much difference in the size of the plants in one-gallon or in three-gallon sizes, but you will have to water a large plant every day in a one-gallon container. (The plants can always be transplanted to a larger container.) The pots must have drainage holes punched in the bottoms. Pot as usual, and add one tablespoon of dolomitic lime or two tablespoons of wood ash to each gallon of mixture.

Germinating

Plants may have problems germinating in soilless mixtures. The top layer of mixture often dries rapidly, and sprouts may die or not germinate. Young seedlings also seem to have difficulty absorbing certain nutrients (notably potassium), even though adequate amounts of nutrients are being added. Since this difficulty may retard growth, it is best to start the plants in small pots with soil. Use eight-ounce paper cups, tin cans, or quart milk containers cut in half. Mix three parts topsoil or potting soil to one part soilless mixture. Fill the starting pots and germinate as usual. When the plants are two to three weeks old, transplant to the soilless mixture. First moisten the soil, and then remove the soil as intact as possible. You might handle the transplant like making castles, by carefully sliding the moist soil out of the pot. Or you can cut away the sides of the container while you place the transplant in the soilless mixture. When watering, make sure you water around the stem to encourage roots to grow into the soilless mixture.

Peat pellets that expand are also good for starting seedling. Plant several seeds in each pellet, and place it in the soilless mixture after the sprouts appear.

Fertilising
Soilless mixtures can be treated with a trace-element solution. We have grown crops with no special addition of trace elements, and the plants completed their lives without showing symptoms of trace-element deficiency. In these cases there were apparently enough trace elements in the lime and the fertilisers that were used to provide the major nutrients. Many all-purpose fertilisers also contain trace elements. However, it is a good idea to treat soilless mixtures with a mild solution of trace elements before planting. Large plants can be treated a second time during the third or fourth month of growth. Do not use trace elements more often unless plants show definite trace-element deficiencies.

Iron is the only trace element that is needed in more than minute quantities. Iron can be supplied by mixing a few brads or nails into the soilless mixture.

Use any soluble fertiliser that is complete, that is, that contains some of each of the major nutrients. Choose one with a formula that is highest in N but contains a good portion of both P and K. For example, Rapid-Gro is 23-19-17 and works well for soilless mixtures.

Table 18 gives a formula that has worked well for us. The figures in it are a guide for estimating the amounts of fertiliser to use. When choosing a fertiliser by means of this chart, use N for a guide. For example, suppose the only fertiliser you can find that has good proportions of the major nutrients as a 20-15-15. Divide 5 (the figure for N in the table) by 20 (the figure for N in the fertiliser), and get the result 1/4. That is, the fertiliser if four times as concentrated in N as you need; so you would use one-fourth the amount of fertiliser shown in Table 18. For instance, during the vegetative stage, you would give the plants one-half to three-fourths of a level teaspoon of fertiliser per gallon of water each time you water.

Table 18 - Guidelines for Fertilizing Soilless Mixtures

<table>
<thead>
<tr>
<th>Growth Stage</th>
<th>N</th>
<th>P2O5</th>
<th>K2O</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1.5 to 2 tsp/gal</td>
</tr>
<tr>
<td>Vegetative</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2 to 3 tsp/gal</td>
</tr>
<tr>
<td>Flowering</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>0.5 tsp 1.5 tsp/gal</td>
</tr>
</tbody>
</table>

It is also not necessary to fertilise in these ratios. You could use a 10-10-10 fertiliser throughout growth; you would use half the amounts listed in Table 18. The most important point is that the plant receive enough of each element, not that they receive specific proportions.

Fertilising according to volume of fertiliser is not very accurate, and also does not take into account other variables (such as variety, light, temperature, etc.) that determine the amounts of nutrients your plants can use. However, it is a simple and useful way of estimating the plant's needs. You can more accurately gauge the plants' needs by giving a sample plant twice the concentration of fertiliser, and another half the concentration. Their performance will give you an idea of whether you are using too much or too little fertiliser. Too much fertiliser is the most damaging condition; so when in doubt give the plants less rather then more. Do not continue to give the plants the recommended amounts of fertiliser if the sample plant
that is receiving less nutrients is growing as well as the other plants.

Another way of monitoring the plant's growth is to grow a few plants in a standard soil mixture. This will show you whether the plants in the soilless mixture are growing as fast as they should, and will give you a reference for diagnosing deficiencies.

Besides providing N, P, K, and the trace elements, you must also give your plants secondary nutrients. Ca is added by mixing a tablespoon of lime or two tablespoons of wood ash when preparing the soilless mixture. (Calcium is usually present in water and in many fertilisers as part of the salts that contain nutrients, for example, Ca(NO3)2.) Magnesium and sulfur are both found in common epsom salts, MgSO4. Use one-eighth teaspoon of epsom salts to each teaspoon of 5 percent N. For example, if you are using a 20 percent N fertiliser, you would use half a teaspoon of MgSO4 to each teaspoon of fertiliser. (Actually, enough sulfur is often present, either as part of the soilless mixture or as part of nutrient salts to allow growth.) Magnesium can also be supplied by using dolomitic limestone.

Soilless mixtures are something between soil mixtures and water cultures (hydroponics). With hydroponics, the plants are grown in a tank of water. The fertilisers are added in solution, and the water solution is periodically circulated by a pump.

Another variation on soilless mixtures is to add a small amount of soil or humus to the soilless mixture. Some examples are:

1. 4 parts soilless mixture to 1 part soil;
2. 8 parts soilless mixture to 1 part humus;
3. 15 parts soilless mixture to 1 part limed manure.

Overfertilising is less a problem with soilless mixtures than with soil, because of higher concentrations of salts are tolerable in soilless mixtures and because excess salts are easily flushed out of the mixture. A good idea is to flush each pot once after two months of growth, again after four months. Any time the plants show symptoms of overfertilisation, leach the pots immediately. Flood each pot with plain water so that it runs out the drainage holes. Continue flooding the pots until a couple of gallons of water have run through the pot. Don't fertilise for at least a week. Then fertilise with a more dilute solution that was used before. (Figure 51a. Over fertilisation. Leaves turn bright gold and die, starting at the top of the plant.)

Chapter Ten
DISEASES AND PLANT PESTS

Plants are considered diseased when their health or development is impaired enough that the adverse effects become visible to the eye. Disease may be caused by infectious microbes, such as bacteria or viruses, by pests such as insects, or by nutritional deficiencies or imbalances. However, for diseases that might affect your plants, there should be no need for a plant doctor. You'll be able to diagnose the symptoms after careful observation.
Leaves naturally drop from plants during the course of their lives. Not every leaf will develop perfectly or so. The small leaves that are formed during the first few weeks of growth normally die within three months. Leaves at the bottom of healthy plants often die because they are shielded by the upper instance, in a garden receiving only 80 watts of fluorescent light, the plants may stay green only up to three or four feet away from the lights. Lower leaves may turn pale and yellow and then dry to gold or rust colours.

10.2 Microbial Diseases

Because Cannabis is not native to the Americas, most of the microbial diseases that attack the plant are not found in this country. Homegrown Cannabis is remarkably free of diseases caused by microbes, and there is little chance of your plants suffering from these diseases. Fungal stem and root rots seem to be the only ones of consequence. These occur only because of improper care. Watering too often, coupled with a stagnant, humid atmosphere, encourages stem rot to develop. Stem rot appears as a brown or black discolouration at the base of the stem and is soft or mushy to the touch. Allow the soil to dry between waterings, and be sure to water around the stem, not on it. Wipe as much of the fungus and soft tissue away as possibly. If the rot doesn't disappear in a few weeks, treat it with a fungicide.

10.3 Nutrient Diseases

Diseases due to nutrient deficiencies (see section 9), are common indoors, and their symptoms usually worsen with time, affecting more and more of the plant. Whole leaves may be pale, or turn yellow or white; the condition may first afflict the bottom, or top, or the entire plant at once. Deficiency symptoms often appear as spots, splotches, or areas or chlorotic (lacking green) tissue. Sometimes necrotic (dead) tissue appears that is copper, brown, or gray. However, before you search to section 9, carefully inspect the plants for any signs of plant pests.

10.4 Plant Pests

The indoor garden is an artificial habitat where the plants live in isolation from the natural world. For this reason, few of you will have any problems with plant pests. However, indoor plants are particularly susceptible to pests once contaminated. In nature, the pest populations are kept in check by their natural enemies, as well as by wind, rain, and changing temperatures. Without these natural checks, pests can run rampant through the indoor garden.

The most common and destructive pests are spider mites and whiteflies. Spider mites are barely visible to the naked eye; they are ovoid-shaped. Juvenile mites are transparent and change to green as they suck the plant's tissue. Adults are tan, black, or semitransparent. False spider mites are bright red. Mites are usually well-established before you discover them, because they are so difficult to see.

Whiteflies are white (obviously) but look like tiny moths rather than flies. The adults are about 1/16 inch long, and you may not see one unless if
flutters by the corner of your eye. Then shake the plants. If the result
looks like a small snowstorm, the plants are infested with whiteflies.
(Figure 52. Left: Spider mite (x16). Right: A match head dwarfs tiny spider
mites.)

The symptoms of infection by mites and whiteflies are similar. Symptoms
usually appear on the lower leaves and gradually spread to the top of the
plant. The first indications are that the plant loses vigour; lower leaves
droop and may look pale. Look closely at the upper surfaces of the leaves
for a white speckling against the green background. The speckles are due to
the pests sucking the plant's chlorophyll-rich tissue. With time, the leaf
loses all colour and dies.

Pests are easiest to find on the leaves that are beginning to show some
damage. You can usually see mites and whitefly larvae as tiny dots looking
up at the lights through the undersides of the leaves.

To find out which pest you have, remove some damaged leaves and inspect the
undersides under bright daylight. With spider mites, if you discover them
early, a leaf may show only one or two tiny dots (adults) and a sprinkling
of white powder (eggs) along the veins. In advanced cases, the undersides
look dusty with the spider mites' webbing, or there may be webbing at the
leaf nodes or where the leaflets meet the petioles. With whiteflies, you
usually see the adults first. On the undersides of the leaves the whitefly
larvae look like mites, but there is no webbing, and there are tiny golden
droplets of “honeydew” excreted by the adult whiteflies. (Figure 53. Mites
appear as black specks when you look up to the lights from the undersides of
the leaves. Also see Plate 14.)

Take quick action once you discover plant pests. If the plants are less than
a month old, you will probably be better off to clean out the garden, in
order to eliminate the source of the pests, and start over. As long as the
plants are healthy they can withstand most attacks. The more mature the
plants are, the less they are affected by pests. Whiteflies and mites
sometimes disappear from flowering plants, particularly the female flowers.
Mites are difficult to eliminate completely. Often a holding action will
save a good crop.

If only a few plants in your garden are infected, remove them. Or else,
remove any leaves that show damage. If the plants are three or more months
old, you might consider forcing them to flower while they are still healthy.
Plants that are good-sized and still vigorous will usually stand up well to
mites once they are flowering.

If you don't want to use insecticides, there are several alternative ways to
keep the pests in check until flowering. Mix 1/8 to 1/4 pound of pure soap
(such as Ivory flakes) thoroughly in one gallon of lukewarm water. Then
cover each pot with foil or newspaper, invert it, and dip and swish the
plant around several times in the soapy solution. Let it drip dry and rinse
with clear water. Use the dunking procedure every week or two until the
plants are larger. This is often enough to get the plants growing well and
into flowering before the pest population can become a serious problem.

Two homemade sprays that can be effective are dormant oil sprays ((See
Insects and Pests in the Outdoor Section.) and hot pepper sprays.

To make hot pepper spray, mix four hot peppers with one medium onion and one clove garlic (213). Grind or chop and mash them along with some water. Cover the mash with water and allow it to stand a day or two. Add enough water to make two quarts. Strain through a coffee filter or paper towels in a funnel. Add one-half teaspoon of detergent and spray as you would an insecticide.

No one wants to use insecticides; yet they seem to be the only way to eliminate mites. There are a number of insecticides on the market that are relatively safe. Insecticides such as pyrethrum, rotenon, and malathion are relatively non-toxic to warm-blooded animals when used as directed. These are effective against many different plant pests besides mites and whiteflies. Additionally, they break down into harmless compounds such as carbon dioxide and water in a matter of days; so they do not persist in the environment.

Safe insecticides are used for vegetables. Follow all the package precautions. Do not use more, or more often, than recommended. Overuse can kill the plant. The label will list the number of days to wait before you can safely ingest the plant, usually from two to 35 days after spraying.

Both mites and whiteflies generally complete their brief life cycles in about one to two weeks. Because sprays are not effective against the eggs, repeat the spraying about once a week for three successive weeks to completely eliminate the pests. Since their generations are short-lived, some pests may become resistant to the spray. This can be a problem with whiteflies. Try a different insecticide if the first one does not seem to be working.

Add a couple of drops of liquid detergent to each quart of insecticide solution. Detergent acts as a wetting agent and helps the insecticide to contact the pests and stick to the plant. Small plants can be dunked directly in the solution, the surest way to kill pests.

To spray the plants, start at the back of the garden so that you are working away from the plants already sprayed. Spray the entire plant and soil surfaces, paying special attention to the undersides of the leaves where pests tend to congregate. Stay out of the garden and keep the room closed that day.

Sulfur dusts can also be effective against mites and many other pests, and are safe to use. The easiest way to apply them is with a plastic "squeeze" bottle which has a tapered top. Make sure you dust the underside of the leaves.

Before using any insecticide, remove all damaged leaves. Do not use any insecticide during flowering. Rinse the plant with a clear water spray about one week after applying any insecticide, and once more before you harvest. Otherwise there may be residues left which will affect the taste of the grass.

There are several other pests that can be a problem, although they rarely seriously affect marijuana. Aphids are about 1/16 inch long and are black,
green, red, or pink. They have roundish bodies with long legs and antennae. Some species have wings. They congregate on the undersides of leaves which may then lose colour and become curled or distorted. Aphids excrete honey-dew droplets on the undersides of the leaves which can attract ants. If ants are also present, set out ant traps, because the ants will spread the aphids to other plants. A few successive washings in soapy water or one or two sprayings of the insecticides mentioned above should eliminate aphids.

Mealy bugs are white, about 3/16 of an inch long, and look like small, flat sowbugs. They don't seem to like marijuana and avoid it if other plants are present. Mealy bugs can be removed individually with cotton swabs and alcohol.

Gnats are attracted to moist soil that is rich in partially decayed organic matter such as manures. To discourage gnats when using manures, cover the top few inches in the pot with the soil mixture and no manure. Drench the soil with malathion solution for gnats or any other soil pest. Flypaper will also help against gnats as well as whiteflies.

Some people don't mind having a few pests on their plants. Whether you want to eliminate the pests completely or simply keep them in check may come down to whether you mind hearing the snap, crackle, and poop as their little bug bodies heat and explode when the harvest is smoked. Commercial marijuana, or any marijuana grown outdoors, will contain innumerable bugs and other small lifeforms.

Prevention

Whiteflies and spider mites are extremely contagious. Mites can be carried to the plant on hands, clothing, or an animal's fur. Many houseplant pests can fly or float to the garden through open windows. Mites crawl through cracks in walls and foundations during autumn, seeking warmth.

Many houseplants are popular because they can withstand abuse and infections by common plant pests. Your houseplants may harbor mites for years without your knowledge. You can find out if your houseplants have mites by placing some marijuana seedlings among the houseplants. Mites seem to enjoy young marijuana plants so much that the plants show symptoms of mites in a matter of weeks of any are nearby.

Hopefully, you'll never have to deal with pests. Prevention is the best policy. Use soil that has been pasteurised or sterilised to avoid bringing pest eggs and larvae into the garden. Keep the garden isolated from other plants. Use separate tools for the marijuana garden and for other plants. Screen windows in the garden with wire screen or mesh fabrics such as nylon.

Chapter 11
MAINTENANCE AND RESTARTING

To start a new crop, it is best to begin with a fresh soil. This is especially true if the plants were in small pots or were root-bound.
If you have fertilised regularly, the soil may contain near-toxic amounts of salts. Most of the salts build up in the top two-inch layer of soil. To salvage large quantities of soil, discard the top three-inch layer of soil from each pot. Add fresh soil and bulk fertilisers. Thoroughly mix and repot in clean containers.

It is generally not advisable to use the same soil for more than two crops. Although the used soil may not support healthy growth for potted plants, it is an excellent addition to any garden soil. Spread the soil as you would a mulch. The salt concentration is quickly diluted and benefits, rather than harms, garden soil.

Periodically clean the tubes and reflectors to remove dust and grime. As with windows, this dirt substantially decreases the amount of light the plants receive. Fluorescents lose approximately 20 to 40 percent of their original output within a year's use. Generally the higher-wattage tubes decline more rapidly than standard-output tubes. Vita-lite tubes last the longest, followed by standard fluorescents. Gro-tubes are the shortest-lived, and most growers replace them after two crops. Older tubes can be used to start seedlings and during the first month of growth. Since the plants are small and the light system is low, the old tubes generate enough light for healthy growth. Replace incandescent bulbs after 500 light hours.

PART 3: OUTDOOR

CULTIVATION

Chapter 12
CHOOSING A SITE

There are several factors to consider when deciding where to plant, including sunlight, microclimate, availability of water, and condition of the soil. But the garden's security should be your first consideration. No matter what size your garden, rip-offs and confiscation are constant threats. But these risks can be minimised by careful planning and common senses.

In some countries, law-enforcement agencies take a tolerant attitude toward small gardens, and people grow Cannabis in their backyards. In other areas, police are not as enlightened and place an emphasis on cultivation busts. In either case, the larger the garden, the greater the potential danger. {Figure 55. A Nassau Country police officer stands in a field of marijuana plants in Lattingtown, Long Island.}

In Hawaii and California, where marijuana growing has become a booming business, helicopters have been a problem for commercial growers. Aircraft outfitted with visual or infrared equipment, dogs, and finks have all been used to seek out illicit plots. Aircraft equipment is least effective on
steep slopes and where the vegetation is lush and varied. Where aircraft are a problem, growers prune marijuana to obscure its distinctive shape. The plants are difficult to detect from a distance when intercropped with bamboo, sunflowers, sugar cane, soybeans, or tall weeds (see Figure 60). Commercial growers often plant several small dispersed stands or many single plants, which are more difficult to detect and serve as insurance against total loss.

But rip-offs rather than the law are more of a problem for marijuana growers. From every section of the United States, reports confirm that marijuana theft has reached epidemic proportions, and even well-hidden plant fall prey to unscrupulous people. These lowlifes often search near hippie communities and popular planting areas. Their best ally is a loose lip; so keep your garden on a "need to know" basis.

12.2 Where to Grow

Given the value of marijuana, many people think they'll grow an acre or two. But it is much harder to find spots suitable for large-scale farming than to find small garden plots. Large gardens require more planning and commitment, and usually a remote area. They may need a lot more time, energy, and investment in materials and labor-saving machinery than smaller gardens.

A small but well-cultivated garden, say, ten by ten feet, can yield over four pounds of grass each crop. By planning realistically, you'll harvest a good stash of potent grass rather than a lot of disappointment.

Most people who grow marijuana plant it in their backyards. They hide the plants from curious neighbours and passers-by with walls, fences, arbor, or similar enclosures. Some people plant Cannabis as part of their vegetables garden, pruning the plants to make them less conspicuous.

Gardeners often use ingenious ideas to keep their gardens secret. A woman on Long Island grows over thirty large plants in containers in her drained swimming pool. Although some of the plants reach a height of 12 feet, they can't be seen over the enclosing fence.

A couple living near Nashville, Tennessee, took the roof off their three-car garage and painted the walls white to create a high-walled garden. Other growers use sheds with translucent roofs.

Guerilla Farming

Many growers feel safer planting away from their property. Should the garden be discovered, they are not in jeopardy. On the negative side, they usually lose the close contact and control that a home gardener has.

Urban gardeners use makeshift greenhouses, rooftops, vacant lots, and city dumps. Vacant lots that are overgrown with lush weeds can support a good crop, if the marijuana plants get a head start on the indigenous weeds.

Fields, forest clearings, railroad rights-of-way, stream banks, runoff and irrigation ditches, clearings beneath high-tension lines, deserted farms and quarries, overgrown fields, and abandoned houses have all been used as
garden spots. In areas where hemp is a problem weed, people plant seeds from high-potency marijuana in the same fields where the weedy hemp grows. Growers harvest the plants in late July before they flower and before the fields are watched or destroyed by law enforcers.

Larger growers often look for rough, unpopulated terrain that is accessible only by plane, helicopter, four-wheel-drive vehicles, or long hikes. They avoid areas which hunters and hikers are likely to use before harvest.

Serious growers often find unusual places to start gardens. A grow in Chico, California, hacks through two hundred yards of dense underbrush and bramble to reach his clearing. In Oregon some growers maintain fields which are a grueling eight-hour uphill hike from the nearest road. Some Florida farmers commute to their island and peninsula gardens by boats. A master gardener in Colorado lowers himself by rope to a fertile plain 50 feet below a cliff.

A farmer in Hawaii wrote, "The main concern is to grow in an undetectable place where the plants can still get enough sun. This is becoming very difficult to find and some very elaborate subterfuges have been developed. People on Maui are growing plants suspended from trees and on tree platforms! Around here some people carry small plants in buckets far out on the lava fields where there is a light shading from Ohia trees and you don't leave tracks. Also people go into the sugarcane fields, tear out some cane, and put in their plants. I am sure many other things are being done."

12.3 Light

Marijuana is a sun plant. The plants will grow in partially shaded areas, but about five hours of direct sunlight are needed for development into a lush bush. Marijuana does best when it has direct sunlight all day. If it grows at all in a heavily shaded area, it will be dwarfed and sparse - a shadow of its potential.

Try to choose a place that maximises light. Flat areas get the most sunlight, but many growers prefer to use slops and hillsides which help to hide the plants. Southern slops usually receive more sun and stronger light than eastern and western slops, which are shaded in the afternoon and morning, respectively. Northern slopes are rarely used, since they get the least sunlight and are also the coldest. Steeper slops are shaded sooner than gradual slopes, and lower areas are shaded earlier than high ones.

Sunlight at high altitudes is more intense, because of the thinner atmosphere and the usually lower pollution. The atmosphere and pollutants at lower elevations absorb and scatter some of the solar radiation.

Backyard gardeners usually compromise between the need for maximum light and the need for subterfuge. An area that gets several hours of direct sunlight and bright unobstructed daylight for the rest of the day will do well. A garden exposed to the south usually gets the strongest light and is the warmest. Overhanging vegetation should be pruned so that the plants are shaded as little as possible.

Most marijuana strains are acclimated to tropical and semitropical latitudes, where the daytime is relatively short (10 to 14 hours, depending
on season), but the sunlight is quite strong. At latitudes in the United States, the sun is not as intense (although in the summer the difference is small), but the days are longer, and the plants can grow extremely fast. It is not true that intense sunlight is needed to grow great marijuana. However, a summer characterised by clear sunny weather will usually produce a larger and slightly more potent crop than if the season is cloudy and rainy.

Sunlight can be maximised by adequate spacing and orientation of the garden. This is covered in section 14.

Chapter 13
SOIL

Of all the factors involved in growing plants, soil is the most complex. It has its own ecology, which can be modified, enriched, or destroyed; the treatment it receives can ensure crop success or failure.

There is no such thing as the perfect soil for Cannabis. Each variety can grow within a wide range of soil conditions. Your goal is garden soil within the range for healthy growth: well-drained, high in available nutrients, and with a near neutral (7.0) pH. Cannabis grows poorly, if at all, in soils which are extremely compacted, have poor drainage, and low in fertility, or have an extreme pH.

There are several soil factors that are important to a grower; these include soil type, texture, pH, and nutrient content. We will begin this chapter by discussing each of these topics in succession, and will then turn to discussion of fertilisers, soil-preparation techniques, and guerilla farming methods.

13.2 Types of Soil

Each soil has its own unique properties. These properties determine how the soil and plants will interact. For our purposes, all soils can be classified as sands, silts, clays, mucks, and loams. Actually, soils are usually a combination of these ingredients. If you look carefully at a handful of soil, you may notice sand granules, pieces of organic matter, bits of clay, and fine silty material.

Sandy Soils

Sands are formed from ground or weathered rocks such as limestone, quartz, granite, and shale. Sandy soils may drain too well. Consequently, they may have trouble holding moisture and nutrients, which leach away with heavy rain or watering. Some sandy soils are fertile because they contain significant amounts (up to two percent of organic matter, which also aids their water-holding capacity. Sandy soils are rich in potassium (K), magnesium (Mg), and trace elements, but are often too low in phosphorous (P) and especially nitrogen (N). N, which is the most soluble of the elements, is quickly leached from sandy soil. Vegetation on sands which is pale, yellowed, stunted, or scrawny indicates low nutrients, usually low N.

Sandy soils can be prepared for cultivation without much trouble. They must
be cleared of ground cover and treated with humus, manure, or other N-containing fertilisers. In dry areas, or areas with a low water table, organic matter may be worked into the soil to increase water-holding capacity as well as fertility. Sandy soil does not usually have to be turned or tilled. Roots can penetrate it easily, and only the planting row need be hoed immediately before planting. Growers can fertilise with water-soluble mixes and treat sandy soil almost like a hydroponic medium.

Sandy soils are also good candidates for a system of sheet composting (spreading layers of uncomposted vegetative matter over the garden), which allows nutrients to gradually leach into the soil layers. Sheet composting also prevents evaporation of soil water, since it functions as a mulch.

Silts

Silts are soils composed of minerals (usually quartz) and fine organic particles. To the casual eye, they look like a mucky clay when wet, and resemble dark sand or brittle clods when dry. They are the result of alluvial flooding, that is, are deposits from flooding rivers and lakes. Alluvial soils are usually found in the Midwest, in valleys, and along river plains. The Mississippi Delta is a fertile alluvial plain.

Silts hold moisture but drain well, are easy to work when moist, and are considered among the most fertile soils. They are frequently irrigated to extend the length of the growing season. Unless they have been depleted by faulty farming techniques, silts are rich in most nutrients. They often support healthy, vigorous vegetation. This indicates a good supply of N.

Mucks

Mucks are formed in areas with ample rainfall which supports dense vegetation. They are often very fertile, but may be quite acidic. They usually contain little potassium.

Mucks range from very dense to light sandy soils. The denser ones may need heavy tilling to ensure healthy root development, but the lighter ones may be cleared and planted in mounds. Mucks can support dense vegetation, and are often turned over so that the weeds thus destroyed form a green manure.

Clay Soils

Clays are composed of fine crystalline particles which have been formed by chemical reactions between minerals. Clays are sticky when wet, and can be moulded or shaped. When dry, they form hard clods or a pattern of square cracks along the surface of the ground. Clays are usually hard to work and drain poorly. Marijuana roots have a hard time penetrating clay soils unless these soils are well-tilled to loosen them up. Additions of perlite, sand, compost, gypsum, manure, and fresh clippings help to keep the soil loose. Clay soils in low-lying areas, such as stream banks, may retain too much water, which will make the plants susceptible to root and stem rots. To prevent this, some growers construct mounds about six inches to one foot high, so that the stems and tap roots remain relatively dry.

Clay soils are often very fertile. How well marijuana does in clay soils...
usually depends on how well these soils drain. In certain areas “clay” soils regularly support corn cotton. This type of soil will support a good crop of marijuana. Red colour in clay soil (red dirt) indicates good aeration and a loose soil that drains well. Blue or gray clays have poor aeration and must be loosened in order to support healthy growth.

A typical schedule for preparing a heavy clay soil In the late fall, before frost, turn soil, adding fresh soil conditioners, such as leaves, grass clippings, fresh manure, or tankage. Gypsum may also be added to loosen the soil. Spread a ground cover, such as clover, vetch, or rye. In early spring, making sure to break up the large clods, and add composts and sand if needed. At planting time, till with a hoe where the seeds are to be planted.

As the composts and green manure raise the organic level in the soil, it becomes less dense. Each year, the soil is easier to work and easier for the roots to penetrate. After a few years, you may find that you only need to turn under the cover crop. No other tilling will be needed.

Loams

Loams are a combination of about 40 percent each of sand and silt, and about 20 percent clay. Organic loams have at least 20 percent organic matter. In actuality, a soil is almost always a combination of these components, and is described in terms of that combination, e.g., sandy silt, silty clay, sandy clay, or organic silty clay. Loams range from easily worked fertile soils to densely packed sod. Loams with large amounts of organic matter can support a good marijuana crop with little modification.

13.3 Humus and Composts

Humus and composts are composed of decayed organic matter, such as plants, animal droppings, and microbes. Their nutrient contents vary according to their original ingredients, but they most certainly contain fungi and other microorganisms, insects, worms, and other life forms essential for the full conversion of nutrients. As part of their life processes, these organisms take insoluble chemicals and convert them to soluble forms, which plant roots can then absorb. Humus and composts hold water well and are often added to condition the soil. This conditioning results from the aerating properties and water-holding capacity of humus and composts, as well as balanced fertility.

Humus and composts have a rich, earthy smell, look dark brown to black, and may contain partially decayed matter, such as twigs or leaves. They are produced naturally as part of the soil’s life process or can be manufactured at the site by gathering native vegetation into piles. Composts cure in one to three months, depending on both ingredients and conditions. Decomposition can be speeded up by turning and adding substances high in N. Composts are frequently acidic and are sweetened with lime when they are piled. This also shortens curing time, since the desirable microbes prefer a neutral medium.

13.4 Texture

Soil texture refers to density, particle size, and stickiness, all of which
affect the soil's drainage and water-holding characteristics. The most important quality of the soil for marijuana is that it drains well - that is, water does not stand in pools after a rain, and the soil is not constantly wet. In a well-drained soil, the roots are in contact with air as well as water.

Cannabis does best on medium-textured soils: soils that drain well, but can hold adequate water. Loams, silts, and sands usually drain well and are loose enough to permit good root development. Some clays and most mucks are too compact to permit the lateral roots to penetrate and grow. In addition, they often drain poorly, and when dry they may form hard crusts or clods, a condition marijuana cannot tolerate.

Several simple tests will indicate the consistency and drainage qualities of your soil. Test when the soil is moist but not wet. First, dig a hole three feet deep to check the soil profile. In a typical non-desert soil, you will find a layer of decaying matter on the surface, which evolves into a layer of topsoil. Most of the nutrients available to the plant are found at this level or are leached down from it. The topsoil layer is usually the darkest. It may only be an inch thick or may extend several feet. When in good condition, the topsoil is filled with life. Healthy topsoil contains abundant worms, bugs, and other little animals, and is interlaced with roots. If you can easily penetrate the underlying topsoil with your hands, its texture is light enough for healthy root growth.

The next layer, or subsoil, may be composed of a combination of sand, clay, and small rocks, or you may hit bedrock. Sandy, rocky, and loamy subsoils present no problems as long as the topsoil is at least six inches thick. Clay or bedrock often indicates drainage problems, especially if the spot has a high water table and stays wet.

Next scrape up a handful of soil from each layer. Press each handful in your fist, release it, and poke the clump with a finger. If it breaks apart easily, it is sandy or loamy. Clods that stick together, dent, or feel sticky indicate clay or muck.

To test for drainage, fill the hole with water. Wait half an hour to let the moisture penetrate the surrounding soil; then fill the hole with water again. If the water drains right through, you are working with sandy soil. If it doesn't drain completely within 24 hours, the soil has poor drainage.

13.5 pH

The pH is a measure of how alkaline (bitter) or acid (sour) the soil is. The pH balance affects the solubility of nutrients, and helps the plant regulate metabolism and nutrient uptake. The scale for measuring pH runs from 0 to 14, with 7 assigned as neutral. A pH below 7 is acid; a pH above 7 is alkaline.

Marijuana grows in soils with a pH range from 5 to 8.5, but it thrives in nearly neutral soils. Relative to other field crops, it has high lime requirements, similar to those for red or white clover or sunflower. But it does well in fields where plants with medium lime requirements, such as corn, wheat, and peanuts, are grown.
The solubility of nutrients is affected by soil type as well as by the pH. In soils with a high content of organic matter, all nutrients are soluble between 5.0 and 6.5. Phosphorous, manganese, and boron are less soluble at pH values above 6.5. Acid soils are usually found in the United States east of the 100th meridian and along parts of the West Coast, and a deep topsoil layer. Marijuana does best in acid soils when the pH is adjusted to a range of 6.3 to 7.0. {Figure 58. Map of pH for US.}

Mineral soils in the dry western states may be slightly acid to highly alkaline. Most nutrients are very soluble in these soils, as long as the pH ranges from 6.0 to 7.5. Some of these soils are too alkaline (over 8.5); so their pH must be adjusted to near neutral to ensure healthy growth.

Adjusting the pH

First test the soil pH in the garden area. Previous gardeners may have adjusted native soils, or your yard soil may have been trucked in to cover poor native soils, so that the pH of your garden soil may be different from that of other soils in the area. Different soils vary in the amount of material needed to adjust the pH. Sandy soils do not require as much as loam, and loam requires less than clays, partly because of the chemistry, and partly because of the density and physical qualities of the soils' particles.

Adjusting Acid Soils

Acidic soils are treated with limestone, which is expressed as an equivalent of calcium carbonate (CaCO3). Limestone is usually quarried and powdered, contains large amounts of trace elements, and comes in different chemical forms: ground limestone, quicklime, and hydrated lime (which is the fastest acting form). Dolomitic limestone is high in magnesium and is often used to adjust magnesium-deficient soils, such as those found in New England. Marl (ground seashells) is also mostly lime and is used to raise soil pH. Eggshells are another source of lime. They should be powdered as finely as possible, but even so, they take a long time to affect the soil. Wood ashes are alkaline and very soluble; so they have an almost immediate effect.

Every commercial lime has a calcium carbonate equivalent or neutralising power which is listed on the package. To find out how much to use, divide the total amount of limestone required by the pH test (see Figure 59) by the calcium carbonate equivalent. For instance, a field requires fifty pounds of limestone, but the calcic limestone you are using has an equivalent of 1.78. Divide the 50 by 1.78. The resulting figure, about 29 pounds, is the amount required. Commercial limes also list the grade or particle size of the powder. In order of fineness they are: superfine, pulverised, agricultural grade, and fine meal. The finer the grade, the faster the action. {Figure 59. Approximate amount of lime required to adjust pH of a 7" layer of different types of soil.}

For best results, lime should be added at least four or five months before planting. In this way, the lime has a chance to react with the soil. But acid soils can be limed profitably and time before planting, or after, as long as the lime does not come into direct contact with the plants. Most
growers add lime at the same time that they fertilise and turn the soil. That way, tilling and conditioning are handled in one operation. The lime should be worked into the soil to a depth of ten inches. Lime can also be added by spreading it before a rain. Make sure that the soil is moist enough to absorb the rain, so that the lime does not run off. Growers who have not adjusted the pH can dissolve lime in water before they irrigate. However, this is not advised if the water runs through a hose or pump, because mineral buildup may occur in the equipment.

Adjusting Alkaline Soils

Most alkaline soils have a pH no higher than 7.5, which is within the range for optimum growth. Soils that are too alkaline can be adjusted by adding gypsum, which frees insoluble salts, and include iron, magnesium, and aluminium sulphate. Marijuana has a low tolerance for aluminium; so marijuana growers should use iron or magnesium sulphate in preference to aluminium sulphate. Sulphur and gypsum are worked into the soil in the same manner as lime.

{Table 19.}

Some growers correct alkaline soils by adding an organic mulch or by working acidic material into the soil. Cottonseed meal, which is acidic and high in nitrogen, can also be used. As it breaks down, cottonseed meal neutralises the soil. Pine needles, citrus rinds, and coffee grounds are all very acidic, and can be used to correct alkaline conditions. The addition of soluble nitrogen fertilisers aids the breakdown of these low-nitrogen additives. (See Table 22 in the section on "Fertilisers" in this section.)

Adjusting Alkali Soils

Alkali soils (pH usually above 8.5) are hardpacked and crusty, and sometimes have an accumulation of white powdery salts at the surface. They may not absorb water easily and can be extremely difficult to work. To prepare alkali soils with a permeable subsurface for cultivation, farmers leach them of their toxic accumulation of salts. The soils is thoroughly moistened so that it absorbs water. Then it is flooded so that the salts travel downward out of contact with the roots. Gypsum can be added to free some of the salts so that they leach out more easily. Gypsum can be added at the rate of 75 lbs per 100 sq.ft., or 18 tons per acre. Leaching requires enormous quantities of water, an efficient irrigation system, and several months.

{Plate 1.  Skylights are a good source of bright, unobstructed light. Thai plant (closest) and Colombian plants reached over 14 feet in six months.}

Plate 2.  Top: A hidden garden using fluorescent light, foil reflectors, and bag containers.  Plants are ten weeks old.  Bottom: Simple to construct dome greenhouse in southern California.  At two months, some of these plants are six feet tall.

Plate 4. Marijuana does well in most gardens. Top: Here a female plant is in early bloom at five months. The main stem was clipped at three months (Berkeley). Middle: Lower branches are spread out to catch the sun. Bottom: A female bud about two weeks before harvest. Leaves show some damage from leafhoppers (insects shown).

Plate 5. A giant sinsemilla cola grown from Mexican seed in northern California.

Plate 6. Top: Purple colours often appear late in life, when vigour is waning. Lower left: Resin glands glistening on a purple, female flowering shoot. Lower right: Yellow male flowers and purple leaves against a normal green leaf.

Plate 7. Top: Male flowers at different stages in development. A line of resin glands can be seen on the anthers of the open flowers. Lower left: Resin glands lining the pollen slit of an anther (x40). Middle right: Male flowers in full bloom. The leaves are covered with fallen pollen. Lower right: Gland heads may fall with the pollen grains. Mature grains are spherical in field of focus (x40).

Plate 8. Top: Resin glands on the lower (adaxial) surface of a small, fresh leaf blade. Integrals are one millimetre (x16). Middle and lower left: Stalked glands are concentrated along the veins of the lower leaf surface (x40). Lower right (x100).


Plate 10. A young female flower (homegrown Colombian). Resin glands are not yet fully developed (x16).

Plate 11. Top left: A mature female flower from the same plant is in Plate 10. The flower bract is swollen from the ripe seed it contains. Notice the well-developed resin glands (x25). Top right: A mixture of seeds from common marijuana varieties shows comparative size. Bottom: The tip of a sinsemilla flower at harvest. Notice cream-coloured stigmas to the left and the fresh, clear resin glands (x40).

Plate 12. Upper and lower left: An overly ripe sinsemilla flower bract. Many gland heads are brown or missing (top, x16; bottom, x40). Upper and lower right: Carefully handled Thai weed with intact glands. Notice the high concentration of glands and very long stalks on this bract (top, x16; bottom, x40).

Plate 13. Upper and lower left: A Colombian Gold. Gland contents are brown and stalks have deteriorated on this bract (top, x16; bottom, x40). Top right: Hawaiian; well-handled and showing little deterioration (bract x40). Middle right: Gland heads easily detach from stalks when overripe (leaf vein x40). Lower right: Stalked glands on both upper and lower leaf surfaces beginning to brown (leaf margin x40).
Another method of reclaiming alkali soils is by adding a thick mulch and letting it interact with the soil during the winter. The mulch should be about nine inches thick, or 130 lbs or more per 100 sq.ft. This thick layer neutralises the salts and also helps to retain moisture.

Nutrients

Marijuana is a high-energy plant which grows quickly to its full potential in a fertile soil that is rich in available nutrients. Nutrients are found in the soil’s parent materials: sand, clay, humus, minerals, rocks, and water. Nutrients dissolve in soil water (soil solution), which is then absorbed by the plant. In complex chemical processes, roots release ions in exchange for nutrients that are dissolved in the soil solution.

The soil acts as a reservoir for the nutrients. Most of them are in non-exchangeable forms: that is, they do not dissolve, or dissolve only slightly in water. Only a small percentage of the total reserve is free at any time as the result of chemical processes or microbial action. Healthy soils maintain a balance between free and unavailable nutrients, so that the plants they support continually receive the right amounts of required nutrients. Alkali soils have large supplies of compounds which are extremely soluble. The solution is so concentrated that alkali soils are often toxic to plants.

There are three primary nutrients, N (nitrogen), P (phosphorus), and K (potassium). These are the nutrients that gardeners are most likely to be concerned with and which most fertilisers supply. Soils are most likely to be deficient in one of these nutrients, especially N.

In addition to the primary nutrients, soil supplies plants with three secondary nutrients, Ca (calcium), Mg (magnesium), and S (sulfur), and seven micronutrients: iron, boron, chlorine, manganese, copper, zinc, and molybdenum. Although deficiencies of all the secondary and micronutrients are reported from various parts of the United States, serious deficiencies do not occur often. (For a discussion of the symptoms of nutrient deficiencies is marijuana, see section 9.)
Marijuana absorbs nutrients primarily through a fine network of lateral roots which grow from the taproot. Lateral roots may spread over an area with a diameter of five feet, and may go as deep as the roots can penetrate. Plants in deep sandy soils or in soils that have porous mineral subsoils may grow roots as deep as even seven feet. Roots which can absorb nutrients from a larger area are more likely to fulfill the plants' needs than are shallow roots which result in shallow topsoil layers over compacted subsoils. When the roots have a large area from which to absorb nutrients, the soil does not need to be as fertile as when the roots are restricted to a small area by poor soil or by being grown in pots.

You can get a good indication of soil fertility by observing the vegetation that the soil supports. If the vegetation is varied, has a lush look to it, is deep green, and looks vigorous, it is probably well-supplied with nutrients. If the plants look pale, yellowed, spindly, weak, or generally unhealthy, the soil is probably deficient in one or more nutrients.

Testing

Agricultural colleges, County Extension Agents, and private companies perform soil analyses for a small fee from a sample you mail to them. The tests include nutrient, pH, and texture analyses, and are very accurate. There are also simple-to-use test kits available at nurseries and garden shops which give a fair indication of soil fertility and pH. Test results include a suggested fertiliser and lime program catered to the soil's individual requirements for the crop to be planted. Marijuana has nutrient requirements similar to those for corn, wheat, and sugarcane, and prefers just a little more lime (a more alkaline soil) than those crops; so soil can be fertilised as it would be for those crops.

Soil tests are one indication of soil fertility. They test for available nutrients, but not for reserves that are held in the soil. Test results may also vary because of recent rainfall, changes of moisture content, and seasonal changes. Most soil tests do not measure the ability of the soil to make nutrients available. This is a very important factor when considering a fertiliser program and should not be overlooked. As an example, an uncultivated field showed only moderate amounts of N available, and indicated a need for N fertiliser. The vegetation - tall grass, weeds, and bush - had a healthy look and was dark green, and the lower leaves remained healthy. Obviously, the soil was able to supply an adequate amount of N to the plants, which withdrew it from the soil solution as it became available. The soil and plants had reached a balance, and the soil solution slowly became more dilute over the course of the season.

To a great extent, the soil's ability to maintain a constant and adequate supply of nutrients depends on the soil's humus content. Humus can support dense populations of microorganisms. As part of their life processes, microorganisms decompose organic matter in the humus. Nutrients contained in the organic matter are released by microbes as simply inorganic molecules (e.g., NO3) which can dissolve in soil water. Generally, soils with a high humus content can keep plants supplied with more nutrients than soil tests indicate.
The Primary Nutrients

If you look at any fertiliser package, you will note three numbers on the package. They stand for N-P-K, always in that order. Marijuana does best in a soil which supplies high amounts of N and medium amounts of P and K.

Nitrogen

The availability of N is the factor most likely to limit the growth of marijuana. For fast healthy growth, marijuana requires a soil rich in available N. Nitrogen is constantly being replaced in the soil solution by microbial breakdown of organic matter. Some microorganisms can use N directly from the atmosphere. They release N as waste in the form NO3, which is the primary form in which plants absorb N. A small amount of N is also dissolved in falling rainwater. When the soil is moist, it loses N through leaching and to plants. In its available form (NO3, NO2, NH4), N is very soluble and may be carried away with runoff or may drain into the subsoil.

Probably the most accurate method of measuring a soil's ability to produce N is by the percentage of organic matter in the soil (see Table 20). Organic matter releases N at a rate that is determined by the type of soil, the temperature, and the moisture. Generally, the more aerated and warmer the soil, the faster organic matter decomposes and releases N. Most professional testing services report the percentage of organic matter, and some sophisticated kits can also test for it.

In its available state, N is tested in two compounds, ammonium (NH4) and nitrate (NO3). Test results are converted into PPM (parts per million) of N and then added to arrive at the total amount of N available in the soil. The formulas to convert nitrate and ammonium to N are (NO3) * 0.226 = N, (NH4) * 0.78 = N. Each PPM indicates 10.7 pounds of N per acre available in the top 7.87 inches. If the soil level is deeper, there is probably more N available. If it is shallower, less is available. But a test for available N gives only a fair approximation of the soil's ability to feed the plant. An individual test may be untypical because of recent leaching or depletion during the growing season.

An intensively cultivated crop of hemp takes about 250 pounds of N per acre or six pounds per 1,000 square feet from the soil during the growing season. When the plants are spaced well apart, the crop does not require as much N.

Fields which have more than 200 lbs of available N per acre (or 4.5 lbs per 1,000 sq.ft.) at the start of the growing season require no additional fertilisation. Soils with less available N will probably yield a larger crop if they are given additional N. Actually, the amount of N that can profitably be used depends on the soil and its potential to produce N as well as on other factors: how fast N is lost, the soil depth, and moisture content.

One way to calculate the amount of N to add to the soil is to build your soil to an "ideal" level. For example, an Iowa silt loam may test about 1.6 pounds of N per 1,000 sq.ft. and an organic content of 3 percent. Together, the available and potential N total about 3.2 lbs per 1,000 sq.ft. To increase the available N to 4.5 per 1,000 sp.ft., you would need to add 1.3
Phosphorus

P is an important nutrient which is used directly by the soil bacteria as well as by the plant, so that an increase in the amount of P in the soil often results in an increase of N. Because of P's low solubility, it is rarely leached from the soil. It is usually found in the greatest concentration in the soil's top layers, where it accumulates as a result of decomposition of organic matter.

In slightly acid organic soil, up to one percent of the total P is available at any time. The total amounts of P in soils range from 1,000 to 10,000 lbs per acre. For example, a typical Kansas prairie soil has 3,000 lbs per acre. In soils with a lower pH, more of the P is tied up in insoluble compounds of iron or aluminium. In highly alkaline soils, the P forms insoluble compounds with calcium.

Insoluble P reacts with the dilute acids that are released during decomposition of organic matter. These compounds are available to the plants. Both the chemical processes in which P is released and the organic processes of decomposition occur faster in warm soils.

If P is available, young plants absorb it rapidly, and may take in 50 percent of their lifetime intake by the time they are only 25 percent of their adult size. Young plants grown outdoors in cold weather may grow slowly until the soil warms up and more P is available. Older plants grown out of season in cold weather sometimes exhibit purple leaves. This condition may result from a P deficiency, because of the unavailability of P at low temperatures.

Most soil-test kits test available P, but the nutrient value of P is usually expressed as phosphoric acid (P2O5), which is converted using the formulas P * 2.3 = (P2O5),(P2O5) divided by 2.3 = P. Any soil that has available P of 25 lbs per acre (0.58 lbs per 1,000 sq.ft.) or more is well-supplied with P. Stated in terms of phosphoric acid, this is 25 * 2.3 = 57.5 lbs per acre (1.33 lbs per 1,000 sq.ft.).

Most inexpensive soil kits test available P. Soil that test less than 1 PPM or 10.7 lbs per acre (0.25 lbs per 1,000 sq.ft.) of available P should be tested to make sure there are adequate reserves, or can be fertilised to assure maximum yield. Soil-test kits give only a fair indication of the P available. A low reading may indicate the plants are absorbing P as fast as it breaks down from its unavailable form, especially during early growth! The main factors affecting the rate at which P becomes available are the total amount of reserve P in the soil and the pH.

Most professional soil analyses include a report of reserve P. Generally soils with reserve P of 3,000 lbs per acre (70 lbs per 1,000 sq.ft.) do not need additional P. Intensively cultivated and cropped fields may have had their reserve supply depleted, and will lock up available P that is supplied as fertiliser until a balance is reached.

Potassium
K is found in adequate quantities in most soils which have a pH within the range needed for growing marijuana. K is held in soils in three forms: unavailable, fixed, and readily available. Most K is held in the unavailable form as part of the minerals feldspar and mica. But a small percentage of the total K in any soil is held in fixed, slightly soluble forms. Some of these can be absorbed and used directly by the plant. The exchangeable K is equal to a fraction of the fixed K. Each soil maintains a balance or ratio of unavailable to fixed and to exchangeable forms. Organic soils have a higher percentage of K in the fixed or available form than mineral soils. As K is used by the plants, some of the unavailable K goes into the more available forms. Plants can use K in both the soluble and the fixed forms.

Most clays and soils that are well-limed have adequate reserves of K. Acidic soils generally have low K reserves. Mucks, silts, and peats have low reserves of K, and have little capacity to hold it chemically when it is applied. Sands have K reserves, but little capacity to convert it to a fixed or available form. Most western soils have adequate reserves or K. The exchangeable K in soils becomes fixed if the soil dries out; so the available K of a recently dried soil is usually low.

K is tested in its elementary state, but when described as a nutrient, it is given as potash (K2O). The formulas for converting are K * 1.2 + (K2O)/(K2O) divided by 1.2 + K. Soils with 180 lbs or more of available potash per acre (4 lbs per 1,000 sp.ft.) have an adequate supply. The total reserve K should test no lower than 900 lbs per acre (21 lbs per 1,000 sq. ft.).

The Secondary Nutrients

Magnesium (Mg), calcium (Ca), and sulfur (S) are usually found in adequate quantities in soils suitable for growing marijuana. However, some New England soils do have Mg deficiencies. Soils which have a neutral or near-neutral pH almost always have adequate Ca and sulfur levels.

Magnesium deficiencies are corrected by adding 50 to 100 lbs of Mg per acre (2.25 lbs per 1,000 sq.ft.). The most inexpensive way to add Mg is to use a dolomitic limestone for adjusting soil pH. Dolomitic limestone is about 12 percent Mg (see Table 21); so 800 lbs of it are needed to supply 100 lbs of Mg. Dolomitic limestone releases Mg to the soil gradually. For faster action, epsom salts (magnesium sulfate, MgSO4) can be used. Five hundred lbs of epsom salts are required to supply soil with 100 lbs of Mg. Mg deficiencies can also be corrected by using foliar sprays. Dissolve one ounce of epsom salts in a gallon of water and spray all foliage.

{Picture The relationship between soil pH and relative plant nutrient availability. The wider the bar, the more the availability. This chart is for soil types recommended in this book.}

{Nitrogen - pH of 6.3 to 8
Phosphorus - 6.5 to 7.5
Potassium - 6.5 to 9
Sulfur - 6 to 9
Calcium - 6.7 to 8.5
Magnesium - 6.5 to 8.5
Iron - <4 to 6}
Micronutrients

Micronutrients are used by plants in minute quantities, and most soils contain enough of them to meet plant requirements. Home gardeners and guerilla farmers seldom encounter any micronutrient deficiencies. But heavily cropped lands sometimes develop a deficiency of one or more micronutrients because of crop depletion. Micronutrients are made available to the plants only if there is a delicate balance in the soil chemistry, and it is easy to create toxic conditions by adding them to soil when they are not needed. For that reason, soils should be treated with micronutrients only when symptoms occur or when the deficiency is known by analysis or past experience. Only small quantities of additives are required for treatment. Manures, composts, other organic fertilisers, lime, rock powders, and ash contain large quantities of trace elements. Active organic additives quickly release micronutrients in a form that is available to the plants.

Boron

Boron deficiencies in marijuana occur in acid soils as a result of depletion by heaving cropping. The areas most affected by it are vegetable fields in the mid-Atlantic states, alfalfa and clover fields east of the Mississippi, and truck farms and orchards in the Northwest. Boron is found in phosphate fertilisers, gypsum, and lime, and is the main ingredient of boric acid and borax. When borax or boric acid are used, they are applied at the rate 10 to 20 lbs per acre. They are used as a foliar spray at the rate of 1 ounce per gallon of water.

Chlorine

Chlorine deficiency does not normally occur. Some chemical fertilisers contain chlorine, and toxic conditions occur infrequently. Toxic chlorine conditions are eliminated by leaching.

Copper

Copper deficiencies occur infrequently in truck farms in Florida, California, and the Great Lakes region. Wood shavings and tobacco contain large amounts of copper. A foliar spray composed of 1 ounce each of calcium hydroxide and copper sulfate (a fungicide) per gallon of water is used by commercial vegetable growers.

Iron

Iron deficiencies occur in orchards west of the Mississippi and in Florida, and in alkaline soils in which iron is largely insoluble. Lowering soil pH often solves the problem. Chelated iron, which is water-soluble, is available at most nurseries and quickly supplies iron even when pH is extreme. Humus and seaweed are excellent sources of iron.
Manganese

Manganese deficiencies occur in the Atlantic states, the Great Lakes area, Utah, and Arizona. Manganese is found in manure, seaweed, and some forest leaf mould (especially hickory and white oak). Manganese deficiencies can be corrected by using a foliar spray of manganese sulfate at the rate of 0.5 to 1.0 oz. per gal. Soil is sometimes treated with manganese sulfate at the rate of 20 to 100 lbs per acre. In neutral or alkaline soils, most of the manganese sulfate becomes fixed and unavailable to the plants by the end of the growing season.

Molybdenum

Molybdenum deficiencies occur primarily along the Atlantic and Gulf coasts and in the Great Lakes region. Plants need extremely small amounts of molybdenum, less than 1 PPM in leaf and stem tissue. Molybdenum deficiencies occur when the soil is too acidic. By raising the pH level, one can make molybdenum available.

Zinc

Zinc deficiencies occur in soils throughout the U.S., primarily because of heavy cropping. It is most likely to occur in acid-leached sandy soils, and in neutral and alkaline soils where it is insoluble. In soils with high amounts of available P, zinc is also unavailable. Many deciduous tree leaves and twigs, composts, slag, and rock phosphate contain large amounts of zinc. Zinc sulfate is used as foliar spray at the rate of 3 oz. of zinc sulfate per gallon of water, or as a soil treatment at the rate of 100 lbs per acre. Some orchard growers drive galvanised nails into the trees to provide zinc.

13.6 Fertilisers

Most soils can benefit from a realistic soil-conditioning program. Most organic programs build soil, and minimise leaching and runoff. Programs using chemical fertilisers emphasise immediate increase in yield and a minimum of labor. The approach that you use should be tailored to the soil's needs and to your situation and goals. For example, a home gardener interested in building soil quality can easily add manure or compost to his garden. But a guerilla farmer may use concentrated chemical fertilisers, which are easy to transport to a remote area. A farmer cannot use the labor-intensive techniques which a small planter might use as a hobby. Many gardeners use both organic and inorganic fertilisers.

Organic Fertilisers

Organic fertilisers are usually less concentrated than chemical mixes. Their bulk consists of fibrous materials which condition the soil by aiding drainage and increasing the organic content and water-holding capacity. As they are decomposed by microbial action, the nutrients they contain are released in soluble form. Since this is a gradual process, there is little chance of creating toxic conditions.

Manures and composts are basic, all-purpose conditioners. They contain adequate amounts of most of the nutrients that marijuana absorbs from the
soil and can be used generously. Uncomposted manures are "active" and should
be used only in the fall. Over the winter they compost in the ground.
Composts and composted manures can be added in the spring. Table 22 lists
some common organic fertilisers which are usually available. Some of them,
such as bone meal and granite dust, break down slowly and are available only
after a period of time. Others are low or lacking in one or more of the
major nutrients. Organic fertilisers can be combined to provide a complete
balance.

Chemical Fertilisers

Most chemical fertilisers act quickly because all the nutrients are in
soluble form. They are usually more concentrated than organic fertilisers,
and can toxify the soil and kill the plants when they are overused.
Fertilisers come in various concentrations and ratios of nutrients. All
packaged fertilisers list the percentages of N-P-K (actually
n-(P2O5)-(K2O)). Also listed is the potential acidity or alkalinity, that
is, the number of pounds of lime or sulfur required to counteract pH changes
caused by the fertilisers. Chemical fertilisers are often incompatible with
each other; so home gardeners who use them should buy them pre-mixed or as a
complete component fertiliser set.

Solubility is a major problem with commercial fertilisers. In irrigated
areas as well as areas with rainfall during the growing season, they are
likely to be leached away; so they must often be applied several times
during the growing season. A typical program might be to fertilise at
planting and every six weeks thereafter until the beginning of flowering.
When spreading fertilisers during the growing season, do not let them come
into direct contact with the roots. An easy way to fertilise during the
growing season is to make a small trough between rows with the corner of a
hoe. Fertiliser is placed in the depression. Some new chemical formulas
release nutrients during the length of the growing season, and therefore
need only one application.

Amounts to Use

The amounts of nutrient needed per acre and per 1,000 sq.ft. are shown in
Table 23. Soils rich in one nutrient may be average or deficient in another.
To calculate the required amount of a specific fertiliser, divide the amount
of nutrient required as listed in the chart by the percentage of nutrient in
the fertiliser. For instance, to add 5 lbs of N to an area by using
bloodmeal, divide 5.00 by 0.15. The total comes to a little more than 33
lbs. Dried cow manure contains about 1.5 percent N. About 333 pounds of it
are needed to supply 5 lbs of N. Urea, a chemical fertiliser, contains 46
percent N. Only 11 pounds are required to supply 5 lbs of N.

Planning a Garden Fertiliser Program

Now let's plan some garden fertilisation programs, to help some cultivators
in three areas which have different soils and climates: New England, Kansas,
and Florida. We'll see how growers with different goals adjust their garden
soil.

New England
Most New England soils, and many soils in humid temperate areas, have a thick layer of humus which supplies N. New England soils also contain moderate amounts of P, but they are low in K.

Our first gardener has a typical New England soil in his backyard. From tests and observation he thinks his soil contains moderate amounts of N and P, but is low in K. A test indicated a pH of 5.8. He plans to start preparing his ten-foot-square plot (100 sq.ft.) in the fall, before frost. By planting time, he expects his backyard garden to have a pH of 6.7 and a balanced, fertile soil.

From Figure 59 he finds that the soil requires about 8.1 lbs of lime. He has decided to adjust the pH by using dolomitic limestone (with a calcium carbonate equivalent of 0.45) because farmers in the area sometimes complain of Mg deficiencies. Dividing 8.1 by 0.45, he finds that the soil requires 18 lbs of limestone. (Lime requirements divided by calcium carbonate equivalent equals the amount of limestone needed.)

He guesstimates that the N content of his soil rates between fair and medium, and figures the soil can use almost 0.2 lbs of N. He has decided to spread fresh manure from a nearby stable mixed with lime. In the spring he will turn this into the soil; at the same time, he will add manure composted with hay and table scraps. The fresh horse manure contains about 0.44 percent N. To find out how much manure he needs, he divides 0.2 (the amount of N required) by 0.0044. The total comes to about 45.5 lbs. (Nutrient required divided by percentage in fertiliser equals amount of fertiliser needed.) The manure also contains 0.17 percent phosphoric acid (P2O5) and 0.35 percent potash (K2O), referred to hereafter in this chapter as P and K, respectively. Multiplying 0.17 percent (0.0017) and 0.35 percent (0.0035) by 66 lbs, he finds that he has added 0.11 lbs of P and 0.23 lbs of K. (Lbs of fertiliser times percentage of nutrient in fertiliser equals amount of nutrient in fertiliser.)

BOX F

Chemical fertilisers usually supply P in the form of superphosphate or triple superphosphate. These chemicals are manufactured by mixing rock phosphate with acids. Potassium is supplied by means or muriate of potassium (K and chlorine) or sulfate or potash, which are mined in the Southwest and purified. All these chemicals are soluble and are available to the plant. But a portion of them gradually reacts with the soil and becomes fixed or unavailable. As this portion becomes unavailable, it increases the total reserve in the soil, which reaches a new balance of available to unavailable nutrients than before fertilisation.

Bone meals and rock phosphate, the most commonly used organic sources of P, and granite dust, a source of K, are not readily available, but increase the total reserve of nutrients and gradually increase the total amount of available nutrients. However, there is some time lag before these nutrients are available to the plant. They are usually
applied in large amounts, at about three times the weight calculated for fertilisers of that concentration. But one treatment lasts four years or more, because the fertilisers remain fixed in the ground until they are used. {Table 24}

From Table 23 he finds that the soil requires about five ounces of P. How many ounces of P is 0.11 lbs? He multiplies 0.11 by 16, the number of ounces in a pound, and finds that the total is about 1.75 ounces. The soil requires another 3.25 ounces. Bone meal is about 20 percent P. To supply three ounces of P, about a pound of bone meal is required. But bone meal breaks down slowly, and is therefore applied at three times the rate used for other fertilisers; so our cultivator uses 3 lbs.

Since the K content of this New England soil is poor, about 0.3 lbs of K is required. The manure has already supplied 0.2 lbs; so the soil requires another 0.1 lb. Our cultivator decides to use wood ashes from his fireplace. Wood ashes are about 7.0 percent K. He divides 0.1 by 7 percent (0.07) and finds that the soil can use at least 1.4 lbs of ashes. He adds this in the spring just before planting, because the ashes are highly soluble. Over the winter, such highly soluble nutrients would leach away or become unavailable.

Our grower knows that some of the N in the fresh manure that was added in the fall will leach away during the winter. But the manure compost that he adds in the spring will more than make up for any losses.

A New England farmer not for from the cultivator has been rotating his field from corn and marijuana to alfalfa and pasture for the past ten years. Each fall he adds 7 tons of manure per acre. Except for occasional additions of lime, no other fertilisation is necessary.

A rural New England grower has decided to plant in a remote mixed-forest area. The first 10 inches of soil is a rich compost of humus. It is full of life: insects, worms, and other creatures. The grower has decided to increase the fertility of the soil by using chemical mixes and dolomitic lime. He is cultivating in three clearings with a total area of about 1,000 sq.ft. He guesstimates that the soil is medium in N and P, but poor in K. It is also acid. He applied enough lime to correct the soil's natural acidity and the pH of the fertiliser.

Using Table 23, he decides that he should purchase a mix with a ratio of 50 parts of N, 10 parts of P (reading from the medium line), and 120 parts of K (from the poor line), that is, a ratio of 5-1-12. A local nursery sells commercial fertiliser with nutrient percentages of 10-5-25, close enough to the desired ratio. By taking the total amount of N required for a medium soil as listed in Table 23 (19 ounces), and dividing it by the N in the fertiliser (10 percent or 0.10), the rural grower finds the total amount of fertiliser required (190 ounces, or a little less than 12 lbs). The other nutrients are automatically added in the same ratio.

Kansas: A cultivator in Kansas decides to plant along a hidden stream bank. The banks are covered with lush vegetation as a result of runoff that contains soluble fertilisers used on nearby farms. The cultivator feels that additional fertilisers are not necessary, since the vegetation is so lush.
Another grower in Kansas found that her soil was very low in N and P, but high in K, typical of dry midwestern and western soils that support scrub vegetation. It had a nearly ideal pH. She started to prepare her 200 sq.ft. garden in the spring after the rain season ended. Using Table 23, she found that it required 3.5 lbs of N, 6 ounces of P, and no K. Activated sludge (5-3-0) was available at the local garden centre. To find out how much sludge her garden required, divide 3.5 by 5 percent (or 0.05). The total comes to 70 lbs.

Florida: A grower planting 500 sq.ft. on a deserted ranch in central Florida started with a very sandy soil whose pH was 4.9 because of sulphurous water in the ground. From Figure 59, she found that the soil required about 35 lbs of lime. To adjust the pH, she used 14.0 lbs of a limestone with a calcium carbonate equivalent of 2.5.

The soil had virtually no organic matter, and she was not sure she could use the same location next year; so she decided to apply soluble mixes throughout the growing season. From Table 23, she found that "poor" required 28 ounces of N, 4 ounces of P, and 24 ounces of K. A chemical fertiliser with nutrient percentages of 15-5-10 was on sale at a local discount store. To find out how much fertiliser is needed to supply 28 ounces of N, divide 28 by 15 percent (or 0.15); the result is about 186 ounces of N, or about 11.5 pounds. Since the other nutrients are supplied at the same proportions or at higher proportions than are required, no supplements are needed at planting time. But additional feedings will be required periodically during the growing season.

13.7 Techniques for Preparing Soils

Each garden situation is unique, and many factors help determine which garden techniques you should use. These include the soil's condition, the size and location of the garden, commitment, and personal preferences. Each technique affects the microecology in its own way. Home gardeners may use techniques that are impractical for a farmer or guerilla planter. But all growers have the same goal when they prepare soil for planting: to create a soil environment conducive to growing a healthy, vigorous plant.

BOX G Fertilising Cannabis Depends on the Crop

Historically, Cannabis is known to require high fertility. In a fertile soil, Cannabis can outgrow practically any annual plant. Cannabis also is a known depleter of soils. This is true particularly with marijuana, since seeds, flowers, and leaves comprise the harvest. Hence it's necessary to fertilise the plants each year. Hemp, on the other hand, comes from the Cannabis stem, and the fibre consists primarily of cellulose (C6H10O5)n. When hemp is grown, all plant parts except the fibre are returned to the soil; so the nutrients are also returned. Moderate fertilisation, if any, is all that's required for hemp farmers.

If you are already growing a vegetable garden, the chances are that your soil is in pretty good shape for growing marijuana. However, vegetable
gardens may be a little acidic, particularly east of the 100th meridian. The soil should be prepared in much the same way that it is prepared for corn cultivation, with the addition of lime to raise the pH to near neutral.

Tilling

Gardens which may not have been planted recently (in the last three or four years) require more work. It is best to begin preparing the soil in the fall, before the first frost. This can be done using a spade or shovel. The ground is lifted from a depth of six or eight inches and turned over so that the top level, with its grass and weeds, becomes the bottom layer. Large clumps are broken up with a blade or hoe. Larger areas can be turned with a power hoer or rototiller. Conditioners, such as fresh leaves, composts, mulching materials, pH adjusters, and slow-release fertilisers are added and worked into the soil, so that they begin to decompose during the winter. It is especially important to add these materials if the soil is packed, mucky, or clay-like. Soluble fertilisers should not be added in the fall, since they leach to the subsoil with heavy rains.

In the spring, as soon as the ground is workable, turn it once again. If the soil still feels packed, add more conditioners. If you are using manure or other organic materials, make sure that they are well decomposed and small clean and earthy. Fresh materials tie up the N in the soil while they cure, making this nutrient unavailable to the plants. Commercial fertilisers and readily soluble organics, such as blood meal and wood ash, are added at this time.

The ground can also be seeded with clover or other legumes. Legumes (alfalfa, clover, vetch, etc.) are plants which form little nodules along their roots. The nodules contain bacteria which live in a symbiotic relationship with the plant. As part of their life processes, these bacteria absorb gaseous nitrogen from the air and convert it into a chemical form the plant can use. During its life cycle, clover uses up most of the N, although some leaks into the surrounding soil. But when the plant, or any of its leaves, die, the contents become part of the soil. The process of growing a cover crop and turning it into the soil is sometimes called green manuring.

After the last threat of frost, at about the same time that corn is planted, the soil should be worked into rows or mounds, or be hoed. At this time, the seeds should be planted. If any concentrated fertiliser is added to the soil, it should be worked into the soil and should not come into direct contact with the seeds.

The actual amount of tilling that a given soil requires depends on soil condition. Sandy soils and light loams may need no turning, since they are already loose enough to permit the roots to penetrate. Turning may break up the soil structure, damaging its ecology. These soils are easily fertilised, by using soluble mixes or by the layering technique described below. Soils which are moderately sandy can be adjusted by "breaking" and levered or pushed, but the soil is not raised. This is done about every six inches, and can be accomplished quickly. Farmers can loosen sandy soil by disking at five or six inches.

Some gardeners mulch the soil with a layer of leaves or other materials to
protect it from winter winds and weather. This helps keep the soil warm so that it can be worked earlier in the spring. In states that border west of the 100th meridian, this helps prevent soil loss due to erosion from dry winds. Soil often drains well in these areas, and the ecology of the soil is better served when it is left unturned. At season's end, marijuana's stem base and root system are left in the ground to help hold topsoil. The next year's crop is planted a cover crop, such as clover, or alfalfa, which holds the soil and also enriches the nitrogen supply.

Layering

Layering is another method of cultivation. The theory behind this program is that in nature the soil is rarely turned, but builds up, as layer after layer of compostable material falls to the ground. This material, which contains many nutrients, gradually breaks down, creating a rich humus layer over a period of years.

The layering method speeds up the natural process. Since gardens are more intensely cultivated than wild fields, new material is required to replenish the soil nutrients. Gardeners like Ruth Stout "sheet compost," that is, they lay down layers of uncomposted material and let it decompose at the same time that it serves as a mulch. But most gardeners prefer to use material which is already composted. The compost shrinks and builds the topsoil layer about an inch for every six inches of compost. After several years, the soil level will be raised considerably, and the top layers will be an extremely rich, porous medium which never needs turning. In order to prevent a spillover of the soil, gardeners usually construct simple beds (using boards) to contain the garden areas.

Layering is most successfully used on porous soils, especially sands, which contain little organic matter. It can also be used with clay soils. However, experienced growers say that clays should be turned several times before the technique is used, or the first couple of harvests will be small.

Planting a cover crop such as clover will give the soil structure. As more compost is added, the clover is covered and the new seed planted. The clover, with its N-fixing properties, remains a permanent cover crop. When marijuana seeds are to be planted, a planting row is easily tilled with a hoe. The clover protects the soil from sun-baking and its resulting water loss, and makes it harder for weed seeds to get started.

Tilling and layering are basic methods which are used with many variations. In some ways, there almost seem to be as many gardening techniques as there are gardeners. For instance, one gardener bought three cubic yards of topsoil and a cubic yard of composted steer manure. He mixed the material and filled raised beds with it to a depth of 18 inches, and had an instant high-power garden. Another grower made compost piles in his raised troughs during the winter. By planting time, the compost was complete and filled with earthworms. The beds became warmer earlier, and he could plant sooner.

A midwestern gardener used marijuana as a companion crop in much the same way Indians used corn. In between the marijuana, she planted beans and squash. She didn't get many stringbeans and only a few squash. But she believes that the beans gave the plants extra N, especially during the first
six weeks, and the broad squash leaves protected the soil from the hot
August sun.

A gardener in Georgia had such a sticky clay soil that a shovel once got
stuck in it. He dug holes two feet deep and two feet wide with a power auger
and filled them with a fertile mix of two parts sand, one part clay, three
parts topsoil, and one part chicken manure. He claimed that his plants grew
six feet in 10 weeks. Filling holes with a rich soil mixture is popular with
guerilla farmers, who often must plant in poor native soils.

Mulching

Mulching is a labor-saving technique that many gardeners and farmers use for
a multitude of reasons. A mulch placed on the ground before fall frosts
helps the soil retain heat and protects it from winds and freezing
temperatures. In the spring the mulched soil becomes warmer earlier in the
season, and can be planted several weeks sooner than usual. A mulch cover
keeps the seedlings’ roots warm and eliminates a lot of weeding, since most
weed seedlings cannot pierce the cover.

During the summer, mulches keep the ground cooler and more moist by
absorbing and reflecting light and reducing surface evaporation. These are
important points for farmers in dry areas. The water savings can be 50
percent or more.

Any plant or animal material will do for mulch. Gardeners use hay or straw,
leaves, composts, manures, sawdust, bark, or plant clippings in two- to
six-inch layers. A barber in Palo Alto uses hair. Baled hay is inexpensive
and easy to use as a mulch. Round hay bales unroll in a long sheet that is
easy to spread over the ground, and square bales can be pulled apart into
tile-like squares.

Mulches create an ideal environment for earthworms and microorganisms which
condition and enrich the soil. These organisms require a relatively cool,
moist, dark environment. The mulch develops a dry outer crust which reflects
light, keeping the underlayers cool and moist. Materials such as leaves,
bark, and sawdust decay slowly because they do not contain enough nitrogen
to maintain dense populations of decomposing microorganisms. Manures and
composts contain more nitrogen and decay more quickly.

With few exceptions, mulches can be applied practically any time of the
year, but the best time is probably in the fall, after the crop is harvested
and before the ground has frozen. Leaves, plant clippings, and straw are
applied in a thick layer from six to ten inches deep. Hay is layered two to
six inches deep. Denser substances, such as manures and composts, should be
mixed with straw and leaves to aid decomposition. This mixture is spread in
an even layer, about two to four inches deep, over the entire surface of the
garden. If winds pose a problem by blowing the mulch away, you can cover it
with newspapers or sheets of plastic held down with rocks. If your area is
dry, give the mulch a good soaking once before frosts.

By the spring, much of the material will seem to have disappeared. But
underneath the top layer, you will find a soft-textured, earthy-smelling
humus, teeming with worms, insects and other small animals. This is a sign
of a healthy ecosystem and a fertile soil.

Some people apply mulch in the spring, placing it between rows as they sow the seeds. The mulch keeps weeds from competing with the seedlings, absorbs the sun's warmth, and releases nutrients to the soil.

In cold areas, such as Montana, New England, and Alaska, growers place black plastic sheets over the soil. These absorb the sun's heat, allowing the soil to be planted sooner. The seedlings develop quickly in the warmer soil. The plastic is removed once the seedlings are well-established.

Newspapers and white plastic can be used to decrease water loss during the summer. They also reflect light back to the plants.

One innovative grower from western Colorado placed a sheet of white plastic over her garden and cut out holes wherever she plant the seeds. Though it is quite dry where she lives, she didn't need to water the plants until late July. And she had no problems with any weeds.

Containers

Containers are another option open to grower. Plants can be grown full-size in containers which are at least five gallons (larger would be better). Fill them with high-grade topsoil, or a plating mixture as described in section 6. Planters are a convenient compromise where the soil is particularly poor or for the home gardener who does not wish to get into large-scale gardening. But remember, eight good-sized plants can yield over four pounds of grass.

Plants in pots need to be watered frequently, but require much less total water than a garden. The gardener can also move the plants. Some gardeners use this technique to maximise the amount of sun the plants get during the day, or as the sun's position changes with the season. And growers can easily induce early flowering by moving the plants to a darkened area. {Figure 61. Containers are convenient for outdoor gardens.}

Almost any large container that can withstand the weight of moist soil and which has holes for drainage is suitable. Containers which held toxic chemicals, herbicides, insecticides, or other possibly harmful substances should be avoided.

We have seen all kinds of ingeniously made containers. Some growers use old bathtubs, and others use wooden packing crates or bushel baskets. A simple wood container 18 inches wide, eight feet long, and 18 inches deep was made by a New Jersey grower, who grew six plants in it. Trash cans, plastic containers, barrels, and even rubber tyres have been used. One grower grew plants in one-cubic-foot bags of soil by cutting a five-inch-diameter hole in the top and poling holes for drainage. To assure drainage, growers sometimes fill the bottom of each container with a six-inch layer of stones or gravel; is you are planning to move such container, lightweight perlite would be more suitable.

13.8 Guerilla Farming
Guerilla growers often use the same techniques as home gardeners. But the soil that they start with is sometimes marginal, and the gardens are in remote, hard-to-get-to areas; so they modify the techniques to fit their needs. When it is impractical to carry bulky organic fertilisers to the growing site, guerilla farmers use highly concentrated commercial mixes. Compost and soil adjusters are gathered from the surrounding area, and the simplest, most light-weight tools are used. Some growers use horses or mules to carry equipment and material, and then use the animal to plough. The animals are quiet and, naturally, require no external power source. Experienced growers say that the animals can work as fast as or faster than a rototiller.

It is hard to generalise about details of guerilla farming, since much depends on the specific circumstances, which can vary greatly. For instance, a grower who plants along the fertile bank of a midwestern stream may not need to do more than pull out weeds and till the actual planting area. But a grower planting on a mountain slope may have to “build a soil,” since soil and nutrients are washed from the slopes and down to the valleys by rainfall. For this reason, we will cover several situations separately: forest; washed-out steep areas; swamps and marshes; stream banks; grasslands and fields; and arid soils.

Forest Clearings

Clearings in forests have always been popular places to plant because they offer security from detection. They vary greatly in drainage qualities, fertility, and pH. The drainage qualities of forest soils depend on the depth of the humus layer and the structure of the underlying subsoil. But most of the forest remaining in the U.S. is sloped, and water that is not absorbed by the soil runs off.

Soils are created in forests from the leaves, branches, animal droppings, etc., which accumulate on the forest floor. The first trees to grow are long-leaf pines, such as jack pines, which can grow in relatively infertile soils. Their roots penetrate deep into the subsoil to obtain some nutrients. Short-leaf pines, conifers, and firs appear as the humus accumulates, since they require a more fertile soil than long-leaf pines. Pine-forest soils vary in fertility from poor to fair, and are usually quite acidic. In the Northeast their pH may be as low as 3.5, but generally the pH ranges from 5.0 to 6.0. In order to support a high-energy, lime loving crop like marijuana, they require fertilisation and liming. Long-leaf pines sometimes grow in compacted clay soils, which also requires tilling.

As the soil evolves, deciduous trees (tree that drop their leaves each winter), such as oak and maple, may begin to grow. Deciduous forests, sometimes called broad-leaf or hardwood forests, have the best soils. These forest floors are covered with bushes, grasses, mosses, and other small plants. They have an adequate rainfall and a humus-rich soil, which is porous, holds water well, and can support a healthy marijuana crop, although additions of nitrogen fertilisers would probably spur growth. Hardwood forest soils have a pH range from 6.0 to 7.5. The soil in timbered forest land has a much smaller humus content, especially if it has been clearcut.

Mountain Soils and Washed-Out Steep Areas
Mountain slopes characteristically have little soil matter; their surface is composed largely of rocks, gravel, and sand. For longterm use they could be terraced so the newly formed soil in not washed away, but most growers are interested in more immediate results. These "soils" do not provide much of an anchor for marijuana's taproot and do not permit a network of lateral roots to form. Many of these soils also suffer from a low water table, since they drain rapidly. But there may be some sand and a bit of organic matter built up along gullies or in depressions or other natural traps. Such soil has usually had most of its nutrients leached out, but may contain some phosphates and potassium and considerable amounts of trace elements. The easiest way to adjust these soils is to use a well-balanced, slow-release, concentrated fertiliser. Bloodmeal, with its high N, works well with these soils.

One grower in the badlands of North Dakota used a timed-release 32-9-26 fertiliser in his "rock garden." He spread it just below the surface at the beginning of the growing season. Every time that it rained, his plants received nutrient-rich water. Toward the middle of the season, he noticed the lower leaves begin to pale, so he fertilised them periodically with urea. Heavy rains leach soluble fertilisers away, and in rainy areas they need to be applied three to four times during growth.

Containers can also be used in this environment. Growers use plastic bags or folded milk cartons instead of backpacking with a column of containers. When they get to the site, they fill the bags with a mixture of sand, as much as they can find, and gravel. The greater the ratio of sand to gravel, the longer the container will hold water.

One grower doublelayers heavy-duty polyethylene bags, and lines them with heavy-duty paper cement sacks or burlap bags. He fills the bag with gravel, then pours in sand and shakes it. He says that the mix is just about right when it looks like a can filled with gravel with sand in the spaces. He carries on a watering and feeding program much as he would for any hydroponic system.

Swamps, Marshes, or Bogs

These soils are very high in fibrous organic material, but are low in calcium and in available N, P, K, and Mg, which are leached from the soil or are insoluble because of the low soil pH. Since these soils are constantly wet, Cannabis roots cannot come in contact with air; as a result, the plant's growth is stunted, and the lower stem becomes susceptible to stem rot. These soils need to be adjusted to support a healthy crop of marijuana; they must be drained, fertilised, and limed. On a small scale, the easiest way to modify them is by constructing raised mounds, hills, or rows, at least one foot wide at the top and two feet high. The raised areas drain well, leaving relatively dry soil. Wood chips, chopped brush, sawdust, or perlite may be added to keep the mound light and the soil loose and aerated.

Wet soils are usually highly acid and should be limed. Once the lime interacts with the soil, nutrients which were locked up become available to the plants. Since these soils are rich in organic matter and have a high rate of microbial action after they are loosened and limes, they may need
little fertilisation.

Grasslands and Fields

These soils are usually fairly fertile and can support a worthwhile crop with little effort. They are usually well-drained, although they may be a little too dry or too wet. (If they have unusually large numbers of earthworms, they are probably a little too wet.) Their pH is usually between 5.5 and 6.5, although it may range up to 7.0. These soils are usually loams, which need only tilling in a two-foot radius, three or four inches deep, around each plant. All weeds and grass should be pulled from the area. Some growers mulch the cultivated area with newspapers, leaves, or dead grass. A grower in the Midwest adds crushed eggshells and a commercial timed-release fertiliser when he plants. He feels that this "extra boost" makes the difference between an adequate crop and a bountiful crop. Other growers periodically fertilise with soluble mixes. Some of these soils have to be irrigated during the long summer droughts. If they aren't, the plants won't die, but they will not grow to full size.

Stream Banks and Canal Ditches

These are some of the most convenient areas for growers to plant, since they provide an ample supply of water, which may contain fertiliser runoff. Stream banks are an area that marijuana naturally colonises, and the planter usually needs only to cultivate the area to be sown, and cut surrounding bush so that the young plants can compete with established plants. If the surrounding vegetation looks pale and stunted rather than lush green and vigorous, the soil should be fertilised. These soils are sometimes low in calcium, which dissolves readily in water. Lime should be added to correct for acidity.

Sometimes the ground is a little too wet early in the growing season, although it dries out later on. Planting on hills or mounds is often used to solve this problem.

Arid Areas

Soils which have a low water table and dry out by June or July need to be irrigated to grow marijuana successfully. When irrigation is not feasible, growers plant along drainage ditches, streams, and canals, or look for green spots which indicate springs or underground reservoirs. Other growers use containers to minimise water loss. One grower in Arizona dug holes two feet wide and three feet deep, and lined the sides with thin polyethylene. He said that when he watered during the summer drought, he did not lose much water to the surrounding soil.

Arid soils usually have little organic matter, and drain quickly with extensive runoff. Some of them have a subsurface layer of clay, and therefore hold water on the surface until it evaporates. In any case their texture can be improved greatly by working in organic matter. The soil should be loosened at least two feet down. This loosening allows the taproot to develop deeply so that it can reach underground water during the drought.

Arid soils more often drain well, are alkaline, and contain P, K, and trace
elements, but are low in N. Fish meal, cottonseed meal, blood meal, or manure may be the only additive the soil needs.

Chapter 14
PLANTING AND TRANSPLANTING

After the soil is adjusted, you are ready to prepare it for planting the seed. Sowing is an important process, since the post-germination or seedling stage is the most critical for Cannabis. You can increase the seedlings' chance of survival by sowing the seeds properly.

14.2 When to Plant

Most hemp-growing manuals advise that the seeds should be planted about two weeks after the last threat of frost, which is the same time that corn is planted. As a rule of thumb, you need not plant until this time in areas that have a growing season of five months or more. These areas include most of the United States, except for Zone One (see Figure 62) and mountainous areas of the country.

Growers in northern areas report that plants have survived light evening frosts with little or no damage. We think of marijuana as a tropical plant, experiencing no chills in its native climes. But the mountainous areas of marijuana cultivation in Mexico and Colombia often have frosts during the growing season. One grower, describing spring (April) conditions in Nebraska, reported "plants (from tropical seed) three and four inches tall were covered with snow in the evening. By midafternoon all the snow had melted, and those little sprouts were healthy as could be."

Early-season sprouts do face more risks than later-germinating plants do. A lingering freeze or chill can weaken or kill them. Sometimes seeds or seedlings get washed away by heavy rains or flooding, or become infected from wet soil. They are also prey to hungry herbivores, who savour the tender young shoots, especially in the early spring, before the native plants have sprouted. These predators include rabbits, groundhogs, rats, mice, and possibly squirrels and cats, as well as large animals, such as deer, cattle, and sheep. Birds frequently eat the seeds and young shoots, especially if the ground looks planted. Snails and insects, such as cutworms and leafhoppers, also eat seedlings. Don't let this impressive list of dangers dim your enthusiasm. Although these problems do occur, they can be controlled or prevented with a little but of planning (see section 16).

As you can see in the Spring Thaw map (Figure 62), the last date of expected frost varies from early February in parts of Florida, Louisiana, Texas, California, and Nevada to mid-June in the coldest regions of New England and the Midwest. Planting time varies locally, as well as regionally. Fields which receive direct sun warm faster than partially shaded ones. Fields covered with a layer of compost or fresh manure, or with black plastic sheets, retain more heat and are ready to plant sooner than other fields. Mountainous areas often vary considerably in planting time. Higher ground usually stays cold longer than low-lying areas. Since soil is dark, it heats
quickly when exposed to sunlight. Soil is usually warmer in the late afternoon.

The time that the soil warms also depends on the weather. During severe winters, a deeper layer of soil becomes frozen than during mild winters; so it will take longer to thaw. Soil below this layer is insulated by the ice and remains unfrozen. Spring weather, rainfall, flooding, and cloud cover also affect the soil's temperature.

Actually, the only way to know whether or not a field is ready to plant is to feel it and look at it. Examine the soil in early morning. It should be easy to work, rather than hardened from ice. There should be no large frozen clods of soil or other organic matter. There should also be no fine crystalline ice particles which glimmer in sunlight.

For fall harvest, sow outdoors after March 21, the first day of spring and the turn of the Equinox, when there are equal lengths of sun-up and sun-down. There are an additional 20 to 30 minutes of light before dawn and after sunset, for a total of 13 hours of daylight. When plants are started earlier, they may flower prematurely because of the short days. The plants may also be subject to sex reversal, and more males may develop.

There is little advantage to starting Cannabis before April. Each plant has a certain genetically defined potential for growth and size. As long as the plants have enough time to grow and develop, usually five or six months, this potential is realised (some Colombian and Asian varieties may need longer to develop). Plants started before spring grow no larger in size than plants started during April. The younger plants are virtually indistinguishable from the older ones by harvest, and plants which are started earlier face more risks of detection and destruction. (Figure 63. Average date of earliest expected fall frosts for the US. Information about Australia can be found in an Atlas.)

However, if you are faced with a short growing season, you can get a head start by germinating the seeds a week to six weeks before the local planting time, and transplanting the seedlings outdoors at about the same time seeds would be planted in your area. You can also hasten planting time by covering the area to be sown or planted with a clear (or black) plastic sheet, which will warm the ground by the greenhouse effect.

14.3 Preparing to Sow

Growers sue three basic techniques to sow marijuana: rows, hills, and broadcast. Each method is suitable within a certain range of conditions and has its own advantages and disadvantages.

Rows

Rows are convenient to use, especially for large areas. They are constructed easily using a how, plough, or tiller.

Rows facilitate the care of gardens and fields by setting up an organised space in which the plants and surrounding area can be reached easily by the gardener. Weeding, watering, thinning, pruning, and harvesting can be
accomplished very quickly. Larger fields are planted in roes to accommodate ploughs, planters, and cultivators. They are essential when fields are flood-irrigated. Furthermore, they provide a way to use space in the most efficient possible manner. But rows make detection easier, since they have an orderliness that plants do not exhibit in nature.

On sloping and hilly ground rows are a major factor in soil conservation: such soil is easily carried away in windstorms and in the runoff after rain. For this reason, rows on hilly and sloping ground are contoured: curved to run perpendicular to the slope.

Space rows two to six feet apart; plant seeds every four to eight inches ((In any description of planting which we give, we refer to 100 percent viable seeds. In this case, for example, if seeds are tested (see section 3) and have a viability of 50 percent, sow the seeds two to four inches apart. If they have a viability of 33 percent, sow them one to two inches apart.)) (See Box H.)

To construct a row, break up any large clods on the surface of the soil. In a garden-size area this is easily done by striking them with the tongs of a rake. In larger areas a tiller or externally powered cultivator can be used. Then level the soil.

If you need to irrigate or have problems with excessive moisture, use a hoe to raise the soil in alternate rows of hills and trenches. Pat the crests of the hills with the hoe or a shovel so that they are an inch or wider at the top, and four to eight inches high than the trenches.

BOX H Plant Size and Spacing

Plants vary tremendously in size and branching habits because of many factors, including variety, soil fertility, length of growing season, amount of light received by the plant, water, spacing, and pruning. As a result, one can have no firm rule about how far apart plants should be spaced.

An individual full-grown plant may have a diameter at its base as wide as ten feet or as small as 18 inches. Most conical-shaped varieties (Colombian and Jamaican) grow between seven and 12 feet tall, and have a width between four and six feet. Mexican plants are somewhat taller and thinner, with a base diameter of three to five feet. Some exotic Indian, Central Asian, and Central African plants may have a diameter only one or two feet across. The descriptions are generalisations; there are many varieties within each country, and much variation within each variety.

Pruned plants have a much wider base than unpruned ones. Plants pruned at the fourth internode and again a month later sometimes grow twice as wide as an unpruned plant.

In order to catch as much sun as possible, rows should be orientated along a north-south axis, perpendicular to the course of the sun. The advantage of lush rows is more pronounced in southern than northern latitudes, but the solar-energy differential in north-south versus east-west rows is significant at all latitudes in the United States, and becomes more important on steep slops. Another factor is the orientation of the garden as
Plants sown in a square plot whose sides point northeast and southeast get about 10 percent more light than ones in a plot whose sides point due north and due east.

Hills

Hills and mounds are especially convenient for small plots. Low hills are often camouflaged to look like natural or wild stands, and are very useful in areas in which the land is too wet in the spring, because the hills drain above the ground level. They are easily adapted to meet unusual requirements. For example, a grower in New Mexico planted a doughnut-shaped hill eight feet in diameter and two feet thick, leaving a centre hole four feet in diameter. He placed a portable plastic tub in the hole after punching pinholes around the edges. To water he just filled the tub. In the swampy Everglades, two industrious farmers constructed a giant hill-row three feet thick and three feet high. The hill had such a good drainage that it kept the plant roots well-drained even during the rainy season.

Hills are usually constructed between two and five feet in diameter. Small hills are usually planted with 15 to 20 seeds, and large ones may be sown with as many as a hundred. The hills are spaced three to 10 feet apart, so that each groups of plants gets a maximum amount of light. Hills can grow more than you would at first suspect. For instance, if you were to grow a hill three by three feet, you could harvest six to nine large plants. Their foliage would extend two and a half feet beyond the hill, for a total of about thirty square feet of foliage space.

Broadcast Seeding

Broadcast seeding is the fastest and easiest way to sow, but is not an efficient way to use seed. Seeds are simply tossed or shaken onto the prepared ground, at the rate of about forty per square foot, and are then usually pressed into the soil with a light roller or by foot. This method is most effective in moist soils. Many of the seeds never germinate or die immediately after germination. The faster growing ones naturally stunt the others by shading them. This method is often used by guerilla farmers who want the stands to look natural and who wish to plant large areas quickly. An experienced grower can sow several acres a day by hand using this method.

Seed Count

There are approximately 2,300 medium-sized seeds in an ounce, or about 85 per gram. An acre is about 43,000 sq. ft., or a square 208 feet on side. To plant an acre in rows two feet apart with a seed every four inches requires about 90,000 seeds or 39 ounces (1,100 grams, or two pounds, seven ounces). At this rate, a ten-by-ten plot requires about 2.5 grams of seed.

A typical hill field has four-foot-wide hills spaced about seven feet apart. A typical hill and surrounding area accounts for approximately 100 square feet. There are approximately 430 hills in an acre. If each of these is planted with 100 seeds, the field requires about 43,000 seeds, which weigh about 18 ounces.

Broadcasting requires a lot more seed. At the rate of 40 seeds per square
foot, a grower uses about 2.3 ounces in a ten-by-ten plot. An acre requires about 47 pounds, or 21 kilograms of seed.

How to Plant

Finally, after the soil is adjusted, and the rows or hills are built, it is time to actually plant the seeds and watch your garden begin to grow. If you are growing with clover as a cover or companion plant, dig it up to a depth of four inches and chop up the soil. Water the soil to the point that it feels almost wet. Drill a hole with a seed drill, stick, or pencil, then drop one seed into the hole, cover it gently, and pat the soil down again. Marijuana seeds are large enough to handle individually; so each one can be planted separately.

How deep one digs the holes depends on the kind of soil in which one is planting. Light woody or organic soils are planted 1/2 to 3/4 inch deep, so that the stem is held firmly in an upright position. Sands and light loams are planted 1/2 inch deep. Heavy loams and clay are planted 1/4 to 1/2 inch deep, so that the sprout's energy is not expended before it breaks through the soil.

If you are broadcast seeding, you can increase the germination rate tremendously by screening a layer of soil over the seeds to help keep them moist. Seeds that dry out weaken or die.

In a garden that has been mulched, lift away the mulch cover at each place you plant, and sow the seed in the underlying soil.

In soft-textured soils, instead of digging or poking holes, press each seed to the desired depth, and cover or pat the soil smooth.

14.4 Germination

The seeds need constant moisture in order to germinate. Therefore, the ground should be well-watered. Keep the soil moist by watering it with a light spray whenever it begin to feel dry. This may mean watering the immediate area once a day. You can keep the soil moist and hasten germination by covering the planted area with transparent glass or plastic. Most of the seeds should sprout in a period ranging from three days to two weeks. This variation depends on variety, age and condition of seed, and soil temperature; the warmer the soil, the faster the rate of germination.

Once they have germinated, the seedlings should be kept moist until the roots grow deep enough to absorb an adequate supply of water from the subsoil. If the ground is still moist from spring rains, as it is in many of the eastern regions, you may not have to water at all. On the other hand, there are sections of the West which are completely dependent on irrigation.

When the seedlings are only an inch or two tall, you can protect them from heavy rains or frosts by using drinking glasses, jars, or paper or plastic cups. You can protect larger plants with containers from which the bottoms have been removed. Transparent containers warm the soil by the greenhouse effect, capturing light and turning it into heat. In warm weather, use white or translucent containers, which prevent burn by reflecting some light and
diffusing the rest. Containers also keep the soil moist, serve as plant markers, and protect the plants from some enemies. A grower in Berkeley, California, used cracked fish tanks to protect plants in the early spring. A guerilla farmer in the Poconos puts up four posts, one at each end of a row. She uses them as a frame for clear polyethylene covering, creating a small greenhouse.

Growers in Zone Five sometimes harvest a spring crop by transplanting indoor-grown, two-month-old plants outdoors right after the last frost date. The naturally short days and long nights trigger the plants into flowering. (See Transplanting below, and the discussion of the photoperiod in section 3.)

If started after May 15, marijuana may not have time to reach its full size or flower. This problem mainly affects growers in Zone One and in mountainous areas. But even if the plants do not grow to full size or flower, you can still harvest a potent crop of preflowering tops, which may be almost as potent as ripe buds. The harvest is not as large as a crop of buds, but it is more than worth the effort.

14.5 Transplanting

Seedlings and young plants are transplanted after the last threat of frost. If the growing season in your area is less than five months, you may want to start the plants indoors, or in cold frames, transplanting when the weather permits. A 10-by-four foot cold frame can easily hold 60 two-month-old plants. The cold frame can be constructed with two-by-two's or branches gathered at the site. Cover the frame with a double layer of six- or eight-mil polyethylene plastic or similar material. Attach the plastic to the frame with tacks or staple-gun tacks. If the area is unprotected from the elements, slant the roof so that rain will run off. If the area is windy, place rocks or branches along the frame to add weight. Orient the cold frame to face the south.

In areas with a growing season of six months or more, plants will not necessarily get larger if they are started earlier than normal. Plants started at normal planting time catch up to the older plants by season's end. It serves no purpose to start plants before about March 21, the spring equinox.

Where there is no threat of frost (in Hawaii, southern Florida, and parts of Texas, Louisiana, and California), growers can raise a winter crop. Grow the plants for two or three months under artificial light. Plant get off to a faster start under artificial lights than natural light during the winter months. Move or transplant them before the beginning of March. Most strains will flower because of the short days (less than 12 hours of light) and fill out to well formed plants by the end of May when they are ripe.

For the normal summer crop, seedlings should be transplanted after the last threat of frost. The best time to transplant is on a rainy or cloudy day, which allows the plants to adjust to the new environment without the strain of intense sunlight. Plants grown in a cold frame or sunny window adjust more easily than plants grown under fluorescent lights. Plants grown under artificial light usually show evidence of shock when they are moved to
sunlight. Near sea level they may lose some of their green colour and appear pale or yellowed. At high altitudes, such as mile-high Denver, the leaves may actually burn, turn brown, and fall. Healthy plants usually recover quickly by adjusting the new growth to the changed conditions. However, plant can be conditioned to the new environment by being placed in a partially sunny area, preferably where they are shaded during the middle of the day and receive either morning or late-afternoon sunlight. The plants need about a week to adjust.

Seedlings grown in planting pellets for up to 10 days after germination can be placed directly in the soil. Peat pots should be scored with a knife so that the lateral roots can penetrate the pot more easily. Seedlings started in milk cartons or flower pots should be removed from the container so that the roots are disturbed as little as possible. Plan on using a pot size which is root-bound by the time that you transplant. (For the relationship between pot size and number of weeks, see Table 17.) To transplant, water the area to be transplanted and the plant. Then dig a hole a bit larger than the pot and loosen the surrounding and underlying soil. Place the plant in the hole, and pack the soil so that the stem base is at the same depth that it was growing at before. Firm the soil and water the area.

In areas where ripoffs are expected, such as parts of Hawaii and California, some guerilla farmers transplant individual plants (one to each site) to sites which are widely spaced over the countryside. In this way they may lose some, but at least not all, of their plants to ripoffs.

Each plant (one to three months old) is transplanted to a cone-shaped hole, two to three feet deep by two feet across the top. This strategy is well-suited to areas with poor soil. Since much of the hole is taken up by rootbound soil, it is easy to gather enough topsoil and sand to fill the hole. The gathered soil should also be mixed with organic or slow-release fertilisers which provide ample N and P.

Chapter 15
CARING FOR THE GROWING PLANTS

15.2 Weeding

Marijuana is a fast-growing annual whose survival depends on its ability to compete with other fast-growing weeds. At the end of each season, plants growing in a wild stand may cover the ground with thousands of seeds per square foot. Many of these are relocated by wind, runoff, and birds, and some are destroyed or die. Other never receive the conditions they need to germinate; and of those that do germinate, many die as seedling. The remaining plants compete with each other and with other weeds for the available light, nutrients, and water. Even so, wild stands may be as dense as forty plants per square foot. In order to survive the competition, Cannabis expends a great deal of its energy during the first two month growing a main shoot which is taller than the surrounding vegetation. Then it develops lateral branches which shades the shorter plants. With their source of energy - light - cut off, the shaded plants stop growing and often die.
When you cultivate - that is, eliminate weeds - the rate of germination and survival of your plants is increased enormously. Growers using clover, sheet composting, or mulch as ground cover can expect very little interference from weeds during seedling development. But plots of fertile, aerated, and cleared soil are open to colonisation by a wide range of plants; so you may have to weed several times before the marijuana's dominance is assured.

When you weed, make sure not to pull out any weed seedlings which may have roots in the same area as the Cannabis roots. Instead, cut the weeds slightly below the surface with a cliperr, scissors, or your fingernails. Weeds more than six inches away can be safely pulled. Leave them to dry right on the soil. As they dry and decay, they return the soil's nutrient to it.

Growers plagued with weeds can cover the soil with mulch, paper, or polyethylene sheets. One grower found that two computer sheets fit exactly between the rows. Another used torn drapes as a temporary ground cover.

Once Cannabis has established dominance over an area, the other weeds are not able to interfere with its growth. But if there is wide spacing between the plants, the weeds may have open space and start to grow rapidly. Keep these weeds clipped short if water or nutrients are scarce.

15.3 Watering

Marijuana requires an ample supply of water to live and grow. The actual quantities that it needs depend on the plant's size, the gardening techniques, type of soil, temperature, wind, humidity, and intensity of light. A vigorous plant may transpire several gallons of water a day during the hot summer months. If it receives less water then it need, it stops growing, wilts, and then dries out. {Figure 66 Areas with less than 30 inches of rain usually require some irrigation.}

Seedlings

Marijuana germinates best in a moist soil. Within a week, it grows a taproot three or four inches long. By the end of the first month, the root system may stretch over an area a foot and a half in diameter and go more than one foot down. Until then, the soil should not be allowed to dry out. Plants which have germinated during warm, sunny weather may need to be watered until the roots have grown deep enough to reach sub-soil moisture. When the soil three inches below the surface feels dry, seedlings should be watered, preferably by using a watering can or the spray setting on a hose. Gently water the soil, making sure not to disturb the seedlings or the soil surrounding. The soil should be thoroughly saturated so the moisture percolates down, encouraging the roots to grow deep. If the surface is only lightly watered, the roots may grow near the surface, leading to water problems as the soil gets drier during the summer.

After the first month, Cannabis does best when the soil goes through alternating moist and dry periods. This alternation allows the lateral roots to come into contact with air. By the end of the growing season, the root system may penetrate the soil to a depth of six feet or more. As long as
they are not blocked by solid rock or dense clay, the roots grow by following a trail of moisture. If the trail leads deep, the roots follow. The deeper layers of soil are less likely to dry out during hot, dry weather.

Older Plants

As a rule of thumb, Cannabis over a month old should be watered when the soil about six inches deep feels dry. But this rule provides only a rough indication that the plants need water, because there may be deeper sources of water that are not apparent. The most obvious indication of a problem is wilting. A more subtle one is slow growth during the (ordinarily fast-growing) vegetative stage.

Since you want to wet the lower layers, you should thoroughly saturate the soil. If the soil is completely saturated, it should hold water for a minimum of a week. Usually only two or three waterings a month are required by a garden that is completely dependent on irrigation.

The most efficient way to water is to let the water slowly seep into the soil, so that all the organic particles which hold the water are saturated. If the soil is very dry, and the water beads or runs off and is not absorbed, add household laundry detergent at the rate of one or two grams per gallon of water. It acts as a wetting agent, which breaks the surface tension. Once the soil is treated with a wetting agent, it usually absorbs water throughout the growing season.

In drier areas where corn, cotton, and other deep-rooted crops are irrigated, marijuana also requires an additional source of water. But in areas where there are patches of wild hemp or where deep-rooted crops grow by using available ground water, marijuana does not need to be watered, although additional water may increase its growth.

Box I

Water in General

Deep soil layers retain water much longer than the top layers. To encourage the development of a deep root system, saturate the ground when you water. The roots follow the moisture trail.

Water conditions also vary from field to field. For instance, many midwestern farmers plant along the banks of meandering streams. Even in dry areas, these plants have a natural source of water. Mountainous areas are usually well-drained and dry out before valleys do. Low-lying fields remain moist later, and are saturated by runoff from higher ground. In browned areas, farmers look for green spots which indicate underground streams, springs or runoff. Planters look for deserted wells or active watermains with leaks. Fields high in organic matter retain moisture longer than other fields, and mulching may cut water evaporation by 50 percent.

Watering Techniques

Gardeners may supply water by using a bucket, can, or water-hose. But growers with larger plots often rely on waterpumps to deliver river, lake,
or well water to their gardens. Irrigation canals, drainage pipes and ditches, and water mains are sometimes convenient sources of water. The two most efficient methods of watering are the drip hose, which seeps water around the plant, and hand watering into an enclosed area around the plant's stem.

There are several kinds of drip hoses. Some have perforations every three to six inches along their length. These are useful when marijuana is planted in rows or large hills. Another kind is actually a kit, consisting of a main feeder hose and several side hoses two to four feet long. Each side hose has a metal bulb at the end which can be adjusted to regulate water flow. The bulb lies near the plant stem. A drip bottle was invented by a grower in the dry area of Nebraska who was only growing a few plants. He punched pinholes in the bottom of several one-gallon milk jugs and placed a jug near each plant. The jugs slowly watered the garden. Every few days, he refilled the jugs from a nearby irrigation ditch. As the plants grew larger, he placed more jugs around them. The drip method moistens the soil slowly, but does not flood it; so the soil and its nutrients are not washed away. Since this method allows you to decide exactly where the water goes you need not waste any on non-productive land.

Growers sometimes use elaborate setups, such as battery-electric, hand- or foot-powered, ram- or windmill-driven pumps. Foot-powered pumps are probably the most convenient for small plots. They are extremely lightweight (just a little heavier than a bicycle), inexpensive, easy to construct and disassemble, and virtually silent. Since you have much more power in your legs than in your arms, foot-powered pumps do more work, and do it faster, than hand-powered pumps.

Electric pumps are relatively quiet and pump and enormous amount for their small size. But they require a source of electricity. They cannot be used unless there is a power line available, although there are car alternators available which produce 110-volt current.

Gasoline pumps and electric generators are heavy and noisy. Even with a muffler, they can be heard for miles in some country areas. They require a source of fuel, and often an elaborate setup, including rigid feed tubing, fuel tank, and platform. But once they are in place, the can deliver a tremendous amount of water. They are usually used by farmers growing large plots. Sometimes growers dig a hole in which they store and run the equipment. This setup helps muffle the sound and keeps the machinery in good working order.

Ram- and windmill-powered pumps use running-water and wind energy, respectively. They come in many sizes and are often used to fill water tanks for later use. They can also be used to generate electricity to run electric pumps. They require no fuel, are usually silent, and can be constructed inexpensively.

But some farmers have devised other methods for getting water to their plants.

A farmer growing near Tucson, Arizona, trucks water to her plants twice a week using a pickup truck and four 55-gallon barrels. She attaches a garden
hose to her tanks, and siphons the water to her garden, 200 feet downhill.

Two foresighted farmers in Texas carried twenty 30-gallon plastic trash cans and lids to their garden. During the spring rains, they filled the containers from nearby gullies. By the end of the rainy season, the had collected enough water to carry them through the summer drought.

A homesteader in Oregon's dry eastern section dammed a gully by using and earth stabiliser, plastic, wood and cement, and pipe. During the winter his private reservoir filled.

Farmers near Atlanta tapped into a city water main. The pressure from the water main allowed them to pipe water uphill.

15.4 Thinning

If the soil is kept moist during germination, most of the viable seeds that you planted will germinate and the seedlings will soon start to crowd each other. This happens frequently when the plants grow on their own. Then they grow into a dense hedge-like mass dominated by a few plant. The dominant plants typically have long internodes and a long sturdy stem with little branching. The shorter, bushier plants are shaded by the taller ones and become stunted from the lack of light. By thinning, you give the plants that are left enough room to grow to their full potential, and you choose the ones that you think will grow to be the best for smoking. Leave the plants that have dense foliage, are branching, and, later in the season, the ones that are the most potent.

Thin the plants as soon as they begin to touch or crowd each other. This should be repeated as often as necessary. Seeds sown six inches apart in rows two feet wide require thinning several times during the season. But guerilla farmers sometimes let the plants compete so that the garden looks more like a wild stand.

There are two methods used to thin: cutting the stem at the base so that the entire plant is destroyed, and cutting just the tops so that the plant's growth is thwarted, and the uncut plants shade it. The cut plants remain relatively inactive, and do not use much water or nutrients, but they do shade the ground and use otherwise wasted space.

15.5 Staking

Outdoor-grown plants rarely need staking. When the stem bends from the wind or rain, tiny tears in the structure develop. These are quickly mended by the plant: it grows new cells which increase the girth of the stem and make it stronger. But plants which are suffering from nutrient deficiencies or are top-heavy because of competition may need to be staked. Heavy rain sometimes cause the plants to fall over, especially if they have shallow root systems which cannot hold the added weight.

To stake, drive a sturdy rod six inches from the stem and deep enough into the ground to be able to give the plant support. Then tie the stem to the stake with wirer twists or string.
If the stem or the branch is cracked, pinched, or bent at the base, its position should be corrected and held firmly with a splint. The splint can be held with masking tape. In a few days the plant grows tissue to support the damaged area.

15.6 Pruning

Growers prune (clip or top) their plants to increase productivity, prevent detection, or to harvest early smoke. In the near future, new laws will decriminalise or legalise marijuana cultivation. These laws will probably limit legal cultivation either by the total gardening area or by the number of plants an individual or group may cultivate. Gardeners limited by space will maximise yield by cultivating a dense stand of tall, unclipped marijuana. Growers permitted to grow only a few plants will grow the largest, most productive plants possible. This is done by giving the plants the best possible growing conditions and a lot of space between plants to maximise light and minimise competition for water and nutrients.

Unpruned marijuana develops in one of three classic shapes, depending on variety. Many Mexican and Thai varieties develop into a tall, narrow bush no wider than three feet and shaped like a poplar tree. Colombian, Cambodian, Indian, and some south Mexican and Vietnamese varieties are Christmas-tree shaped. Some Moroccan and Afghani varieties have complex branching and naturally grow into small, dense bushes, about five feet tall. Marijuana usually grows to its full height by early September. Most of the marijuana plants you are likely to cultivate will grow to between eight and fifteen feet tall. Some Hawaiian and Thai varieties average between twelve and twenty feet tall.

Increasing Yield

When marijuana is clipped to increase the number of growing shoots, the total yield at season's end may not be increased. Provided that soil and water are not limiting to growth, each plant can reach a maximum size when given enough room. The more surface area the plant presents to light, the closer it will get to its maximum potential. Where the plants are grown with much space between them, clipped plants can yield more than unclipped plants, especially if the branches are spread out to maximise the light on the plant. When the plants are grown close together, the taller a plant is, the more sunlight it will receive, and hence the larger the possible yield.

Some growers prefer to harvest a top stem that is thick with buds (colas). The largest colas form on the main growing shoot of unclipped plants. When the growing shoot is clipped from a plant, the new shoots and leaves grow slower and smaller than the main shoot of an unpruned plant because the capacity for growth is spread out over several shoots. When a plant is clipped early in the season, most of the difference in lead and bud size is made up by harvest time.

Marijuana can be pruned at any time during the seedling or vegetative growth stage, but you should prune plants when they are young if you plan on harvesting growing shoots during the season. A seedling clipped anywhere from the fourth to sixth node will usually form at least six strong growing shoots that can be harvested during the third or fourth month. If these
shoots are cut again while the plant is still young, marijuana often develops into a small, very compact, hedge-like bush.

Yield can be increased by spreading the plant's branches so that more light reaches the inner growth. Cannabis stems are bent most easily when they are still green and fleshy, nearer to the new growth, but the whole plant can be bent to form a gentle arch with the top of the main stem in a horizontal position. Within a few days the side branches along the top will begin to grow vertically, competing with the main stem. They will soon develop their own horizontal side branches. To bend a plant, tie the main stem loosely with a cloth or heavy string. Tie the other end of string to a heavy weight or anchor on the ground. Don't put too much pressure on the stem as this tears some of the roots and weakens the plant. You can bend the plant a little each day until the plant is in the desired position.

You may also increase yield by bending only the growing tip. This encourages the side branches to develop sooner than they naturally would. Only the flexible part (about the last foot) is bent. To bend the top, use stiff wire or wire twists used for plastic bags and wrapping vegetables. Fasten the other end of the wire lower in the stem to hold the tip in position. {See Figure 49.}

A common mistake that cultivators make is pulling off the large leaves on the main stem (sun or fan leaves), when the plants are young. These leaves are removed by cultivators who believe that their removal will cause the undeveloped side shoots to grow. But fan leaves are net producers of sugar and energy, which are used by the side shoots to begin growth. Rather than encouraging new growth, the removal of fan leaves slows growth. The plant will also be more susceptible to attacks from pests and predators.

When the plant is several weeks old and growing well, the difference between plants with their leaves removed and those left intact may not be large. The biggest difference can be seen when leaves are removed from branches just prior to, or during, flowering. The buds that form from leaf axils with leaves removed are noticeably smaller than those where the leaves have been left on the branch.

Detection

Cannabis can be detected from both the ground and the air. From the ground, marijuana is revealed by its familiar shape, unmistakable leaves, and odour. Tall plants are usually more conspicuous than shorter ones. From the air, stands may have a different colour than the surrounding vegetation, especially where natural vegetation is not as lush as marijuana. Individual plants usually have a circular profile when viewed from above; this can be altered by bending or pruning the plant. Varieties which are naturally tall-growing may need to be cut several times during the season to keep them hidden.

Plants are sometimes cut back severely, to much as half their height when they get too tall, but this may damage the plant. A less drastic topping technique is to remove the top foot of growth. Whenever new shoots get too tall they are clipped. But the plants should not be severely pruned late in the season when the growth rate has slowed (preflowering), because there
will be fewer branches left on which buds can develop.

If you are trying to conceal plants behind a fence or wall, start bending or pruning the plants early, at about one month of age. By starting early and continuing to prune during the vegetative growth stage, you will train the plant to branch and fill up the area. If you wait until the plants are already tall, you may have to cut the plants back severely or clip shoots continuously.

15.7 Gardening Tips

Transplant Older Plants

A friend of ours was warned that his garden had been spotted by local authorities. Rather than cut down his four-month-old plants, he decided to transplant them. He dug the plants out, leaving a ball of soil about two feet square around the roots of each one. He wrapped each soil ball tightly in a plastic bag to transport it, and placed the plants in newly dug holes in a different spot. He kept the plants well-watered. After a few days, they recovered from transplant shock and started to grow once again. Transplanting large plants is not easy to do, but it could save a crop. The marijuana root system is not very extensive when the plants are in fertile soil with plenty of water; the tap root may only be six inches long on a ten-foot plant.

Wind Protection

Hemp Cannabis planted closely together has been used by farmers to form a windbreak to protect other crops. If you are growing in an especially windy area such as the Midwest, you may wish to plant a perimeter if tightly spaced Cannabis to protect your garden. Construct a rope and stick fence against the windbreak to hold the plants upright and prevent them from falling into the central garden. Simply keeping the plants clipped short is a simpler approach.

Inducing Flowering

Growers may wish to induce their plants to flower early, especially in the North, where the growing season is short. Plants in containers can be moved to a dark area for 12 hours of darkness or more per day. Black sheets of polyethylene film, dark plastic bags, and large appliance cartons can be used to provide periods of uninterrupted darkness. Use the dark treatment nightly until the plants are flowering (usually after one to two weeks of long-night treatments).

Winter and Spring Crops

In southern parts of the U.S., Hawaii and parts of California, you can grow more than one crop in a season. Greenhouses that stay above freezing can also be used for year-round growing. Plants started during the winter or early spring get naturally long nights and flower early, when they are relatively small, usually no more than four feet tall. Flowering can be postponed by breaking the long nights with short periods of light. This extends the vegetative growth period, yielding older, larger plants at
flowering. Start breaking the night period with artificial light when the plant is about a month old. Continue the treatment until you want the plants to flowers. (See the discussion of photoperiod in section 3.)

Spring crops can be trimmed of buds when mature. The plant is left in the ground, and as the daylength increases, the plant will renew vegetative growth and flower once more in the fall. Plants can also be started in November or December indoors under lights and planted outdoors in February for harvest in April or May. The plants will grow faster under lights than they would outdoors under the weak winter sun. When they are placed outdoors, the long nights will induce flowering. By April the sunlight gets much stronger, perfect for flower development. Plants placed outdoors in February adjust easily to sunlight. Even so, they should be conditioned so that they do not suffer severe burn, as described in the Transplanting section in section 14.

Rejuvenation

Plants grown in areas where the weather is mild can survive winter when there are no heavy freezes. During the winter the plants will grow very slowly, but as soon as the weather warms, and the light gets more intense, the plants respond. This technique can also be used to obtain a second growth crop during Indian summers. The second growth is not as vigorous as the original, but is does increase the total harvest.

To prepare plants for rejuvenation, leave three or four pairs of lowers branches with leaves on the plant when you harvest. The leaves need not be large, but they must be green. Water and fertilise the plants. Within a few days the plants will show new growth.

The authors observed an outdoor container composed entirely of plants which survived a mild San Francisco Bay Area winter. These developed healthy second growth the following summer and flowered again in the fall. Some growers in Hawaii claim that their plants are three years old and that the plants have yielded as many as six crops of buds. Perennial marijuana plants also grow in Jamaica and Thailand.

Water Deprivation

Many cultivators begin to limit the amount of water their plants receive as soon as the flowers start to appear. Other growers give their plants as little water as possible after the middle of the plant's life. The plants are given small amounts of water only when they begin to wilt. (See section 9 on the reasons for stressing the plants.)

Under water stress many of the leaves may die and fall from the plant. Sometimes the plants appear “burned,” and turn brown or gold. At harvest, water-stressed plants may only have buds left on them and these may have the colour, resin, and harshness typical of Colombian grass. These plants yield less grass at season's end. Not only are they smaller overall, but many of the leaves will have fallen away.

Water stress can be difficult to control in areas with heavy summer rain. Water-stressed plants often make up for their smaller size by a raped burst
of growth after a heavy rain. One method of control is to cover the ground with plastic sheets when it rains so that most of the water runs off.

Tacks and Nails

Some growers hammer nails or tacks into the stems of plants several weeks before harvest. Many growers use long thick nails; others prefer to use several half-inch-long tacks. The nails are usually placed at the base of the stem. This is supposed to "increase potency." {Figure 72. Wilted plant. Unless watered it will die.}

Stem Splitting

This is a popular way to stress used by cultivators in the United States. The stem is split (not cut) at the base to from a space through the stem. Growers place a rock, small piece of wood, an old Cannabis stem, or piece of opium (in Africa) in the split. Sometimes the wound is bound with cloth or plastic. We don't recommend this procedure, and advise you to be careful not to kill the plants and ruin the harvest.

Varieties

Outdoor growers are well-advised to plant several varieties of marijuana, because some varieties adapt to their new environment better than others. Also, each variety (and to small extent, each plant) has its own bouquet. By planting several varieties, cultivators assure themselves a varied selection of smoking material.

In areas with short growing seasons, many tropical varieties do not have a chance to flower. But immature material from these varieties may be more potent than mature flowers of a plant grown from seed of lower-quality grass. For instance, compare a flowering Mexican with a Colombian that doesn't. The Colombian may be better because the difference in varieties is so great. On the other hand, the Mexican may be better because it is flowering and has reached its full potential.

Intercropping

It is well-known that certain plants may be antagonistic to other species of plants, and that there are also beneficial relationships between species. Cannabis is known not to grow well among spinach 222. Although tomatoes and tobacco have been recommended as crops to avoid when growing marijuana, because of pests and diseases that these plants may harbor 67, marijuana grows very well in healthy tomato patches. Growers have also commented on how well marijuana grows when planted with corn, sugarcane, and beets.

Chapter 16
INSECTS AND OTHER PESTS

Outdoors, where it functions as part of an ecological system, marijuana is less susceptible to insect attacks than it is indoors. In an outdoor environment, insects are subject to the vagaries of the weather, food
supply, and predators. And marijuana grows so fast that insects usually do little damage. Plants, plant eaters, and predators usually maintain an equilibrium which minimises damage. But this balance is disturbed by tilling and gardening, and may take a while to re-establish itself.

The soil surrounding your plants may be teeming with insects, and it would be unnatural not to see some on your plants. Most insects do not eat marijuana. The few that do are the food which helps to keep a small population of their predators alive. Insects in the garden need to be controlled only when there is a real threat of damage.

Marijuana is most vulnerable in its early stages. After the plant increases production of the cannabinoids and resins at the eighth or ninth week, most insects are repelled. When the plants are small, an occasional munch affects a relatively larger part of the plant. That same bite affects a relatively smaller part when the plant is larger.

The insects that infect marijuana indoors - aphids, mealy bugs, mites, and whiteflies - do best in humid conditions with constantly warm temperatures. Outdoors they rarely inflict much damage on marijuana. The pests that are most likely to damage marijuana are leafhoppers, treehoppers, cucumber beetles, thrips, flea beetles, several kinds of caterpillars, snails, and slugs. The younger the plants are, the more susceptible they are to attack. Your prime goal is to protect the plants during the first two vulnerable months. You need to keep the pest population low, so that the damage is relatively light. The pests don't have to be eliminated, only kept under control.

There are many ways to keep pests from damaging your crops. These fall into one or more of several categories: biological control; capture traps and barriers; home remedies; and chemical insecticides.

16.2 Biological Control

The theory behind biological controls is that methods for control of pests can be found within nature. These methods are safer to humans and less damaging to the environment than commercial insecticides. Gardeners have many forms of biological control at their disposal, including companion planting, use of predators, and sprays made from plant extracts or ground-up insects.

Companion Planting

Some plants, including marijuana in its later stages, produce resins or essences which repel or kill plant pests. Some of them are general repellents that affect a broad range of plant pests; others affect specific species. Generally, the heavily scented plants, such as spices, mints, and other herbs, are most likely to have these qualities.

Some of the more familiar plants used to protect gardens are the Alliums, or onion family, with garlic, chives, green onions, and other oniony-type plants as members. This group repels a broad range of plant pests such as aphids, spider mites, flea beetles, potato bugs, bean beetles, and many other insects, as well as rabbits and some deer. They are easily planted
around the garden or between the marijuana plants. Just plant onion bulbs or the cloves from a garlic bulb so that the top of the bulb is about one inch deep. One garlic bulb yields quite a few cloves; so a large garden requires only a few bulbs.

Geraniums are reputed to repel leafhoppers and many kinds of beetles. These plants prefer a dry soil, thrive in full light, and usually grow two feet tall. Geraniums should be interspersed with the marijuana, or potted geraniums can be set out if problems develop. Tansy (Tanacetum vulgare) is a tall, fragrant, woody perennial which grows five feet tall. It protects against cut-worms, beetles, cucumber beetles, and other eaters and borers.

Mints repel many insects and are sometimes used as mouse repellents. They are especially useful for the control of the flea beetle. They thrive in semi-shaded areas with rich soil.

Marigolds can be planted to eliminate nematodes. They are fast-growing annual plants which flower profusely. They come in many varieties, ranging in height from six to 30 inches. They grow in a wide range of soils and do best in the sun. The scented varieties - usually nonhybrids - offer the most protection.

All companion plants must be planted close to the plants to be protected, since their repellent qualities spread only a short distance beyond their circumference. They are effective when they are planted before the damage is apparent, and offer long-term protection. They are used when a pest is expected. For instance, growers in the San Francisco Bay Area expect rose leafhoppers to attack their plants. Since geraniums grow in the area as perennial plants, some growers plant them permanently in the garden. As the geraniums develop into small bushes, the hoppers leave, never to return.

Predators

Many of the insects in your garden are called beneficials, because they perform a useful service in the garden. Some of them eat decaying matter; others help in the pollination process; and some pry on insects which damage crops. Almost everyone is familiar with the ladybug, which eats aphids and insect eggs and has a voracious appetite. They are available commercially by the pint. The praying mantis eats slow-moving insects. When it first hatches, it starts out on aphids and mites. But as it grows larger, it eats bigger insects and worms. Mantis-egg cases are foam-like, straw-coloured masses which contain 100 to 300 eggs. These cases are sold commercially but can also be found in the late fall in bushy areas. Another insect which is sold commercially as a plant protector is the green or brown lacewing. It has golden eyes, looks fragile, and flies erratically. But in their larval state, lacewings eat thrips, mites, caterpillar eggs, scale, leafhopper nymphs, aphids, and mealybugs. The trichogramma wasp is an egg parasite which lays its eggs in the eggs of over 200 species of insects, including many moths and butterflies which hatch into worm pests. Cryptolaemus is used to destroy mealybugs. Adults are released when mealybugs appear in the spring. They seek out the mealybug colonies and lay their eggs. When the eggs hatch the larvae wander around the infested area and eat the young mealybugs.

The use of commercially bred or gathered predators is most feasible in large
garden or fields. The insects may not have much effect on small gardens, since they wander off to find food and may never return. Try to buy from manufacturers who intentionally do not feed their product before shipping. Hungry predators are more likely to stay and eat the pests.

Insects are just one group of predators. Birds such as purple martins, robins, blue jays, chickadees, and even starlings and English sparrows eat large quantities of insects and other small pests. They can be attracted to the garden by placing a feeder, bird houses, and water in the area. When plants get larger, some gardeners let chickens, ducks, or geese run through the garden. In a short time, they pick it clean of pests and weeds. Reptiles and amphibians, including frogs, toads, snakes, lizards, and turtles, all eat garden pests and should be encouraged to make a home in the garden.

**Homemade Repellents and Insecticides**

Another way to control garden pests is to make sprays from plants which repel insects by using a juicer or blender or by baking a tea. Ingredients can be found in most kitchens. Chile pepper, garlic, coffee, horseradish, radish, geranium, and tobacco are the usual mainstays of herbal sprays, although most strong-smelling herbs and spices have some repellent qualities. Many gardeners experiment to see what works in their garden. For instance, if an insect which bother marijuana stays clear of a nearby weed, a tea or blended spray made form that plant may control the pest. But try it on only one plant (or part of a plant) first, because the spray may also be harmful to the marijuana.

Garlic is probably the most popular ingredient for general-purpose sprays made from kitchen ingredients. A typical formula is to soak three ounces of chopped or minced garlic in a covered container of mineral oil for a day. Then, slowly add a pint of lukewarm water in which a quarter ounce of real soap (Ivory will do) has been dissolved. Stir and let stand several hours, then strain. Use as a concentrate, adding between 20 to 100 parts water to one part concentrate.

Other recipes call for boiling the garlic or for grinding or juicing it. Some brewers add other spices to the basic formula. One recipe calls for one clove garlic, three cayenne peppers, one onion, a quarts ounce of soap, and sufficient water to blend. Let it sit for three or four days before using, and use one part concentrate to 20 parts water. Homemade tobacco teas are sometimes used as insect sprays. Use one cigarette in a quart of water. Let it brew 24 hours before using.

Snails and slugs are attracted by yeast solutions, which are easily prepared from cooking yeast, sugar, and water. This is also why gardeners have success trapping these leaf munchers in bowls of stale beer. Place deep-sided containers at the soil level. The pests slide in and drown.

Gardeners should not overlook handpicking as a viable method of pest control. The foot or a quick thumb and forefinger can eliminate large numbers of pests and can keep a small garden pest-free. Collect the bugs and drop them in a tin can with some alcohol to kill them. Early morning is the best time to collect pests, since they are slower-moving until the sun warms them.
Snails, slugs, earwigs, and some other insects gather in cool, moist areas during the heat of the day. By providing just such a space in a garden, many of these pests can be located and destroyed. Place pieces of cardboard or boards around the garden; look under them each day.

Home Remedies

Gardeners and farmers have discovered and invented ingenious ways to control insects without harming the environment. Some of the more popular ones are listed here, but there are many more, each suited to a particular situation.

Soap and water is an effective control measure for mealybugs, mites, leafhoppers (nymph stage), leaf miners, and aphids. Simply wash the plants thoroughly with a solution of two tablespoons of soap dissolved in a gallon of water. Rinse the soap off thoroughly. (Some growers feel that the addition of kerosene or alcohol makes the solution more effective, but these can harm the plants and dissolve THC.) This treatment does not eliminate all of the pests, and may need to be repeated weekly, but it does keep them under control.

Sprays are sometimes made from healthy insects, which are caught, ground up, and then sprayed back onto the plants. When the pests come in contact with the spray, they become infected with the pathogen and get sick. This method is very effective, and is considered safe, but it is not easy to capture sick insects. A variation in this technique was described in the October 1976 Organic Gardening and Farming Magazine, in which a spray was made from healthy insects. In a followup article in the May 1977 issue, the authors theorised that any population of insects contains pathogens. If enough insects are collected, some of them are sure to be sick, and they contain enough germs to spread the disease. To make an insect spray, capture about a hundred pests. (Make sure not to include any beneficial insects or the spray may also work against them.) Using a blender, mix them with a cup of spring water, strain, and dilute with enough water to spray your garden.

Whenever making or storing sprays, use a glass container. Metal or plastic ones may react with the chemicals that the liquids contain.

Another home remedy for the control of mites and aphids is a mixture consisting of a half cup of milk in four cups of wheat flour, added to five gallons of water. When it is sprayed on the undersides of the leaves, it suffocates the insects and then flakes off as it dries.

Some growers use mulches to control insects. Cedar chips repel beetles, moths, mites, and mealybugs. Aluminium foil is used for aphid and thrip control on small plants; the reflected light disorients them and they do not land on the plants. A sprinkling of cream of tartar eliminates ants, and boric acid kills roaches. Sulfur powders, available at nurseries, are used to control mites and fungus infections.

Organic Insecticides

Pyrethrum, rotenone, and ryania are effective insecticides which come as powders (dusts) or sprays. They are concentrated form of naturally occurring
plant substances, and are considered harmless to warm-blooded animals when used as directed.

Ryania, which is found in the roots of a tropical shrub, is most effective against chewing insects, worms, and larvae, which it incapacitates, rather than kills.

Rotenone is a general-purpose insecticide with little residual effect; that is, it breaks down soon after application, and is therefore one of the safest insecticides. Two or three dustings during the seedling stages afford protection against most insects and bugs.

Pyrethrum is one of the most powerful natural insecticides, and is effective against a wide range of pests. It is also relatively nontoxic to bees and ladybugs. Pyrethrums are found in the pyrethrum plant as well as in chrysanthemums. They are non-persistent, and in small doses may make the insects sick without killing them. These insecticides are available at many nurseries and may provide the surest, easiest form of protection against serious insect attack.

Barriers and Traps

In gardens and small farms, insects and other pests are sometimes controlled by the use of traps and barriers that prevent them from reaching the marijuana. When the plant are young, they can be protected from cutworms, caterpillars, snails, and slugs by a collar that is buried an inch into the ground and is six inches high. Some growers face it with aluminium foil, which many insects seem to dislike. One ingenious grower painted collars with molasses to capture the crawlers. She also caught a significant number of leafhoppers. Commercial stickums such as Tanglefoot can also be used to trap insects.

Snails, slugs, and some crawling insects are repelled by a border perimeter of lime, potash (wood ash), sulfur, sharp sand, or cinders. Place a thin layer, six inches wide, around the perimeter of the garden, or around each plant. Flea beetles and some other flying insects are repelled by wood ashes dusted on the leaves. The powders are water-soluble; so they should be replaced after a heavy rain. Crawling pests sometimes have a hard time reaching plants grown in containers or raised beds.

Flying insects, such as leaf and treehoppers, can be prevented from getting to plants by barriers made from cheesecloth. Other growers place cardboard sticky with glue between plants, and then shake the plants. The cardboard catches a good proportion of them. One innovative grower in Palo Alto, California, placed a furniture crate, with the top cut off and with Tanglefoot spread on the inside, around each of his six plants. He said that by shaking the plants, he eliminated leafhoppers in four days.

16.3 Chemical Insecticides

Insecticides were developed as an easy way to control pests. They have an immediate dramatic effect, but the long-range damage that they do to the entire ecological system is sometimes overlooked. The chlorinated hydrocarbons, such as DDT, DDC, Aldrin, Kelthane, and Dieldrin, were the
most dangerous commercial insecticides. They affect warm-blooded animals and are no longer available. (In no case should any of these by used.)

Diazinon, Sevin, and Malathion are three insecticides which are often soil in nurseries to protect vegetable crops. They are considered safe for warm-blooded animals and have a limited residual effect, since they break down in a few days. But these insecticides are not too selective and may kill beneficials as well as pests. Sevin is the most toxic and kills the widest range of insects, including bees.

These chemicals come as sprays, powders, and baits, formulated for specific pests. They should be used only when an intolerable situation has developed. Plants should be harvested only after the required safety period has passed since application. This period is from two to 35 days, and is specifically listed on all insecticides that can be safely used. Insecticides should be used and handled carefully, following instructions, wearing protective clothing, with no children or pets around. It is advisable to use a mask when applying dusts and to work upwind.

16.4 Common Pests

Cucumber Beetles

Cucumber beetles are about a quarter-inch long and look a lot like ladybugs. There are several species of cucumber beetles. The striped beetle is found east of the Rocky Mountains. It is yellow, has two or three black stripes running down its back, and has a black head. The spotted cucumber beetle has a yellow-green back with 11 or 12 black spots and a black head. There are related species, such as the banded cucumber beetle, throughout the United States. The larvae of all varieties are white, turning brownish at the ends, slender, about one-third inch long.

Cucumber beetles do the most damage in the early spring, when the adults come out of hibernation and begin to eat the new growth and leaves. These leaf-eating adults damage young marijuana, especially when there is a scarcity of other food. They also transmit bacterial diseases and viruses to the plants. Within a few weeks after they come out of hibernation, they lay their eggs at the base of plant roots. The larvae of the striped cucumber beetle feed only on melon- and cucumber-type plant roots. The spotted-beetle larvae are fond of corn, and are known as the "Southern cornroot worm" in some places.

The best way to prevent cucumber-beetle attacks is to keep the areas that you plant isolated from corn and melon plantings. Heavy mulching or tilling destroys the pests when they are hibernating. Late plantings minimise damage inflicted by cucumber beetles.

Cucumber beetles can be controlled by use of Rotenone or Malathion. Dust several times during seedling growth. These beetles are also prey to many insects, including the common garden soldier beetle, predator flies, wasps, and nematodes. Hand picking is also an effective control for cucumber beetles.

Thrips
Thrips are slender, yellow or brownish, winged insects about 1/25 inch long. They have fragile wings which keep them aloft while they are blown by the wind. Thrips have a cone-shaped mouthpart, which they use to cut stems in order to suck plant juices. The larvae look like adults, but are smaller and wingless. Most thrips feed on a range of plants, especially onion and other bulbs, and marijuana is at most a marginal part of their diet. A well-cultivated marijuana plant can outgrow and damage that thrips are likely to inflict.

Thrips hibernate in plant debris during the winter and begin sucking in early spring. They lay eggs during warm weather, and can produce a new generation every two weeks. Since thrips eat a varied diet, keeping the garden area clear of weeds is an effective control. Thrips can also be controlled by turning debris under, so that their nesting sites are destroyed.

Thrips can be controlled by use of tobacco sprays. Rotenone, or Malathion. Aluminium-foil mulches are effective thrip repellents. The light reflected from the foil confuses their sense of direction.

Flea Beetles

There are many species of flea beetles. The adults range in size between one-twentieth and one-fifth of an inch, and are usually black or metallic green or blue. They are called flea beetles because they use their enlarged hind legs to jump like fleas when disturbed. Many flea beetles are host-specific, and probably only a few species munch on marijuana.

Flea beetles hibernate in plant debris. By ploughing the debris under, their hibernation places are eliminated, and there should be few pests the following spring. Flea beetles are repelled by a mixture of equal parts of wood ashes and limestone sprinkled on foliage every few days. Containers of the mixture may also by placed around the plants. Garlic sprays also repel flea beetles. The chemical poisons used specifically for flea beetles are stomach poisons, which break down slowly and may not be safe to inhale. Home remedies are best for flea beetles.

16.5 Vertebrate Pests

Mammals Until it develops a hard fibrous main stem, usually at about two months, the young marijuana plant attracts rodents, including mice, rabbits, moles, squirrels, groundhogs, and rats, as well as raccoons. Cats are probably the best means of rodent control. They stalk small prey, go after any movement, and are active at night, when most of these animals forage. Young plants are often protected from rodents by placing a coffee can with top and bottom removed around each plant. When the plants get bigger, they can be protected from rabbits and other animals with a wire fence three feet in height. A double layer of one-inch chicken wire is most effective. But many animals can climb or burrow; so more ingenious methods are needed to protect the plants. Rodents, especially moles, are repulsed by castor beans and castor oil. A formula that gardeners sometimes use is two parts castor oil, one part detergent, mixed to a consistency of shaving cream in a blender. Use a tablespoon of concentrate per gallon of water. Spray or mist
Rabbits shy away from blood, bloodmeal, and tankage. To use, sprinkle the powder around the perimeter of the plot in a band about a foot wide. They can also be mixed into a concentrated solution and applied as a spray. However, the small of blood may attract mongoose or other predators, which dig up the garden in search of flesh. Noise from radios, chimes, and bells deter some animals, and human smalls such as hair and urine may also deter some animals. In dry areas, a half-filled bucket of water is an effective rodent trap. The animals fall in and drown.

Deer seem to go out of their way to munch on tender marijuana leaves, but generally don't bother marijuana after it has grown for a few months. Gardeners and farmers use many ingenious techniques to keep them away from crops. Sturdy fences are the best deterrent. The fences should be about 10 feet high: the bottom five feet should be made up of single strands of wire string at two-foot intervals. The wire strands prevent deer from jumping the fence. Some growers use fresh blood, dried blood, or bloodmeal to deter them, placing it in either powder or liquid form around the perimeter of the garden. Other growers claim that human hair, or manure from predators such as wolves, bears, lions, and even dogs, keeps them out. Lion urine (glans extract) is available commercially, and is said to be an effective deterrent against many animals. (Figure 73. Tin cans protect against cutworms and many other plant eaters.)

Bottles

Birds

On the whole, birds are beneficial, rather than harmful, in the garden. Most of the common species, including English sparrows, robins, swallows, wrens, finches, bluejays, bluebirds, and starlings, eat insects and other garden pests as a substantial portion of their diet. The only time that birds may be harmful is during planting, when they sometimes feed on the planted seed. The main culprits seem to be starlings, sparrows, and crows. They can be kept off the planted areas physically, by means of plastic netting or fencing, which is sold commercially for the purpose, or by using scarecrows, aluminium strips, or noise makers. Once the plants have germinated, birds are no longer a threat and should be encouraged to nest in the area, since they are an ideal biological control for plant pests.

Chapter 17
GENETICS AND SEX IN CANNABIS

Sex is an inherited trait in Cannabis, and can be explained in much the same terms as human sexuality can. Like a human being, Cannabis is a diploid organism: its chromosomes come in pairs. Chromosomes are microscopic structures within the cells on which the genes are aligned. Cannabis has 10 pairs of chromosomes (n=10), for a total of 20 chromosomes (2m=20).
One pair of chromosomes carries the primary genes that determine sex. These chromosomes are labelled either X or Y. Male plants have an XY pair of sex chromosomes. Females have XX. Each parent contribute one set of 10 chromosomes, which includes one sex chromosome, to the embryo. The sex chromosome carried by the female ovule can only be X. The one carried by pollen of the male plant may be either X or Y. From the pollen, the embryo has a 50/50 chance of receiving an X, likewise for Y; hence, male and female progeny appear in equal numbers (in humans, the sperm carries either an X or a Y chromosome.)

17.2 Flowering

Male Plant

Under natural light, males usually start to flower from one to four weeks before the females. Where the photoperiod is artificially controlled, as with electric lights, males respond quickly (in about a week) to a change to short photoperiods and usually show flowers sooner than the females.

Male flowers develop quickly, in about one to two weeks on a vigorous plant, not uniformly. Scattered flowers may open a week or more before and after the general flowering, extending the flowering stage to about four weeks.

The flowering stage continues to demonstrate the male's tall, relatively sparse growth. Most of the flowers develop near the top of the plant, well above the shorter females. The immature flower buds first appear at the tips of the main stem and branches. Then tiny branches sprout from the leaf axils, bearing smaller clusters of flowers. The immature male flowers are closed, usually green, and develop in tight clusters of knob-like buds. The main parts of the male flowers are five petal-like sepals which enclose the sexual organs. As each flower matures, the sepals open in a radiating pattern to reveal five pendulous anthers (stamens).

Inside the ovoid, sac-shaped anthers, pollen grains develop. Initially, pollen sifts through two pores near the top of the anther; then, starting from the pores, longitudinal slits slowly open (zipperlike) over the course of a day, releasing pollen to the wind. Once a flower sheds pollen, it shortly dies and falls from the plant. Normally, male plants begin to die one to two weeks after the bulk of their flowers have shed pollen. Healthy males may continue to flower for several more weeks, but secondary growth seldom has the vigour of initial bloom.

Female Plant

The female plant generally starts to flower later than the male, under either natural light or an artificially controlled photoperiod. Female marijuana plants flower when the average daily photoperiod is less than about 12 to 13 hours. However, some varieties and individuals may flower with a photoperiod of over 14 hours. Some Colombian varieties may not respond until the photoperiod falls below 12 hours for a period of up to three weeks.

The duration of flowering also depends on the particular rhythm of the variety, as well as growing conditions, and whether or not the plant is
pollinated. Within these variables, females maintain vigorous growth and continue to rapidly form flowers for a period that ranges from 10 days to about eight weeks.

Females generally do not grow much taller during flowering. Growth emphasises a "filling out," as flower clusters develop from each leaf axil and growing tip. Normally, the flowers arise in pairs, but the pairs form tight cluster of 10 to over 100 individual flowers that are interspersed with small leaves. These clusters are the "buds" of commercial marijuana. Along the top of the main stem and vigorous branches, "buds" may form so thickly that the last foot or more of stem is completely covered. Usually the leaves that accompany the flowers tend toward simpler structure, until each leaf has one to three blades. {Figure 76. Female in full bloom.}

The visible parts of the female flower are two upraised stigmas, one-quarter to one-half inch long, usually white or cream, sometimes tinged with red, that protrude from a tiny, green, pod-shaped structure called the floral bract. This consists of modified leaves (bracts and bracteoles) which envelop the ovule or potential seed. The mature bract is a tiny structure, about 1/8 inch across and 1/4 inch long. When fertilised, a single seed begins to develop within the bract, which then swells until it is split by the mature seed.

Bracts are covered more densely with large resin glands than is any other part of the plant, and are the most potent part of the harvest. Resin glands may also be seen on the small leaves that are interspersed among the flowers.

The differences between male and female Cannabis become more apparent as the plants mature. The same can be said of the differences between varieties. Often, two varieties may appear to be similar, until they actually flowers and fill out to different forms. These appear in many ways: some varieties maintain opposite phyllotaxy with long internodes throughout flowering; bud sizes vary from about one-half inch to about three inches, with a norm of about one to two inches; buds may be tightly arranged along the stem, yielding a "cola" two feet long and four inches thick; and some varieties only form buds along their main stem and branch tips, with a few "buds" forming along the branches.

{Figure 77. Upper left: Buds form thickly into colas along the top of the main stem and branches (full bloom). Upper right: A cola about two feet long. Lower left: A huge leafy cola. Lower right: Long, slim buds form late in the year when light is weak. (these four colas are from Mexican plants.)

When a female is well-pollinated, growth slows and the plant's energy goes into forming seeds and thus into the continuation of the species. Some plants (but only the more vigorous ones) will renew flowering even when pollinated. Females that are not well-pollinated continue to form flowers rapidly. This extends the normal flowering period, of 10 days to four weeks, up to eight weeks or more.

Individual flowers are pollinated by individual pollen grains. In a matter of minutes from its landing on a stigma, the pollen grain begins to grow a
microscopic tube, which penetrates the stigma and reaches the awaiting ovule wrapped within the bracts. The pollen tube is a passageway for the male's genetic contributions to the formation of the embryo (seed).

The union of the male and female complements of genes completes fertilisation and initiates seed formation. The stigmas, having served their purpose, shrivel and die, turning rust or brown colour. On a vigorous female, the seeds reach maturity in about 10 days. When growing conditions are poor, the seed may take five weeks to ripen to full size and colour. Naturally, all the flowers do not form, nor are they pollinated at the same time - and there will be seeds that reach maturity weeks before others do. Although each flower must be individually fertilised to produce a seed, a single male plant can release many millions of pollen grains. A large female plant can produce over 10,000 seeds.

17.3 Sexual Variants in Cannabis

Cannabis has been studied for many years because of its unusual sexuality. Besides the normal dioecious pattern, where each plant bears exclusively male or female flowers, it is not uncommon for some plants to have both male and female flowers. These are called hermaphrodites, or monoecious plants, or intersexes. Hermaphroditic plants form normal flowers of both sexes in a wide variety of arrangements, in both random and uniform distributions.

Natural Hermaphrodites

Some hermaphrodites seem to be genetically determined (protogynous). That is, they naturally form flowers of both sexes given normal growing conditions. Possibly genes carried on the autosomes (the chromosomes other than the sex chromosomes) modify the normal sexual expression. Monoecious varieties have been developed by hemp breeders in order to ensure uniform harvests.

It is also possible that these particular are polyploid, which means they have more than the usual two sets of chromosomes. This kind of hermaphrodite may have XXY (triploid), or XYY or XXXY (tetraploid) sex chromosomes. However, no naturally occurring polyploids have ever been verified (by observation of the chromosomes) in any population of Cannabis. Polyploids have been induced in Cannabis by using mutagens, such as the alkaloid colchicine.

Whatever then genetic explanation may be, one or more of these natural hermaphrodites may randomly appear in any garden. They are sometimes faster-maturing, have larger leaves, and are larger in overall size than their unisexual siblings. They usually form flowers of both sexes uniformly in time and distribution, and in some unusual patterns. For example, from Mexican seed, we have seen a plant on which separate flowering cluster consisted of both female and male flowers: and upper section of female flowers had upraised stigmas, and a lower section of male flowers dangled beneath the female flowers. In other plants from Mexican seed, the growing tips throughout the plant have female flowers; male flowers sprout from the leaf axils along the main stem and branches. Plants from "Thai" seed sometimes form male and female flowers on separate branches. Branches with female flowers tend to predominate, but branches having mostly male flowers
Abnormal Flowers, Intersexes, Reversals

Gender is set in the new plant at the time of fertilisation by its inheritance of either the X or the Y chromosome from the male (staminate) plant. With germination of the seed, the environment comes into play. Heritage sets the genetic program, but the environment can influence how the program runs. (Sexual expression in Cannabis is delicately balanced between the two.) The photoperiod, for example, controls the plant's sequence of development. Also, the plant's metabolism and life processes are dependent on growing conditions. When the environment does not allow a balance to be maintained, the normal genetic program may not be followed. This is mirrored by abnormal growth or sexual expression.

Abnormal Flowers

Abnormal sexual expression includes a whole range of possibilities. Individual flowers may form abnormally, and may contain varying degrees of both male and female flower parts. For instance, a male flower may bear a stigma; or an anther may protrude from the bracts of a female flower. Abnormally formed flowers are not often seen on healthy plants, although if one looks hard enough, a few may be found in most crops. When many of the flowers are abnormal, an improper photoperiod (coupled with poor health) is the most likely cause. Abnormal flowers sometimes form on marijuana grown out of season, such as with winter or spring crops grown under natural light.

Intersexes and Reversals

Much more common than abnormally formed flowers is for the plant's sex to be confused. One may find an isolated male flower or two; or there may be many clusters of male flowers on an otherwise female plant, or vice versa. These plants are called intersexes (also hermaphrodites or monoecious plants). Intersexes due to environment causes differ from natural hermaphrodite in having random distributions and proportions of male and female flowers. In more extreme cases, a plant may completely reverse sex. For example, a female may flowers normally for several weeks, then put forth new, sparse growth, typical of the male, on which male flowers develop. The complete reversal from male flowering to female flowering also happens.

All other things being equal, the potency of intersexes and reversed plants is usually less than that of normal plants. If there are reversals or intersexes, both of the sexes will usually be affected. Female plants that reverse to male flowering show the biggest decline. Not only is the grass less potent, but the amount of marijuana harvested from male flowers is negligible compared to the amount of marijuana that can be harvested from a normal female. Plants that change from male to female flowering usually increase their potency, because of the growth of female flower bracts with their higher concentration of resin. Female flowers on male plants seldom form as thickly or vigorously as on a normal female. Between the loss in
potency and the loss in yield because of females changing to males, a crop from such plants is usually inferior, in both yield and potency, to one from normal plants.

Environmental Effects

Many environmental factors can cause intersexes and sexual reversals. These include photoperiod, low light intensity, applications of ultraviolet light, low temperatures, mutilation or severe pruning, nutrient imbalances or deficiencies, senescence (old age), and applications of various chemicals (see bibliography on sex determination).

The photoperiod (or time of planting using natural light) is the most important factor to consider for normal flowering. In 1931, J. Schaffner (105) showed that the percentage of hemp plants that had confused sexual characteristics depended on the time of year they were planted. Normal flowering (less than five percent of the plants are intersexes) occurred when the seeds were sown in May, June, or July, the months when the photoperiod is longest and light intensity is strongest. When planted sooner or later in the year, the percentage of intersexuals increased steadily, until about 90 percent of the plants were intersexual when planted during November or early December.

Marijuana plants need more time to develop than hemp plants at latitudes in the United States. Considering potency, size, and normal flowering, the best time to sow for the summer crop is during the month of April. Farmers in the south could start the plants as late as June and still expect fully developed plants.

If artificial light is used, the length of the photoperiod can influence sexual expression. Normal flowering, with about equal numbers of male and female plants, seems to occur when the photoperiod is from 15 to 17 hours of light for a period of three to five months. The photoperiod is then shortened to 12 hours to induce flowering. With longer photoperiods, from 18 to 24 hours a day, the ratio of males to females changes, depending on whether flowering is induced earlier or later in the plant's life. When the plants are grown with long photoperiods for six months or more, usually there are at least 10 percent more male than female plants. When flowering is induced within three months of age, more females develop. Actually, the extra males or females are reversed plants, but the reversals occur before the plants flower in their natural genders.

Some plants will flower normally without a cutting of the photoperiod. But more often, females will not form thick buds unless the light cycle is cut to a period of 12 hours duration. Don't make the light cycle any shorter than 12 hours, unless the females have not shown flowers after three weeks of 12-hour days. Then cut the light cycle to 11 hours. Flowers should appear in about one week.

Anytime the light cycle is cut to less than 11 hours, some intersexes or reversed plant usually develop. This fact leads to a procedure for increasing the numbers of female flowers indoors. The crops can be grown for three months under a long photoperiod (18 or more hours of light). The light cycle is then cut to 10 hours. Although the harvest is young (about five
months) there will be many more female flower buds than with normal flowering. More plants will develop female flowers initially, and male plants usually reverse to females after a few weeks of flowering.

Of the other environmental factors that can affect sexual expression in Cannabis, none are as predictable as the photoperiod. Factors such as nutrients or pruning affect the plant's overall health and metabolism, and can be dealt with by two general thoughts. First, good growing conditions lead to healthy plants and normal flowering: female and male plants occur in about equal numbers, with few (if any) intersexes or reversed plants. Poor growing conditions lead to reduced health and vigour, and oftentimes to confused sex in the adult plant. Second, the age of the plants seems to influence reversals. Male plants often show female flowers when the plant is young (vigorous) during flowering. Females seven or more months old (weaker) often develop male flowers after flowering normally for a few weeks.

Anytime the plant's normal growth pattern is disrupted, normal flowering may be affected. For instance, plant propagated from cuttings sometimes reverse sex, as do those grown for more than one season.

17.4 Sexing the Plants

The female plant is more desirable than the male for marijuana cultivation. The female flowering clusters (bus) are usually the most potent parts of the harvest. Also, given room to develop, a female generally will yield twice as much marijuana as her male counterpart. More of her weight consists of top-quality buds.

Because the female yields marijuana in greater quantity and sooner you can devote your attention to nurturing the females. Where space is limited, such as in indoor gardens and small outdoor plots most growers prefer to remove the males as soon as possible, and leave all available space for the females. To harvest sinsemilla (seedless female buds), you must remove the male plants before they mature and release pollen.

Differences in the appearance of male and female Cannabis become more apparent toward maturation. During the seedling stage, gender is virtually impossible to distinguish, although in some varieties the male seedling may appear slightly taller and may develop more quickly.

We know of no way to discover gender with any certainty until each plant actually forms either pollen-bearing male flowers or seed-bearing female flowers. However, certain general characteristics may help. Using guidelines like the following, growers who are familiar with a particular variety can often predict gender fairly accurately by the middle stage of the plant's life.

Early Vegetative Growth

After the initial seedling stage, female plants generally develop more complex branching than the male. The male is usually slightly taller and less branched. (Under artificial light, the differences in height and branching are less apparent throughout growth.)
Some plants develop a marked swelling at the nodes, which is more common and pronounced on female plants.

Middle Vegetative Growth

In the second to fourth months of growth, plants commonly form a few isolated flowers long before the actual flowering stage begins. These premature flowers are most often found between the eighth and twelfth nodes on the main stem. Often they appear near each stipule (leaf spur) on several successive nodes, at a distance two to six nodes below the growing tip. These individual flowers may not develop fully and are often hard to distinguish as male or female flowers. The fuzzy white stigmas of the female flower may not appear, and the male flowers seldom open but remains a tightly closed knob. However, the male flower differs from the female; it is raised on a tiny stalk, and the knob is symmetrical. The female flower appear stalkless and more leaflike.

The presence of premature female flowers does not assure that the plant is a female, but premature male flowers almost always indicate a male plant. Unfortunately, it is much less common for male plants to develop premature male flowers than for female flowers to appear on either plant. For example, in one garden of 25 mixed-variety plants, by age 14 weeks, 15 plants showed well-formed, premature female flowers with raised stigmas. Eight of these plants matured into females and seven became males. Only two plants showed premature male flowers and both of these developed into males. The eight remaining plants did not develop premature flowers or otherwise distinguishable organs until the actual flowering stage at the age of 21 weeks. From these eight, there were four females, three males, and one plant bearing both male and female flowers (hermaphrodite). It does seem, however, that plants bearing well-formed female flowers, on several successive node, usually turn out to be females.

Preflowering

In the week or two prior to flowering and throughout flowering, many common marijuana varieties follow two general growth patterns which depend on gender. With these varieties, you can tell gender by the spacing between the leaves (internodes). For the female, the emphasis is on compact growth. Each new leaf grows closer to the last, until the top of the plant is obscured by tightly knit leaves. The male elongates just prior to showing flowers. New growth is spaced well apart and raises the male to a taller stature. This may be the first time the male shows its classic tall, loosely arranged profile.

{Figure 79. Premature flowers are found on the main stem next to the leaf spurs. Upper left: Early female flower without stigmas. Lower left: Undifferentiated (indistinguishable). Centre: Early male flower. Upper and lower right: Well-formed female flowers on successive nodes usually indicate a female.}

17.5 Sinsemilla

Sinsemilla ((The word "sinsemilla" comes from the Spanish, and means without seeds. It is also spelled "sansimilla.") is any marijuana
consisting of seedless female flower buds. Sinsemilla is not a variety of marijuana; it is the seedless condition that results when the female flowers are not fertilised with pollen.

In the United States, most sinsemilla comes in the form of Thai sticks that are imported from Southeast Asia and Japan. Thai sticks are made up of seedless buds wrapped around a sliver of bamboo or a long wooden matchstick. The buds, which may be on one or more stems, are secured with a hemp fibre wound around the stick. A growing amount of fine sinsemilla now comes from domestic sources, such as Hawaii and California. The grass is usually boxed or bagged with pure buds that are manicured (extraneous leaf removed). Infrequently sinsemilla comes from Mexico and, rarely, from Colombia.

Sinsemilla has a reputation as high-potency marijuana, with a sweet taste and mild smoke. It doesn't have the harsh, gagging qualities of the usual Colombian and Mexican grasses. These qualities, however, have nothing to do with sinsemilla as such. The potency of any grass depends primarily on the variety and development of the plant, and the taste and mildness of the smoke depend on the condition of the plant when harvested and the cure. Heavily seeded grass can be as mild and sweet-smoking as sinsemilla when it is properly handled.

When buying grass, remember that sinsemilla indicates a conscientious effort on the grower's part to bring you the best possible product. Sinsemilla is almost pure smoking material with no wasted weight in seeds. An ounce of sinsemilla has about twice as much smoking material as a typical seeded ounce. Also, any marijuana that is fresh, with intact buds, indicated less deterioration of cannabinoids. {Figure 80. Thai Sticks.}

Sinsemilla is becoming a preferred form of grass with homegrowers, many of whom believe that a seedless female is more potent than a seeded one, reasoning that the plant's energy goes to the production of resin rather than seed. There seem to be no scientific studies on this point. Many experienced growers believe the difference is small, perhaps 10 percent.

From observing the resin glands on the bracts, one sees that they continue to develop in size after pollination. Any difference from the unseeded state is not apparent. Whether pollination does in fact hamper or lessen resin production or potency is questionable. but the effect on the plant as a whole can be dramatic. Usually when the female is well-pollinated, growth noticeably slows, and the plant enters the last phase of life, which is seed set. Seed set is a period of incubation, in which the seeds grow and reach their mature state. New growth forms more slowly and lack the vitality of the bloom before pollination. The plant's reaction to pollination is relative. The more thoroughly pollinated the female is, the more pronounced the change in rhythm from vigorous to incubation. A plant on which only a few flowers have been fertilised continues to actively form flowers as sinsemilla.

Not all plants react alike to pollination. When the weather is good and the plant vigorous, even a well-seeded plant may bloom a second or third time before the rate of growth starts a final decline.

To put this in perspective, the main advantage to growing sinsemilla is that
the plant remains in a flowering state for a longer period of time. Flowers may rapidly form for four to ten weeks. The flower buds develop larger and more thickly along the stems, yielding more top-quality grass (more buds) than in the seeded condition.

Anyone can grow sinsemilla. Simply remove the male plants before they release pollen. Given a normal spring planting, males usually flowers in August and September, but may being to flower as early as mid-July. Under artificial lights, males sometimes flower after only three months, and before the grower has shortened the photoperiod. Even though the females are not flowering, remove the males from the room before any flowers open. Indoor, the pollen will collect as dust and can fertilise the females weeks later.

Male flowers mature quickly, in about one to two weeks after the immature buds are first visible. Check each plant about twice a week to make sure you harvest all the males before any shed pollen. If you can't visit your garden consistently, then thin the garden, using the preceding section on "Sexing" as a guide. Even though you may not get all the males, the females will be more lightly seeded. Actually, even in carefully watched gardens, the females may have a few seeds. Pollination may come from on occasional male flower on a basically female plant, or a female may reverse and form male flowers. And pollen may come from a neighbour's garden, a problem that is becoming more common. But in practical terms, an occasional seed makes no difference. The female can form thousands of flowers, and when only a few are pollinated, there is little impact on the plant's growth.

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Chapter 18
PROPAGATION AND BREEDING

18.2 Producing Seeds

Marijuana is naturally prolific. It has been estimated that a single male plant can produce over 500 million pollen grains 41. A large female plant can bear tens of thousands of seeds. In nature, pollen is carried from the male flowers to the stigmas of the female flowers by air currents or the wind. Indoors or out, if the plants are simply left on their own, most gardens produce many more seeds than are needed for the next crop.

Seeds usually become viable within two weeks after pollination, although they may not have developed good colour by this time. The colour can take several more weeks to develop, particularly indoors or late in the year, when the light is not as strong. Once seeds are plump, well-formed, and of a mature size, most of them will be viable. When seeds have also developed good colour, their viability should be over 90 percent.

Pollination may also be carried out artificially. Pollen can be collected and the transferred to the female flowers with a cotton swab or artist's brush, or shaken directly over the flowers. Store pollen in a clean, open container and keep in a dry area at moderate temperature. Remove any flowers or vegetative matter from the pollen, because they encourage fungal attack.
Once advantage of artificial pollination is that only the flowers on certain plants need be pollinated. This allows you to harvest most of your grass as sinsemilla, while developing seed on part of the plant. If you have only a few plants, pollinate a single branch, or perhaps only a few lower buds, in order to leave the most potent buds seedless.

A good way to insure a thorough pollination, and to avoid contaminating other females, is to loosely tie a transparent bag containing pollen directly over individual buds, branches, or whole plants. Shake the bag to distribute the pollen and carefully remove it from several hours to a few days later.

To avoid contaminating a sinsemilla crop, you must remove any males from the garden before their flowers open. Males in pots can simply be moved to another area or room if you want to keep them growing. Male plants can complete development even in low light; so they do not need artificial light. Otherwise, the best procedure is to harvest the males intact by cutting them at their base after some flowers have formed distinct (but unopened) buds. Hang the whole plants upside down in a sheltered area where there is moderate light and where temperatures and humidity are not extreme. Place clean plates or sheet plastic beneath the plants to catch falling pollen. Generally there is enough stored water in the plant for the unopened flowers to mature and drop pollen. Well-formed flowers may open the next day. Usually all the flowers that are going to open will do so within two weeks.

Pollen gradually loses viability with time, but pollen that is about three weeks old generally has sufficient viability for good seed production. However, the age of the pollen may influence the sex ratio of the next generation.

For instance, in a 1961 study with hemp plants 97, the percentage of females in the next generation was 20 percent higher than in the control plants (natural pollination) when pollen 14 to 17 days old was used. A small increase in female-to-male ratios also occurred when pollen was fresh (six hours or less). The age of the stigmas appeared not to affect the sex ratio.

18.3 Producing Female Seeds

If it were possible to know which seeds are female and which are male, marijuana growing would be even simpler than it is. There is not practical way to discern the gender of a seed - but there is a simpler procedure for producing seeds that will all grow into female plants.

To produce female seeds, the plants are fertilised with pollen with male flowers that appear on a basically female plant. Such flowers appear on intersexes, reversed females, and hermaphrodites (see section 17). Female plants have an XX complement of sex chromosomes; therefore, the pollen from the male flowers that form on female plants can only carry an X chromosome. All seeds produced from flowers fertilised with this "female" pollen will thus have an XX pair of sex chromosomes, which is the female genotype.

Although the male Cannabis plant can produce female flowers, it cannot produce seed; so there is no chance of mistakenly producing seed on a male
plant. It is possible to use pollen from an intersexual plant that is basically male (XY); the resulting crop of seeds will have the normal 1:1 ratio of males to females. For this reason, choose a plant that is distinctly female as a pollen source. A female plant with a few random male-flower clusters, or a female plant that has reversed sex are both good pollen sources. The seed bearer can be any female, female intersex, or reversed-female plant.

In most crops, careful inspection of all the females usually reveals a few male flowers. And often, when females are left flowering for an extended period of time, some male flowers will develop. If no male flowers form, you can help to induce male flowers on female plants by severe pruning. One such procedure is to take the bulk of the harvest, but to leave behind some green leaves to maintain growth (as described in the section on "Double Harvests" in section 20). Most of the plants will continue to form female flowers, but male flowers are also likely to form. At times, the plants may not grow particularly well, and may in fact form distorted and twisted leaves, but they will produce viable seeds as long as some stigmas were white when pollinated. (Remember, it only takes a few fertile buds to produce hundreds of seeds.) Pollinate the female flowers by hand as soon as pollen becomes available.

{Figure 82. A solitary male flower on a female plant provides "female" pollen. (Also see Figure 84 for a female reversing sex.)}  
{Figure 83. Growth may not be vigorous, but seeds will form if stigmas are white when pollinated.}

Under artificial lights, turn the light cycle down to eight hours after cutting the plants back. The short cycle helps to induce male flowers on female plants.

Male-free seed can also be produced by pollen from a natural hermaphrodites. The progeny, however, may inherit the hermaphroditic trait, resulting in a crop with some hermaphrodites as well as females. This could be a problem if you want to grow sinsemilla the next crop.

18.4 Breeding

Breeding Cannabis is done simply by selecting certain plants to be the pollinators and the seeds bearers. Characteristics such as fast growth, early maturation, and high potency might be the reasons for choosing one plant over another. Selection can be by means of the male plants, the females, or both. A simple procedure would be to harvest all male plants, sample each for potency, and use the most potent plant for the pollen source. At harvest, compare the seeded females for potency, and use seeds from the most potent plant for the pollen source. At harvest, compare the seeded females for potency, and use seeds from the most potent plant for the following generation.

There are two basic approaches to breeding. One is inbreeding, and the other is outbreeding. Inbreeding involves starting with a single variety and crossing individuals to produce seeds. In this way, certain desirable characteristics that the parents have in common will probably be perpetuated by the offspring.
Certain variants with unusual characteristics, such as three leaves to a node instead of the usual two leaves, can be inbred continuously until all progeny carry the trait. One problem with inbreeding is that other desirable characteristics may be lost as the new population becomes more homogeneous. Inbreeding plants indoors seems to lead in a loss in potency by the fourth generation. (Preceding generations were considered comparable to the original imported grass.)

Outbreeding is crossing two different varieties. Offspring from parents of two different varieties are called hybrids. Cannabis hybrids exhibit a common phenomenon on plants called "hybrid vigour." For reasons not wholly understood, hybrids are often healthier, larger, and more vigorous than either of their parents. {Figure 84. Upper left: An old female reversing to male flowering. Lower left: Three leaves to a node (trifoliate). Upper right: A plant with three leaves to a node alternating with one leaf on next node. Lower right: Three-leafed plants sometimes split into two growing shoots.}

A reference to cannabinoid content of hybrids from crosses between chemotypes was made in a 1972 study by the Canadian Department of Agriculture: "The ratio of THC to CBD in hybrids was approximately intermediate between the parents ... there was also occasionally a small but significant deviation toward one of the parents - not necessarily the one with the higher or lower ratio of THC to CBD." 51 This means that a cross between a midwestern weedy hemp (type III) and a fine Mexican marijuana (type I) would yield offspring with intermediate amounts of THC and CBD, and which hence would be considered type II plants.

Homegrowers have mentioned that inbreeding plants often led to a decrease in potency after several generation. Outbreeding maintained potency, and sometimes (some growers claimed) led to increases in potency.

One area in which breeding can be useful for homegrowers is the breeding of early-maturing plants for northern farmer. Farmers in the north should always plant several varieties of marijuana. Mexican varieties generally are the fastest to mature. Individual plants that mature early and are also satisfactorily potent are used for the seed source in next year's crop. This crop should also mature early. Some growers cross plants from homegrown seed with plants from imported seed each year. This assures a maintenance of high-potency stock.

Potency Changes Over Generations

It is well-established that plants of the P1 generation (parentals, or the first homegrown plants from imported seed) maintain their chemical characteristics. (For example, type I plants yield type I progeny whose cannabinoids are about equal both quantitatively and qualitatively to those in their native grown parents.) This fact is shown by Table 25.

In the study 66 from which Table 25 has been adapted, individual plants within varieties differed by more than four times in CBD content and by more than three times in THC content. The researchers also noted that illicit marijuana samples contained proportionately less leaf material and
proportionately more stem and seed material than samples grown in Mississippi. (Mississippi samples may be more dilute.) New Hampshire and Panama samples were nearly equal in terms of the sum of THC plus CBN.

One of the questions that persists in marijuana lore is what effect if any a change in latitude has on the plant chemotype over a period of generations. Non-drug types of Cannabis usually originate above 30 degrees latitude in temperate areas. Drug types of Cannabis usually originate in tropical or semitropical areas below the 30-degree parallel. Whether this is due entirely to cultural practices is questionable. More likely, the environment (natural selection) is the prime force, and cultural practices reinforce rather than determine chemotype.

Cannabis is notorious for its adaptability. Historically, there are many statements that the drug type of Cannabis will revert to the "fibre" type when planted in temperate areas, whereas the fibre type will revert to the drug type after several generations in a tropical area. That a change in chemotype is actually caused by transfer between tropical and temperate areas has not been verified scientifically. (Such studies are ongoing in Europe.) If such changes occur, it is also not known whether the change is quantitative (the plant produces less total cannabinoids) or whether it is qualitative (succeeding generations, for example, change from being high in THC and low in CBD to being high in CBD and low in THC).

We believe that qualitative changes can occur within a few generations, but can only guess what environmental factor(s) might be responsible for such a change. Probably the change has more to do with adaption of general growth and developmental characteristics than with particular advantages that production of either CBD or THC may bestow upon the plants.

The reason we suspect a change in chemotype is that these changes occur rapidly in evolutionary terms, in a matter of several generations. This rapidity implies that some very strong selective pressure are acting on the plant populations. Also, changes in the chemotype seem to occur globally, which implies that the selective pressures responsible are globally uniform rather than local phenomena. Such globally uniform pressures might be light intensity, daylength, ambient temperatures, and the length of the growing season. For example, in populations adapting to temperate areas, those plants that are able to grow well under relatively lower light intensity and cooler temperatures, and which are able to complete development in a relatively short growing season, would be favoured over siblings with more tropical characteristics.

Adaption acts on populations by means of whole organisms which are reacting to a total environment. Shifts in the chemotype of the population are probably linked genetically to the strong selective pressures exerted on the populations by the need to adapt general growth and maturation to either northern (temperate) or southern (tropical) conditions. (From the northern hemisphere.)

18.5 Cuttings

Marijuana growing often transcends the usual relationship between plant and growers. You may find yourself particularly attached to one of your plants.
Cuttings offer you a way to continue the relationship long beyond the normal lifespan of one plant.

To take a cutting, use scissors or a knife to clip an active shoot about four to six inches below the tip. Cannabis does not root easily compared to other soft-stemmed plants. Cuttings can be rooted directly in vermiculite, Jiffy-MIX, a light soil, or in a glass of water. The cutting is ready to plant when roots are about an inch long, in about three to four weeks. A transplant compound such as Rootone can be used to encourage root growth and prevent fungi from forming.

Keep the mixture consistently moist but not too saturated. Roots need oxygen as well as water in order to grow. Change the water daily if the cutting are in a glass of water. Cuttings root best in moderate light, not in intense light (HID's) or direct sunlight. The best light is fluorescent set on constant light (24 hour photoperiod).

Cuttings taken from the same plant are genetically identical and are clones. Clones eliminate genetic differences between individuals, and hence are particularly useful in scientific experiments. By using clones, one can attribute variations between individuals specifically to outside factors. This would be particularly useful when testing, for example, the affect of fertilisers on potency. In the 1980's, scientists finally began to use this useful tool in Cannabis experiments.

18.6 Grafting

One of the most persistent myths in marijuana lore concerns grafting Cannabis to its closest relative, Humulus, the hops plant of beer-making fame. The myth is that a hops scion (shoot or top portion of the stem) grafted to a marijuana stock (lower stem and root) will contain the active ingredients of marijuana. The beauty of such a graft is that it would be difficult to identify as marijuana and, possible, the plant would not be covered under marijuana statutes. Unfortunately, the myth is false. It is possible to successfully graft Cannabis with Humulus, but the hops portion will not contain any cannabinoids.

In 1975, the research team of Crombie and Crombie grafted hops scions on Cannabis stocks from both hemp and marijuana (Thailand) plants 205. Cannabis scions were also grafted to hops stocks. In both cases, the Cannabis portion of the graft continued to produce its characteristic amounts of cannabinoids when compared to ungrafted controls, but the hops portions of the grafts contained no cannabinoids. This experiment was well-designed and carried out. Sophisticated methods were used for detecting THC, THCV, CBD, CBC, CBN, and CBG. Yet none of these were detected in the hops portions.

The grafting myth grew out of work by H.E. Warmke, which was carried out for the government during the early 1940's in an attempt to develop hemp strains
that would not contain the "undesirable" drug 58. The testing procedure for the active ingredients was crude. Small animals, such as the water flea Daphnia, were immersed in water with various concentration of acetone extracts from hemp. The strength of the drug was estimated by the number of animals killed in a given period of time. As stated by Warmke, "The Daphnia assay is not specific for the marijuana drug ... once measures any and all toxic substances in hemp (or hop) leaves that are extracted with acetone, whether or not these have specific marijuana activity." Clearly it was other compounds, not cannabinoids, that were detected in these grafting experiments.

Unfortunately, this myth has caused some growers to waste a lot of time and effort in raising a worthless stash of hops leaves. It has also led growers to some false conclusions about the plant. For instance, if the hops scion contains cannabinoids, the reasonable assumption is that the cannabinoids are being produced in the Cannabis part and translocated to the hops scion, or that the Cannabis root or stem is responsible for producing the cannabinoids precursors.

From this assumption, growers also get the idea that the resin is flowing in the plant. The myth has bolstered the ideas that cutting, splitting, or bending the stem will send the resin up the plant or prevent the resin from going down the plant. As explained in our discussion of resin glands in section 2, these ideas are erroneous. Only a small percentage of the cannabinoids are present in the internal tissues (laticiferous cells) of the plant. Almost all the cannabinoids are contained and manufactured in the resin glands, which cover the outer surfaces of the above-ground plant parts. Cannabinoids remain in the resin glands and are not translocated to other plant parts.

We have heard several claims that leaves from hops grafted on marijuana were psychoactive. Only one such case claimed to be first hand, and we never did see or smoke the material. We doubt these claims. Hops plants do have resin glands similar to those on marijuana, and many of the substances that make up the resin are common to both plants. But of several species and many varieties of hops tested with modern techniques for detecting cannabinoids, no cannabinoids have ever been detected.

The commercially valuable component of hops is lupulin, a mildly psychoactive substance used to make beer. To our knowledge, no other known psychoactive substances has been isolated from hops. But since these grafting claims persist, perhaps pot-heads should take a closer look at the hops plant.

Most growers who have tried grafting Cannabis and Humulus are unsuccessful. Compared to many plants, Cannabis does not take grafts easily. Most of the standard grafting techniques you've probably seen for grafting Cannabis simply don't work. For example, at the University of Mississippi, researchers failed to get one successful graft from the sixty that were attempted between Cannabis and Humulus. A method that works about 40 percent of the time is as follows. (Adapted from 205)

Start the hops plants one to two weeks before the marijuana plants. Plant the seeds within six inches of each other or start them in separate six-inch
pots. The plants are ready to graft when the seedling are strong (about five and four weeks respectively) but their stem has not lost their soft texture. Make a diagonal incision about halfway through each stem at approximate the same levels (hops is a vine). Insert the cut portions into each other. Seal the graft with cellulose tape, wound string, or other standard grafting materials. In about two weeks, the graft will have taken. Then cut away the unwanted Cannabis top and the hops bottom to complete the graft. Good luck, but don't expect to get high from the hops leaves. (Smoking any plant's leaves will give a short, slight buzz.)

18.7 Polyploids

H.R. Warmke also experimented with breeding programs during the war years. Polyploid Cannabis plants were produced by treatment with the alkaloid colchicine. Colchicine interferes with normal mitosis, the process in which cells are replicated. During replication, the normal doubling of chromosomes occurs, but colchicine prevents normal separation of the chromosomes into two cells. The cell then is left twice (or more then) the normal chromosome count.

Warmke's experiments concluded that polyploids contained higher concentrations of the "active ingredient." However, the procedure for measuring that ingredient was much the same is described for grafting, with probably similar shortcomings.

Polyploid Cannabis has been found to be larger, with larger leaves and flowers. Recent experience has shown that polyploids are not necessarily higher in potency. Usually they are about equal to diploid siblings.

Colchicine is a highly poisonous substance. The simplest and safest way to induce polyploids is to soak seeds in a solution of colchicine derived from bulbs of winter or autumn crocus (Colchicum). Mash the bulbs and add an equal part of water. Strain through filter paper (or paper towels). Soak seeds in the solution and plant when they start to germinate. Cultivate as usual.

Only some of the seeds will become polyploid. Polyploid sprouts generally have thicker stems, and the leaves are often unusually shaped, with uneven-sized blades. Leaves also may contain more than the usual number of blades. As the plant grows, leaves should return to normal form, but continue to be larger and with more blades.

If no polyploids sprout, use less water in preparing the solution.

Colchicine is also a prescribed drug for treatment of gout and is taken in pill form. These usually contain .6 mg per tablet. Use 10 tablets per ounce of water, and soak the seeds as described above.

Colchicine is also sold by mail-order firms which advertise in magazines such as Head or High Times.

Because colchicine is a poison, it should be handled carefully. It is not known if plants from seeds treated with colchicine will contain a harmful amount of colchicine when plants are grown. Harm is unlikely, because the
uptake by the seed is so small, and because the colchicine would be further
diluted during growth, as well as diminished by smoking. But we cannot
guarantee that you can safely smoke colchicine-treated plants.

Chapter 19
EFFECTS OF THE ENVIRONMENT ON POTENCY

This chapter deals only with the influence of the environment on the potency
of your crop. Differences or changes in potency can also result from
inherent differences between plants, such as in their variety or growth
stage, from chemical degradation of the harvested marijuana, and from
genetic processes that take place over several generations of plantings
((For discussion of these other causes of differences in potency, see the
following sections: "Cannabis Chemotypes" in section 2; "Inherent
Variations" in section 3; "Breeding" in section 18; "Potency and
Decomposition" in section 20; and "Storage" in section 21.))

We have emphasised the heredity is the most important factor that determines
potency. Potent marijuana grows from seeds of potent marijuana. A healthy,
mature plant bears an abundance of flowers, guaranteeing you a potent
harvest.

Some researchers have investigated the impact of the environment on relative
potency, since this question is of interest to officials concerned with
marijuana control as well as to marijuana growers. Their primary goal has
been to discover the gross effects of different environments rather than to
single out the effects of any particular factor. A consensus is that the
impact of environment on potency is small relative to that of the plant's
heredity. Nevertheless, where scientists have commented on this question,
the common denominator for higher potency has been stress.

19.2 Stress

Stress in anything that detracts from the plant's health or vigour.
Environmental factors such as competition from other plants, low water
availability, and poor soil conditions are examples of stress factors.

In many marijuana-growing cultures, farmers have practices that are
stress-related; splitting the base, severe pruning, bending or contorting
the stem, and water deprivation are common examples. Of course, the fact
that marijuana-growing cultures have such practices does not mean that these
practices actually increase potency, or that this is, or ever was, their
intention. This original meaning may well have been forgotten centuries ago.
For instance, cultivation of sinsemilla has been practiced for centuries,
not for potency, but because the seedless product is easier to process or
smoke.

There does seem to be some underlying relationship between stress and higher
potency. Stress factors may slow growth in general, but at the same time,
may not slow the synthesis of cannabinoids. Potency may be affected in much
the same way by growth factors that are not considered stressful. As
described previously, marijuana plants grow more compactly and have smaller
leaves under conditions of relatively warm temperatures, or strong sunlight, or a dry atmosphere; they grow taller and have larger leaves when grown under cool temperatures, moderate light, or a humid atmosphere. Higher relative potency seems to correlate with conditions which favour compact development of the plant and its parts.

The rate of cannabinoids synthesis relative to photosynthesis may be affected in ways not apparent. Sunlight, for instance, is a growth factor. In almost all cases, the more sunlight the plants receive, the faster and larger they will grow. Yet plants grown with intense sunlight seem to maximise potency. Intense sunlight can raise plants' internal temperatures to levels that interfere with the photosynthesis cycle. Absorption of light energy and conversion to biochemical energy continues unimpeded, but the synthesis of sugars is impeded. (Under a midday sun, this phenomenon has been observed in other field crops. (206)) In marijuana, cannabinoids synthesis may continue unaffected at these higher temperatures. This might account, in part, for the slightly higher potency of plants grown in tropical zones.

The subject of potency is mired in confusion and mystery, largely because of fertiliser and soil ads, marijuana-growing books, and individuals who promise ways of increasing potency or growing super grass. There are no magic formulas or secrets to divulge that will make or break the potency of your crop. We have tried to play down this type of thinking throughout this book. Choice of seed, and a harvest of well-developed buds, far outweigh any other factors in determining potency.

We know of no one who has demonstrated that manipulation of any particular environmental factor leads to higher potency. This lack of demonstration probably exists for two reasons: (1) environmental effects on potency are relatively small compared to the effects of inheritable traits, and hence are not easy to discern; and (2) "increased potency" is difficult to prove. ((Most scientific experiments are observations, and test effects or compare results rather than try to prove something.)) The variations in potency within any variety, and within each plant, require stringent methods of sampling for comparative tests. And since potency also changes with time, meaningful comparisons can be difficult to make. Scientific papers reflect this difficulty.

An experiment on potency must account for inherent variations in potency before environmental effects can be analysed. Samples would need to be equivalent in terms of variety, growth stage and development, sex, plant part, and the position of the part on the plant. A simple way to do this would be to harvest females when each reached full bloom and then compare the uppermost buds from each plant.

Most of the research on potency done to date either has not reported sampling techniques or did not account for certain inherent variations. In the extreme case, all vegetative matter from one plant was mixed together, and the THC concentration in a sample of this matter was compared with that in a similar sample of mixed marijuana from another plant. Such practices can give misleading results. Consider the fact that an unhealthy plant will have dropped many of its lower, less-potent leaves. A healthy plant has more leaf overall and retains more of its lower leaves. There is a good chance
that the unhealthy plant will test higher in average THC content, because proportionately shoots, which are relatively more potent. Such a sampling error could create the impression that stress is positively correlated with potency.

Marijuana scientists have recognised the need for testing equivalent samples and for setting standards for testing. In 1974, the English scientist John Fairburn (68) published a number of well-controlled experiments concerning potency and light. This is a hopeful sign that more meaningful experiments will be forthcoming.

We have said that the common denominator for increasing potency is stress. Let's put that in perspective.

You cannot go wrong if you grow the largest and healthiest plants possible. Our experience has been that the most potent plants are more often the healthiest and most vigorous in the garden.

Factors that limit growth rate are probably related to potency, and if growth rate is relatively slower, cannabinoids concentrations may be higher. Plants whose average yield is six ounces may be slightly more potent than plants whose average yield is eight ounces. Factors related to potency affect growth rate rather than ruin the plant's health. When a plant is so traumatised that it is barely surviving, potency as well as growth rate declines.

Obviously, if the growth rate is slower, the harvest will be smaller. Any difference in potency due to stress is quite small, but the difference in yield can make the difference between harvesting an ounce and harvesting several pounds (i.e., don't get carried away with the practice of stressing the plants). If you wish to stress the plant, wait until it is firmly established and growing well.

Outdoors, don't stress the plant until at least the middle of its life. You want the plant to be large enough to bear a good harvest of buds. Water deprivation is a good method of limiting growth outdoors. However, wilted plants must be watered, or they will die.

Competition from other weeds has been correlated with higher potency in two recent studies (71,74). You might prefer not to weed your patch after the seedling stage. (Initially, weeding is necessary because indigenous weeds generally outgrow marijuana seedlings.)

Another safe way of applying stress is to remove all large leaves from the plant once it has begun to flower.

Indoors, the plants are already in a delicate state. We advise indoor growers to grow the largest and healthiest plants possible for best results.

19.3 Nutrients

Most growers show a keen interest in fertilising, since it is one factor over which they have some control. Most growers also feel that nutrients, which play such an important part in plant growth, probably have a
relationship to the potency, and this is a reasonable assumption. In marijuana lore, potency is sometimes attributed to particular soil types (for instance, red dirt, which is iron-rich) or to presence or lack of certain nutrients (for examples, nitrogen or potassium deficiency).

The relationship of potency to soil conditions, in particular the nutrient content, has been looked at recently by several research groups. In two such studies, (71,74) the cannabinoid content of naturalised weedy hemp stands in the Midwest was examined. Variations in potency were then correlated to soil properties, such as N, P, and K content. The two papers came to similar conclusions. First, stands growing in areas where they were under stress tended to produce less biomass (yield) but were more potent overall. Second, when nutrients or other growth factors, such as height and weight of plants or root size, were correlated with potency, potency was almost always correlated positively with positive growth factors. That is, higher potency occurred when the plants were growing with adequate or high amounts of nutrients present, not when nutrients were inadequate.

What appears to be a contradiction (stress leads to higher potency, or good growing condition lead to higher potency) may be explainable in terms of what these experiments actually measured.

A basic assumption in these studies was that all the plants were relatively homogeneous genetically, since they may have originated from a single stock of hemp grown during World War II. Assuming this is true, then variations between stands would be due to differences in local environmental factors. However, since environmental condition differed locally for separate stands, one cannot tell whether variations in potency between stands are due to present environmental factors (phenotypic responses) or reflect thirty years of adaption by each stand to its local environment (genotypic shifts).

It may be that positive growth factors are associated with higher potency in phenotypes (plants now growing), whereas stress leads to higher potency in succeeding generations, because of selective pressure. It is interesting that both papers reported strong positive correlations between higher potency and competition from other weeds, since competition between plants does exert strong selective pressures.

The following list of possible effects of nutrients on potency has been adapted from these four studies. (63,71,74,231)

Nitrogen

Nitrogen was positively correlated with higher potency. Once controversy in marijuana lore is whether a nitrogen deficiency during flowering increases potency. We have grown plants with N deficiencies, and they seemed no more potent than those grown with high amounts of nitrogen available. However, the N-deficient plants did produce a much smaller harvest.

Phosphorus

P has been correlated positively with higher potency in all studies that have examined this factor. Phosphorus is necessary for good flower development and seed production. Give the plants a steady supply of
phosphorus throughout growth and in particular during flowering.

Potassium

K has been correlated both positively and negatively with potency. More often, it has been found to be negatively correlated. As discussed previously, plants that show some potassium deficiencies may grow well; so you may choose not to treat minor symptoms of K deficiency often grows vigorously with little harm other than the spotting and the loss of some lower leaves. It should not be necessary to fertilise with potassium during flowering unless deficiency symptoms are severe and the plant has ceased growing.

Calcium

Abundant Ca levels have been consistently correlated with higher potency.

Magnesium

Mg has been negatively correlated with potency. However, this may have been due to the interaction of Ca and Mg, and may reflect Ca's strong positive correlation to potency, rather than the negative effects of Mg per se. Plants that show Mg deficiencies must be fertilised, or they will quickly lose most of their leaves and barely remain alive.

Chapter 20

HARVESTING

Figure 30 is a hypothetical plot of the increase in potency of a male plant and a female during the course of their growth. (Potency is measured by the percentage by weight of THC in a dried sample of the uppermost leaves or growing shoots until flowers appear.) It shoes that generally potency increases as the plant develops. Cues such as phyllotaxy changes and rate of growth are helpful indicator to changes in development and the chronological age of the plant has little significance.

The development of the cannabinoids, resin glands, and, in practical terms, the potency in the living plant is not clearly understood. We believe that, for the most part, potency does not increase steadily throughout the entire plant. Rather, each plant part reaches a point of maximum potency as it individually develops. A leaf that is formed when the plant is four weeks old does not increase in potency during the rest of the season. To say that potency is increasing means that the leaves that are now forming are more potent than those previously formed.

We also believe that cannabinoid formation is very fast as each plant part forms. Once matured (for example, when a leaf is fully expanded), cannabinoids are decomposing. This is one reason why the potency can decrease as well as increase during growth, especially late in the season, after the flowers have formed. The practical aspects of these points are detailed in the following sections.
20.2 Harvesting During Growth: Leaves and Growing Shoots

Leaves

We have emphasised that you should harvest grass during the course of the season. One reason is to assure yourself a return for your efforts. It is a sad commentary on our times that the greatest danger in growing marijuana outdoors is that the plants may be ripped off. On a more positive note, vegetative shoots and leaves can be surprisingly potent and should be sampled.

The potency of each new set of leaves is higher than the last pair until a plateau is reached, usually during the middle of vegetative growth. Thereafter potency of new leaves stays about the same as in those preceding. Often there is a noticeable decline in potency just prior to flowering. Leaves that form during flowering are usually more potent than those formed during the vegetative plateau. Leaves that form after the bloom are less potent.

Of course, not all varieties or individual plants will follow this rhythm. Faster-developing plants may reach the plateau sooner, and slower plants later. Potency of plants that have a longer life cycle may stay at the vegetative plateau for several months. Some plants do not seem to experience any drop in potency before flowering. Potency of these plants continues to increase gradually after the initial quick increase during early vegetative growth.

Whenever you harvest green leaves during growth, you should always take the uppermost leaves, since these are the most potent. Also, the smaller leaves that form on the branches are more potent than the large leaves on the main stem. These large stem leaves (fan, shade, or sun leaves) are often the first leaves that growers pick. But these are the least potent of all leaves, and the may not get you high at all. As long as these leaves are healthy and green, let them stay on the plant for the plant's growth. Many growers simply use these leaves for mulch or compost as they die.

Don't think that you should harvest each leaf as soon as it appears; this procedure would seriously affect normal growth and result in a small harvest of buds. The potency of individual leaves does not increase during the course of the season, but the decrease in potency is not great. Some of the loss in potency may even be made up for by the loss in tissue weight that a leaf experiences as it dies. Many growers prefer to harvest leaves during growth only after they lose colour, preferring the taste of the smoke to that of green leaves.

Leaves should always be harvested if they die; with indoor gardens, remove any leaves that show signs of insects or other pests.

Do keep yourself supplied with grass (that is the reason you are growing the plant); just don't overdo it. The main harvest is made up of buds, and you want a large, healthy plant that can support vigorous flowering. The larger and healthier a plant is, the more leaf you can harvest without seriously affecting the plant.
Growing Shoots

You may prefer not to clip the growing shoot of the main stem. This forms the largest and most potent cola by harvest time. Plants grown close together usually are not clipped, so that the plants may grow as tall as possible. Where there is much space between plants, the main shoot is clipped to encourage the plant to develop its branches, which fill the available space.

The potency of growing shoots follows the rhythm described for new leaves. However, growing shoots can be the most potent parts of the harvest when picked at the right time. Shoots sometimes reach a very high peak of potency during the middle of vegetative growth. Outdoor gardens should be samples from mid-June through July, since this is the period in which shoots usually reach their peak.

Potency also fluctuates according to local weather conditions. Try to harvest after a period of clear, sunny weather. Potency may declining for several days after a period of cloudy weather or heavy rainfall. After a heavy rain, harvest the shoots a week or two later, since the shoots often peak in potency during a burst of fast growth.

Growing shoots can be harvested from each plant at least twice during growth. The first clipping may not give you much worthwhile grass, but it is done when the plants are young (roughly six weeks old) to force the plant to develop several growing shoots which are harvest about six to eight weeks later. The main shoot is clipped, leaving about four or five nodes below the cut. Two shoots should start to grow from each node, the strongest at the top of the plant and the weakest at the bottom. (This difference is more pronounced under artificial light, since the light is strongest on the top of the plants.) Each plant should produce at least six strong growing shoots after this first clipping. The yield from growing shoots can be considerable (especially during the summer marijuana drought) and will probably keep you supplied until the main harvest.

A third harvest of shoot can be made later if the plants have a long growing season or are indoors. You don't want to clip shoots from the plants just prior to or during flowering, since doing so cuts down on the harvest of buds. Each plant should have at least twelve growing shoots after being clipped twice previously. You might harvest only a few shoots from each plant if the time for flowering is near.

20.3 Male Plants

Male plants usually do not have the dramatic increase in potency during flowering that the females do. Male flowers take about two weeks to mature, from the time they are first visible as tiny knob-like buds. New flowers continue to appear for several weeks.

When male flowers open and are about to release pollen, they reach their maximum potency. Since all flowers do not mature at the same time, for maximum potency the plants should be harvested after the first few flowers have opened.
Male flowers actually make up little of the total weight of the harvest, and few new leaves form once flowering begins. There is no significant loss in either potency or yield if the male is harvested before its flowers open. Once male flowers appear, there is little change in their potency. Also, once the flowers do open and release pollen, they shortly fall from the plant and are lost to the harvest.

Males should therefore be harvested before any flowers open unless you want the females to produce seeds. In a small garden, male flower clusters can be individually harvested as they mature. Most growers treat male flowers more as a novelty. Potency of male flowers is quite variable, and seldom are they as good as the female flowers. To remove male plants, cut them near the base of the stem. Don’t rip them up by the roots if they are near females that will be left to grow.

Male plants normally begin to lose their vigour after the initial bloom. When the weather is mild, or the plants are indoors, they can be encouraged to bloom a second and sometimes a third time before they finally die.

20.4 Harvesting Female Buds

The decision of when to harvest females can be simplified by understanding that you want to pick the buds after they have developed fully, but before degradation processes begin to lower potency. There are two criteria you can use to tell when the plants have reached full bloom. The first is recognising the rhythm, with which the plants are blooming. A second is the condition of the flowers as judged by the health of the stigmas and the colour of the resin.

Sinsemilla

Since sinsemilla flowers are not pollinated, the flowering period may last for many weeks. The most common rhythm for sinsemilla is that plants go through a stage of rapid bud formation, and the plants do indeed bloom. This bloom often lasts four to five weeks. The bloom ends when the rate at which new flowers form noticeably declines. At his time you should be able to sense that the bloom is completed. Buds are at their peak potency about one week after flower formation slows. This is the time to harvest. True, the plant may continue to grow slowly, but the main harvest is ready and should be taken.

With sinsemilla, some marijuana varieties have an extended bloom that may last more than two months. With this rhythm, the rate at which the buds form is drawn out, and progresses at a slower but steadier pace. The point at which the bloom is essentially over may not be as obvious as in the first case. Here, use the condition of the buds to make your decision. Stigmas wither first at the base of the buds (older flowers). Those stigmas at the top of the buds (younger) will still be white and healthy, although their tips are often brown. Harvest the plants when about half the stigmas in the buds have withered. The coating of resin glands should still be clear or white, with only a few golden or browned gland heads.

A third type of flowering rhythm is sometimes seen on plants from Thai seed. Flower buds bloom and ripen at different times. These plants also have an
extended flowering stage that can last for over two months. You may choose to harvest individual buds, colas, or branches as they ripen.

Seeds

If your primary interest is seeds, the plant should be harvested after the seeds have developed their mature colour. Mature seeds can be seen splitting their sheaths or bracts. When enough seeds have ripened, the plants should be harvested. If the plants are left in the ground and die, many of the seeds will fall from the plant.

For most growers, potency will be of primary interest, seeds only a secondary. With seeded marijuana, flowering is initially rapid until the plant is well-pollinated. If pollination occurs early in flowering, the plants often bloom for another week or two. Generally, you want the plants to flower for at least four weeks before picking, and usually longer, about six to seven weeks.

With seeded marijuana, the bloom is of shorter duration than with sinsemilla. Once growth slows, wait another two to three weeks before harvesting. All the seeds may not be matured, particularly at the top of the bud. But potency of the buds should be about maximum at this time.

20.5 Weather

Because of such variables as variety and growing conditions, there can be so much variation in the ripening process that no one criterion for judging when maximum potency is reached will be reliable for all cases.

Warm, sunny weather encourages rapid flowering and a long period of receptivity by the stigmas. Cool, rainy weather can wither the stigmas and dampen the vigour of the bloom.

If brief frost or long, cool rain has withered the stigmas, use the plants' growth as a guideline, because ultimately this is the most important criterion. You want the buds to reach a mature size, and to ripen for about another week. You do not want the buds to be left on the plant longer than necessary.

Ideally, harvesting should follow a period of warm, sunny weather. In northern and mountainous parts of the country, many tropical varieties will note flower until late in the season, when the weather has cooled and night-time frosts are threatening. Most mature plant can withstand mild frosts and continue to grow well if daytime temperatures are mild. In this case, let the plants mature, since formation of the buds is more important than the weather in determining potency. Watch the plants carefully, and harvest when the buds reach mature size. Marijuana killed by frost may smoke harshly, but potency does not seem affected. Well-formed buds should be picked if heavy rains are expected. Cannabinoids are not water-soluble, but gland heads will be washed away.

Barring a catastrophe, such as a long frost, death to Cannabis is usually not sudden. The plants will continue to grow, and may infact rejuvenate the next year if the stalks are left in the ground. But after the main bloom,
the growth that follows is usually much less vigorous and sometimes forms abnormally. Leaves at this time are simplified, and have one blade. Later leaves are smaller, and tend to have entire margins (no serrations). Sometimes they are twisted or misshaped, as are the flowers that form along with them. This slow growth that follows the initial bloom will contribute little to the weight of the harvest. Additionally, this post-bloom growth is much less potent than the original bloom. Resin glands on these plant parts are feeble and poorly developed. When this abnormal growth forms, the time for harvesting is past. {See Figure 83.}

When a plant seems to persist in growing, and you are not sure bloom is past, the best procedure to follow is to try for a double harvest.

Double Harvests

Most marijuana plants take at least five months to reach maturity. Once the plant has reached maturity, it is forming its most potent marijuana, and should not be cut down completely. You can often induce the females to flower a second (and sometimes a third) time, especially if the plants are indoors or if the weather is expected to stay mild for several more weeks.

To encourage a second bloom, first take the bulk of the harvest: all but the smallest buds, and most of the leaf. Some green leaves should be left on the plant to maintain the plant's growth. After harvesting, give the plants a thorough watering, and water with a soluble, complete fertiliser that provides a good supply of both N and P. This will encourage new growth and continued flowering.

Indoors, the best procedure is to treat the plants like a hedge. Cut all the plants back to equal heights, about two to three feet tall. Remove most of the grass, but again leave a few green leaves on the plant. Don't remove lower branches even if they are leafless, since these will sprout again. Lower the light system to the tops of the plants, and maintain the daily cycle at about 12 hours. The second crop of buds will be ready for harvest in four to eight weeks. With this system, the plants appear like dense hedges of buds. If the second crop of buds forms quickly, you should try for a third crop. Continue to fertilise the plants regularly, and watch for signs of magnesium deficiencies, which often show up when the plants have been growing for an extended time.

Double and triple harvests are one of the benefits of indoor growing. Although plants are relatively small indoors, the original harvest of buds can be triples in the next four months.

20.6 Potency and Decomposition

We have said that when buds are picked too late, the potency may decline because of decomposition of the cannabinoids, especially THC.

In section 21, Tables 26-29 give measured rates of decomposition of the major cannabinoids due to exposure to light and air. Light rapidly decomposes THC into unknown products (possibly polymers (122,164)). Light also converts CBD to CBS and CBC to CBL. Air (oxygen) slowly converts THC to the less active CBN. Conversion to CBN is hastened by higher temperatures.
Degradative processes do not occur as quickly in the living plant as when the cannabinoids are purified or in solution, as is shown by the data in Tables 27-30 in section 21 {Tables on disk only}. Resin glands seem to function well in storing the cannabinoids in dried plant material. However, the rates of decomposition in Tables 27 and 28 are for samples exposed to north light and a maximum of 80F temperatures. Temperature would be higher, and light stronger, under full sunlight.

Studies with fresh plant material usually show negligible CBN content in fresh marijuana from immature plants. When mature buds are tested, their CBN content is generally equal to at least five percent of their THC content. When growing temperatures are higher, such as in the tropics, CBN content can account for more than 20 percent of the original THC. Even if we assume a low figure, such as five percent conversion of THC to CBN, there is actually a much greater decline in THC content because of the simultaneous degradation of THC by light.

When the slow rate at which THC oxidises to CBN is considered, five percent decomposition in a period of less than two months represents considerable exposure of the THC to air, and most of this exposure occurs in the last critical weeks when the resin glands begin to degenerate. Plates 8 and 11-13 show the condition of the resin glands on several different kinds of marijuana.

Stalked glands that cover the female flower bracts sometimes rupture or secrete cannabinoids through pores in the glands head. Secretion is not a continuous flow, but more of an emptying of the glands’ contents. At this time, gland heads may dehisce. Also, because of their abundance and raised positions, resin glands on the female bracts are exposed to strong sunlight and possible physical damage. These conditions may explain the significant decline in potency of buds that are overripe.

Leaves are also affected by decomposition of the cannabinoids, but not as quickly or seriously as the buds, probably because the resin glands on the leaves are most numerous on the undersurface, where they are somewhat protected from light. These glands rarely rupture or secrete cannabinoids. Often they are intact, clear, and apparently unchanged for many weeks on the living plant.

As the plates show, one can, with the naked eye, see the glands change colour, from colourless or white to golden, and then to reddish or brown. THC is colourless. If the colour changes of the resin do indicate decomposition of THC, then decomposition in the stalked glands that cover the buds can be considerable.

We have smoked buds that seemed to lose about half their potency when left on the plant for an addition three weeks. Colour changes are after the fact. If many of the glands are beginning to brown, the grass should be harvested.

20.7 Timing the Harvest

Many growers will disagree with us on when the best time is to harvest the buds (female plants). When the plants are left in the ground, and are alive
but past the main bloom, the resinous qualities of the plant may become more apparent. The bracts and tiny leaves may swell in size, and the leaves feel thicker. The coating of resin glands will change colour. Leaves often yellow and fall form the plant. Much of the green colour in the flowering buds may also be lost. Harvests of these buds more closely resembles commercial Colombian grass than typical homegrown. The resin content of the dried buds may be higher, and the grass will smoke more harshly than if the buds were younger when picked. You may prefer these qualities in your grass, and some growers insist this grass is stonier. We feel that the grass will give you the highest high when it is picked as described previously. Smoking is a personal experience, and you should try different approaches and come to your own conclusions.

The first time you grow marijuana is largely a learning experience. Most growers can't wait to start their second crop, because they are certain that they'll improve on both the quantity and the quality of their crop, and this is usually true. The wise grower will not put all his proverbial eggs in one basket. It is a good idea to monitor potency by taking samples every few days when harvest time is drawing near, just as such monitoring is for deciding when to harvest growing shoots during vegetative growth.

In any garden, some of the plants will mature sooner than others. Use the plant(s) that is earliest to mature to decide at what point in its development the plant reaches maximum potency. This finding then serves as a guide for harvesting the rest of the plants.

Try to use buds from approximately the same position on the plant each time you sample. Take only enough to make a joint or two. The more you standardise your testing (and this includes your smoking evaluation), the more accurate your results may be.

20.8 Final Harvesting

The time of harvest is a time of joy. It is also a time for caution. Unless the safety of your garden is assured, you will want to harvest quickly, quietly and as efficiently as possible. Ideally, each plant is harvested as it matures, but some of you will have to harvest all at once.

It is best to take cardboard boxes or large, sturdy bags to carry the harvest. You want to harvest the plants with as little crushing or damage to the flowers as possible.

Bring a strong knife, heavy shears, or clippers for cutting the stalks. The quickest way to harvest is to cut each plant at its base. Once the plants are on the ground, cut the stalks into manageable lengths for boxing or bagging. Separate large branches as needed for packing.

The bagged or boxed material should be moved to the curing or drying area as soon as possible. If you let the plants sit in the trunk of a car or in plastic bags, they will start to ferment and small in less than a day.

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Chapter 21
AFTER THE HARVEST

Once the marijuana plant is harvested, it ceases to produce cannabinoids and resins, and the main changes in potency that occur are degradative. However, when the material is handled carefully, dried or cured properly, and then stored well, little degradation will occur. During drying or curing, the resin content may seem to increase, as the plant’s tissues shrink away from their resinous coating.

More than 70 percent of the fresh weight of the plant os water. Drying is done to evaporate most of this water, so the marijuana will burn evenly and smoke smoothly. Additionally, the cannabinoids in fresh plant material are mostly in the acid forms, which are not psychoactive. The acid cannabinoids decarboxylate (they lose the gas, carbon dioxide) during the drying or curing processes, which convert them to their psychoactive neutral forms. Decarboxylation is complete if the marijuana is actually smoked. For this reason, no special procedures are needed to decarboxylate the marijuana unless it will be eaten. In that case, the recipe should include a period of dry heating. The heat converts the cannabinoids to their psychoactive neutral forms, and also melts the sharp-pointed cystolith hairs that cover leaves, stems and petioles. Cystolith hairs can cause stomach pains if you eat uncooked marijuana or chew on raw marijuana, which we strongly advise you not to do.

Commercial marijuana us usually composed of just the flower tops (colas), which have been stripped, manicured, cured, and dried. Homegrowers often do not cure their crop before drying, and if the smoke is smooth, there is no reason not to dry it directly. But harsh-smoking marijuana can be cured so that the smoke is smoother. Curing has little affect on potency when done properly.

21.2 Stripping

Stripping, the removal of large leaves, is usually done soon after harvesting. Fan leaves are stripped because they are much less potent than the colas that they cover, and do not cure as well as the prime material. In commercial growing areas, the fan leaves are often stripped in the field and form a green manure. But fan leaves are sometimes quite potent, especially if they are recent growth. The lower leaves are usually weak, but they can be used in cooking or concentrated in an extract.

The easiest time to strip fan leaves is after they have wilted, because they are easier to pull off when they are limp then when they are turgid. Wilting takes place in less than an hour if the plants are in a well-ventilated space. Plants placed in a plastic bag in a cool area may take a day or more to wilt.

Some growers leave the fan leaves on until the plants have dried. After the buds are removed, they strip the remaining leaves by running their (gloved) hands from the base of stems and branches toward their tips. The fan leaves disintegrate into shake.

21.3 Grading and Manicuring
Grading and manicuring are important steps in preparing fine grass. Grading is done by separating the plants according to variety, sex, and the particular stash uniform, and the quality of the better grades is not diluted. Plant parts are usually graded as follows: main top colas, small side colas, immature buds, leaves accompanying flowers, and fan and stray leaves. This is important, because the differences in potency will be considerable. For instance, the buds on a Colombian homegrown will be top quality, but the lower leaves will be more like a low-grade commercial Mexican.

Manicuring is done to remove the extraneous leaf from the colas. First the large fan leaves are stripped. The exposed colas are then trimmed with scissors to remove the ends of leaves that stick out from the colas. Plants should be manicured and (usually) graded before drying, since dried material crumbles into shake when handled. Also, leaves dry much more quickly than buds, and different plant parts cure at their own rates.

Male flowers are often treated as a novelty by growers, who make individually rolled sticks from them, as follows. Hang the plants upside down; the leaves will wilt and hang down, covering the male flower clusters. Then roll each cluster within its leaves between the palms of your hands, to compress the cluster into a joint-shaped mass. Dry the "stick" in a warm dark place. Rolling the grass ruptures many of the glands; so dried sticks should be stored carefully until each is used.

Hashish

When you handle your crop, you may notice a resin build-up on your hands and the tools you are using. This resin can be collected by rubbing and scraping it into a ball. It makes a quality hash that is several times as concentrated as the grass.

Small quantities of hash can be made by rubbing resinous plant parts across a thin, fine mesh screen. The resin is then scraped off the screen and rolled into finger shapes. Hash can also be made by thrashing fresh plants over a mesh screen inside an enclosed box whose floor is lined with sheet plastic. A box about one yard square is a suitable size. On one side of the box a hole is made large enough for the colas to be shaken by hand. In this way, the resin glands are knocked loose, but are contained by the box and settle on the plastic.

Plastic or paper should be placed beneath the marijuana during manicuring, grading, or drying. Besides fallen grass, a considerable amount of glands and fine shake can be caught and compressed to a hash-like mass.

21.4 Curing

Curing is a process employed to naturally enhance the bouquet, flavour, and texture of marijuana. Curing does not lower potency when done correctly, although poor curing methods often result in some less of THC.

Curing is not an essential procedure, and many growers prefer the "natural" flavour of uncured grass. Sweet sinsemilla buds usually are not cured.
Curing is most successful on plants which have "ripened" and are beginning to lose chlorophyll. It is less successful on growing tips and other vigorous parts which are immature. These parts may only lose some chlorophyll.

Curing proceeds while the leaf is still alive, for until it dries, many of the leaf's life processes continue. Since the leaf's ability to produce sugars is thwarted, it breaks down stored starch to simple sugars, which are used for food. This gives the grass a sweet or earthy aroma and taste. At the same time, many of the complex proteins and pigments, such as chlorophyll, are broken down in enzymatic processes. This changes the colour of the leaf from green to various shades of yellow, brown, tan, or red, depending primarily on the variety, but also on growing environment and cure technique. The destruction of chlorophyll eliminates the minty taste that is commonly associated with green homegrown.

There are several methods of curing, most of which were originally designed to cure large quantities of tobacco. Some of them can be modified by the home grower to use for small marijuana harvests as well as large harvests. The methods used to cure marijuana are the air, flue, sweat, sun, and water cures.

Air Curing

Air curing is a technique developed in the United States for curing pipe and cigar tobacco. It was originally done in specially constructed barns made with ventilator slats which could be sealed; a small shed or metal building can easily be adapted for this use. However, this method of curing works only when there is enough material to keep the air saturated with moisture. Wires are strung across the barn, and the marijuana plants or plant parts are hung from them, using string, wire twists, or the crooks of branches. The plants material should be closely spaced, but there should be enough room between branches (a few inches) so that air circulates freely. The building is kept unventilated until all the material loses some chlorophyll (green colour). This loss occurs rapidly during warm sunny weather because heat builds up, which hastens the cure. In wet or overcast weather, the temperature in the chamber will be cooler, and the process will proceed more slowly. If these conditions last for more than a day or two, unwanted mould may grow on the plants. The best way to prevent mould from forming is to raise the temperature to 90F by using a heater.

After the leaves have lost their deep green and become pale, the ventilator or windows are opened slightly, so that the temperature and humidity are lowered and the curing process is slowed. The process then continues until all traces of chlorophyll are eliminated. The entire process may take six weeks. Then the ventilators are opened, and an exhaust fan installed if necessary, to dry the material to the point that it can be smoked but still is moist, that is, bends rather than crumbles or powders when rubbed between thumb and forefinger.

Flue Curing

Flue curing differs from air curing in that the process is speeded up by
using an external source of heat, and the air circulation is more closely regulated. This method can be used with small quantities of material in a small, airtight curing box constructed for the purpose. Large quantities can be hung in a room or barn as described in Air Curing.

A simple way to control the temperature when curing or drying small amounts of marijuana is to place the material to be cured in a watertight box (or a bottle) with ventilation holes on the top. Place the box in a water-filled container, such as a pot, fish-tank, or bathtub. The curing box contains air and will float. The water surrounding the box is maintained at the correct temperature by means of a stove or hotplate, fish-tank or water-bed heater, or any inexpensive immersible heater. Temperature of the water is monitored. With the marijuana loosely packed, maintain water temperature at 90 degrees. After several days, the green tissue turns a pale yellow-green or murky colour, indicating yellow or brown pigments. Then increase temperature, to about 100 degrees, until all traces of green disappear. Raise the temperature once again, this time to 115 degrees, until a full, ripe colour develops. Also increase ventilation at this time, so that the marijuana dries. Plants dried at high temperature tend to be brittle; so lower the temperature before drying is completed. This last phase of drying can be done at room temperature, out of the water bath. The whole process takes a week or less.

Marijuana cured by this technique turns a deep brown colour. Immature material may retain some chlorophyll and have a slight greenish cast. Taste is rich yet mild.

Sweat Curing

Sweat curing is the technique most widely used in Colombia. Long branches containing colas are layered in piles about 18 inches high and a minimum of two feet square, more often about ten by fifteen feet. Sweat curing actually incorporates the fermenting process. Within a few hours the leaves begin to heat up from the microbial action in the same way that a compost pile ferments. Then change in colour is very rapid; watch the pile carefully, so that it does not overheat and rot the colas. Each day unpack the piles, and remove the colas that have turned colour. Within four or five days, all the colas will have turned colour. They are then dried. One way to prevent rot while using this method is to place cotton sheets, rags, or paper towels between each double layer of colas. The towels absorb some of the moisture and slow down the process.

Sweat curing can be modified for use with as little marijuana as two large plants. Pack the marijuana tightly in a heavy paper sack (or several layers of paper bags), and place it in the sun. The light is converted to heat and helps support the sweat.

Another variation of the sweat process occurs when fresh undried marijuana is bricked. The bricks are placed in piles, and they cure while being transported.

A simple procedure for a slow sweat cure is to roll fresh marijuana in plastic bags. Each week, open the bag for about an hour to evaporate some
water. In about six weeks, the ammonia smell will dissipate somewhat, and
the grass should be dried. This cure works well with small quantities of
mediocre grass, since it concentrates the material.

Sun Curing

A quick way to cure small quantities of marijuana is to loosely fill a
plastic bag or glass jar, or place a layer between glass or plastic sheets,
and expose the material to the sun. Within a few hours the sun begins to
bleach it. Turn the marijuana every few hours, so that all parts are exposed
to the sun. An even cure is achieved in one to two days {(see Plate 16)}. Some degradation of THC may occur using this method.

Water Cure

Unlike other curing methods, the water cure is performed after the marijuana
is dried. Powder and small pieces are most often used, but the cure also
works with whole colas. The material is piled loosely in a glass or ceramic
pot which is filled with luke-warm water. (When hot water is used, some of
the THC is released in oils, which escape and float to the top of the
water.) Within a few hours many of the non-psychoactive water-soluble
substances dissolve. An occasional gentle stirring speeds the process. The
water is changed and the process repeated. Then the grass is dried again for
smoking.

THC is not water-soluble; so it remains on the plant when it is soaked. By
eliminating water-soluble substances (pigments, proteins, sugars, and some
resins), which may make up 25 percent of the plant material by weight, this
cure may increase the concentration of THC by up to a third.

Marijuana cured by this method has a dark, almost black colour, and looks
twisted and curled, something like tea leaves. The water cure is frequently
used to cure dried fan leaves and poor-quality grass.

21.5 Drying

Living marijuana leaves are 80 percent water; colas are about 70 percent
water. Marijuana dried for smoking contains only eight to 10 percent water,
or about 10 percent of the original amount. There are several methods used
to evaporate water; these have little effect on potency, but can affect the
taste, bouquet, and smoothness of the smoke. Generally, the slower the dry,
the smoother the taste. Excess drying and drying methods that use heat will
evaporate some of the volatile oils that give each grass its unique taste
and aroma.

Grasses which are dried as part of the curing process usually have a smooth,
mild taste, because of the elimination of chlorophyll and various proteins. Cured marijuana may also be a little sweeter than when first picked, because the curing converts some of the plant's starch to simple sugars.

Some grasses are tasty and smooth-smoking when they are dried without
 curing, especially fresh homegrown buds which retain their volatile oils and
sugar. Many homegrowers have acquired a taste for "natural" uncured grass,
with its minty chlorophyll flavour; such marijuana is dried directly after
Slow Drying

Slow drying is probably the method most commonly used to dry marijuana. Because of the slowness of the dry, a slight cure takes place, eliminating the bite sometimes associated with quickly dried grass.

There are many variations of the technique, but most commonly whole plants or separated colas are suspended upside down from a drawn string or from pegs on a wall in a cool dark room, closet, or other enclosed space. A large number of plants may take a week or two to dry. The drying time for small numbers of plants can be increased (for a slight cure) by placing the plants in large, open paper sacks that have ventilation holes cut in their sides. The drying room should have no heavy drafts, but mould may form on the plants if the air is stagnant. If weather is rainy or the air humid, increase ventilation and watch for any mould. Plants should be dried quickly under moderate heat if any mould appears.

Many experienced growers prefer slow drying to curing. There is little chance of error with this method, and buds usually smoke smooth and develop a pliable consistency. Slow-dried ripe buds retain their delicious, sweet aroma and taste.

Fast Drying

The fast dry-method produces a harsher smoke than slow drying, but it is often the most convenient method to use. The plants are suspended in the same way as for slow drying, but the temperature in the drying area is increased to between 90 and 115 degrees, often by means of electric or gas heater. The drying area is kept well-ventilated with a fan. As the plants dry, they are removed from the drying area. By this method, plants in a tightly packed room can be dried in less than four days, but the exhaust will contain the deliciously pungent odour of drying marijuana.

Indoor growers often hang plants to dry over radiators or stream pipes. Leaves are dried by placing them on a tray over a radiator or on top of the light fixture.

Marijuana that is fast-dried retains its original green colour and minty taste.

Oven Drying

Oven drying is often used by gardeners to sample their crop. Small quantities of material can be quickly dried by being placed in a 150 to 200 oven for about 10 minutes. Larger quantities can be dried in trays that contain a single layer of material or in a dehydrator. Oven-dried and dehydrator-dried marijuana usually has a harsh taste and bite, and loses much of its bouquet. The method is often used to dry marijuana which has been cured and dried but is too moist to smoke, or to dry marijuana which is to be used for cooking or extractions. It is an adequate method for obtaining dry material for testing and emergencies, but the main harvest
should not be dried in this way. Oven drying works best with leaves. When leaves are dried together with buds or shoots, remove the material from the oven periodically, to separate the faster-drying leaf material (before it burns) from the slower drying buds. One way to do this is to place all the material on a wire screen over a tray. Every few minutes rub the material across the screen. Dried material falls unto the tray and is removed from the oven. Repeat until all the material has dried.

Oven curing works well when closely watched. Dried marijuana that is left in the oven will lose potency quickly. Any time the marijuana begins to char, most of the potency will already have been lost. This should not be a problem unless you are careless, or allow the temperature to go above 200 degrees.

Sun Drying

Some growers dry their crops right in the field. There are many methods of sun drying. In Oregon, some growers break the main stem about two feet from the ground. The leaves and buds dry gradually, since they are still partly attached to the plant. Other growers spread burlap and cover it with plants left to dry. Fan leaves are left on the plants to protect the drying buds from the sun. The grass is manicured after drying. Growers in Arizona shade drying plants with cheesecloth.

Sun-dried marijuana usually has a taste similar to that of oven-dried. Often the sun bleaches it slightly but also destroy some of the delicate bouquet. Prolonged exposure to the sun will decrease potency, although there is no noticeable loss if drying is done quickly.

Dry Ice

Many homegrowers have written to us that the dry-ice cure increases the potency of marijuana considerably, and we would be remiss not to mention it.

Dry ice is frozen carbon dioxide. When it melts (sublimates), it turns from a solid directly into a gas. This gas absorbs some moisture from the frozen marijuana and partially dries it.

There are many variations of the dry-ice method. Fresh or partially dried material is usually used, although some enthusiasts claim that the cure also works with dried material. The marijuana is placed in a coffee can or similar container with a lid, along with at least an equal volume of dry ice. Puncture the lid so that the gas can escape as it evaporates. Place the can in a freezer to prolong the evaporation process. When the dry ice is gone, the grass is dried, but still moist.

Some growers claim that simply freezing the grass increases potency. They often freeze fan leaves or other less-potent material for a couple of months before smoking it. This is said to work only with fresh (wet or dried) grass.

21.6 Fermentation

When vegetation dries, the individual cells which maintained life processes
die. But marijuana can still be conditioned by means of fermentation. Fermentation is the process in which microbes and plant enzymes break down complex chemicals into simpler ones, mainly starch and sugars into alcohol and simple acids. In the process chlorophyll is destroyed, giving the material a more ripened appearance. If the fermentation is stopped early, the marijuana has a sweeter taste because of the sugars which the ferment produced.

Fermentation occurs when the moisture content of the marijuana is raised above 15 percent and the temperature is above 60 degrees. The more tightly packed the material, the faster the ferment proceeds. The rate of ferment is controlled primarily by varying the moisture content, but each batch proceeds at its own rate because of differences between plants in nitrogen content. (Nitrogen is necessary to maintain fermenting bacteria.) The process is delicate; should the ferment proceed too rapidly, the marijuana may be converted to compost. Watch the fermentation closely. After the desired colour or flavour (from a dried sample) is reached, dry the grass quickly to stop the process.

During fermentation, flavourings can be added to give the marijuana a spicy aroma. Such spices as cinnamon, cloves, ginger, mace, sage, or vanilla are placed between the fermenting material. Orange, lemon, or lime peels are also used. About half an ounce of spice or four ounces of peel are used for each cubic foot of material to be fermented. The spices are wrapped in cloth sachets. The citrus peels are strung. They can be placed between the layers of marijuana.

There are two types of fermentations: self-generating and forced. They are best used with leaves or immature plants.

Self-Generating Fermentation

Self-generating fermentation proceeds rapidly only when there is enough material to make a heap at least one cubic yard large. When smaller quantities are used, too much of the heat generated by the bacteria is dissipated, so that the process is slow and is more properly considered aging.

Place the material in a large container or in a pile with a tarpaulin placed over it, and lightly spray it with a mister if it is dry. Let the pile heat up for a few days, and then break it down. If it is repacked, the marijuana will develop a dull matte appearance and lose its sugars. If the process is allowed to proceed even further, the marijuana will disintegrate.

Forced Fermentation

Forced fermentation can be used with small quantities of material. It requires an enclose chamber in which heat and humidity can be regulated.

Pack the marijuana loosely in a kiln or other chamber, and raise the temperature to 135 degrees. Maintain humidity at 75 percent. Check the progress of the ferment periodically. Within a week the ferment should be completed. During this ferment there is a release of ammonia compounds, resulting in some foul odours, but upon completion of the ferment and
drying, the marijuana should smoke sweet and mellow.

21.7 Storage

THC is degraded by both heat and light. Table 26 shows results of an experiment conducted at the University of Mississippi, in which marijuana was stored under varying temperature conditions. These results indicate that marijuana stored at room temperature (72) or below, and in darkness for up to two years will lose only an insignificant amount of its original potency; whereas marijuana stored in darkness at 97 or above will lose almost all its potency within two years.

In another experiment, Fairbairn stored dried marijuana at different temperatures in both light and dark conditions. The samples in light were exposed to a north-facing windows (no direct sunlight). The results are shown in Table 27.

Fairbairn also performed an experiment to discover the effect of air on THC. Freshly prepared Cannabis resin was stored as a loose powder, a compressed powder, and an unbroken lump for one year at 68 degrees F (about room temperature). Samples were stored under two conditions: in light and air, and in darkness and air. The results are shown in Table 28.

Fairbairn experimented further with pure cannabinoids and extracts of marijuana dissolved in petroleum ether, chloroform, and ethanol (alcohol). The results, in Tables 29 and 30, show that the THC and CBD in solution are much more unstable than when they are left in marijuana, especially if they are held by the plant in undamaged glands, where they are protected from exposure to air and, to some degree, light. Crude extracts seem more stable than highly refined cannabinoids, especially CBD, which is very unstable in refined solutions.

Extract makers and purchasers should limit the exposure of the solution to light and heat as well as to air. Oils and extracts should be kept refrigerated in opaque, sealed container. Notice that THC is almost completely degraded in a few weeks when it is held in solution and exposed to light. Red oil, hash oil, and honey oil must be stored in light-tight containers to preserve potency.

From the tables, you can see that light is the primary factor that causes decomposition of THC. The decomposition products are unknown, but are suspected to be polymers or resins. We also do not know whether the rate of decomposition would be faster in direct sunlight.

Air (oxygen) acts much more slowly to convert THC to CBN. Decomposition of THC to CBN is not significant unless temperatures are in the nineties or higher. However, such high temperatures can occur in grass that is packed before it is properly dried. The moisture that is left supports microbial activity, which heats the grass internally, as occurs during certain types of curing. Potency of cured grass is not lowered significantly when the cure is done properly and when the buds are left intact during the process.

The figures for powdered and compressed grass in Table 28 show that both light and air cause rapid decomposition when the resin is exposed through
breaking of the resin glands. Intact resin glands appear to function well in storing the cannabinoids. For this reason, it is important to handle fresh and dried grass carefully, in order not to crush the material and thus break the glands, especially in the buds, which have a cover of raised resin glands. Most well-prepared marijuana will have intact, well-preserved buds.

The best place to store marijuana is in a dark container in a refrigerator or freezer. Cannabis should be stored uncleaned, so that the glands containing the THC are not damaged, since damage causes their precious contents to be exposed to light and air. Marijuana should be cleaned only when it is about to be smoked.

Many growers place a fresh lemon, orange, or lime peel in with each lid of stored grass. The peel helps to retain moisture, which keeps the buds pliable, and also gives the grass a pleasant bouquet.

Most growers take well-earned pride in the quality of the marijuana that they grow. By supplying yourself with an herb which may play an important role in your life, you gain a feeling of self-sufficiency that can be infectious.

Since your homegrown is well-tended and fresh, it has a sweet flavourful taste, far superior to that of commercial grass. And there need be no fear of contamination from herbicides, pesticides, adulterants, or other foreign matter. By growing your own, you come to the pleasant realisation that you are free from the vagaries and paranoia of the marijuana market - not to mention how little a home garden costs. All of these feeling can add up to a very heady experience.

In a time of quiet contemplation, you might also reflect on the experiences that brought you this wondrous herb from a tiny seed. There is a tradition of mutual nurture and support between humanity and this plant that goes back 10,000 years.

You are now part of this continuing tradition.

As you probably realised while reading this book, some of the practical information came to us through letters from growers. We appreciate these letters and will continue to refer to them when we update and improve future editions of the Marijuana Grower's Guide. We would also like to hear ideas, criticisms, and feedback from our readers. Other research material and copies of professional research are also welcome.

Wishing you a Happy Harvest,
Mel Frank
Ed Rosenthal

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Storage/Smoking


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[1] [Image]
by Mel Frank and Ed Rosenthal
Typed by Ben Dawson
Revised 1992

NOTE:- Footnotes have been placed in double brackets (()). Numbers throughout refer to bibliography and are sometimes in brackets, sometimes they aren't. All dates are for northern hemisphere only. Comments on pictures are in curly brackets {}. Please distribute this widely so we can all smoke better marijuana. Legalise marijuana.

4-Oct-96

Copying this book was a megamission that took about 3 weeks in the September of 1993. Everything in the book has been copied - even the bibliography. The online version of this guide is available at:
ben@iinet.net.au

Jan-98

Hyperlinks were added throughout the document for easy navigation. Also the text was formated to be more readable. Alonso Acu–a.

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Marijuana, or cannabis as it is known internationally, is a plant whose presence is almost universal in our world today. Conservative international reports estimate that there are now 300 million cannabis users. Recent reports indicate that 10 percent of the adult population in the United States are regular users, a figure which is probably similar for many countries in Europe. Its use is also widespread in Africa, Asia, many Arab nations, parts of South America and the Caribbean, as well as Australia and New Zealand. In 1978, more than 5.2 million kilograms (12 million pounds) of cannabis were seized by police worldwide. Authorities estimated that this did not exceed 10 percent of the total traffic.

What has been the response of officials around the world to the use of this plant by its citizens? Regrettably, the climate has been one of almost universal repression, hostility and open violence. Despite gains made in the United States and Europe throughout the 1970's, a new wave of ignorance regarding the use of this plant seems to be sweeping the world. Predictably, the United States has sought to export this "neo-Reefer Madness" to other countries. A united Nations sub-commission of drug enforcement officials in the Far East released a report some time ago extremely critical of the efforts of some countries to decriminalize (i.e. remove criminal penalties for possession of a small amount) cannabis. The sub-commission stated that any such reduction of penalties would vastly increase use, and strongly urged that all countries continue to keep strict laws on the books even for possession of cannabis. Others requested that publicity campaign be conducted in the media against cannabis, and that more funding be given to scientific work to prove that cannabis was harmful.

US officials, alarmed by reports of cannabis use among adolescents (which, although undesirably high, is in fact leveling off), and by political pressure from reactionary elements, have attempted to depict cannabis as the greatest threat since the atomic bomb. The results of this new hysteria have been great confusion among the public and a slowdown in the progress of cannabis law reform. The results have been predictable: in 1979, over 448,000 people were arrested in the USA for cannabis possession, 80 percent for simple possession. The estimated direct arrests cost to our increasingly debt-ridden government was over $600 million. But no one has ever attempted to account for the total cost of the immense law enforcement efforts against cannabis: for the salaries of Drug Enforcement Administration agents and federal and state narcotics agents and support personnel, the cost of incarcerating the thousands of people sentences to jail (estimated at 10 percent of the total arrests, or 48,000 people), the costs of the anti-cannabis media campaign, the secret grants from NSA/CIA for cannabis eradications, and the economic cost to society created by turning law-abiding citizens into criminals. When these factors are taken into consideration, the cost goes into the billions. By contrast, in the eleven
states which have enacted decriminalization since 1972, millions of dollars and hundreds of thousands of court, police and administrative work-hours have been saved.

What can the concerned cannabis consumer do to end this climate of hysteria and ignorance? First, we must stress that cannabis legalisation would entail adult use only, and that social and legal restrictions on the use of cannabis would curtail, not increase, use by adolescents. Second, we must educate the public about the genuine effects of cannabis and stress moderate responsible use. This is what we stress about the user of society's legal drugs - alcohol, nicotine and caffeine, and we should take the same approach toward cannabis. Third, the public should be educated about the limits of the law and the rights of citizens; we should not seek to regulate private behaviour through the use of the criminal sanction. Laws protecting public safety, such as driving while under the influence of any substance, would still be kept on the books.

However, as consumers we have an additional responsibility: we must begin to address the problems of supply and demand. It is essential that we take upon ourselves the task of proposing viable solutions to the current unworkable prohibition.

With this in mind, numerous cannabis reform organizations around the world have begun exploring models for the legalization of cannabis. Under the auspices of the International Cannabis Alliance for Reform (ICAR), an international organization of cannabis law-reform groups, many of these organizations met in Amsterdam, Holland in February, 1980, at the first International Cannabis Legalization Conference to discuss legalization plans and proposals. The many plans presented reflected the various backgrounds and interests of the countries they represented some called for a totally open-market system run by cooperatives, others employed elaborate organizational systems with varying degrees of governmental control, and still others called for total control by the private sector. Emphasis was placed on the need for all groups to develop legalization models suited to their own particular climate and country and that a single, monolithic legalization plan was neither feasible nor desirable.

However, virtually all the plans had one important element in common: every person would have the right to grow cannabis for his or her own personal use. This is the very minimum requirement upon which all legalisation models are based, for this would allow the consumer the chance to remove himself or herself from the black market, whether it be licit or illicit.

This is an essential aspect of cannabis reform: to convince consumers to diversify their sources of supply by growing their own cannabis. Growing cannabis enables one to reduce drastically the costs and at the same time establish a closer relationship with the plant itself. Its amazing adaptability, acquired through centuries of travel to all four corners of the earth, users that it can grow and thrive anywhere there is sunlight and water. By learning the relatively simple techniques involved in cannabis horticulture, the consumer can avoid the illicit market with all its attendant problems, and concentrate on growing the plant itself, on producing and consuming the product of one's own labor, a product which is pure and can be produced at a cost of pennies per ounce.
We must take this step, for just as the nations of the world are seeking energy, self-sufficiency, so now must we seek cannabis self-sufficiency.

The willingness of consumers greatly to diversify their sources has caused tremendous changes in the manner in which cannabis is grown and marketed. Plagued by ridiculously high prices, dangers in purchasing, wild fluctuations in quantity and quality, impurities, and continual police harassment, consumers all over the world are discovering that anyone can grow good cannabis just about anywhere.

In Central and South America, production has increased so rapidly in the last few years that large quantities are now being exported to Europe. Arab countries, traditionally dependent on Lebanon and Syria, are now reporting increasing domestic cultivation attempts. Many countries of Europe, especially the southern countries of Spain, Italy, Portugal and Greece, are reporting cultivation. India noted that both its legal (in the states of West Bengal, Orissa and Madhya Pradesh) and illegal (all other states) under a similar scheme. In the Near and Middle East, notably Nepal, Pakistan and Afghanistan, the people are continuing their traditional production of cannabis for local and export use.

Australia, a country whose huge size (roughly that of the US) and relatively sparse population make it virtually ideal for cultivation, reported widespread cultivation and seizures of over 70,000 kilos of cannabis, 2,500 kilos of hashish, and 850,000 plants uprooted in a two-year period between 1977 and 1978. Many people living on Pacific islands such as New Zealand, New Caledonia, Fiji, the Cook Islands and elsewhere have discovered that cannabis will grow very well in their environment; Jamaica and other islands in the Caribbean are also experiencing an increase in cultivation. Recent newspaper reports from that country indicate that as many as 1/2 million Jamaican farmers out of a total population of 2 million may be producing cannabis to satisfy domestic and export demand. The total gross income from the Jamaican cannabis business is estimated to exceed $200 million a year.

Virtually every country in South America reported at least some cannabis cultivations. In addition to increased production in Colombia, whose 1978 crop was estimated to be worth between $1.5 and $2 billion, other countries are experiencing an increase in cultivation. Over 50,000 acres of cannabis were discovered under cultivation in western Venezuela in 1978. In 1976 in Brazil, 271 kilos of cannabis were reported seized, but the next year increased to 91,207 kilos, and by 1978, authorities seized over 276,000 kilos. Cultivation was also reported in Argentina, Ecuador, Guyana, Surinam and Uruguay. Soviet officials go to inordinate lengths to deny that cannabis-use exists in their country though Russia is known to be a large cannabis producer, and not just for commercial purposes. (Soviet officials reported to the United Nations that they seized only 227 grams of cannabis in the entire country in 1978; the few offender were immediately sent to psychiatric hospitals.) In several Eastern European countries the best hashish is known as "Tashkenti," named for the major city in south-central Russia. Tashkent is ethnically dominated by Turkic tribesmen and shares the Hindu Kush mountain range with Afghanistan.

The key to stability in the cannabis market is clearly domestic production,
which offers many economic and social advantages over continued importation.

Domestic varieties offer ease of access and supply, and help to diversify the overall market by offering new products which compete in quality and price with the imported varieties. In addition, they serve to stimulate the local concentrating bulk of the profits in the region in which they were produced. This is a noticeable reversal of the previous consumer-producer relationship, where most of the profits were realized by exporters and middlepersons who operated outside the source country. Expanded domestic production would decrease the influence of these middlepersons and greatly strengthen the overall market.

This book was written to make the consumer aware of how easy (and important) it is to cultivate cannabis. In a clear and simply style, Mel Frank and Ed Rosenthal describe everything you need to know about growing cannabis. By employing some of these simple methods you can greatly reduce your dependence on foreign products and at the same time gain a greater understanding of a plant whose relationship with humanity dates to prehistoric times.

Be fruitful, and multiply...

Bob Pisani Coordinator, International Cannabis Alliance for Reform (ICAR) Philadelphia, PA

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Preface

The purpose of this book is to show you how to grow enough marijuana to supply all your family's needs. It doesn't matter where you live, or even if you are growing your first plant, because all the information needed to become a master marijuana farmer in your own home, or in the field, is provided in these pages.

The world has seen an enormous increase in marijuana use in the past ten years. Consequently, many governments have sponsored research in order to understand the nature of the plant as well as its psychoactive compounds - substances that are being smoked or ingested by more than 400 million people all over the world. Before the recent interest, marijuanaphiles had only research papers (mostly on hemp varieties) to glean for information about the plants and their cultivation. Now there are thousands of papers dealing directly with the plants and their use as marijuana. This doesn't mean all is known about marijuana. In fact, much of what is discussed deals with unknown aspects of these ancient and mysterious plants. The mysteries, however, are beginning to unravel.

Our information resources include our personal experience with growing and the experience and knowledge shared with us by marijuana growers all across the country. We also rely on the professional research of many scientists (see the Bibliographic Notes). For the experienced growers, we've included the latest research on increasing potency, some ideas for improving yield and controlling flowering (time of harvest), and also procedures for breeding quality strains suited to a particular growing situation.
Some of the best grass in the world is grown right here in the United States (that is our very own stoned opinion of homegrown gratefully sampled from Hawaii to Maine). You can do it too - it's not magic, and it's not difficult to do. Highly potent plants can be grown indoors, as well as in gardens, fields, and the wilds. Indoor growers must create an environment, whereas outdoor gardeners work within the environment. Following these two approaches to cultivation, this book is divided into separate, parallel parts on indoor and outdoor sections, preceded by some background information on marijuana plants, and followed by general procedures for breeding, harvesting, etc., that are independent of the type of growing site.

Cultivation is not a complicated process, and we hope we don't make it appear difficult. But even if you're a novice when you first sow your seeds, your questions on the plants and their cultivation will become more complex as you gain experience and insight. We hope we have anticipated your questions with solid and clearly stated answers; we intend this book to serve as a guide long after your first reading and harvest.

There are probably as many ways to grow marijuana as there are marijuana farmers. We hope to impart an understanding of the plants and their cultivation, so that you can adapt the knowledge to fit your particular situation - where you live, the land or space available, and the time, energy, and funds at your disposal.

Modest indoor gardens are quite simple to set up and care for. All the materials you'll need are available at nurseries, garden shops, and hardware and lighting stores, or they may be found around the house or streets. The cost will depend on how large and elaborate you make the garden and on whether you buy or scavenge your materials. With a little ingenuity, the cost can be negligible.

It takes about an hour every three or four days to water and tend to a medium-sized indoor garden.

Outdoors, a small patch in your summer garden can supply all your smoking needs with little or no expense. Generally, marijuana requires less care than most other crops, because of its natural tenacity and ability to compete with indigenous weeds. Hardy Cannabis resists mild frost, extreme heat, deluge, and drought. In this country, few diseases attack marijuana; once the plants are growing, they develop their own natural protection against most insects.

In some areas of the country, such as parts of the Midwest and East, the plants may require no more attention than sowing the seeds in spring and harvesting the plants in autumn. But if you're like most growers, you'll find yourself spending more and more time in your garden, watching the tiny sprouts emerge, then following their development into large, lush, and finally resinous, flowering plants.

Nurturing and watching these beautiful plants as they respond can be a humanising experience. Marijuana farmers know their plants as vital living organisms. If you already are a plant grower, you may understand. If not,
read through this book, imagining the various decisions you, as grower,
would be making to help your plants reach a full and potent maturity. Then
make your plans and get started. There's just no reason to pay $50 an ounce
for superior smoke when it grows for free. Free, grass, free yourself.

This book is the result of the efforts of many people, each of whom
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Chapter One
History and Taxonomy of Cannabis

1.2 CANNABIS AND ANCIENT HISTORY

The ancestors of Cannabis originated in Asia, possibly on the more gentle
slopes of the Himalayas or the Altai Mountains to the north. The exact
origin, obscured by Stone Age trails the cross the continent, is not known.

We don't know when Cannabis and humanity first met. Given the growth habit
of the plant and the curiosity of humanity, such a meeting was inevitable.
In the plant world, Cannabis is a coloniser. It establishes new territory
when running water or seed-eating animals carry seed to cleared and fertile
soil open to the sun. Fertile soil, clear of competing plants, is rare and
short-lived in nature, and is commonly caused by catastrophe such as flood
or earthslide. Natural dissemination is slow and the plats tend to grow in
thick stands by dropping seed about the spread of their branches.

During the Neolithic era, some 10,000 years ago nomadic groups scavenged,
hunted, fished, and gathered plants in an unending search for food. The
search ended when they learned to plant the native grains (grasses) and
developed agriculture. Agriculture requires a commitment to the land and
grants a steady food supply which enables people to form permanent settlements. Cannabis and Neolithic bands probably came in contact often as the plants invaded the fertile clearings - the campsites, roadsides, fields and garbage heaps - that occur wherever people live.

In 1926 the Russian botanist Vavilov summarised the observations of his comrade, Sinkaia, on the domestication of hemp by peasants of the Altai Mountains: "1. wild hemp; 2. spreading of hemp from wild centers of distribution into populated areas (formation of weedy hemp); 3. utilisation of weedy hemp by the population; 4. cultivation of hemp." 24

The plants which people learn to use help define aspects of their way of life, including perceptions of the world, health, and the directions their technologies and economies flow. The plants you are about to grow are descended from one of the ancient plants that made the transition to civilisation possible.

The earliest cultural evidence of Cannabis comes from the oldest known Neolithic culture in China, the Yang-shao, which appeared along the Yellow River valley about 6,500 years ago (*Cannabis is known to have been used in the Bylony culture of Central Europe (about 7,000 years ago).184). The clothes the people wore, the nets they fished and hunted with, and the ropes they used in the earliest machines were all made of the long, strong, and durable fibre, hemp. This valuable fibre separates from the stem of Cannabis when the stem decays (rets).

In the early classics of the Chou dynasty, written over 3,000 years ago, mention is often made of "a prehistoric culture based on fishing and hunting, a culture without written language but which kept records by tying knots in ropes. Nets were used for fishing and hunting and the weaving of nets eventually developed into clothmaking." 8 These references may well be to the Yang-shao people.

As their culture advanced, these prehistoric people replaced their animal skins with hemp cloth. At first, hemp cloth was worn only by the more prosperous, but when silk became available, hemp clothed the masses.

People in China relied on Cannabis for many more products than fibre. Cannabis seeds were one of the grains of early China along with river barley, millet, and soybeans. The seeds were ground into a meal, or roasted whole, or cooked in porridge. The ancient tombs of China had sacrificial vessels filled with hemp seed and other grains for the afterlife. From prehistoric times there is a continuous record of the importance of hemp seed for food until the first to second century BC when the seed had been replaced by more palatable cereal grains.7 (an interesting note from the Tung-kuan archives (28 AD) records that after a war-caused famine the people subsisted on "wild" Cannabis and soybean.8)

The effects of Cannabis' resinous leaves and flowers did not go unnoticed. The Oen-ts-ao Ching, the oldest pharmacopoeia known, states that the fruits (flowering tops) of hemp, "if taken in excess will produce hallucinations" (literally "seeing devils"). The ancient medical work also says, "If taken over a long term, it makes one communicate with spirits and lightens one's body." 9 Marijuana, with a powerful effect on the psyche, must have been
considered a magical herb at a time when medical concepts were just being formed. The Pen-ts'ao Ching, speaking for the legendary Emperor Sh[n-nung of about 2000 BC, prescribes marijuana preparations for "malaria, beriberi, constipation, rheumatic pains, absent-mindedness, and female disorders." Even the Cannabis root found its place in early medicine. Ground to form a paste, it was applied to relieve the pain of broken bones and surgery.

New uses were discovered for Cannabis as Chinese civilisation progressed and developed new technologies. The ancient Chinese learned to mill, heat, and then wedge-press Cannabis seeds to extract the valuable oil, a technique still used in the western world in the twentieth century. Pressed seeds yielded almost 20 percent oil by weight. Cannabis oil, much like linseed oil, could be used for cooking, to fuel lamps, for lubrication, and as the base in paint, varnish, and soap making. After oil extraction, the residue or "hemp cake" still contained about 10 percent oil and 30 percent protein, a nutritious feed for domesticated animals.

Another advancement came with the Chinese invention of paper. Hemp fibres recycled from old rags and fish nets made a paper so durable that some was recently found in graves in the Shense province that predates 100 BC (9). Hemp paper is known for its longevity and resistance to tearing, and is presently used for paper money (Canada) and for fine Bibles.

The ancient Chinese learned to use virtually every part of the Cannabis plant: the root for medicine; the stem for textiles, rope and paper making; the leaves and flowers for intoxication and medicine; and the seeds for food and oil. Some of the products fell into disuse only to be rediscovered by other people at other times.

While the Chinese were building their hemp culture, the cotton cultures of India and the linen (flax) cultures of the Mediterranean began to learn of Cannabis through expanding trade and from wandering tribes of Aryans, Mongols, and Scythians who had bordered China since Neolithic times.

The Aryans (Indo-Persians) brought Cannabis culture to India nearly 4,000 years ago. They worshipped the spirits of plants and animals, and marijuana played an active role in their rituals. In China, with the strong influence of philosophic and moralistic religions, use of marijuana all but disappeared. But in India, the Aryan religion grew through oral tradition, until it was recorded in the four Vedas, compiled between 1400 and 1000 BC. In that tradition, unlike the Chinese, marijuana was sacred, and the bhangas spirit was appealed to "for freedom of distress" and as a "reliever of anxiety" (from the Atharva Veda). A gift from the gods, according to Indian mythology, the magical Cannabis "lowered fevers, fostered sleep, relieved dysentery, and cured sundry other ills; it also stimulated the appetite, prolonged life, quickened the mind, and improved the judgement."15

The Scythians brought Cannabis to Europe via a northern route where remnants of their campsites, from the Altai Mountains to Germany, date back 2,800 years. Seafaring Europe never smoked marijuana extensively, but hemp fibre became a major crop in the history of almost every European country. Pollen analysis dates the cultivation of Cannabis to 400 BC in Norway, although it is believed the plant was cultivated in the British Isles several centuries
earlier. The Greeks and Romans used hemp for rope and sail but imported the fibre from Sicily and Gaul. And it has been said the "Caesar invaded Gaul in order to tie up the Roman Empire," an allusion to the Romans' need for hemp.

Marijuana, from its stronghold in India, moved westward through Persia, Assyria and Arabs by 500 AD. With the rising power if Islam, marijuana flourished in a popular form as hashish. In 1378, the Emir Soudon Sheikhouni tried to end the use of Indian hashish by destroying all such plants, and imprisoning all users (first removing their teeth for good measure). Yet in a few years marijuana consumption had increased.

Islam had a strong influence on the use of marijuana in Africa. However, its use is so ingrained in some ancient cultures of the Zambezi Valley that its appearance clearly predated Islam. Tribes from the Congo, East Africa, Lake Victoria, and South Africa smoke marijuana in ritual and leisure. The ancient Riamba cult is still practiced in the Congo. According to the Riamba beliefs, marijuana is a god, protector from physical and spiritual harm. Throughout Africa treaties and business transactions are sealed with a puff of smoke from a yard-long pipe.

With increased travel and trade, Cannabis seed was brought to all parts of the known world by ships and caravans rigged with the fibre of its kind. And when the first settlers came to the Americas, they brought the seed with them.

1.3 CANNABIS AND AMERICAN HISTORY

Like their European forbears, Americans cultivated Cannabis primarily for hemp fibre. Hemp seed was planted in Chile in 1545, Canada in 1606, Virginia in 1611, and in the Puritan settlements in Massachusetts in the 1630s. Hemp-fibre production was especially important to the embryonic colonies for homespun cloth and for ship rigging. In 1637, the General Court at Hartford ordered that "every family within this plantation shall procure and plant this present year one spoonful of English hemp seed in some soyle." Hemp growing was encouraged by the British parliament to meet the need for fibre to rig the British fleets. Partly to dissuade the colonists from growing only tobacco, bounties were paid for hemp and manuals on hemp cultivation were distributed. In 1762, that state of Virginia rewarded hemp growers and "imposed penalties upon those that did not produce it." The hemp industry started in Kentucky in 1775 and in Missouri some 50 years later. By 1860, hemp production in Kentucky alone exceeded 40,000 tons and the industry was second only to cotton in the South. The Civil War disrupted production and the industry never recovered, despite several attempts by the United States Department of Agriculture to stimulate cultivation by importing Chinese and Italian hemp seed to Illinois, Nebraska, and California. Competition from imported jute and "hemp" (Musa textiles) kept domestic production under 10,000 tons per year. In the early 1900s, a last effort by the USDA failed to offset the economic difficulties of a labour shortage and the lack of development of modern machinery for the hemp industry. However, it was legal force that would bring an end to US hemp production.
For thousands of years marijuana had been valued and respected for its medicinal and euphoric properties. The Encyclopaedia Britannica of 1894 estimated that 300 million people, mostly from Eastern countries, were regular marijuana users. Millions more in both the East and the West received prescription marijuana for such wide-ranging ills as hydrophobia and tetanus.

By the turn of the century, many doctors had dropped marijuana from the pharmacopoeias: drugs such as aspirin, though less safe (marijuana has never kill anyone), were more convenient, more predictable, and more specific to the condition being treated. Pill-popping would become an American institution.

Marijuana was not a legal issue in the United States until the turn of the twentieth century. Few Americans smoked marijuana, and those that did were mostly minority groups. According to author Michael Aldrich, (1) "The illegalisation of Cannabis came about because of who was using it" - Mexican labourers, southern blacks, and the newly subjugated Filipinos.

In states where there were large non-white populations, racist politicians created the myths that marijuana caused insanity, lust, violence and crime. One joint and you were addicted, and marijuana led the way to the use of equivalent drugs - cocaine, opium and heroin. These myths were promoted by ignorant politicians and journalists, who had neither experience nor knowledge of Cannabis, and grew into an anti-marijuana hysteria by the next generation.

For example, the first states to pass restriction on marijuana use were in the Southwest, where there were large populations of migrant workers from Mexico. One of the first states to act was California, which, "with its huge Chicano population and opium smoking Chinatowns, labelled marijuana 'poison' in 1907, prohibited its possession unless prescribed by a physician in 1915, and included it among hard narcotics, morphine and cocaine in 1929." (1)

In marijuana, the mainstream society found a defenceless scapegoat to cover the ills of poverty, racism, and cultural prejudice. San Franciscans "were frightened by the 'large influx of Hindoos ... demanding Cannabis indica' who were initiating 'the whites into their habit.'" (11) Editorialists heightened public fears with nightmarish headlines of the "marijuana menace" and "killer weed," and fear of Cannabis gradually spread through the West. By 1929, 16 western states had passed punitive restrictions governing marijuana use.

{Figure 5. (Sample -- Warning card to be placed in R. R. Trains, Buses, Street Cars, etc.)
Beware! Young and Old - People in All Walks of Life!
This {joint} may be handed you by the friendly stranger.
It contains the Killer Drug "Marihuana" -- a powerful narcotic in which lurks Murder! Insanity! Death!
WARNING!
Dope peddlers are shrewd! They may put some of this drug in the {teapot} or in the {cocktail} or in the tobacco cigarette.
WRITE FOR DETAILED INFORMATION, ENCLOSING 12 CENTS IN
Marijuana was not singled out by anti-drug campaigners. During this time, Congress not only banned "hard" narcotics, but also had prohibited alcohol and considered the prohibition of medical pain killers and even caffeine.

The Federal Bureau of Narcotics was established in 1930 with Harry Anslinger as its first commissioner. During the first few years of operation, the bureau minimized the marijuana problem, limited mostly to the Southwest and certain ghettos in the big cities of the East. However, the bureau was besieged with pleas from local police and sheriffs to help with marijuana problems. The FBN continued to resist this pressure, because Commissioner Anslinger had serious doubts as to whether federal law restricting marijuana use could be sustained as constitutional. Further, FBN reports indicate that the bureau did not believe that the marijuana problem was as great as its public reputation. Control of the drug would also prove extremely difficult, for as Anslinger pointed out, the plant grew "like dandelions." (11)

The joblessness and misery of the depression added impetus to the anti-marijuana campaign. This came about indirectly, by way of focusing public sentiment against migrant and minority workers who were blamed for taking "American" jobs. Much of this sentiment grew out of cultural and racial prejudice and was supported by groups such as Key Men of America and the American Coalition. The goal of these groups was to "Keep America American."

However, by 1935 almost every state had restricted marijuana use, and local police and influential politicians had managed to pressure the FBN to seek a federal marijuana law. The constitutional question could be circumvented by cleverly tying restrictions to a transfer tax, effectively giving the federal government legal control of marijuana.

With this new tack, the FBN prepared for congressional hearings on the Marijuana Tax Act so that passage of the bill would be assured. Anslinger and politicians seeking to gain from this highly emotional issue railroaded the Marijuana Tax Act through the 1937 Congress. Anslinger made sure that
defence, and doctors and scientists were ridiculed for raising contrary views (16). The new federal law made both raising and use of the plant illegal without the purchase of a hard-to-acquire federal stamp. The FBN immediately intensified the propaganda campaign against marijuana and for the next generation, the propaganda continued unchallenged.

The marijuana hysteria also ended any hopes for a recovery of the hemp industry. What had been needed was a machine that would solve the age-old problem of separating the fibre from the plant stem, an effort which required considerable skilled labour. The machine that could have revolutionised hemp production was introduced to the American public in the February 1938 edition of Popular Mechanics. But the Marijuana Tax Act has been passed four months earlier, and the official attitude toward all Cannabis is best illustrated by this quote from Harry J. Anslinger, commissioner of the Federal Bureau of Narcotics: "Now this (hemp) is the finest fibre known to man-kind, my God, if you ever have a shirt made of it, your grandchildren would never wear it out. You take Polish families. We'd go in and start to tear it up and the man came out with his shotgun yelling, 'These are my clothes for next winter!'" (2)

During the war years, after the Japanese had cut off America's supply of manila hemp, worried officials supplied hemp seed and growing information to Midwestern farmers. In Minnesota, Iowa, Illinois, and Wisconsin, hemp farmers showed their wartime spirit by producing over 63,000 tons of hemp fibre in 1943.

Unlike many of our ancient domesticated plants, Cannabis never lost its colonising tendencies or ability to survive without human help. Cannabis readily "escapes" cultivated fields and may flourish long after its cultivation is abandoned. However, Cannabis always keeps in contact by flourishing in our waste areas - our vacant fields and lots, along roads and drainage ditches, and in our rubbish and garbage heaps. Perhaps it awaits discovery by future generations. The cycle has been repeated many times.

States that once supported hemp industry are now dotted with stands of escaped weedy hemp. Weedy hemp grows across the country, except in the Southwest and parts of the Southeast. Distribution is centered heavily in the Midwest. Most of these plants are descended from Chinese and European hemp strains that were bred in Kentucky and the grown in Midwestern stated during World War II. But some weed patches, such as in Kentucky and
Missouri, go back perhaps to revolutionary times.

The Anslinger crusades that continued through the sixties are a fine example of government propaganda and control of individual lives and beliefs. We still feel the ramifications in our present laws and in the fear-response to marijuana harassed by many people who grew up with Anslingian concepts. Poor Cannabis, portrayed as a dangerous narcotic that would bring purgatory upon anyone who took a toke - violence, addiction, lust, insanity - you name it, and marijuana caused it. All it ever did to us was get us stoned ... things slowed down a bit ... enough to stop and look around.

{Figure 6. A weedy hemp stand in Nebraska.}

Hopefully, we are living in the last years of the era of illegal marijuana and the persecution of this plant. Cannabis is truly wondrous, having served human needs for, perhaps, 10,000 years. It deserves renewed attention not only for its chemical properties, but also as an ecologically sensible alternative for synthetic fibres in general and especially wood-pulp paper. May Cannabis be vindicated.

1.4 Cannabis: Species or Varieties

The 10,000-year co-evolution of Cannabis and humanity has had a profound impact on both plant and humans. Cannabis has affected our cultural evolution; we have affected the plant's biological evolution.

From small populations of ancient progenitors, hundreds of varieties or strains of Cannabis have evolved. These variations can be traced to human acts, both planned and accidental.

Ancient farmers, knowing that like begets like, selected Cannabis for certain characteristics to better suit their needs. With the need for fibre, seeds from plants with longer stems and better fibres were cultivated. Gradually, their descendants became taller, straight-stemmed, and had a minimum of branches. Some farmers were interested in seed and oil. They developed large-seeded, bushy plants that could bear an abundance of seeds. Marijuana farmers interested in potency selected plants that flowered profusely with heavy resin and strong psychoactive properties.

The subsequent variations in Cannabis are striking. In Italy, where hemp fibre supports a major textile and paper industry, some fibre varieties grow 35 feet in a single season. Other Italian varieties may reach only five or six feet in height, but have slender, straight stems that yield a fibre of very fine quality. In Southeast Asia, some marijuana plants grow only four feet or less, yet these are densely foliated and heavy with resin. Other varieties of marijuana grow 15 to 20 feet in a season and yield over a pound of grass per plant.

Breeding plants is a conscious act. The plant's evolution, however, has also been affected by its introduction to lands and climates different from its original home. Whether plants are cultivated or weeds, they must adapt to their environment. Each new country and growing situation presented Cannabis with new circumstances and problems for survival. The plants have been so successful at adapting and harmonising with new environments that they are
now considered the most widely distributed of cultivated plants. (45)

In French, Cannabis is sometimes called "Le Chanvre troumper" or "tricky hemp," a name coined to describe its highly adaptable nature. The word adaptable actually has two meanings. The first refers to how a population of plants (the generic pool) adjusts to the local environment over a period of generations. (The population is, in practice, each batch of seeds you heave, or each existing stand or field.) For instance, a garden with some plants that flower late in the season will not have time to seed in the north. The next year's crop will come only from any early seeding plants. Most of them will be like their parents and will set seed early. (See section 18.)

Adaptable is a term that also applies to the individual living plant (phenotype) and, in practical terms, means that Cannabis is tenacious and hardy -- a survivor among plants. It thrives under a variety of environmental conditions, whether at 10,000 feet in the Himalayas, the tropical valleys of Colombia, or the cool and rainy New England coast.

Through breeding and natural selection, Cannabis has evolved in many direction. Botanically and historically, the genus is so diverse that many growers are confused by the mythology, exotic names, and seeming contradictions that surround the plants. Many inconsistencies are explained by understanding how variable Cannabis is. There are hundreds of wild, weedy, and cultivated varieties. Cultivated varieties may be useful for only hemp, oil, or marijuana. "Strains," "varieties," "cultivars," "chemovars," or "ecotypes" differ widely in almost every apparent characteristic. Varieties range from two to 35 feet tall; branching patterns run from dense to quite loose, long (five or six feet) or short (a few inches). Various branching patterns form the plant into shapes ranging from cylindrical, to conical, to ovoid, to very sparse and gangly. The shape and colour of leaves and stems, seeds, and flowering clusters are all variable characteristics that differ among varieties. Life cycles may be as short as three months, or the plants may hang on to life for several years. Most importantly, different varieties provide great variations in the quality and quantity of resin they produce, and hence in their psychoactive properties and value as marijuana.

The taxonomy (ordering and naming) of Cannabis has never been adequately carried out. Early research placed the genus Cannabis within the Families of either the Moraceae (mulberry) or the Urticaceae (nettle). Now there is general agreement that the plant belongs in a separate family, the Cannabaceae, along with one other genus, Humulus, the hops plant. (See section on Grafting in section 18.)

A modern Scheme for the phylogeny of Cannabis would be:

- Subdivision Angiospermae (flowering plants)
- Class Dicotyledoneae (dicots)
- Order Urticales (nettle order)
- Family Cannabaceae (hemp family)
- Genus Cannabis (hemp plant)

Below the genus level, there is no general agreement on how many species should be recognised within Cannabis. The Cannabis lineage has not been
possible to trace after thousands of years of human intervention.

Most research refers to Cannabis as a single species - Cannabis sativa L. (The word Cannabis comes from ancient vernacular names for hemp, such as the Greek Kannabis; sativa means "cultivated" in Latin; L. stands for Linnaeus, the botanical author of the name.) But some botanists who are studying Cannabis believe there are more than one species within the genus.

Richard Schultes, for example, describes three separate species (see Box A) based on variations in characteristics believed not to be selected for by humans (natural variations) such as seed colour and abscission layer (scar tissue on the seed which indicates how it was attached to the stalk).

**BOX A**
Schultes' Key as it appears in Harvard Botanical Museum Leaflets (45)

Cannabis Sativa
1. Plants usually tall (five to 18 feet), laxly branched; akenes (Akene (or Achene) is the botanical name for the fruit of Cannabis. In Cannabis, the fruit is essentially the seed.) smooth, usually lacking marbled pattern on outer coat, firmly attached to stalk and without definite articulation.

Cannabis Indica
1A. Plant usually small (four feet or less), not laxly branched; akenes usually strongly marbled on outer coat, with a definite abscission layer, dropping off at maturity.
2. Plants very densely branched, more or less conical, usually four feet tall or less; abscission layer a simple articulation at base of akene.

Cannabis ruderalis (Limited to parts of Asia.)
2A. Plants not branched or very sparsely so, usually one to two feet at maturity. Abscission layer forms a fleshly carbuncle-like growth at base of akene.

Ideally, the classification of living things follows a natural order, reflecting relationships as they occur in nature. Species are groups of organisms that are evolving as distinct units. Biologically, the evolutionary unit is the population, a population being a group of freely inbreeding organisms. Living things don't always fit neatly into scientific categories. And the meaning of species changes with our understanding of life and the evolutionary processes. Often, the definition of species will depend on the particular being studied.

A traditional way of defining separate species is that off-spring that result cannot reproduce successfully. As far as is known, all Cannabis plants can cross freely, resulting in fully fertile hybrids (107). But growth habit and actual gene exchange are important considerations in plant taxonomy. If different populations never come in contact, then there is no pressure for them to develop biological processes to prevent them mixing. Cannabis is pollinated by the wind. Although wind may carry pollen grains hundreds of miles, almost all pollen falls within a few feet of the parent
plant. The chance of a pollen grain fertilising a tiny female flower more than 100 yards away is extremely small (201). Hence, separate stands or fields of Cannabis (populations) are quite naturally isolated. For Cannabis, the fact that populations are isolated by distance is not sufficient grounds for labelling them separate species, nor is successful hybridisation reason enough to group all populations as one species.

The species question and Cannabis mythology are complicated by the plant's ability to rapidly change form and growth habits. These changes can be measured in years and decades, rather than centuries or millennia.

The fact that a pollen grain does occasionally fertilise a distant flowers leads to a process called introgression. Introgression means that new genes (new variations and possible variations) are incorporated into the population via the foreign pollen. This crossing between populations leads to an increase in variation within the population, but a decrease in the differences between the populations. Although introgression confuses the species question, it also adds to the plant's adaptable nature by providing a resource for adaptive variations. In other words, Cannabis has been around. The plants have a rich and varied history of experience, which is reflected in their variety and adaptive nature.

If breeding barriers do not exist, species are often delimited by natural differences in morphology (structure or appearance). The natural variations on which Schultes' key is based are actually affected by contact with farmers. For instance, seeds which drop freely from the plant are less likely to be collected and sown by the farmer, so that cultivated Cannabis may eventually develop a different type of abscission layer than when wild or weedy.

Seed colour and pattern are affected naturally by the need for camouflage. Under cultivation this natural selection pressure would not be the same. Many farmers select seeds by colour, believing the darkest are the best developed. In other words, there are serious problems with this limited approach to categorising species in Cannabis. This does not go unrecognised by Dr. Schultes, and the key represents a starting point. However, species should represent distinct groups within a genus, and populations with intermediate characteristics should be the exception. When you grow marijuana, you'll find that most varieties do not fit into any of these categories, but lie somewhere between. The majority of the marijuana from the Western Hemisphere would follow this description: plants tall (eight to 18 feet); well-branched; akenes usually strongly marbled; base of the seed sometimes slightly articulated.

Other characteristics, such as variations on wood anatomy (17) and leaf form (28), have been suggested for delimiting Cannabis species. However, wood anatomy, like stem anatomy, can be seriously affected by selection for hemp in particular, but also by selection for marijuana and seed. Wood anatomy also depends on the portion of the stem examined and on the arrangement of leaves (phyllotaxy), which, in turn, is influenced by light levels, photoperiod, and the physiological development of the plant.

Most Cannabis plants have compound leaves with seven to nine blades or leaflets per leaf. Occasionally, varieties are seen where all the leaves
have only one to three blades (monophyllous). Such plants sometimes arise from varieties with compound leaves. The factor is genetic, but carries little weight for the separation of species.

Human selection for particular traits can powerfully alter plants. Sex vegetables - cabbage, cauliflower, brussel sprouts, broccoli, kale, and kohlrabi - are all descended from a single wild species of mustard herb, Brassica oleracea (216). Human preference for particular parts of the plant led to their development. All six are still considered one species.

Any classification of species in Cannabis, based solely on morphological grounds, will prove difficult to justify with our present knowledge of the plant. At this time it seems that all Cannabis should be considered one species, Cannabis sativa L.

The debate on whether there is more than one species has been intense, for the issue has legal implications. Many laws specifically prohibit only Cannabis sativa. Presumably other species would not be prohibited. However, in the United States, this argument was recently dismissed when tested in a California court. The court upheld the argument that the law's intent is clear, although it may be questionable botanically: under law all Cannabis are regarded alike.

Luckily, the controversy over the number of species is of no more than academic interest to the marijuana grower. The most important characteristic to enthusiasts is the quality or potency of the grass they'll grow.

Potency is mostly a factor of heredity. The quality of the grass you grow depends on how good its parents were, so choose seeds from the grass you like best.

The environment has an impact, too, but it can only work on what is contained in the seed. A potent harvest depends on an environment which encourages the seed to develop to a full and potent maturity. The way to begin is to find the most potent grass you can; then you will have taken the first step.

CHAPTER 2
CANNABINOIDS: THE ACTIVE INGREDIENTS OF MARIJUANA

Cannabis is unique in many ways. Of all plants, it is the only genus known to produce chemical substances known as cannabinoids. The cannabinoids are the psychoactive ingredients of marijuana; they are what get you high. By 1974, 37 naturally occurring cannabinoids had been discovered 115,118. Most of the cannabinoids appear in very small amounts (less than .01 percent of total cannabinoids) and are not considered psychoactive, or else not important to the high. Many are simply homologues or analogues (similar structure or function) to the few major cannabinoids which are listed.
1. (-)-{triangle}9-trans-tetrahydrocannabinol ((There are several numbering systems used for cannabinoids. The system in this book is most common in American publications and is based on formal chemical rules for numbering pyran compounds. Another common system is used more by Europeans and is based on a monoterpenoid system which is more useful considering the biogenesis of the compound.) This (delta-9 THC) is the main psychotomimetic (mindbending) ingredient of marijuana. Estimates state that 70 to 100 percent (121) of the marijuana high results from the delta-9 THC present. It occurs in almost all Cannabis in concentration that vary from traces to about 95 percent of all the cannabinoids in the sample. In very potent varieties, carefully prepared marijuana can have up to 12 percent delta-9 THC by dry weight of the sample (seeds and stems removed from flowering buds). ("Buds" of commercial marijuana is the popular name given to masses of female flowers that form distinct clusters.))

Delta-8 THC - This substance is reported in low concentration, less than one percent of the delta-9 THC present. Its activity is slightly less than that of delta-9 THC. It may be an artefact of the extraction/analysis process. Here we refer to delta-9 THC and delta-8 THC as THC.

2. Cannabidiol - CBD also occurs in almost all varieties. Concentration range from nil (119,138), to about 95 percent of the total cannabinoids present. THC and CBD are the two most abundant naturally occurring cannabinoids. CBD is not psychotomimetic in the pure form (192), although it does have sedative, analgesic, and antibiotic properties. In order for CBD to affect the high, THC must be present in quantities ordinarily psychoactive. CBD can contribute to the high by interacting with THC to potentiate (enhance) or antagonise (interfere or lessen) certain qualities of the high. CBD appears to potentiate the depressant effects of THC and antagonise is excitatory effects (186). CBD also delays the onset of the high (183) but can make it last considerably longer (as much as twice as long). (The grass takes a while to come on but keeps coming on.) Opinions are conflicting as to whether it increases or decreases the intensity of the high, "intensity" and high" being difficult to define. Terms such as knock-out or sleepy, dreamlike, or melancholic are often used to describe the high from grass with sizeable proportions of CBD and THC. When only small amounts of THC are present with high proportions of CBD, the high is more of a buzz, and the mind feels dull and the body de-energised. {See Figure 11 to 16 for chemical structure in monochrome bitmap format.}

3. Cannabinol - CBN is not produced by the plant per se. It is the degradation (oxidative) product of THC. Fresh samples of marijuana contain very little CBN but curing, poor storage, or processing such as when making hashish, can cause much of the THC to be oxidised to CBN. Pure forms of CBN have at most 10 percent of the psychoactivity of THC (192). Like CBD, it is suspected of potentiating certain aspects of the high, although so far these
affects appear to be slight (183, 185). CBN seems to potentiate THC's disorienting qualities. One may feel more dizzy or drugged or generally untogether but not necessarily higher. In fact, with a high proportion of CBN, the high may start well but feels as if it never quite reaches its peak, and when coming down one feels tired or sleepy. High CBN in homegrown grass is not desirable since it represents a loss of 90 percent of the psychoactivity of its precursor THC.

4. Tetrahydrocannabivarin - THCV is the propyl homologue of THC. In the aromatic ring the usual five-carbon pentyl is replaced by a short three-carbon propyl chain. The propyl cannabinoids have so far been found in some varieties originating from Southeast and Central Asia and parts of Africa. What are considered some very potent marijuana varieties contain propyl cannabinoids. In one study, THCV made up to 48.23 percent (Afghanistan strain) and 53.69 percent (South Africa) of the cannabinoids found (136). We've seen no reports on its activity in humans. From animal studies it appears to be much faster in onset and quicker to dissipate than THC (181). It may be the constituent of one- or two-toke grass, but its activity appears to be somewhat less than that of THC.

The propyl cannabinoids are a series corresponding to the usual pentyl cannabinoids. The counterpart of CBD is CBDV; and of CBN, CBV. There are no reports on their activity and for now we can only speculate that they are similar to CBD and CBN. Unless noted otherwise, in this book THC refers collectively to delta-9 THC, delta-8 THC, and THCV.

5. Cannabichromene - CBC is another major cannabinoid, although it is found in smaller concentrations than CBD and THC. It was previously believed that is was a minor constituent, but more exacting analysis showed that the compound often reported as CBD may actually be CBC (119, 137). However, relative to THC and CBD, its concentration in the plants is low, probably not exceeding 20 percent of total cannabinoids. CBC is believed not to be psychotomimetic in humans (121); however, its presence in plants is purportedly very potent has led to the suspicion that it may be interacting with THC to enhance the high (137). Cannabicyclol (CBL) is a degradative product like CBN and CBV (123). During extraction, light converts CBC to CBL. There are no reports on its activity in humans, and it is found in small amounts, if at all, in fresh plant material.

2.2 Cannabinoids and the High

The marijuana high is a complex experience. It involves a wide range of psychical, physical, and emotional responses. The high is a subjective experience based in the individual - one's personality, mood, disposition, and experience with the drug. Given the person, the intensity of the high depends primarily on the amount of THC present in the marijuana. Delta-9 THC
is the main ingredient of marijuana and must be present in sufficient quantities for a good marijuana high. People who smoke grass that has very little cannabinoids other then delta-9 THC usually report that the high is very intense. Most people will get high from a joint having delta-9 THC of .5 percent concentration to material. Grass having a THC concentration of three percent would be considered excellent quality by anyone's standards. In this book, for brevity, we use potency to mean the sum effects of the cannabinoids and the overall high induced.

Marijuana (plant material) is sometimes rated more potent that the content of delta-9 THC alone would suggest. It also elicits qualitatively different highs. The reasons for this have not been sorted out. Few clinical studies with known combinations of several cannabinoids have been undertaken with human subjects. This field is still in its infancy. So far, different highs and possibly higher potency seem to be due to the interaction of delta-9 THC and other cannabinoids (THCV,CBD,CBN, and possibly CBC). Except for THCV, in the pure form, these other cannabinoids do not have much psychoactivity.

Another possibility for higher potency is that homologues of delta-9 THC with longer side chains at C-3 (and higher activity) might be found in certain marijuana varieties. Compounds with longer side chains have been made in laboratories and their activity is sometimes much higher, with estimates over 500 times that of natural delta-9 THC (55,113,191). Compounds besides THCV with shorter chains (methyl (139) and butyl (118)) in this position have been found in small amounts in some marijuana samples, indicating that variations do exist. However, this is not a very likely explanation. More likely, THCV is more prevalent in marijuana than supposed and probably had additive or synergistic effects with delta-9 THC.

The possibility that there are non-cannabinoids that are psychoactive or interacting with the cannabinoids has not been investigated in detail. Non-cannabinoids with biological activity have been isolated from the plants, but only in very small quantities (181). None are known to be psychotomimetic. However, they may contribute to the overall experience in non-mental ways, such as the stimulation of the appetite.

Different blends of cannabinoids account for high of different qualities. The intensity of the high depends primarily on the amount of delta-9 THC present and on the method of ingestion. A complex drug such as marijuana affects the mind and body in many ways. Sorting out what accounts for what response can become quite complex. The methodology to isolate and test the different cannabinoids now exists. The National Institute of Mental Health (NIMH) is funding research on the pharmacology of marijuana. However, such research is paltry, considering that over 30 million people in the United States use the crude drug. Much more research is needed before definite understanding of the cannabinoids and the high is attained.

When the legal restriction are removed, marijuana will probably be sold by particular blends of cannabinoids and standard amounts of delta-9 THC. Synthetic marijuana will probably be made with homologues of delta-9 THC that have much higher activity than the natural form. For now, without access to a lab, you must be satisfied with your own smoking evaluation (for research purposes only), ultimately the most important criterion any way.
Many people consider potency and resin concentration synonymous. People hear of plants oozing or gushing with copious resin, and the image is of resin flowing in the plant like the latex of a rubber tree or the sap of a maple tree. But these visions are just pipe dreams.

It is quite possible to have a resinous plant with little potency or a plant with little apparent resin which is very potent. Potency depends primarily on the concentration of THC in the plant material. Many more substances besides the cannabinoids make up the crude resin of Cannabis. Preparations such as ghanja or hashish are roughly about one-third by weight non-psychoactive water-soluble substances and cellular debris. Another third is non-psychoactive resins such as phenoloic and terpenoid polymers, glycerides, and triterpenes. Only one-fourth to one-third is the cannabinoids. In many Cannabis plants, THC may be only a very small percentage of the total cannabinoids. ((These figures are very approximate. Actual percentages depend on sample material, processing, and extraction procedures. See Table 8 and 9 for percentages of THC in hashish.)) The remainder (5 to 10 percent) of the resin will be essential oils, sterols, fatty acids, and various hydrocarbons common to plants.

<table>
<thead>
<tr>
<th>COUNTRY IN WHICH SEIZED</th>
<th>THC</th>
<th>CBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Greece</td>
<td>1 - 15.8</td>
<td>1.4 - 11.1</td>
</tr>
<tr>
<td>Nepal</td>
<td>1.5 - 10.9</td>
<td>8.8 - 15.1</td>
</tr>
<tr>
<td>Afghanistan</td>
<td>1.7 - 15</td>
<td>1.8 - 10.3</td>
</tr>
<tr>
<td>Pakistan</td>
<td>2.3 - 8.7</td>
<td>6.8(b)</td>
</tr>
</tbody>
</table>

a Figures compiled from many sources.
b Only one figure reported

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>THC</th>
<th>CBD</th>
<th>CBN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Afghanistan</td>
<td>52</td>
<td>36</td>
<td>12</td>
</tr>
<tr>
<td>Burma</td>
<td>15.7</td>
<td>16.3</td>
<td>68</td>
</tr>
<tr>
<td>Jamaica</td>
<td>77.5</td>
<td>9.1</td>
<td>13.4</td>
</tr>
<tr>
<td>Lebanon</td>
<td>32.2</td>
<td>62.5</td>
<td>5.3</td>
</tr>
<tr>
<td>Morocco</td>
<td>55</td>
<td>34.2</td>
<td>10.8</td>
</tr>
<tr>
<td>Nigeria</td>
<td>53.7</td>
<td>9.3</td>
<td>37</td>
</tr>
<tr>
<td>Pakistan</td>
<td>35.7</td>
<td>48.3</td>
<td>16.1</td>
</tr>
<tr>
<td>South Africa</td>
<td>75.6</td>
<td>8.4</td>
<td>16</td>
</tr>
</tbody>
</table>

a Each row sums to 100%

The cannabinoids basically do not flow in the plant, nor are they the plant's sap. About 80 to 90 percent of the cannabinoids are synthesised ad stored in microscopic resin glands that appear on the outer surfaces of all plant parts except the root and seed. the arrangement and number
The concentration of resin glands varies somewhat with the particular strain examined. Marijuana varieties generally have more resin glands, and they are larger than resin glands on non-drug varieties.

Although resin glands are structurally diverse, they are of three basic types. The bulbous type is the smallest (15-30 \( \mu \text{m} \) (\( \mu \) is the symbol for a micrometer (or micron), equal to 1/1,000,000 of a meter, or approximately 1/25,000 of an inch.)) or about .0006 to .0012 inches). From one to four cells make up the "foot" and "stalk," and one to four cells make up the head of the gland (25). Head cells secrete a resin - presumably cannabinoids - oils, and related compounds which accumulate between the head cells and the outer membrane (cuticle). When the gland matures, a nipple-like outpocket may form on the membrane from the pressure of the accumulating resin. The bulbous glands are found scattered about the surfaces of the above-ground plant parts.

The second type of gland is much larger and more numerous than the bulbous glands. The are called "capitate," which means having a globular-shaped head. On immature plants, the heads lie flush or appear not to have a stalk and are called "capitate sessile." They actually have a stalk that is one cell high, although it may not be visible beneath the globular head. The head is composed of usually eight, but up to 16 cells, that form a convex rosette. These cells secrete a cannabinoid-rich resin which accumulates between the rosette and its outer membrane. This gives it a spherical shape, and the gland measures from 25 to 100 \( \mu \text{m} \) across. In fresh plant material about 80 to 90 percent of their contents will be cannabinoids, the rest primarily essential oils (146).

During flowering the capitate glands that appear on the newly formed plant parts take on a third form. Some of the glands are raised to a height of 150 to 500 \( \mu \text{m} \) when their stalks elongate, possibly due to their greater activity. The stalk is composed mostly of adjacent epidermal tissue. These capitate-stalked glands appear during flowering and form their densest cover on the female flower bracts. They are also highly concentrated on the small leaves that accompany the flowers of fine marijuana varieties. Highest concentration is along the veins of the lower leaf surface, although the glands may also be found on the upper leaf surface on some varieties. The male flowers have stalked glands on the sepals, but they are smaller and less concentrated than on the female bracts. Male flowers form a row of very large capitate glands along the opposite sides of anthers.

Capitate-stalked resin glands are the only ones visible without a microscope. To the naked eye, this covering of glands on the female flower bracts looks like talcum or dew sprinkled on a fuzzy surface. With a strong hand lens, the heads and stalks are distinct. Resin glands also can be seen on the anthers of the male flowers and on the undersides of the small leaves the intersperse the flower clusters.

Resin glands are not visible until flowers form. The more obvious covering of white hairs seen on stems, petioles, and leaves are not resin glands.
They are cystolith hairs of carbonate and silicate which are common to many plants. These sharp-pointed hairs afford the plant some protection from insects and make it less palatable to larger, plant-eating animals.

In India, to make the finest quality hashish (nup), dried plants are thrashed over screens. Gland heads, stalks and trichomes collect in a white to golden powder which is then compressed into hashish (for hashmaking search section 21 for "hash").

Resin rarely accumulates in the copious quantities people would lead you to believe. Actually, the plants form a cover of resin glands rather than a coating of resin. Usually this is no more apparent than for the female flowers to glisten with pin-points of light and for the leaves and stems to feel a bit sticky when you run your fingers over them.

On some fine marijuana strains, resin may become obvious by the end of flowering and seed set. Resins occasionally secrete through pores in the membrane of gland heads. Usually secretion occurs many weeks after the stalked glands appear. The glands seem to empty their contents, leaving hollow spaces (vacuoles) in the stalk and head cells. After secretion, the glands cease to function and begin to degenerate. Gland heads, stalks, and trichomes become clumped together, and the whole flowering surface becomes a sticky mass. For reasons we'll go into later, this is not necessarily desirable. (see sections 20,21.)

Small quantities of cannabinoids are present in the internal tissues of the plant. The bulk is found in small single cells (non-articulated laticifers) that elongate to form small, individual resin canals. The resin canals ramify the developing shoots, and penetrate the plant's conducting tissue (phloem). Minute clumps of resin found in the phloem are probably deposited by these resin canals. Other plant cells contain insignificant amounts of cannabinoids and probably a good 90 percent of the cannabinoids are localised in the resin glands.

Cannabinoid synthesis seems to occur primarily in the head and apex of the stalk cells of the resin glands (26). Laticifers and possibly other plant cells probably contribute by synthesising the simpler molecules that will eventually make up the cannabinoids. Biosynthesis (the way the plant makes the molecules) of the cannabinoids is believed to follow a scheme originally outlined by A.R. Todd in his paper "Hashish," published in 1946 (see Figure 19). In the 1960s the pathway was worked out by Raphael Mechoulam, and confirmed in 1975 by Dr. Shimomura and his associates.

{Figure 19. Possible biosynthesis of cannabinoids.}

Notice that all the cannabinoids are their acid forms with a (COOH) carboxyl group at C-2 in the aromatic ring. This group may also appear at C-4 and the compounds are called, for example, THC acid "A" and THC acid "B", respectively. The position of the carboxyl group does not affect the potency, but, in fact, in their acid forms the cannabinoids are not psychoactive. In fresh plant material, cannabinoids are almost entirely in their acid forms. The normal procedure of curing and smoking the grass (heat) removes the carboxyl group, forming the gas CO2 and the psychoactive neutral cannabinoids. Removing the CO2 in important only if you plan to eat
the marijuana. It is then necessary to apply heat (baking in brownies, for example) for the cannabinoids to become psychoactive. Ten minutes of baking marijuana at 200F is enough to convert the THC acids to neutral THC.

The formation of CBG acid, from which all the other cannabinoids are formed, is initially made from much simpler compounds containing terpene units. The example here is olivetolic acid condensing with a terpene moiety called geranyl pyrophosphate. It is not known whether these are the actual or only precursors to CBG in the living plant.

Terpenes and related substances are quite light and some of them can be extracted by steam distillation to yield the "essential oil" of the plant (from essence - giving the flavour, aroma, character). Over 30 of these related oily substances have been identified from Cannabis (143). On exposure to light and air, some of the polymerise, forming resins and tars.

The cannabinoids are odourless; most of the sweet, distinctive, pleasant minty fragrance and taste of fresh marijuana comes from only five substances which make up only 5 to 10 percent of the essential oils: the mono- and sesqui-terpenes alpha- and beta-pinene, limonene, myrcene, and beta-phalandrene (144). These oily substances are volatile and enter the air quickly, dissipating with time. Subsequently, the marijuana loses much of its sweetness and minty bouquet.

The essential oils constitute about .1 to .3 percent of the dry weight of a fresh marijuana sample, or on the order of 10 percent of the weight of the cannabinoids. Essential oils are found within the heads of the resin glands and make up about 10 to 20 percent of their contents in fresh material (146). They have also been detected in the resin canals (laticifers) (31). Different samples of Cannabis have essential oils of different composition. This is not surprising given the variability of the plant. Since substances found in the essential oils are, or are related to, substances that are the precursors of the cannabinoids, there is some chance that a relationship exists between a particular bouquet and cannabinoids content. No such relationship is yet known, but it has only been studied superficially. When connoisseurs sample the bouquet of a grass sample, they are basically determining whether it is fresh. Fresh grass mean fresh cannabinoids and less of these are likely to have been degraded to non-psychoactive products.

2.4 Production of Cannabinoids by Cannabis

Why Cannabis produces cannabinoids and resins is a question probably every grower has wondered about. Supposedly, if you know, you could stimulate an environmental factor to increase cannabinoids production. Unfortunately, it does not follow that increasing a particular selective pressure will affect a plant's (phenotype) cannabinoids production. However, over a period of generations, it is possible that environmental manipulations can increase the overall cannabinoids concentrations in a population of plants. But even this procedure would work slowly compared to direct breeding by the farmer.

From the microstructure of the resin glands and the complexity of the resin, it is apparent that Cannabis invests considerable energy in making and storing the cannabinoids. Obviously, the cannabinoids are not a simple
by-product or excretory product. No doubt the cannabinoids and resins serve the plant in many ways, but probably they have more to do with biotic factors (other living things) rather than abiotic factors (non-living environment such as sunlight, moisture, etc.).

The cannabinoids, resins, and related substances make up a complex and biologically highly active group of chemicals, a virtual chemical arsenal from which the plant draws its means for dealing with other organisms. This would apply especially to herbivores, pathogens, and competing plants. In the case of humans, the cannabinoids are an attractant. Some possible advantages to the plant are listed below, but no direct studies have been done on this question. Indeed, it is surprising that botanists have shown so little interest in this question; they have even gone out of their way to state their lack of interest.

Possible Advantages of Cannabinoid Production

1. Obviously the cannabinoids are psychoactive and physiologically active in many animals. This may dissuade plant-eating animals from eating the plant, especially the reproductive parts. Many birds enjoy Cannabis seeds. But in nature, birds will not bother young seeds, probably because they are encased in the cannabinoids-rich bracts. In wild or weedy plants, when the seed is mature it "shells out" and falls to the ground. Birds will eat the naked seeds. However, mature seeds are quite hard. Many will not be cracked and eventually will be dropped elsewhere, helping the plant to propagate. Bees and other insects are attracted to the pollen. The cannabinoids and resins may deter insects from feeding on pollen and developing seeds. Resin glands reach their largest size on the anthers (which hold pollen) and bracts (which contain the seed). {See plates 6, 7, 10 and 11.}

2. Terpenoid and phenolic resins are known to inhibit germination of some seeds. Cannabis resins may help Cannabis seedlings compete with other seedlings by inhibiting their germination.

3. Many of the cannabinoids (CBD, CBG, CBC and their acids) are highly active antibiotics against a wide range of bacteria (almost all are gram +) (36,130,184). Crude resin extracts have been shown to be nematocidal (36). (However, fungicidal activity is low.)

Most of the explanations you've probably heard for resin production from both lore and scientists have to do with physical factors such as sunlight, heat, and dryness. Presumably the resin coats the plant, protecting it from drying out under physical extremes. These explanations make little sense in light of the resins' chemistry.

The physical qualities of the glands and resins probably aid the plant in some ways. The sticky nature of resin may help pollen grains to adhere to the flowering mass and stigmas, or simply make the plant parts less palatable. And gland heads do absorb and reflect considerable sunlight, and so possibly protect the developing seed. For instance, gland heads are at first colourless (i.e., they absorb ultraviolet light). This screening of ultraviolet light, a known mutagen, may lower possible deleterious mutations. But physical properties seem to be secondary to the resins' chemical properties as functional compounds to the plant.
2.5 Cannabis Chemotypes

All Cannabis plants produce some cannabinoids. Each strain produces characteristic amounts of particular cannabinoids. Strains differ in the total amounts they contain. Usually they average about three percent cannabinoids to dry weight, but concentrations range from about one to 12 percent cannabinoids in a cleaned (seeds and stems removed), dried bud. Strains also differ in which cannabinoids they produce. Based on which cannabinoids, Cannabis strains can be divided into five broad chemical groups. (Chemical classification based on work by Small et al (51)) The general trend is for plants to have either THC or CBD as the main cannabinoid.

Type I

Strains are high in THC and low in CBD. This type represents some of the finest marijuana strains. They usually originate from tropical zones below 30 degrees latitude, which in the north runs through Houston and New Orleans to Morocco, North India, and Shanghai, and in the south through Rio de Janeiro, South Africa, and Australia. Most of the high-quality marijuana from Mexico, Jamaica, and Colombia sold in this country is this type; most of you will grow this type. As with all five chemical types, type I comes in different sizes and shapes. Most common are plant about 10 to 12 feet tall (outdoors), quite bushy, with branches that grow outward to form the plant into a cone (Christmas tree shape). Other tall varieties (to 18 feet) have branches that grow upward (poplar-tree shaped - some Mexican, Southeast and Central Asian varieties). A less common short variety (up to eight feet) develops several main stems and the plants appear to sprawl (Mexico, India).

Type II

This is an intermediate group, with high CBD and moderate to high THC. They usually originate from countries bordering 30 degrees latitude, such as Morocco, Afghanistan and Pakistan. In this country, this type of grass usually comes from Afghan and Colombian varieties. Type II plants are quite variable in the intensity and quality of the high they produce, depending on the relative amounts of THC and CBD in the variety. Probably because of their high CBD and overall resin content, these plants are often sued to prepare hashish and other concentrated forms of marijuana. The most common varieties grow to about eight to 12 feet and assume a poplar-tree shape with long branches that grow upward from the stem base and much shorter branches toward the top. They usually come from Turkey, Greece, and Central or Southeast Asia and occasionally from Colombia and Mexico. Some varieties are shorter, about four to eight feet at maturity, and very bushy with a luxuriant covering of leaves. These usually originate from Nepal, northern India, and other parts of Central Asia as well as North Africa. Other varieties appear remarkably like short (five to seven feet) hemp plants, with straight,
slender stems and small, weakly developed branches (Vietnam). A common short variety, less than four feet tall (Lebanon, N. Africa), forms a continuous dense cluster of buds along its short stem. They appear remarkably like the upper half of more common marijuana plants.

(Figure 20. Left: This Pakistani variety ("indica") reaches a height of five feet (large leaves removed). Right: Flowering top two months later.)

Type III

Plants are high in CBD and low in THC. These are often cultivated for hemp fibre or oil seed. Usually they originate from countries north of 30 degrees latitude. As marijuana they yield a low-potency grass and are considered non-drug varieties. If you choose your seeds from potent grass, it will not be this type. An example of these plants are Midwestern weedy hamps which are often collected and sold for low-grade domestic grass. The high CBD content can make you feel drowsy with a mild headache long before you feel high. These plants are very diverse morphologically even when categorised by cultivated types. Hemp plants are usually tall (eight to 20 feet) with an emphasis on stem development and minimal branching. Starting from the base, long, even internodes (stem portion from one set of leaves to the next pair) and opposite phyllotaxy (see 3.2) cover a good portion of the stem. Some varieties form long, sparse branches only on the upper portion of the stem (many Midwest weeds). Other varieties (Kentucky hemp) are the familiar Christmas-tree shape.

Seed varieties are usually short (two to eight feet) and very bushy. Branches on some are short, grow outward and are all of approximately the same length, giving the plant a cylindirical shape. Some of the shorter (two to three feet) seed varieties have undeveloped branches, and almost all of the seeds collect in a massive cluster along the top portion of the stalk. Seed plants are often the most unusual-appearing of Cannabis plants, and you won't find them in the United States.

As expected, the figures for average THC in Midwestern weeds are quite low. this is consistent with their reputation for low potency. But the range of THC goes up to 2.37 percent in the Illinois study. This is comparable with some of the higher-quality imported marijuana and is consistent with some people's claims that Midwestern weeds provided them with great highs.

Type IV

Varieties that produce propyl cannabinoids in significant amounts (over five percent of total cannabinoids) form a fourth group from both type I and II plants. Testing for the propyl cannabinoids has been limited and most reports do not include them. They have been found in plants from South Africa, Nigeria, Afghanistan, India, Pakistan, and Nepal with THCV as high as 53.69 percent of total cannabinoids (136). They usually have moderate to high levels of
both THC and CBD and hence have a complex cannabinoid chemistry. Type IV plants represent some of the world's more exotic marijuana varieties.

A fifth type, based on the production of CBGM, which is not psychoactive, is found in northeastern Asia, including Japan, Korea and China. This type is not relevant to us and will not be mentioned again.

There are many different techniques for sampling, extraction, and estimation of cannabinoids in plant material. To minimise differences among research groups, the above data (except for Midwestern weedy hemps) are taken from studies at the University of Mississippi at Oxford (66,119,136).

Unfortunately, some of the best Colombian, Mexican and Thai varieties are not included in the data. Many of these have not been tested until recently, and the figures are not yet published. Under the system for testing at the University of Mississippi, the highest THC variety reached six to eight percent THC in a bud. These seeds originated from Mexico.

{See Table 01 to 10.}

These five chemical types are not distinct entities; that is, each type contains several quite different-appearing varieties. Actually, varieties of different types may look more similar than varieties from the same type. But the ability to produce characteristic amounts of particular cannabinoids is genetically based. This means the each type contains certain genes and gene combinations in common, and in biological terms, the plants are called chemical genotypes.

These types may be from virtually any country simply because of the plant's past and ongoing history of movement. The first three can be found in most countries where Cannabis is heavily cultivated, although marijuana plants (types I, II, IV) usually originate from lower latitudes nearer the equator. This may be simply explained in terms of cultural practices. Marijuana traditionally has been cultivated in southerly cultures such as India, Southeast and Central Asia, Africa; and in the West in Mexico, Colombia, Jamaica, and Central American countries. On the other hand, useful characteristics must exist before cultures can put them to use after selection. And the characteristic (drug or fibre) must maintain itself within the local environment (see 18.4).

Non-drug types (type III) usually originate at higher latitudes with shorter growing seasons. A definite gradation exists for non-drug to drug types, starting in temperate zones and moving toward the equator. The same gradation may be found for the appearance of propyl cannabinoids toward the equator. This doesn't mean that the quality of the grass you grow depends on whether you live in the north or south, but that over a period of years and decades, a group of plants may drift toward either the drug or the non-drug type (either rich in THC or rich in CBD).

The majority of the marijuana sold in the United States has less than one percent THC; and the bulk of this comes from Mexican and domestic sources. The highest percentages of THC in marijuana that we've seen are: Colombian (9.7), Mexican (13.2), Hawaiian (7.8), and Thai sticks (20.2; however, this
is believed to be adulterated with hash oil). The percentages of THC reported vary greatly, because they depend on the particular method of sampling and estimation used.

Five samples of Colombian Golds, bought in New York City and San Francisco for from $30 to $50 (1976) an ounce, averaged 2.59 percent THC and 1.27 percent CBN. The CBN represents an average of about one-third of the THC originally present in the fresh plant by the time it reaches American streets. This is one advantage that homegrowers have, since their marijuana is fresh. In fresh plant material, less than 10 percent of the THC will have been converted to CBN, as long as the material is properly harvested, cured, and stored.

By the time hashish reaches the American market, THC content is usually at the low end of the ranges given here, usually between 1.5 and 4 percent THC. The darker outer layer of hashish is caused by deterioration. The inner part will contain the highest concentration of THC.

The average range for hash oil and red oil is 12 to 25 percent when it is fresh. It is not uncommon for illicit hash oil to have more than 60 percent THC. However, light, as well as air, very rapidly decomposes THC in the oil form (see the section on "Storage" in section 21). You can't tell whether the oil will be wondrous or worthless unless you smoke it.

The preparations listed in Tables 9 and 10 are relatively fresh compared to hashish on the American market. Total cannabinoids make up roughly 25 to 35 percent by weight of hashish and resin preparations. Note that the data in these tables are relative concentrations.

Table 10 - Relative Percentages of Major Cannabinoids in Hashish from Nepal

<table>
<thead>
<tr>
<th>Percentage(a) of THC HASHISH THC CBD CBN THCV CBDV CBV LOST(b)</th>
<th>Sample 1</th>
<th>Sample 2</th>
<th>Sample 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.5</td>
<td>3.4</td>
<td>5.5</td>
<td></td>
</tr>
<tr>
<td>35.9</td>
<td>41.1</td>
<td>41.2</td>
<td></td>
</tr>
<tr>
<td>22.1</td>
<td>24.8</td>
<td>30.3</td>
<td></td>
</tr>
<tr>
<td>5.7</td>
<td>3</td>
<td>2.3</td>
<td></td>
</tr>
<tr>
<td>12.5</td>
<td>11.9</td>
<td>11.6</td>
<td></td>
</tr>
<tr>
<td>12.3</td>
<td>15.8</td>
<td>85</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>88</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Each row in these columns sums to 100%
b Percentage of original THC lost as CBN

The very high figures for CBN in hashish indicate that much of the THC is converted to CBN because of processing and aging. During hashmaking many of the gland heads are broken and the THC is exposed to light and air. The figures in these tables are typical of what to expect for relative concentrations of THC in hashish on the American market. Actual concentrations are roughly one-fourth to one-third of these figures.

Obviously, THC percentages for hashish and tinctures are not that high compared to fine marijuana. Hashish in the United States seldom lives up to its reputation. The best buy in terms of the amount of THC for the money is hash oil when it is high quality and fresh. More often a fine homegrown sinsemilla or sometimes a lightly seeded Colombian is the best investment. (Of course, the best value is always what you grow yourself.)

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Chapter Three
BEFORE CULTIVATION BEGINS
3.2 Choosing Seeds

Popular Market names of different grades of grass, such as Colombian commercial and Mexican regular, are familiar to growers, but each grade actually may encompass many different varieties. For example, there are Colombian Golds that are similar in most respects, but some varieties grow no taller than six feet. The more common types grow 12 to 15 feet under the same conditions. Some Oaxacan Cannabis forms several strong upright branches by maturity, and at a glance may seem to have several stems, yet more often, Oaxacan is conical-shaped and grows about 12 feet.

Most of the fine marijuana sold in this country comes from type I plants with THC as the predominant cannabinoid. Type II plants are less common. You might recognise type II plants by the high. The grass takes longer before its effects are felt, but the high lasts much longer than with other marijuana. Type IV plants are the least common; this marijuana seldom reaches the general American market. This type will get you high after only a few tokes. Type III plants are considered non-drug varieties because they are predominantly CBD with little THC. The effects of CBD are not felt unless it is accompanied by a sizeable concentration of THC, such as in type II plants. However, a lot of marijuana from these plants is sold in the United States. Some Mexican and Jamaican regular and much of the low-grade domestic is harvested from type III plants.

You may not be able to tell what type plant you're smoking, but you can tell what you like. Seeds from high-quality marijuana will grow into high-quality marijuana plants. If you like the grass you're smoking, you'll like the grass you grow.

The name of your grass has little to do with potency and may have originated in the mind of some enterprising dealer. Always choose your seeds from what you consider to be the best grass. Don't be swayed by exotic names. If you are not familiar with grass of connoisseur quality, ask someone whose experience you respect for seeds. Smokers tend to save seeds from exceptional grass even if they never plan to plant them.

The origin of your grass even if you knew it for certain, has little to do with wether it will be dynamite or worthless smoke. In both India(45) and Brazil, hemp is grown which is worthless for marijuana. Likewise, extremely potent marijuana plants grow which are useless for hemp fibre. These plants are sometimes found growing in adjacent fields. Most of the fine-quality marijuana varieties develop in those countries nearer to the equator. How much this had to do with environmental conditions or cultural practices is unknown. In either case, marijuana traffic has been so heavy that fine varieties now grow all over the world. For example, in the United States thousands of people now grow varieties from Mexico. These fine varieties originated in Asia and Africa, and many were brought to Mexican farmers by American dealers during the 1960s. As more farmers grew these new varieties, the quality of Mexican grass imported to the United States improved. Already people are speaking of varieties such as Maui Wowie and Kona Gold.

The colour of the grass does not determine its potency. Marijuana plants are almost always green, the upper surface of the leaves a dark, luxuriant green, and the undersurface a lighter, paler green. Some varieties develop
reds and purples along stems and leaf petioles. Occasionally, even the leaves turn red/purple during the last stages of growth (plate 6). Grasses termed "Red" more often get their colour from the stigmas of the female flowers, which can turn from white to a rust or red colour, giving the marijuana buds a distinct reddish tinge. The golds and browns of commercial grasses are determined by the condition of the plant when it was harvested - whether it was healthy (green) or dying (autumn colours). How the plants are harvested, cured, and stored also has a serious effect on colour. Commercial grasses from Colombia, Mexico, and Jamaica are often poorly cured and packed. Too much moisture is left in the grass, encouraging microbial decomposition; with warm temperatures, whatever green was left disappears, leaving the more familiar browns and golds. By the time they reach the United States, commercial grasses lose about five to 20 percent of their weight in water loss and often smell mouldy or musty.

Colour also depends on origin - varieties adapted to tropical or high-altitude areas have less chlorophyll and more accessory pigments, giving the plant their autumn colours (accessory pigments protect the plant from excessive sunlight). Varieties adapted to northern climates, where sunlight is less intense, have more chlorophyll and less accessory pigments. The dying leaves often turn light yellow, grey, or rust. Variations in pigment concentrations are also influenced by local light particularly the soil conditions under which the plants are grown.

The taste of the smoke - its flavour, aroma, and harshness - also depends more on when the marijuana was harvested and how it was handled after it was grown than on the variety or environmental influences.

You can detect subtle differences in the overall bouquet between freshly picked varieties. The environment probably influences bouquet too, but with most commercial grass the harvesting/storing procedures for outweigh these other, more subtle factors. A musty, harsh-smoking Colombian marijuana can give the mildest, sweetest, homegrown smoke when properly prepared. Don't be influenced by the marijuana's superficial characteristics. Choose seeds from the most potent grass.

Grasses of comparable potency can yield plants of different potencies. This is because fine sinsemilla (homegrown, Hawaiians, Thai weeds, and some Mexicans) are carefully tended and harvested at about peak potency. They are also cured and packed well; so they are fresh when they are distributed in the American market. When you smoke them you are experiencing the at about its peak potency. The seeds you plant from this grass will produce plants, at best, of about equal potency. Sometimes they are slightly less simply because of differences in growing conditions. Colombian grasses are not usually harvested at their peak potency. A significant amount (20 percent and up) of the active cannabinoids (THC,CBD) are converted to much less active cannabinoids (CBN,CBS) or inactive ingredients (polymers-tars, resins, oils, etc.). This is also true of many Mexican and Jamaican grasses that are heavily seeded and poorly handled. Homegrown from this grass can produce plants of higher potency than the original, simply because the homegrown is fresh, and is harvested and cured well so that the THC content is at its peak.

When choosing seeds you might consider the following Broad Generalisations.
Mexican, Jamaican (if you can find goof Jamaican anymore), and homegrowns, including Hawaiians, often develop quickly and have a better chance of fully maturing in the shorter growing seasons over most of the north and central states. Colombian, African, and Southeast Asian varieties, such as Vietnam and Thai sticks (from Thailand and Japan), more often need a longer season to fully develop. Under natural conditions they seldom flower in the short growing season that covers the northern United States.

For indoor growers, the growing season is all year; so it doesn’t matter if plants need longer to develop. Mexican and Jamaican plants usually reach full potency in about six months. Colombian and Southeast Asian varieties may need eight or nine months until they reach their maximum THC or general resin content under indoor conditions.

The grass you choose should have a good stock of mature seeds. Thai weed and fine homegrowns (sinsemillas, which are by definition female flowers buds without seeds) may have no seeds at all but more often have a few viable seeds. Most Colombian and Mexican grasses contain between one and two thousand seeds per ounce bag or lid of grass. This may sound like an exaggerated figure, but it’s not. Look at the photos in Figure 21 showing the yield from some Michoacan buds. The yield is 40 percent grass (1.22 grams, about three joints), 50 percent seeds (1.56 grams or 120 seeds), and 10 percent stems (0.3 grams).

Relative to smoking material, seeds are heavy. Colombian grasses average about 50 percent seeds by weight. A film canister holds about 1,200 Colombian seeds. (Figure 21, Seeded buds often contain more weight in seeds than grass)

Depending on the variety, healthy mature seeds (which are botanically achene nots) vary in size between 1/12 and 1/4 inches in length. From any variety, choose seeds that are plump and well-formed with well-developed colour. Seed colours range from a buff through a dark brown, and from light grey to almost black colours. Often seeds are mottled with brown or black spots, bars, or lines on a lighter field (plate 11). Green or whitish seeds are usually immature and will germinate feebly if at all. Fresh seeds have a waxy glimmer and a hard, intact shell. Shiny, very dark brown or black seeds often mean the contents are fermented and the embryo is dead. Fermented seeds crush easily with finger pressure and are hollow or dust inside. Seeds that are bruised or crushed are also not viable. This happens to some seeds when grass is compressed or bricked.

Fresh, fully matured Cannabis seeds have a high rate of germination; 90 percent or better is typical. It is sometimes helpful to have an idea of how many seeds to expect to germinate. You can tell simply by placing a sample number between wet paper towels which are kept moist. Most of the seeds that germinate do so within a few days of each other. After a week or two, count how many of the original seeds germinated. This gives you a rough idea of what to expect from the seeds when planted.

The viability of seeds gradually declines with time; left in the ground, only 40 percent may germinate next season. Seeds are an ideal prey for many fungi, which are responsible for most of their deterioration. In a warm (70F or over) and humid atmosphere, fungi rapidly destroy seeds. If kept cool and
dry in an airtight container, seeds stored in this way and left in the buds also maintain high viability for over two years.

3.3 CANNABIS LIFE CYCLE

Marijuana plants may belong to any one of a number of varieties which follow somewhat different growth patterns. The following outline describes the more common form of growth. Differences between varieties can be thought of as variations on this standard theme.

Cannabis is an annual plant. A single season completes a generation, leaving all hope for the future to the seeds. The normal life cycle follows the general pattern described below.

Germination

With winter past, the moisture and warmth of spring stir activity in the embryo. Water is absorbed and the embryo's tissues swell and grow, splitting the seed along its suture. The radical or embryonic root appears first. Once clear of the seed, the root directs growth downward in response to gravity. Meanwhile, the seed is being lifted upward by growing cells which form the seedling's stem. Now anchored by the roots, and receiving water and nutrients, the embryonic leaves (cotyledons) unfold. They are a pair of small, somewhat oval, simple leaves, now green with chlorophyll to absorb the life-giving light. Germination is complete. The embryo has been reborn and is now a seedling living on the food it produces through photosynthesis. The process of germination is usually completed in three to 10 days.

Seedling

The second pair of leaves begins the seedling stage. They are set opposite each other and usually have a single blade. They differ from the embryonic leaves by their larger size, spearhead shape, and serrated margins. With the next pair of leaves that appears, usually each leaf has three blades and is larger still. A basic pattern has been set. Each new set of leaves will be larger, with a higher number of blades per leaf until, depending on variety, they reach their maximum number, often nine or 11. The seedling stage is completed within four to six weeks.

Vegetative Growth

This is the period of maximum growth. The plant can grow no faster than the rate that its leaves can produce energy for new growth. Each day more leaf tissue is created, increasing the overall capacity for growth. With excellent growing conditions, Cannabis has been known to grow six inches a day, although the rate is more commonly one to two inches. The number of blades on each leaf begins to decline during the middle of the vegetative stage. Then the arrangement of the leaves on the stem (phyllotaxy) changes from the usual opposite to alternate. The internodes (stem space from one pair of leaves to the next, which had been increasing in length) begin to decrease, and the growth appears to be thicker. Branches which appeared in the axils of each set of leaves grow and shape the plant to its characteristic form. The vegetative stage is usually completed in the third to fifth months of growth.
Preflowering

This is a quiescent period of one to two weeks during which growth slows considerably. The plant is beginning a new program of growth as encoded in its genes. The old system is turned off and the new program beings with the appearance of the first flowers.

Flowering

Cannabis is dioecious: each plant produces either male or female flowers, and is considered either a male or female plant. Male plants usually start to flowers about one month before the female; however, there is sufficient overlap to ensure pollination. First the upper internodes elongate; in a few days the male flowers appear. The male flowers are quite small, about 1/4 inch, and are pale green, yellow, or red/purple. They develop in dense, drooping clusters (cymes) capable of releasing clouds of pollen dust. Once pollen falls, males lose vigour and soon die.

The female flowers consists of two small (1/4 to 1/2 inch long), fuzzy white stigmas raised in a V sign and attached at the base to an ovule which is contained in a tiny green pod. The pod is formed from modified leaves (bracts and bracteoles) which envelop the developing seed. The female flowers develop tightly together to form dense clusters (racemes) or buds, cones, or colas (in this book, buds). The bloom continues until pollen reaches the flowers, fertilising them and beginning the formation of seeds. Flowering usually lasts about one or two months, but may continue longer when the plants are not pollinated and there is no killing frost.

Seed Set

A fertilised female flower develops a single seed wrapped in the bracts. In thick clusters, they form the seed-filled buds that make up most fine imported marijuana. After pollination, mature, viable seeds take from 10 days to five weeks to develop. When seeds are desired, the plant is harvested when enough seeds have reached full colour. For a fully-seeded plant this often takes place when the plant has stopped growth and is, in fact, dying. During flowering and seed set, various colours may appear. All the plant's energy goes to reproduction and the continuance of its kind. Minerals and nutrients flow from the leaves to the seeds, and the chlorophylls that give the plant its green colour disintegrate. The golds, browns, and reds which appear are from accessory pigments that formerly had been masked by chlorophyll.

Figure 30 THC potency through various growth stages in the male and female plant

About Plants Generally

Plants use a fundamentally different "life strategy" from animals. Animals are more or less self-contained units that grow and develop to predetermined forms. They use movement and choice of behaviour to deal with the changing environments. Plants are organised more as open systems - the simple physical characteristics of the environment, such as sunlight, water, and
temperature, directly control their growth, form, and life cycles. Once the seed sprouts, the plant is rooted in place and time. Since growth is regulated by the environment, development is in accordance with the plant's immediate surroundings. When a balance is struck, the strategy is a success and life flourishes.

Behaviour of a plant is not a matter of choice; it is a fixed response. On a visible level the response more often than not is growth, either a new form of growth, or specialised growth. By directly responding, plant in effect know, for example, when to sprout, flower, or drop leaves to prepare for winter.

Everyone has seen how a plant turns toward light or can bend upward if its stem is bent down. The plant turns by growing cells of different length on opposite sides of the stem. This effect turns or right the plant. The stimulus in the first case is light, in the second gravity, but essentially the plant responds by specialised growth. It is the same with almost all facets of a plant's live - growth is modified and controlled by the immediate environment. The influence of light, wind, rainfall, etc., interacts with the plant (its genetic make-up or genotype) to produce the individual plant (phenotype).

The life cycle of Cannabis is usually complete in four to nine months. The actual time depends on variety, but it is regulated by local growing conditions, specifically the photoperiod (length of day vs night). Cannabis is a long-night (or short-day) plant. When exposed to a period of two weeks of long nights - that is, 13 or more hours of continuous darkness each night - allows the grower to control the life cycle of the plant and adapt it to local growing conditions or unique situations. Since you can control flowering, you control maturation and, hence, the age of the plants at harvest.

3.4 PHOTOPERIOD AND FLOWERING

For the marijuana grower the most important plant/environment interaction to understand is the influence of the photoperiod. The photoperiod is the daily number of hours of day (light) vs. night (dark). In nature, long nights signal the plant that winter is coming and that it is time to flowers and produce seeds. As long as the day-length is long, the plants continue vegetative growth. If female flowers do appear, there will only be a few. These flowers will not form the characteristic large clusters or buds. If the days are too short, the plants flowers too soon, and remain small and underdeveloped.

The plant "senses" the longer nights by a direct interaction with light. A flowering hormone is present during all stages of growth. This hormone is sensitive to light and is rendered inactive by even low levels of light. When the dark periods are long enough, the hormones increase to a critical level that triggers the reproductive cycle. Vegetative growth ends and flowering begins.

The natural photoperiod changes with the passing of seasons. In the Northern Hemisphere, the length of daylight is longest on June 21. Day-length
gradually decreases until it reaches its shortest duration on December 22. The duration of daylight then begins to increase until the cycle is completed the following June 21. Because the Earth is tilted on its axis to the sun, day-length also depends on position (or latitude) on Earth. As one moves closer to the equator, changes in the photoperiod are less drastic over the course of a year. At the equator (0 degrees altitude) day length lasts about 12.5 hours on June 21 and 11.5 hours on December 22. In Maine (about 45 degrees north), day-length varies between about 16 and nine hours. Near the Arctic Circe on June 21 there is no night. On December 22 the whole day is dark. The longer day-length toward the north prevents marijuana from flowering until later in the season. Over most of the northern half of the country, flowering is often so late that development cannot be completed before the onset of cold weather and heavy frosts.

The actual length of day largely depends on local conditions, such as cloud cover, altitude, and terrain. On a flat Midwest plain, the effective length of day is about 30 minutes longer than sunrise to sunset. In practical terms, it is little help to calculate the photoperiod, but it is important to realise how it affects the plants and how you can use it to your advantage.

Cannabis generally needs about two weeks of successive long nights before the first flowers appear. The photoperiod necessary for flowering will vary slight with (1) the variety, (2) the age of the plant, (3) its sex, and (4) growing conditions.

1. Cannabis varieties originating from more northerly climes (short growing seasons) react to as little as nine hours of night. Most of these are hemp and seed varieties that are acclimated to short growing seasons, such as the weedy hemps of Minnesota or southern Canada. Varieties from more southerly latitudes need longer nights with 11 to 13 hours of darkness. Since most marijuana plants are acclimated to southerly latitudes, they need the longer nights to flower. To be on the safe side, if you give Cannabis plant dark periods of 13 or more hours, each night for two weeks, this should be enough to trigger flowering. 2. The older a plant (the more physiologically developed), the quicker it responds to long nights. Plants five or six months old sometimes form visible flowers after only four long nights. Young marijuana plants (a month or so of age) can take up to four weeks to respond to long nights of 16 hours. 3. Both male and female Cannabis are long-night plants. Both will flower when given about two weeks of long nights. The male plant, however, will often flower fully under very long days (18 hours) and short nights (six hours). Males often flowers at about the same time they would if they were growing in their original environment. For most marijuana plants this occurs during the third to fifth month. 4. Growing conditions affect flowering in many ways (see Chapter 12). Cool temperatures (about 50F) slow down the flowering response. Cool temperatures or generally poor growing conditions affect flowering indirectly. Flower development is slower, and more time is needed to reach full bloom. Under adverse conditions, female buds will not develop to full size.
Applications of Photoperiod

The photoperiod is used to manipulate the plants in two basic ways:

1. By giving long dark periods, you can force plants to flower. 2. By preventing long nights, using artificial light to interrupt the dark period, you can force the plants to continue vegetative growth.

Outdoors

Most marijuana plants cultivated in the United States begin to flower by late August to early October and the plants are harvested from October to November. For farmers in the South, parts of the Midwest, and West Coast, this presents no problem and no special techniques are needed for normal flowering.

In much of the North and high-altitude areas, many varieties will not have time to complete flowering before fall frosts. To force the plants to flower earlier, give them longer night periods. If the plants are in containers, you can simply move them into a darkened area each evening. Plants growing in the ground can be covered with an opaque tarpaulin, black sheet plastic, or double or triple-layers black plastic trash bags. Take advantage of any natural shading because direct sunlight is difficult to screen completely. For instance, if the plants are naturally shaded in the morning hours, cover the plants each evening or night. The next morning you uncover the plants at about eight to nine o’clock. Continue the treatment each day until all the plants are showing flowers. This usually takes two weeks at most, is the plants are well developed (about four months old). For this reason, where the season starts late, it is best to start the plants indoors or in cold frames and transplant outdoors when the weather is mild. This in effect lengthens the local growing season and gives the plants another month or two to develop. By the end of August the plants are physiologically ready to flower; they sometimes do with no manipulation of the photoperiod. More often female plants show a few flowers, but the day-length prevents rapid development to large clusters. The plants seem in limbo - caught between vegetative growth and flowering. The natural day-length at this time of year will not be long enough to reverse the process, so you can discontinue the treatment when you see that the new growth is predominantly flowers.

In areas where frosts are likely to occur by early October, long-night treatments may be the only way you can harvest good-sized flower clusters. These clusters, or buds, are the most potent plant parts and make up the desired harvest. Forcing the plants to flowers early also means development while the weather is warm and the sun is shining strongly. The flower buds will form much faster, larger and reach their peak potency. A good time to start the treatments is early to middle August. This allows the plants at least four weeks of flowering while the weather is mild.

Another reason you may want to do this is to synchronise the life cycle of the plants with the indigenous vegetation. In the northeast and central states, the growing season ends quite early and much of the local vegetation dies back and changes colour. Any marijuana plants stick out like green thumbs, and the crop may get ripped off or busted. Plants treated with long
nights during late July will be ready to harvest in September.

Outdoors, growers should always plant several varieties, because some may naturally flower early, even in the northern-most parts of the country. These early-maturing varieties usually come from Mexican, Central Asian, and homegrown sources. By planting several varieties, many of you will be able to find or develop an early-maturing variety after a season or two. This, of course, is an important point, because it eliminates the need for long-night treatments.

Preventing Flowers

Manipulation of the photoperiod can also prevent the plants from flowering until a desired time. For example, in Hawaii the weather is mild enough to grow winter crops. The normal summer crop is harvested anytime from September to mid-November. The winter crop is generally planted from October to December. Because the winter days are so short, the plants flower almost immediately, usually within two month. The plants are harvested in their third or fourth month and yield about 1/4 the yield of summer plants. A large Hawaiian female can yield a pound of buds. Most of the plant's overall size is reached while it is vegetatively growing. By interrupting the night period with light, you can keep these plants vegetatively growing for another month, yielding plants of about twice the size.

The amount of light needed to prevent flowering is quite small (about .03 foot candles - on a clear night the full moon is about .01 foot candles). However, each plant must be illuminated fully, with the light shining over the whole plant. This might be accomplished with either electric light or a strong flashlight. The easiest way is to string incandescent bulbs, keeping them on a timer. The lights need be turned on for only a flash at any time during the night period, from about 9:00 pm to about 3:00 am. The interrupts the long night period to less then nine hours. Start these night treatments each night or two, until you want the plants to flower.

Indoors

Natural Light

Indoors, the growing season lasts all year. The night period is much easier to control. Sometimes people grow plants in their windows for more than a year without any female flowers ever forming. This is because household lamps are turned on sometime at night, illuminating the plants. Under natural light exclusively, indoor plants flower at about the same time they would outdoors (sometime a bit sooner because it is warmer indoors or the plants may be shaded). When plants are well developed and you want them to flower, make sure that no household lamps or nearby street lamps are shining on them. During late fall and winter, the natural day-length is short enough for the plants to flower naturally, if you simply keep off any lights at night that are in the same room as the plants. If you must use light, use the lowest wattage possible, such as a six-watt bulb. (The hormone is also least sensitive to blue light.) Shield the light away from the plants. Or shield the plants from any household light with aluminium foil curtains. Once the flowers are forming clusters, you can discontinue the dark treatments, especially if it is more convenient. However, if it is too soon
(when you see only a few random flowers), household lights can reverse the process.

By using natural light, you can grow indoor crops all year. The winter light is weak and the days are short, so it is best to use artificial lights to supplement daylight, as well as to extend the photoperiod. The extra light will increase the growth rate of the plants and hence size and yield. You should allow winter crops to flower during late January or February, using the natural photoperiod to trigger flowering. If you wait until spring, the natural light period will be too long and may prevent flowering.

Artificial Lights

Under artificial light the photoperiod is, of course, any length you wish. The most popular way to grow with artificial lights is the harvest system. Start the plants under long light periods of from 16 to 18 hours daily. After the plants have reached a good size, usually between three and six months, shorten the light cycle to about 12 hours to force flowering.

To decide exactly when to force the plants to flower, let their growth be the determinant. If male plants are showing their flowers, then the females are physiologically ready to flower. Most of the plant's overall height is achieved during vegetative growth. Some varieties, of course, are smaller and grow more slowly than others. Wait until the plants are nearing the limits of the height of the garden or are at least five feet tall. This is large enough to support good flower development and return a good yield. If you turn down the light cycle when the plants are young and small, you'll harvest much less grass because the plants simply can't sustain a large number of flowers.

Some leaf growers prefer a continuous growth system, emphasising leaf growth and a continuous supply of grass. The light cycle is set for 18 to 24 hours a day. This prevents flowering and the plants continue their rapid vegetative growth. Growing shoots and leaves are harvested as used, and plants are removed whenever they lose their vigour and growth has noticeably slowed. New plants are started in their place. In this way, there will be plants at different growth stages, some of which will be in their rapid vegetative growth stage and will be quite potent. Male plants and some females eventually will form flowers, but the females will not form large clusters. People often use this system when the lights are permanently fixed. Small plants are raised up to the lights on tables or boxes. This garden never shuts down and yields a continuous supply of grass.

3.5 INHERENT VARIATIONS IN POTENCY

The potency of a particular marijuana sample will vary because of many factors other than the variety. Many of these have to do with the natural development of the plants and their resin glands. Environmental factors do affect potency but there are large differences in any variety. These inherent factors must be explained before we can talk of factors outside the plant that affect relative potency. Strictly environmental effects are discussed in Chapter 19.

Variations in Potency Within Varieties
There are noticeable differences in THC concentrations between plants of the same variety. Differences are large enough so that you can tell (by smoking) that certain plants are better. This is no news to homegrowers, who often find a particular plant to be outstanding. Five-fold differences in THC concentration have also shown up in research. However, when you consider a whole group of plants of the same variety, they're relatively similar in cannabinoid concentrations. Type II plants are the most variable, with individual plants much higher than other in certain canninbinoids.

Variations by Plant Part

The concentration of cannabinoids depends on the plant part, or more specifically, the concentration and development of resin glands to plant part. The female flower bracts have the highest concentration of resin glands and are usually the most potent plant parts. Seeds and roots have no resin glands. These shoe no more than traces of canninbinoids. Smoke seeds will give you a headache before you can get high. If you got high on seeds, then there were probably enough bracts adhering to the seeds to get you high. {Figure 29 The highest concentration of stalked resin glands forms a cover on the female flower bracts Resin glands beneath cystolith hairs on a leaf petiole}

Here are the potencies, in descending order, of the various plant parts:

1. Female flowering clusters. In practice you don't separate hundreds of tiny bracts to make a joint. The whole flowering mass (seeds removed), along with small accompanying leaves, forms the material.
2. Male flower clusters. These vary more in relative potency depending on the strain (see "Potency by Sex," below).
3. Growing shoots. Before the plants flower, the vegetative shoots (tips) of the main stem and branches are the most potent plant parts.
4. Leaves (a) that accompany flowers (small);
   (b) along branches (medium);
   (c) along main stem (large).
   Generally, the smaller the leaf is, the more potent it can be.
5. Petioles (leaf stalks). Same order as leaves.
6. Stems. Same order as leaves. The smaller the stem (twig), the higher the possible concentration of cannabinoids. Stems over 1/16" in diameter contain only traces of cannabinoids and are not worth smoking. The small stems that bear the flowers can be quite potent.
7. Seeds and Roots. Contain only traces (less then .01 percent) and are not worth smoking or extracting.

This order is fairly consistent. The exceptions can be the small leaves that accompany male flowers, which are sometimes more potent than the flowers themselves. The growing shoots are sometimes more potent than the mature female flowers.

Samples of pollen show varying amounts of cannabinoids. Resin glands are found inside the anthers, alongside the developing pollen grains, and form two rows on opposite sides of each anther. Pollen grains are smaller than the heads of large resin glands ({see Plate 7}), and range from 21 to 69
micrometres in diameter. A small amount of resin contaminates the pollen when glands rupture, but most of the THC in pollen samples comes from gland heads that fall with pollen when the flowers are shaken to collect it. One study, using pollen for the sample, found concentrations of up to 0.96 percent THC, more than enough to get you high.

Potency by Position on Plant

The potency of marijuana on any plant increases toward the top of the plant, the topmost bud being the most potent. The bottommost leaves on the main stem are the least potent of the usable material. Along branches there is a less steep THC gradient increasing to the growing tip.

The ratios in Table 11 are representative of high-quality marijuana varieties. Plant no. 2 is an exception, with four percent THC in its lower leaves, a figure comparable to high-quality Colombian and Mexican buds in commercial grass.

Table 11 - Relationship of THC Content to Leaf Position (68)

<table>
<thead>
<tr>
<th>Plant</th>
<th>No. 1 (SP-5)</th>
<th>NO.2 (SP-5)</th>
<th>NO.3 (UNC-335)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top</td>
<td>6.1</td>
<td>6.9</td>
<td>4.8</td>
</tr>
<tr>
<td>Middle</td>
<td>3</td>
<td>5.5</td>
<td>3.1</td>
</tr>
<tr>
<td>Bottom</td>
<td>0.8</td>
<td>4</td>
<td>1.5</td>
</tr>
<tr>
<td>Ratio (gradient)</td>
<td>8:4:1</td>
<td>1.7:1.4:1</td>
<td>3:2:1</td>
</tr>
</tbody>
</table>

Notice the large difference in the gradients of Plants no. 1 and 2, which are from the same variety (SP-5). Like almost all characteristics of these plants, considerable variation occurs even among sibling. Our experience is that generally the better the quality of the variety, the steeper the gradient: in other words, the bigger the difference between top and bottom leaves. For example, the plants given here are high-quality type I varieties. Plant no. 1 is more typical, with its steep gradient, than no.2, where the gradient is much less pronounced. Lower-quality varieties generally do not have as steep a gradient and the ratios would look more like that of Plant no. 2.

Potency by Sex

Although marijuana lore claimed the female to be the more potent, scientists disclaimed this. But there is some truth to both sides. In fine marijuana varieties, male and female leaves average about the same in cannabinoid concentrations. Either a male or a female individual may have the highest concentration in any particular case. The largest variation is in comparing the flowers. Male flowers may be comparable to the females, or they may not even get you high. It seems that the higher the quality of the grass, the better the male flowers will be. In fine type I plants, male flowering clusters usually approach the potency of the female. In low-quality type III varieties females are usually more potent (20 to 30 percent) than the males.

Type II plants are the most variable, with large differences among individual plants. But the trend is for the females to average about 20 percent high in potency of leaves and flowers.
Table 12 - Relative Potencies of Male and Female Plants (66)

<table>
<thead>
<tr>
<th>COUNTRY OF ORIGIN</th>
<th>SEX (a)</th>
<th>THC</th>
<th>CBD (C)</th>
<th>TYPE PLANT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mexico</td>
<td>M</td>
<td>3.7</td>
<td>0.86</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.7</td>
<td>0.35</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>4.3</td>
<td>0.12</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.78</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Thailand</td>
<td>M</td>
<td>3.2</td>
<td>0.08</td>
<td>I</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>3.2</td>
<td>0.42</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>0.81</td>
<td>2.1</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>1.3</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>M</td>
<td>1.37</td>
<td>1.24</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.71</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Turkey</td>
<td>M</td>
<td>0.84</td>
<td>2.11</td>
<td>II</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.92</td>
<td>1.33</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>M</td>
<td>0.15</td>
<td>2.2</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.12</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>M</td>
<td>0.04</td>
<td>0.97</td>
<td>III</td>
</tr>
<tr>
<td></td>
<td>F</td>
<td>0.06</td>
<td>1.1</td>
<td></td>
</tr>
</tbody>
</table>

a) M, male (staminate); F, female (pistillate). (b) Of flowering mass with accompanying leaves. (c) Includes CBC.

Potency by Age

In general, the longer the life cycle of the plant, the more the concentration of cannabinoids increases, as long as the plant stays health and vigorous. Actually, it is the development of the plant, rather than chronological age, that determines this difference in potency. A plant that is more developed or more mature is generally more potent.

Because you decide when to plant and/or can control the photoperiod, you also control when the plants flowers and, hence, the overall age at maturity. A six-month-old plant will generally be better than a four-month-old plant, both of which are flowering. Plants eight months old will usually be more potent than six-month-old plants. Most indoor growers plan their gardens to be about five to eight months old at harvest. Healthy plants can be extended to about 10 months. Plants older than 10 months often develop abnormally. There is usually a decline in vigour and a loss in potency. But some growers have decorative plants several years old.

Outdoor growers more often simply allow the plants to develop according to the local growing conditions which will govern their development and flowering time. Where the growing season is short, some growers start the plants indoors and transplant when the local growing season begins. This gives the plants a longer growing season.

One reason female plants are considered more potent is because of age. Males often flower in four to five months and die, while the females may continue to a ripe old age of eight or nine months, especially when they are not pollinated.
Although then general trend is for the cannabinoid concentration to increase with age, this is not a matter of the simple addition or accumulation of cannabinoids. The concentration of cannabinoids changes with the general metabolic rate of the plant, and can be related to the plant's growth pattern or life cycle. Figure 30 shows a hypothetical curve following the concentration of THC from the upper leaves and growing tips of a male and female plant.

Notice that THC increases immediately with germination and establishment of the seedling, and continues to rise until the plant enters its vegetative stage. At this point, the plant is well-formed, with a sturdy stem, and no longer looks fragile. As the plant's rate of growth increases, there is a corresponding rise in THC that continues throughout the vegetative stage until a plateau is reached. Before the plateau is reached the arrangement of leaves on the stem (phyllotaxy) changes from opposite to alternate. The plateau is maintained until the plant's rapid growth all but stops and the plant has entered preflowering. By this time, the branches have formed the plant to its characteristic shape. Preflowering lasts about one to two weeks, during which THC concentration falls until the appearance of the first flowers.

For the male plant, preflowering ends with renewed growth. This lengthens the uppermost internodes and the first male flower buds appear. THC immediately increases with the development of the male flower clusters, and reaches its peak when most of the flowers are fully formed and a few are beginning to release pollen. After pollen release, the male normally loses vigour and THC content slowly declining until the plant is cured and stored.

Female plants reach their maximum THC when the plants are in full bloom. Full bloom is when the plant has filled out with well-formed flower clusters, but flowers are still slowly forming. Most of the stigmas will still be white and healthy.

Flowering lasts anywhere from two to 10 weeks, depending on whether the plants are pollinated or not, as well as on variety and the environment. (See Chapter 20 for details.) THC content declines as the formation of new flowers slows and the majority of the stigmas begin to brown. The only changes you may see in the plants are the maturation of the seeds and the loss of green colour in the leaves and flowers. In some cases the plant's apparent resin (its look and feel) increases during the last few weeks of life while the THC concentration is still declining.

You may feel that you should only pick marijuana when the plants are in full bloom, but this is not the case. Think of the garden as a continuous supply of grass. You can never be sure of the fate of your plants. The biggest problem with outdoor growing is that there is a good chance that the plants will be ripped off before you plan to harvest. It is much better to harvest grass during the course of a season, assuring yourself a return for your efforts. For example, during the third month of growth, you could cut back the growing tips, which should be quite potent, often more potent than Figure 30 suggests. This doesn't mean there will be less to harvest at season's end. In fact, the plant will be forced to develop its branches,
possible yielding a larger plant.

Common sense tells you that it is always best to test one sample before you harvest. By taking one tip, curing and smoking, you'll know whether it's worthwhile to harvest more at that time or to wait longer. When a tip is about equal to its parents' potency, then definitely harvest more growing tips. This peak high often occurs during the middle to late rapid, vegetative-growth stage.

The reader should keep in mind that Figure 30 serves only as an example. Chronological age is not as important as the physiological age of the plant. In this graph, the life of the plants is about six months. But the life cycle depends on the particular variety and the growing conditions, which strongly influence the rate of development. (For details on how to use the graph, see Chapter 20.) The important facts that the reader should get from the graph are that the potency of the grass can decrease as well as increase during the plant's life cycle. Actual studies of the cyclic variations in potency over the course of a season have shown much more complicated rhythms, with many more peaks and valleys then here 71,74,80,86,92. Most varieties will more or less follow a growth pattern as described. Changes in the plant's development, such as phyllotaxy and growth rate, are cues to changes in THC concentration. Secondly, the growing tips of the main stem and branches can be very potent. Growers do not have to wait until flowers form to harvest top-quality smoke.

3.6 Cultivation: Indoors or Outdoors?

The basic elements of the environment (light, water, air, and soil) provide plants with their fundamental needs. These environmental factors affect the growth rates of plants, as well as their life cycles. If one factor is deficient, growth rate and vigour will wane regardless of the other three. For instance, with low light, the growth will be limited no matter how fertile and moist the soil is. In the same sense, if soil minerals are scarce, the growth rate will be limited no matter how you increase the light.

Photosynthesis

Cannabis, like all green plants, manufactures its food through the process photosynthesis. Unlike animals, which depend on pre-formed food for survival, plants can use energy from light to form food (carbohydrates) from simple inorganic molecules absorbed from the air and soil.

Plants absorb light energy through pigments that are concentrated in the leaf cells. These pigments are also found in most of the aboveground parts of the plant. The most abundant pigment is chlorophyll, which gives the plants their green colour. The energy absorbed is stored in chemical compounds such as ATP and NADPH2. (ATP, adenosine-triphosphate; NADPH2, nicotinamide-adenine-dinucleotide-phosphate.) These are storage/transfer compounds that function to transfer energy and matter in the living system. ATP transfers energy that fuels the reactions for the making of carbohydrates as well as most other metabolic functions. NADPH2 transfers electrons, usually as hydrogen, for the synthesis of carbohydrates as well as other compounds.
The raw material for the synthesis of carbohydrates (CH2O)n comes from carbon dioxide (CO2) and water (H2O). Carbon dioxide is absorbed primarily from the air, but can also be absorbed from the soil and secondarily from the air.

Photosynthesis is summarised as follow:
light energy ------- ATP + NADPH2
CO2 + H2O ------- (CH2O)n + O2

For more complex bio-molecules such as amino acids and proteins, the plant absorbs minerals (including nitrogen, phosphorus, and sulfur) from the soil. Carbohydrates provide food energy for the plant using processes similar to those that occur in humans. They also form the basic building blocks for plant tissues. For example, the sugar glucose (CH2O)6 is strung and bonded to form long chains of cellulose, the most abundant organic compound on earth. About 80 percent of the structure of the plant's cells is made from cellulose.

The plant is a living thing existing in a holistic world; a myriad of factors affect its life. However, good cultivation techniques require attention to only four basic growth factors. With this accomplished, the plants will do the rest.

As grower, your strategy is to bring out the plant's natural qualities. The cannabinoids are natural to the plants. Seeds from potent marijuana grow into potent marijuana plants when they are nurtured to a full and healthy maturity.

Since most marijuana plants are adapted to tropical or semitropical climates, it is up to the grower to make the transition to local growing conditions harmonious. The requires sensible gardening techniques and, in some cases, manipulation of the photoperiod. There is no magic button to push or secret fertiliser to sue. The secret of potency lies within the embryo. The environment can and does affect potency, as it does most aspects of the plant's life. However, environmental factors are secondary to the plant's heritage (genetic potential).

Indoors vs. Outdoors

At this point the book divides into separate indoor and outdoor cultivation sections, and you may wonder whether it is better to grow the plant indoors or outdoors. Each alternative has advantages and disadvantages. It is usually better to grow the plants outdoors if possible, because the plants can grow much larger and faster than indoors. Indoors presents space and light limitations. It is possible to grow a 15-foot bush indoors, but this is unrealistic in most home. There simply isn't enough room or light for such a large plant. Outdoor gardens return a much higher yield for the effort and expense. most indoor gardeners buy soil and may have to buy electric lights. So there is an initial investment of anywhere from $10 on up.

On the other hand, outdoor plants are more likely to be seen. Many gardens get ripped off, and busts are a constant threat. Indoor gardens are much
less likely to be discovered. Gardening indoors allows the grower closer contact with the plants. The plants can be grown all year long; it is an easy matter to control their growth cycles and flowering. Probably the biggest attraction of indoor gardens is that they are beautiful to watch and easy to set up anywhere.

One popular compromise is to construct a simple greenhouse. Use plastic to either enclose part of a porch or to cover a frame built against the house.

The potency of the plants doesn't depend on whether they are grown indoors or outdoors. As long as you grow healthy plants that reach maturity and complete their life cycle, the grass can be as good as any you've ever smoked.

PART 2: INDOOR GARDENING

Chapter Four
INTRODUCTION

Marijuana adapts well to indoor conditions. You can grow it in sunny rooms or with artificial light. The factor limiting the rate of growth indoors is often the amount of light, since it is less a problem to supply the plants with plenty of water, nutrients, and air.

Natural light is free. If feasible to use, natural light eliminates the most expensive components for indoor gardeners: artificial lights and the electricity they use. Window light is the easiest way to grow plants for decorative purposes or for a small crop. On the other hand, a greenhouse, sunporch, or particularly sunny room can support larger plants than most artificial light systems. A sunny porch or roof area enclosed in sheet plastic to form a greenhouse is a simple, inexpensive way to grow pounds of grass.

Cannabis grows into a fully formed bush when it receives a minimum of five hours of sunlight a day. But you can grow good-sized plants of excellent quality with as little as two hours of daily sunlight provided windows are unobstructed by buildings or trees and allow full daylight. Windows facing south usually get the most light, followed by windows facing east and west (north-facing windows seldom get any sun). Use the location with the longest period of sunlight. The corner of a room or alcoves with windows facing in two or three directions are often very bright. Skylights are another good source of bright, unobstructed light.

Some growers supplement natural light with artificial light from incandescent or fluorescent fixtures. This is essential during the winter, when sunlight is weaker than the summer, and in spaces where the plants get little direct sunlight. Artificial lights can also be used to lengthen the natural photoperiod in order to grow plants all year.

The best time to plant using natural light is in late March or April, when the sun's intensity and the number of hours of daylight are increasing. Cleaning windows dramatically increases the amount of light, especially in cities where grime collects quickly. Paint walls adjacent to windows a flat white or cover them and the floor with aluminium foil to reflect light to
the plants. Place young plants on shelves, blocks, or tables to bring them up to the light. Position the plants as close to the windows as possible. Insulate germinating plants from freezing winter drafts by stapling clear sheets of polyethylene film to the window frame.

The main problem with marijuana in windows is that it may be seen by unfriendly people. This won't be a problem at first, but when the plants grow larger, they are easily recognised. You could cover the windows with mesh curtains, rice paper, polyethylene plastic or other translucent materials to obscure the plants. A strip covering the lower part of the window may be enough to conceal the plants from outsiders.

Most of you will want the garden completely hidden. Some gardeners opt for closets, basements, attics - even under loft beds. They cover the windows if the garden is visible and grow the plants entirely with artificial light.

The amount of light you provide is what determine the garden's size - the amount of soil, number and eventual size of the plants, and the overall yield. Since light is the factor on which you base the planning of your garden, let's begin with artificial light.

{A picture of a self-contained mini-horizontal (150 or 175 watt HID) is perfect for a personal small garden.}

Chapter Five
ARTIFICIAL LIGHT

5.2 Fixtures

Florescent light is the most effective and efficient source of artificial light readily available to the home grower. Florescent lamps are the long tubes typical of institutional lighting. They require a fixture which contains the lamp sockets and a ballast (transformer) which works on ordinary house current.

Tubes and their fixtures come in length from four inches to 12 feet. The most common and suitable are four- and eight-foot lengths. Smaller tubes emit too little light for vigorous growth; longer tubes are unwieldy and hard to find. The growing area must be large enough to accommodate one or more of these fixtures through a height of at least six feet as the plants grow. Fixtures may hold from one to six tubes and may include a reflector, used for directing more light to the plants. Some fixtures are built with holes in the reflectors in order for heat to escape. They are helpful in areas where heat builds up quickly. You can make reflectors with household materials for fixtures not equipped with reflectors. Try to get fixtures that have tubes spaced apart rather than close together. See 5.5 for further suggestions.

The tubes and their appropriate fixtures are available at several different wattage or outputs. Standard or regular output tubes use about 10 watts for each foot of their length - a four-foot tube has about 40 watts and an eight-foot tube about 80 watts.
High Output (HO) tubes use about 50 percent more watts per length than regular output tubes and emit about 40 percent more light. An eight-foot (HO) runs on 112 to 118 watts. Very High Output (VHO) or Super High Output (SHO) tubes emit about two-and-a-half times the light and use nearly three times the electricity (212 to 218 watts per eight-foot tube).

The amount of light you supply and the length of the tube determine the size of the garden. Marijuana will grow with as little as 10 watts per square foot of growing area, but the more light you give the plants, the faster and larger they will grow. We recommend at least 20 watts per square foot. The minimum-size garden contains a four-foot fixture with two 40-watt tubes, which use a total of 80 watts. Dividing total watts by 20 (watts per square foot) gives 80w divided by 20w/sq. ft = four sq.ft. (an area one by four feet). A four-tube (80 watts each) eight-foot fixture would give: 320w divided by 20w/sq. ft. = 16 sq. ft. or an area the length of the tube and about two feet wide.

VHO and HO tubes in practice don't illuminate as wide an area when the plants are young, because the light source is one or two tubes rather than a bank. Once the plants are growing well and the light system is raised higher, they will illuminate a wider area. Figure about 25 w/(ft*ft) for HO and 35 w/(ft*ft (or foot squared)) for VHO to determine garden size. A two-tube, eight-foot VHO fixture will light an area the length of the tube and one-and-a-half feet wide.

The more light you give the plants, the faster they will grow. Near 50w/sq. ft. a point of diminishing returns is reached, and the yield of the garden is then limited by the space the plants have to grow. For maximum use of electricity and space, about 40w/sq. ft. is the highest advisable. Under this much light the growth rate is incredible. More than one grower has said they can hear the plants growing - the leaves rustle as growth changes their position. In our experience, standard-output tubes can work as well as or better than VHO's if four or more eight-foot tubes are used in the garden.

The yield of the garden is difficult to compute because of all the variable that determine growth rate. A conservative estimate for a well-run garden is one ounce of grass (pure smoking material) per square foot of garden every six months.

In commercial grass, the seeds and stems actually make up more of the bulk weight than the useable marijuana.

The grass will be of several grades depending on when and what plant part you harvest. The rough breakdown might be 1/3 equal to Mexican regular, 1/3 considered real good smoke, and the rest prime quality. With good technique, the overall yield and the yield of prime quality can be increased several fold.

5.3 Sources

When sunlight is refracted by raindrops, the light is separated according to wavelengths with the characteristic colours forming a rainbow. Similarly, the white light of electric lights consists of all the colours of the
visible spectrum. Electric lights differ in the amount of light they
generate in each of the colour bands. This gives them their characteristic
colour tone or degree of whiteness.

Plants appear green because they absorb more light near the ends of the
visible spectrum (red and blue) and reflect and transmit more light in the
middle of the spectrum (green and yellow). The light energy absorbed is used
to fuel photosynthesis. Almost any electric light will produce some growth,
but for normal development the plants require a combination of red and blue
light.

Sunlight has such a high intensity that it can saturate the plants in the
blue and red bands, though most of the sun's energy is in the middle of the
spectrum. Artificial lights operate at lower intensities; so the best lights
for plant growth emit much of their light in the blue and red bands.

Fluorescent Tubes

Several lighting manufacturers make tubes (gro-tubes) the produce much of
their light in the critical red and blue bands. (Plant-gro (GE), Gro-Lux
(Sylvania), Agro-Lite (Westinghouse), and gro-lum (Norelco) are examples,
and they look purple or pink. Vita-lite and Optima (Duro-test) produce a
white light with a natural spectrum very similar to daylight. Duro-test
blubs are more expensive than other tubes but they last twice as long. {See
spectrum for "The action spectra of chlorosynthesis and photosynthesis
compared to that of human vision. Adapted from IES Lighting Handbook237"}

Theoretically, these tubes should work better for growing plants than
standard lighting tubes. However, some standard or regular fluorescent tubes
used for lighting actually work better for growing plants than more
expensive natural-spectrum tubes and gro-tubes specifically manufactured for
plant growth. The reason is that regular fluorescent produce more light
(lumens), and overall lumen output is more important for growth rate than a
specific light spectrum. To compensate for their spectrums, use them in
combinations of one "blue" fluorescent to each one or two "red" fluorescent
(Box B).

Manufacturers use standardised names such as Daylight and Sofwhite to
designate a tube that has a certain degree of whiteness. Each name
corresponds to a tube that emits light in a particular combination of colour
bands. For example, Cool White emits more blue light than other colours and
appears blue-white. By combining tubes that emit more blue light with tubes
that emit more red light, the tubes complement each other and produce a more
natural spectrum for healthy plant growth. More "red light" than "blue
light" sources are needed to foster healthy growth, so use two red tubes to
each blue tube.

The best combinations are either Warm White or Soft White (red) tubes used
with either Cool White or Daylight (blue) tubes. These four tube types are
common, much cheaper, and when used in combination, will give you a better
return than any of the more expensive gro-tubes or natural-spectrum tubes.
Any hardware store carries these common lighting tubes, and the cost may be
less than a dollar each.
Do not use tubes with "deluxe" in their designation. They have a more natural spectrum but emit considerably less light. Preferably, buy "Cool White" since it emits 50 percent more light than "Cool White Deluxe."

Incandescents and Flood Lights

The common screw-in incandescent bulb produces light mainly in the longer wavelengths: far-red, red, orange, and yellow. Higher-wattage bulbs produce a broader spectrum of light than lower-wattage bulbs. Incandescents can be used alone to grow marijuana, but the plants will grow slowly and look scraggly and yellow. Incandescents combined with fluorescent work well, but fluorescent are a better source of red light. Fluorescent tubes generate slightly less heat per watt. With incandescents, heat is concentrated in the small bulb area, rather than the length of the tube, and can burn the plants. In addition, incandescents have less than one-third the efficiency of fluorescent in terms of electricity used. If you decide to use incandescents in combination with fluorescent, use two times the wattage of incandescents to blue source fluorescent, that is, two 40-watt Daylight tubes to about three 60-watt incandescents, evenly spacing the red and blue sources.

The common floodlight has a spectrum similar to but somewhat broader than incandescents. Because they cast their light in one direction and operate at higher intensities, these lights work better than incandescents, both as a single source and to supplement natural or fluorescent light. {Figure 33. Supplement natural light with floodlights. Use foil curtains for reflectors.}

The best application for floodlights and incandescents is to supplement natural and fluorescent light, especially when the plants get larger and during flowering. Incandescents and floodlights require no special fixtures, although reflectors increase the amount of light the plants receive. These lights are easy to hang or place around the sides of any light system, and their strong red band promotes more growth and good flower development. Some of their energy is in the far-red band. Most purple gro-tubes and white fluorescent are deficient in this band, and addition of a few incandescents make them more effective. Agro-lite and W/S Gro-Lux emit adequate far-red light and need no addition of incandescents.

Several companies make screw-in spotlights specifically for plant growth. Two brand names are Duro-Test and Gro n'Sho. Although they are an improvement over incandescents as a single source, these lights don't perform nearly as well as fluorescent. A 150-watt bulb would grow one plant perhaps four feet tall. Two eight-foot fluorescent tubes (160 watts) will easily grow eight six-foot plants. For supplemental lighting, the incandescents and floodlight work as well and are cheaper.

HID Lamps. Metal Halide (MH) and Sodium-Vapour Lamps (HPS)

HID's (High-Intensity-Discharge) are the lamps of choice for serious indoor gardeners. HID lamps commonly illuminate streets, parking lots, and sports stadiums, and they emit very intense light and produce more light, more efficiently than fluorescent. All HID's require specific ballasts and fixtures to operate, so purchase complete systems (fixture, ballast,
reflector) along with the lamp. High Times and Sinsemilla Tips magazines (p. 332) feature numerous ads by retailers of horticultural HID systems. Contact the advertisers, and they'll send you brochures with enough information to make an informed choice.

Ordinary metal-halides (MH's and HP's) may emit dangerous UV and particle radiation of the bulb envelop breaks, cracks, or develops a small hole. Broken MH bulbs may continue to operate apparently normally, and exposure may cause serious eye or skin injury. Make sure to purchase MH bulbs designed with a safety feature (such as GE Sat-T-Gard or Sylvania Safeline) that causes the bulb to burn out immediately if the outer envelope ruptures. OR purchase fixtures that shield the bulb in protective tempered glass.

HID's come in many sizes, but generally, use only 400 and 1,000 watt sized lamps. The largest size (1,500 watts) is not recommended because of its relatively short bulb life. Sizes less than 400 watts do not return as much marijuana considering set-up costs and ease of operation. The only exceptions are certain "self-contained" mini-units of 150 and 175 watts (see 4.1). These mini-self-contained units have a horizontal fixture and built-in ballast, which is easy to set up. The horizontal fixture directs up to 45 percent more light to the plants than conventional, vertically positioned lamps with reflectors. The intense light encourages excellent growth and bud formation with modest electrical consumption. They are the best overall light system for small, personal gardens such as closet set-ups.

Position 400 watt HID lamps 18 to 30 inches above plant tops, and 1,000 watt lamps 30 to 42 inches above the tops. During flowering, flowers may "run" rather than form in compact buds if lamps are positioned too close to the plant tops, particularly when using HPS's.

Heat is the main problem with HID's, and the room must be well-ventilated. Use exhaust fans to draw heat out of the room. The fan doesn't need to be large, just active enough to create a strong, ventilating draft.

Light Balancers

Sophisticated gardeners use light balancers which employ a small motor to move reflectors and HID lamps held on tracks or mechanical arms slowly across a garden in either a linear or circular pattern {(see p. 88 Figure 38b)}. Light balances save considerable power and bulb costs because they dramatically increase the effectively illuminated garden size, while using less the 24 watts per balancer. With the lights moving on a balancer, all of the garden becomes equally illuminated for modest running costs. Instead of adding another 1,000 watt HID, a light balancer increases the garden size without measurably increasing power consumption, an important consideration when electricity consumption or costs are of concern.

With multi-bulb HID gardens, use one MH to each HPS lamp on a light balancer, and hang the lamps about one foot closer to the plant tops than usual. MH's favour blue light, and HPS's produce more orange-red light. By combining the two, the spectrum is more balanced, and you'll get a better return of well-formed buds.

Low Cost HID Systems
By far, the most efficient and effective set-up for a modest artificial light garden is to use fluorescent lamps set on a long photoperiod for germination, growing seedlings or to raise clones; use another room, or part of the room separated by a light-tight curtain or barrier, for flowering with (HPS) lamps in horizontal reflectors kept on a short photoperiod to induce and promote flowering.

For example, separate and average sized room into two growing areas by hanging an opaque curtain to block light between the two sections. In the smaller area, grow seedling or clones (see 18.5) for two to six weeks under fluorescent set on a constant light. In the larger section, keep HPS lamp(s) on a 12-hour light cycle for flowering. Move larger seedlings under the HPS lamp(s) for about 9 to 15 weeks to initiate and complete flowering. Meanwhile, start more seedling under fluorescent. It's easy to maintain both sections of the room be constantly replenishing either area with new plants. This setup is very productive for a modest investment in both costs and labour - no time or costly light and electricity is wasted on empty space, and you'll find yourself continuously harvesting mature buds.

A no frills setup with an HID. Notice that the ballast is insulated from the floor with pieces of wood; the fixture is supported by rope and not the electric cord; plastic protects the floor; there is a timer, a reflector, and fan.)

Figure 34 and 35 for light-output from two and four 40 watt white fluorescent and comparing effectiveness in footcandles.)

Using this setup, the initial long photoperiod and small area necessary for seedlings or clones is illuminated cheaply by fluorescent. Seedlings grow, and cuttings root, better under fluorescent than HPS's. The larger, more costly flowering section is kept under a short photoperiod of 12 hours of daily light and the strong red light is necessary for good flowering.

For example, the whole operation could draw less then 650 watts: 160 watts by four, four-foot fluorescent set on constant light to start the seedlings; one 400 watt HPS set on 12 hours daily light for flowering; two timers and a venting fan for automating the lights and controlling heat. It's possible to harvest four to six, fully mature crops each year, or continuously harvest. (See Mel Frank's new Marijuana Grower's Insider Guide by RED EYE PRESS for much more information on efficient, low cost, indoor systems and greenhouse gardening.)

5.4 Setting up the Garden

Under artificial light, marijuana grows from three to six feet in three months, so the height of the light must be easy to adjust. Fixtures can be hung from the ceiling, shelves, walls, or from a simple frame constructed for the purpose. If you are hanging the lights from the walls or ceiling, screw hooks directly into a stud. Studs are located in every room corner and are spaced 16, 18 or 24 inches apart. Light can be supported from lathing using wingbolts, but plaster is too weak to hold a fixture unless a wooden strip held by several wingbolts is attached to the walls or ceiling first to distribute the pressure. Then hang the fixture from a hook in the strip. Closets have hooks and shelves or clothes rungs that are usually sturdy
enough to support the fixture. People have gardens under loft beds.

Chains are the easiest means of raising and lowering fixtures. Two chains can be suspended from a solid support from above, and attached to an "S" hook at each end of the fixture. Raise the fixture by inching the hooks to higher links on the chain. Or tie rope to the fixture, pass through an eye hook or pulley in the ceiling or frame, and tie-off at a hook or boat cleat anchored in the wall or frame.

You can also hang the lights permanently and lower plants on a shelf or plywood. The shelf could be suspended or lowered by supporting the shelf with progressively smaller block. This arrangement is often used in "growing factories" where plants are rotated to larger gardens and grow for only a few weeks in each space. One garden may have fluorescent for starting plants and another garden for maturing plants under HID's. With HID's and skylights, lowering the plants may be your best option. Use lightweight soil components or hydroponics rather than heavier soil, and the operation is easier.

If you plan to use six or more fluorescent, remove end sockets and ballasts from fixtures. Mount end sockets and tubes on a frame of one-by-twos or plywood. Space sockets so tubes cover the garden evenly (see Figure 37 and 38). This arrangement illuminates the garden more evenly and drastically reduces the suspended weight since ballasts make up most of a fixture's weight. Keep ballasts off floors and away from water. Mount the ballasts on a nearby wall or on a wooden box. Wet ballasts could actually explode, and at best, are electrically dangerous when wet.

Always buy fixtures with reflectors. For HID's, companies make their own reflectors, but the best reflectors are for horizontally positioned lights no matter which company. Horizontal reflectors focus much more useable light than either parabolic or cone reflectors. HPS's can work in any position, but MH lamps are made to work in either a horizontal or vertical position, and you must buy bulbs that correspond with the fixtures.

For fluorescents, you can make an overhead reflector from the cardboard cartons in which tubes and fixtures are packaged. Cut off the end flaps and form the cardboard into a "U". Face inner side with aluminium foil or paint them white. Leave enough space so the foil or cardboard does not contact end sockets. Staple or tape the reflector behind the tubes to the fixture or from to reflect light toward the plants.

Surround all garden with reflective surfaces, but not so tightly that air can't freely circulate. Even in window gardens, reflective sheets set adjacent to the plants make a marked difference in growth. When artificial lights are high, reflectors from the floor on up keep lower branches actively growing. Mylar, with its mirror-finish, is popular for facing walls. A flat white paint (super or decorator white) reflects better than glossy white or aluminium foil. Flat white has about three percent more reflecting capacity than aluminium foil, and reflects light more uniformly. The difference is slight, so use whatever means is most convenient. Paint walls that border the garden a flat white or cover them with aluminium, mylar, or white plasterboard. {Figure 36. Reflectors can be made from sturdy paper faced with aluminium foil. Make them with staples, tape, or tacks.
Natural-light gardens also benefit from reflectors. Make them out of cardboard painted white or faced with aluminium foil. Once the plants are past the seedling stage, surround them with reflectors; otherwise only one side of the plants will be fully illuminated.

Covering the floor with a plastic dropcloth (about $1 at any hardware store) will protect your floor and your neighbour's ceiling from possible water damage.

Marijuana grows well in a dry atmosphere, but heated or air-conditioned homes are sometimes too dry during germination and early growth. Enclosing the garden in reflectors will contain some of the moisture and insure a healthy humidity. White sheet plastic is available to enclose open gardens. Do not completely enclose the garden. Leave some open spaces at the bottom, top and ends of the garden to allow air to circulate. Air circulation will become more important as the plants grow larger.

Don't rely on training your pets to stay out of the garden. The garden will attract them, and they can easily destroy young plants by chewing on leaves and stems. Soil is more natural to their instincts than the sidewalk or kitty litter. Protect the garden from pets and toddlers; surround it with white plastic or chicken wire. Large plants are more sturdy and animals can do them little harm. The jungle ambience and an occasional leaf are irresistible to most cats, and they'll spend hours in the garden.

5.5 Electricity

For most growers, the amount of electricity used is of little concern. A four-tube, regular-output, eight-foot fixture draws about 320 watts per hour or about the same as a colour TV. The cost increase to your electric bill will be about two to six dollars a month, depending on local rates.

Farmers who devote entire basements or attics to their gardens are sometime restricted by the amount of current they can draw. Older homes or apartments may have only one 15-ampere circuit but more often have two, for 30 amperes total. Newer homes have either 60 or 100 amperes available through four to six circuits. One 15-ampere circuit can safely accommodate three, two-tube VHO fixtures or six tubes for 1,290 watts, or 16 regular-output, eight-foot tubes for about 1,280 watts total. This allows for a 20 percent safety margin of circuit capacity, which is necessary considering heat loss, starting voltages, etc.

In kitchen and basements the circuits may be rated higher, at either 20 or 30 amperes. You can find out the amperage of the circuit by looking at the fuse rating on the face of the fuse. Determine what room or rooms each circuit is feeding by removing the fuse and seeing which outlets are not working. The wattage capacity of any circuit is found by multiplying volts time amps. Standard United States voltage is 110 to 120 volts.

Fluorescent light fixtures are sometimes sold unwired or without a line cord, and the job is left to you. Follow the diagram on the ballast which shows the wires marked by their colour. Simply attach the wires to the
sockets as diagrammed. New sockets have small holes which automatically make contact when the bare end of the wire is pushed into them. Older fixtures have sockets with conventional screw terminals.

Indoor gardens may have aluminium foil, chains, reflectors, and wet floors, all of which are good electrical conductors. Coupled with hanging lights, these conditions could lead to dangerous electrical shocks. Never touch a reflector, fixture, or ballast while watering or standing on a damp floor. Eliminate the chance of serious shocks altogether by turning off the lights whenever you work in the garden. An HID ballast on a damp floor is very dangerous. Raise HID ballasts on wood blocks off the floor.

Reduce the risk of dangerous shocks by using fixtures grounded to the power source. A fixture with a three-pronged plug connected to a three-wire outlet is grounded in a properly wired house. You can also ground a fixture by connecting a #12 or #14 gauge wire to any bare metal screw (not an electric terminal) on the fixture housing to the screw that holds the cover plate on the electrical outlet your using.

{With two prong outlets, connect an adaptor plug with a terminal (top left) or third wire (top right) from the plug to the screw that holds the cover plate. This converts two-wire outlets to three wire grounded systems when a three-wire electric cord is used, an important electrical safeguard which grounds the light system.}

Chapter Six
SOIL AND CONTAINERS FOR IT

6.2 Pots and Other Containers

In its natural state, marijuana may grow an extensive root system - a fibrous network of fine, lateral roots that branch off a main, carrot-shaped tap root. In dry areas, the tap root can grow more than six feet deep in its search for water. In moist areas with fertile soil (such as in potting mixtures), the lateral roots are able to supply water and nutritive needs and the tap root remains small, often only three or four inches long on a seven-foot-tall mature plant.

The purpose of the growing medium is to provide adequate water and nutrients in addition to anchoring the roots, which hold the plant upright. By watering and fertilising as needed, you could grow a six-foot plant in a four-inch ((Pots are measured by diameter across the top.)) pot or in a three-foot layer of soil over your whole garden; but neither of these extreme procedures is very practical.

Most growers use containers that will hold between two and five gallons of soil. These are a good compromise in terms of weight, space, cost, and labour. They can be moved easily and hold an adequate reservoir of water and nutrients to support a large mature plant.

Some growers use a single large box or several long troughs that hold a six-to 12-inch layer of soil. These have the advantage of minimal restriction of roots and less frequent waterings, but they require more soil and make rotating or moving the plants impractical.
Determine the right size pot to use in your garden by the amount of light per square foot. For a moderately lighted garden (15 to 25 watts per square foot and most window gardens), use one- to three-gallon containers. For gardens with more light energy - over 25 watts per square foot or one-half day or more of sunlight - use three- to eight-gallon containers. The smallest pot we recommend for a full-grown plant is eight inches or one gallon. This is also a good size for starting plants to be transplanted after two months.

Practically any container that can withstand repeated waterings and has a top at least as wide as its base will do. Each pot must have several holes in the bottom to assure drainage. Growers use flower pots, institutional-sized cans and plastic buckets, baskets and small trash cans, milk crates and wooden boxes.

Plastic trash bags are sometimes used when other large containers can't be found. They must be handled carefully, since shifting the soil damages the fragile lateral roots. They are also more difficult to work with when transplanting. However, a roll of trash bags is an available and inexpensive substitute for other large containers. Plastic bags should be double or triple bagged. Small holes should be punched in the bottom to drain excess water. Use masking tape to patch any unwanted tears. The capacity of the bag should be no more than twice as many gallons as the amount of soil used. For example, with four gallons of soil, the bag should be of a five-gallon, but not more than eight-gallon size. Otherwise, it will not form a cylinder, and the bag will remain a shapeless mass.

Use as many pots as can fit in the lighted area to make the most efficient use of space. Many growers prefer to start the plants in smaller pots, transplanting into larger pots when the plants are larger. There are definite advantages to this method in terms of the yield in the garden, given its space and light energy. Seedlings and small plants take up much less space than they will at maturity, so they can be placed closer together. As the plants grow and begin to crowd each other, remove the less vigorous (to smoke, of course) and transplant the rest into larger pots. Start plants which will be transplanted later in four- to eight-inch flower pots, or one-quart to one-gallon tin cans or milk containers. Peat pots or planting pots are made of compressed plant fibre for the purpose of starting young plants. They are available at garden shops and come in several sizes. Use at least a four-inch pot so that the roots are not restricted in early growth. Peat pots are supposed to break down in the soil, but marijuana's delicate lateral roots may not be able to penetrate unless you score or break away the sides while transplanting. Wax paper cup (six to eight ounces), filled with a soil mixture, work as well as peat pots and are cheaper.

BOX C
Finding Large Containers

Use your ingenuity in finding large containers. Large clay flower pots do not work any better than the large metal and plastic containers discarded by restaurants and food stores. Various milk containers are good starting pots. Many garden shops sell used pots for a few cents each. Wholesalers sell
plastic pots by the carton at a discount. Large plastic pots and pails can sometimes be picked up inexpensively at flea markets or variety stores. Any vessel that holds an adequate amount of soil and does not disintegrate from repeated waterings is a satisfactory container.

6.3 Properties of Soil

The soil or growing medium serves as a source and reservoir for water, air, and nutrients, and to anchor the roots. Since marijuana grows extremely fast, it has higher water and nutritive needs than most plants grown indoors. The success of your garden depends on supplying the plant with a medium that meets its needs without creating toxic conditions in the process.

There is no such thing as the perfect soil for Cannabis. Each variety can grow within a range of soil conditions. For healthy, full growth, marijuana prefers a medium with good drainage, high in available nutrients, and near a neutral pH (7.0). These conditions result from a complex set of physical, chemical and biological factors. We will refer to them simply as: (1) texture; (2) nutrients; (3) pH.

Most indoor growers prepare the growing medium using commercial potting mixes. These mixes are usually sterilised or pasteurised and have good general soil properties. Since they seldom list the contents, nutrients, or pH, do some simple test of your basic soil whether you buy or dig for it. Then you can adjust the soil to meet the basic requirements of the plant.

Texture

The texture of the medium determines its water-holding and draining properties. Marijuana must have a well-drained medium for healthy growth. Soils that hold too much water or hold it unevenly can drown the roots, leading to poor growth or death of the plant. In a well-drained soil the roots are in contact with air as well as water. Soils that have too much clay, or are overly rich in compost or other organic matter, tend to hold too much water and not enough air. This condition worsens in time. This is especially true of the soil in pots.

You can determine the texture of your soil from its appearance and feel. Dry soil should never cake or form crusts. Dry or slightly moist soil that feels light-weight, airy, or spongy when squeezed, and has a lot of fibrous material, will hold a lot of water. Mix it with materials which decrease its water-holding capacity, such as sand, perlite, or even kitty litter.

Wet soil should remain spongy or loose and never sticky. A wetted ball of soil should crumble or separate easily when poked.

Soil that feels heavy and looks dense with fine particulate matter, or is sandy or gritty, will benefit by being loosened and lightened with fibrous materials such as vermiculite, Jiffy Mix, or sometimes sphagnum moss.

Soil Conditioners to Improve Texture
Perlite (expanded sand or volcanic glass) is a practically weightless horticultural substitute for sand. Sand and perlite contribute no nutrients of their own and are near neutral in pH. They hold water, air, and nutrients from the medium on their irregular surfaces and are particularly good at aerating the soil.

Vermiculture (a micaceous material) and sphagnum moss contribute small amounts of their own nutrients and are near neutral in pH. They hold water, air, and nutrients in their fibre and improve the texture of sandy or fast-draining soils. Jiffy Mix, Ortho Mix, or similar mixes are made of ground vermiculite and sphagnum moss, and are fortified with a small amount of all the necessary nutrients. They are available at neutral pH, are good soil conditioners, and are also useful for germinating seeds.

Sphagnum and Peat Moss (certain fibrous plant matter) are sometimes used by growers to improve water holding and texture. Both work well in small amounts (10 to 15 percent of soil mixture). In excess, they tend to make the medium too acidic after a few months of watering. Use vermiculite or Jiffy Mix in preference to sphagnum or peat moss.

Nutrients

Nutrients are essential minerals necessary for plant growth. The major nutrients are nitrogen (N), phosphorus (P), and potassium (K), which correspond to the three numbers, in that order, the appear on fertiliser and manure packages, and that give the percentage of each nutrient in the mix (see section 9).

Marijuana prefers a medium that is high in nitrogen, and mid-range in phosphorus and potassium. Generally, the darker the soil, the more available nutrients it contains. Commercial soils usually contain a good balance of all nutrients and will support healthy growth for a month or two, even in smaller (one gallon) containers. Many growers prefer to enrich their soil by adding sterilised manures, composts, or humus. All of these provide a good balance of the three major nutrients. They also retain water in their fibre. In excess they cause drainage problems, make the medium too acidic, and attract insects and other pests. A good mixture is one part compost or manure to five to eight parts of soil medium. In large pots (four or five gallons), these mixtures might provide all the nutrients the plant will ever need. {Table 13.}

The many prepared organic and chemical fertilisers that can be mixed with the soil vary considerably in available nutrients and concentrations. Used in small amounts, they do not appreciably effect the soil texture. Many prepared fertilisers are deficient in one or more of the major nutrients (see Table 14). Mix them together so there is some of each nutrient, or use them with manures, which are complete (contain some of all three major nutrients). When adding fertilisers, remember that organic materials break down at different rates. It is better to use combinations which complement each other, such as poultry manure and cow manure, than to use either fertiliser alone. (See Table 22 in section 13 for a complete list of organic fertilisers.)

Table 14 - Prepared Organic Fertilisers
<table>
<thead>
<tr>
<th>Type of fertiliser</th>
<th>Percentage by weight of</th>
<th>Availability to Plant</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>P2O5</td>
</tr>
<tr>
<td>Blood meal</td>
<td>13</td>
<td>0</td>
</tr>
<tr>
<td>Bone meal</td>
<td>0.5</td>
<td>15</td>
</tr>
<tr>
<td>Blood/bone meal</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Cottonseed meal</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Fish meal</td>
<td>8</td>
<td>2</td>
</tr>
<tr>
<td>Hoof and bone meal</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Rock phosphate</td>
<td>6</td>
<td>24</td>
</tr>
<tr>
<td>Wood ash</td>
<td>0</td>
<td>1.5</td>
</tr>
<tr>
<td>Greensand</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Chemical fertilisers are made in about every conceivable combination and concentration. Pick one that is complete and where the first number (N) is at least equal if not higher than both P and K. For example, rose foods may be 12-12-12 or 20-20-20, and work very well for marijuana. Others are: Vigoro 18-4-5 and Ortho 12-6-6. The higher the number, the more concentrated the mix is, and consequently, the more nutrients are available.

Don't use fertilisers which come in pellets or capsules, or that are labelled "timed" or "slow release." They do not work as well indoors as do standard organic and chemical fertilisers. Chemical fertilisers seldom list the amount to mix per pot. You can get some idea by the instructions for application per square foot. Use that amount of each one-half cubic foot of soil mixture.

Many growers add no nutrients at this time but rely on watering with soluble fertilisers when they water. These fertilisers and their application are discussed in section 9.

pH

The pH is a convenient measure of the acidity or alkalinity of the soil medium. It is another way of expressing whether the soil is bitter (alkaline) or sour (acid). The pH is measured on a scale of 0 to 14, with 7.0 assigned neutral; below 7.0 is acid and above is alkaline.

You can think of the pH as a measure of the overall chemical charge of the medium. It affects whether nutrients dissolve to forms available to the plant or to forms the plant can't absorb, remaining locked in the soil medium.

Marijuana responds best to a neutral (7.0 pH) medium, although in a fertile, well-drained soil, it will grow well in a range of 6.0 to 8.5. The simplest way to check the pH is with a soil-test kit from a garden shop or nursery. Test kits are chemicals or treated papers - for example, litmus papers or Nitrazine tape - that change colour when mixed with a wet soil sample. The colour is then matched to a colour chart listing the corresponding pH. Nitrazine tape is available, inexpensively, in drug stores. Some meters measure pH, but these are expensive. Agricultural agents, agricultural schools, and local offices of Cooperative Extension will test a soil sample for pH and nutrient content. Occasionally, a garden-shop person will check
pH for you or will know the pH of the soils they sell.

Highly alkaline soils are characteristically poor soils that form cakes, crusts, and hardpan. Soil manufacturers don't use them, nor should they be dug for indoor gardens. Alkaline soils are treated with sulphur compounds (e.g., iron sulphate) to lower the pH.

We have never seen commercial soils that were too alkaline for healthy growth, but they are sometimes too acidic. The pH of acid soil is raised by adding lime (calcium-containing) compounds. Liming compounds come in many forms and grades. Some are hydrated lime, limestone, marl, or oyster shells, graded by their particle size or fineness. Use the finest grade available, since it will have more of a neutralising potential than a coarse grade. You need to use less and are more interested in immediate results than long-term soil improvement. For indoor gardens, use hydrated lime (available in any hardware store) or wood ashes to raise the pH. Hydrated lime is rated over 90 percent for its neutralising potential. Wood ashes will neutralise soil acids roughly one-half as well as hydrated lime. However, they also contain some nutrients (potassium, phosphorus, magnesium, and micronutrients) and are handy and free.

There is no exact formula we can give you for raising the pH. The pH does not have to be exact; it's an approximation. At low pH it takes less lime to raise the pH one point than it does when the pH is near neutral. Sandy soils need less lime to raise the pH one point than soils high in clay or organic matter. In general, add three cups of hydrated lime or six cups of fine wood ash to every bag (50 pounds or a cubic foot) of soil to raise the pH one point. For soils that test slightly acid (about 6.5), add two cups of lime or four cups of wood ash.

Soil that tested below 6.0 should be retested in about two weeks, after thoroughly mixing and wetting the soil. Repeat the application until the pH is in an acceptable range. Check the pH of plain water to see if it is influencing the tests. Distilled water is neutral, but tap water sometimes has minerals that can change the pH. Hard water is alkaline. Sulphurous water and highly chlorinated water are acidic.

If you have already added lime to a soil that now tests from 6.5 to 7.0, don't add more lime trying to reach exactly 7.0. Too much lime will interfere with nutrient uptake, notably of potassium, phosphorus, and magnesium.

General Soil Characteristics

The texture, pH, and available nutrients of the soil are all related. The most important single factor is texture (good drainage). When soil drains poorly, it creates anaerobic (without air) pockets in the soil. Bacteria or microbes that live without air will begin to multiply and displace beneficial microbes that need air to survive. The anaerobic microbes break down organic matter to a finer consistency, and release CO2 and organic acids to the medium. Drainage worsens, the acids lower the pH, and nutrients, even though present, become unavailable to the plant.

The result can be a four-month-old marijuana plant that is only three inches
tall, especially if you use high concentrations of manures and composts, peat and sphagnum moss. If your soil lists manures or composts as additives, add no more than 10 percent of these on your own.

Drainage problems sometimes develop after several months of healthy growth. It is a good idea to add about 20 percent sand or perlite to even a well-drained soil. You can never add too much of these; they can only improve drainage. They dilute the nutritive value of the soil, but you can always water with soluble fertilisers.

Mixtures using many components in combination seem to work particularly well. This may be because, at a micro-level each component presents a slightly different set of physical, chemical and biological factors. What the plant can't take up at one point may be readily available at another.

6.4 Preparing Commercial Soils and Mixes

Garden soils (or loams) and potting mixes are actually two different groups of products, although they are frequently mislabelled. Some companies sell soil in large bags and a potting mixture in smaller bags, while labelling them the same. Soils and potting mixtures are usually manufactured locally, since transportation costs are prohibitive; so they differ in each area.

Texture and Nutrients

Soils and loams are usually topsoil blended with humus or compost for use as a top dressing in gardens, for planting large outdoor containers, or for the soil part of a potting mixture. They may have a tendency to compact under indoor conditions and will benefit from the addition of perlite or vermiculite. Soils and loams usually contain a good supply of nutrients and may support a full-grown plant in a large container. Commercial soils that are heavy generally work better than lightweight soils. Heavy soils usually contain topsoil, in which marijuana grows very well. Lightness indicates more fibrous content.

For example of possible soil mixtures, see Box D.

BOX D Examples of Soil Mixtures* 1. 5 parts soil 2. 8 parts soil 2 parts perlite 3 parts sand 1 part cow manure 1/4 part 10-10-10 chemical fertiliser 3. 5 parts soil 4. 4 parts soil 2 parts perlite 1 part sand 2 parts humus 1 part vermiculite 1/2 part cottonseed meal 2 parts humus 1/2 part poultry manure 5. 3 parts soil 6. 6 parts soil 1 part perlite 2 parts perlite 1 part sand 2 parts vermiculite 2 parts Jiffy Mix 1/2 part poultry manure 1/2 part blood/bone meal 1/2 part cow manure 1/2 part wood ash 1 part wood ash

*Almost all fertilisers are acidic, and need to be neutralised by lime. For the above mixtures, or any similar ones, mix in one cup of lime for each five pounds of manure, cottonseed meal, or chemical fertiliser in order to adjust the pH.

Potting mixes are intended to support an average-size house plant in a relatively small pot. They are sometimes manufactured entirely from wood and bark fibre, composts, and soil conditioners. These mixes are made to hold a lot of water and slowly release nutrients over a period of time, which is what most house plants require. For marijuana, these mixes seldom contain
enough nutrients to support healthy growth for more than a couple of months. (Their N is usually low, P adequate, and K usually very high.) They work best when sand or perlite is added to improve drainage, and fertilisers are added to offset their low nutrient content.

The pH

Most commercial mixes and soils are between 6.0 and 7.0 in pH, a healthy range for marijuana. If you buy your soil, it will not be too alkaline for healthy growth, but it might be too acidic. You can minimise the chances of getting and acid soil by avoiding soils with "peat" or "sphagnum" in their names. Avoid soils that are prescribed for acid-loving plants such as African violets or azaleas, or for use in terrariums. With common sense, you can buy a soil, add two cups of lime to each large bag, and not have to worry about the pH. However, the surest procedure is to test the pH yourself.

Probably the best way to find the right soil for your garden is to ask long-term growers. They can relate their past experiences with various mixes and blends. Most long-term growers with whom we have talked have tried many of the mixes available in their areas. A reliable, enlightened nurseryperson or plant-shop operator may also be able to give you some advice.

6.5 Buying Soil Components

All the materials discussed here are available at farm and garden stores or nurseries. Many suburban supermarkets sell large bags of soil and humus. Always buy your materials in the largest units possible to reduce the cost.

Large bags of soil and humus come in either 50-pound bags or one- to four-cubic-foot bags. A 50-pound bag fills about six gallons. There are eight gallons to a cubic foot. Perlite is sold in four-cubic-foot bags (thirty-two gallons). Jiffy Mix and vermiculite are sold in four-cubic-foot bags and in 16 pound bags (about 18 gallons). Sand, perlite and vermiculite come in coarse, medium, and fine grades. All grades work well, but if you have a choice, choose coarse. Sand (not beach sand) is an excellent soil conditioner. The only disadvantage is its heavy weight. Buy sand from lumber yards or hardware stores where it is sold for cement work. It will cost from 1/50 to one-half the cost of garden or horticultural sand. Sand from piles at construction sites works very well.

Calculating the Amount of Soil

The maximum amount of soil mixture for any garden can be found by multiplying the capacity of the largest pot you plan to use by the number of pots that you can fit in the garden. In many cases, the actual amount of the mixture used will be somewhat less. Two illustrations follow.

1. A small garden with a two-tube, eight-foot fixture (160W). Using 20 watts per square foot for fast growth gives 160W divided by 20W/sq.ft. + eight sq.ft. The largest pot needed for this system is three gallons, but two gallons would work. You can fit about 10 three gallon pots in eight square feet; so 3 * 10 + 30 gallons of soil mixture are needed (see Box E).
Examples Showing How Much Soil Material to Buy to Fill a Known Number of Unit-Volume Containers

Example 1. For a garden eight square feet in size,
Buy Component Which amounts to
3 50-lb (6 gal. ea.) bags of soil 18 gallons
1 cubic foot of perlite 8 gallons
30 lbs of humus 3 gallons
10 lbs of chicken manure 2 gallons
TOTAL 31 gallons

Example 2. For a garden 24 square feet in size,
Buy Component Which amounts to
4 1-cu. ft. bags of soil 32 gallons
2 1-cu. ft. bags of perlite 16 gallons
1 1-cu. ft. bag of vermiculite 8 gallons
20 pounds of cow manure 3 gallons
cottonseed meal 2 gallons
wood ash 2 gallons
TOTAL 63 gallons

2. A large garden with two two-tube, eight-foot VHO fixtures (four times 215 watts or 860 total watts) illuminating a garden three by eight feet, or 24 square feet.

860 watts divided by 24 sq. ft. = about 36W/sq. ft.

The largest pot size for this system is about five gallons. About 16 five-gallon containers can fit in 24 square feet; so 16 * 5 + 80 gal. of mixture are needed. But you could start many more plants in smaller containers and transplant when they are root-bound. You do not use more soil by starting in smaller pots, since all soil is reused. In many cases, you actually use much less soil.

In this system you could start and fit about 40 plants in one-gallon pots in 24 square feet. When the plants begin to crowd each other, some are harvested, making room for the others, which are transplanted to larger pots. In practice, a high-energy system such as this one (36W/sq. ft.) will grow large plants whose size is limited mainly by the space available. Twelve large female plants are about the most you would want in the system during flowering and for final harvest. Sixty gallons of mixture is all that is needed for the seedlings and the mature crop. This is one-fourth less than the original estimate of 80 gallons, and you actually will harvest a lot more grass (see Box E).

Mixing and Potting

Mix your soil in a large basin, barrel, or bathtub. Individual pots are filled with mixtures by using a smaller container to measure out by part or volume.
Perlite, sand, and dry soil can give off clouds of dust. When mixing large amounts of these, wear a breathing mask or handkerchief over your nose and mouth.

To pot any of the mixtures, first cover any large drainage holes with a square of window screen or newspaper to prevent the mixture from running out. Place a layer of sand, perlite, or gravel about one inch deep to insure drainage. Fill the pots with soil mixture to within three-fourths of an inch from the top of the pot. If your mixture contains manures or composts, cover the last inch or two in each pot with the mixture minus the manure and compost. This will prevent flies, gnats, moulds, and other pests from being attracted to the garden. Press spongy soils firmly (not tightly) to allow for more soil in each pot; otherwise, after a period of watering, the soil will settle and the pot will no longer be full.

Some growers add a few brads or nails to each pot to supply the plant with iron, one of the necessary nutrients. Water the pots and allow them to stand for a day or two before planting. As the soil becomes evenly moist, beneficial bacteria begin to grow and nutrients start to dissolve. {Figure 40.}

6.6 Digging Soil

Most growers prefer to buy their soil, while some prefer to dig it. Marijuana cannot tolerate heavy clays, mucks, or soils that dry to crusts. Choose a soil from a healthy garden or field, or from an area that supports a lush growth of annual weeds.

Fields that support a good crop of alfalfa, corn or other grains will support a good crop of marijuana. Fields with beets, carrots, and sugar cane indicate a well-drained soil, with near neutral pH. Red clover, sweet clover, and bluegrass have soil requirements similar to those of marijuana. Garden soils are usually fertile and well-drained, but often need lime to counteract soil acidity.

Take the topsoil layer that starts about two inches below the surface debris. Good soil will look dark, feel moist, and small clean and earthy. Use all of the topsoil layer that maintains its dark colour and is interlaced with roots. Your hands should be able to easily penetrate the underlying topsoil if the soil is in good condition. When the soil changes colour, or roots no longer apparent, then you are past the fertile topsoil layer. Abundant worm, millipedes, and other small lifeforms are a good indication that the soil is healthy. A rich layer of topsoil collects by walls, fences, and hedges where leaves and debris collect and decay to a rich humus. Sift the soil to remove stones and root clods. Also, shake out the root clods, which are rich in nutrients.

Soil that is dug should be tested the same way as already prescribed. It should be adjusted with at least 30 percent sand or perlite (vermiculite for very sandy soils), since potting will affect the drainage of even well-drained soils. Never use manures or composts that are not completely degraded to a clean-smelling humus.

Soil that is dug must be sterilised to kill weed seeds, insect eggs, and
harmful moulds and fungi. Some chemical treatments (e.g. formaldehyde) are mixed with water and poured over the soil to sterilise it. Soil can be sterilised in a pressure cooker at 15 pounds pressure for 15 minutes, or by baking wet soil in a large pot at 200 degrees for 30 to 40 minutes. Be advised that baking soil will release some formidable odours.

6.7 Growing Methods

As we said before, there are probably as many growing methods as there are marijuana growers. These methods are personal preferences or adaptions to fit particular situations; one method is not necessarily better than any other. However, the value of a garden is often based on the amount of high-quality grass it yields. Since indoor gardens are limited in size, you want the plants to quickly fill the garden with lush growth in order to use the garden efficiently. Otherwise, for the first couple of months, the lights are shining on empty space.

Secondly, the possession of small quantities of marijuana will probably be decriminalised nationally within the next few years. Decriminalisation for personal possession will open the way for decriminalisation for cultivation for personal possession. But small quantities are more difficult to define for cultivation than for simple possession, which is done by weight. Several possible ways to limit the amount for cultivation have been raised: by the number of plants, by the area cultivated, or by the number of plants at a particular stage of development. The outcome may determine whether you try to grow the largest plants possible or the most plants possible in a given area.

There are several ways to increase your garden's yield.

1. Pinch or cut back the growing shoots when the plants are young. This forces each plant to develop several strong growing shoots and generally yield large robust plants.
2. Plant a number of plant in each pot.
3. Start many plants in small pots and transplant the best plants to larger pots when the plants crowd each other.
4. Use different light systems to grow plants at different growth stages.

Here are some examples of how to carry out each of these four methods.

1. Fill the growing area with large containers (about five gallons each). Start several plants in each pot but thin the seedlings over a period of six weeks to two months, until one plant is left in each pot. During the fourth or fifth week of growth, pinch back the plants to about equal heights. Cut the growing shoot at about the fourth internode. Each plant will develop a sturdy stem which will support four to eight growing stems and will quickly fill any empty space in the garden. The whole garden is the treated like a hedge. After another month or two, you cut back the growing shoots again to have plants of equal heights. Remove the male plants as soon as they begin to release pollen (or before any male flowers open for sinsemilla). This will leave more space and light for the females to develop. By the time females flower, they've been cut
back two or three times or more, and form a dense growth of growing shoots that fill the garden with a cubic layer of flowers. Some growers maintain the plants for up to a year before the final harvest.

{Figure 41. Plant clipped at fourth internode.}

2. This method also requires large pots. Instead of thinning the seedlings to leave one per pot, leave at least three. After a few months of growth, remove any plants that lag far behind or any plants that show male flowers. The value of this method is that the odds are at least seven to one that any pot will have at least one female plant.

Most of the plants you'll grow will fill out with branches by four months at the latest. Often the branches develop young seedlings. The plants may begin to look like small Christmas trees by the second to third months of growth.

Generally, you don't want to have more than three or four plants in a five-gallon container, because growth will be limited by competition for light and space.

{Figure 42. Basement growing factory in Atlanta.}

Some varieties never do fill out. The branches remain small, only two to three inches long, and yield very little grass. We've seen plants like this grown from grass from Vietnam, Thailand, Afghanistan, and Africa. These plants are also quite short, being four to six feet tall fully grown. With varieties like this, it is better not to pinch tops, and to start about six plants per square foot of garden space. At harvest, the garden will be crowded with top stems that are laden with flower clusters.

Of course, you don't know what varieties will look like until you've seen them grow. For most varieties, each plant will need at least one square foot or space at maturity. It is much less common to find varieties that naturally grow small or especially thin, and, therefore, are those of which you would want to plant more than a few per large pot.

3. Another popular way to grow is to start plants in a large number of small pots. As the plants crowd each other, some are removed and the rest transplanted to larger pots.

4. To get the most for your investment requires conservation of light and soil. When the plants are young, a large number fit into a small place. Some growers take advantage of this fact by having several light systems, each with plants at different growth stages. The plants are rotated into larger gardens and pots. This method conserves space, materials, and electricity, and yields a harvest every two months. Using this method, "growing factories" turn out a steady supply of potent grass. {Table 15.}
Chapter Seven
MAINTAINING THE CORRECT ENVIRONMENT

7.2 Requirements for Germination

Before the seed fell, almost all of its water was sapped to prepare the seed for winter. With only the tiny drop that it holds, the embryo lives a life so slow as to be outside of time as we know it. Cannabis seeds need only water to germinate or sprout. The seeds germinate without light and at temperatures low enough to form ice. Higher temperatures hasten germination. Fresh, homegrown Oaxacan seeds germinated in three days at 70F and in eight days at 33F. Temperatures 70 to 90F are best for germination.

Fresh, mature seeds have a high rate of germination (about 90 to 100 percent) and sprout quickly. Usually sprouts appear three to seven days after planting. Older seeds (over a year, depending on storage) have a lower rate of germination and respond slower. They may take up to three weeks to sprout. To get an idea of what to expect from the seeds follow the procedure in 3.1.

Seeds that do sprout will grow normally, no matter how old they are or how long they take to sprout. From any batch of seeds, most of the ones that sprout will do so within two or three days of each other. A few will continue to come up as many as six months later, but the garden should consist of plants that are basically the same age and size. This makes the garden easier to care for.

Choosing Seeds

Different varieties grow at different rates and attain different sizes and shapes. Under artificial lights, gardens plants from one batch of grass require the least attention, because the plants sprout and grow uniformly and can all be tended at the same time. When several varieties are grown together, some plants are taller than others; you must adjust the height of the plants to keep the marijuana equally illuminated. You may also have to water and fertilise the plants on an individual basis. Some growers start at different varieties under separate light systems. On the other hand, planting several varieties offers you a comparison in potency and yield, and a source for hybrids if you want to develop seed. The next time you plant you'll know which seeds gave the best results and what growing methods will work best for you. {Figure 43. Within each seed lies an embryo.}

There is no strict correlation between the form and height of the plants and seed size, colour, or pattern. However, some large-seeded varieties grow too tall, with long spaces between leaves. Under artificial lights they yield more stems than leaves. If you have a choice between two equally potent grasses, and one has particularly large seeds (3/16 to 1/4 inch), choose the smaller-seeded variety.

Sowing

The easiest way to start the plants is to sow the seeds directly into the
soil. First, wet the soil with a moderate amount of water, enough to wet the soil evenly moist without water running out the bottom. This takes about one-half quart of water for one-gallon containers, and about one quart for three-gallon containers. Plant the seeds a quarter- to half-inch deep. The germination rate is lower when they are planted deeper; and if seeds are planted less than one-quarter inch deep, the sprouts may have difficulty anchoring their roots. Plant about six seeds per pot to assure some sprouts in each pot. Gently press each seed into the soil. Cover the seeds with soil and sprinkle lightly with water. Each day, sprinkle or spray the surface with enough water to thoroughly wet the top half-inch of soil, since the seed must be kept moist for germination.

For most people, germinating the seed is easy. Problems with germination come from either too much or too little water. If you saturate the pots with water, and especially if you continue to saturate the pots after the seeds have sprouted, the seedlings may develop stem rot or root problems. When stem rot develops, the base turns brown, and the seedlings fall over, ending the garden. This can also happen if you keep seedlings in germination boxes or terrariums where the humidity is very high. When the humidity is low, the soil surface dries out quickly and the seeds won't germinate. Sprouts that may come up shrivel and dry at the base of the stem and die.

The key to germination is to keep the soil surface moist after first having moistened the whole pot; then, after the first sprouts have been up for a few days, let the surface of the soil dry between waterings. Don't spray the surface any more. Water with medium amounts of water when the soil in the top couple of inches feels dry. For small pots, water seedlings about twice a week. For larger pots, once each week or two may be enough.

Some growers prefer to plant only seeds they know will sprout, especially when planting seeds which have a low viability. Start the seeds in wet towels or a glass of water. Add one teaspoon of liquid bleach (a three-percent solution) to each cup of water. This will prevent fungus from attacking the seeds, which happens when they are soaked for more than three days. Check the seeds each day. Plant when the radical or roots begins to come out from the pointed end of the seed. Cannabis seed is quite small and has only enough stored food for the embryo to anchor its root and raise its cotyledons. The more developed the root is when planted, the less energy it has to anchor itself in the soil. The sprout may die or growth be delayed until the root is established (transplant shock). In Figure 44, the seeds in a circle are all ready to plant. The centre seed will not survive transplanting. {Figure 44. Seeds in a circle are ready to plant. Centre sprout will not survive planting

{**Centre sprout too large**}

Some growers prefer to start the plants in a germination box. This extra hassle is not necessary. Transplanting seedlings from one medium to another often causes transplant shock. It is best to plant the seeds directly into the soil.

If you use Soilless mixtures, your seedlings should be started in paper cups, peat pots, or other small pots filled with a soil mixture (see
Transplanting in Chapter 8 {8.3}). This procedure is also helpful if you have the difficulty starting the plants in large containers. Expandable peat pellets also work very well.

The position of the seed in the soil has a slight effect on germination. The root directs its growth in response to gravity, as shown in Figure 45. However, germination is a little faster when the seeds are planted with the pointed end up. The difference is small, and it's not really necessary to position the seeds in the soil.

If a dry atmosphere presents problems, you can create the moist atmosphere of a germination box and still plant directly in the pot. Cover the seeds with transparent plastic cups or glasses, or cover the pot with plastic kitchen wrap. This creates a greenhouse effect and keeps the soil surface moist without watering. Remove all the covers as soon as you see the first sprouts begin to appear; the sprouts will die if the cover is left on. {Figure 45. The root directs its growth toward gravity. Seeds are germinated between glass and cotton, and held vertically. Four seeds to left have pointed and up. Two middle seeds are horizontal. Sex seeds on right have pointed end down.} {Figure 46. During germination soil can be kept moist by using plastic covers to create a greenhouse effect.}

7.3 Light Cycle and Distance of Lights from Plants

The seed doesn't need light to germinate. The sprout does need light as soon as it breaks through the soil. Most growers turn the light on when they sow the seeds, though, to warm the soil and encourage germination. Lights may also dry the surface of the soil, especially in large pots or with VHO fixtures. If this is a problem during germination, leave the lights off until you see the first sprout breaking through the soil; or hang the lights about 18 inches above the soil, and lower them to six inches as soon as the sprouts appear.

It is important for normal development that the plants receive a regulated day/night cycle. We emphatically recommend that you use an automatic electric timer (about $8). A timer makes gardening much easier, since you don't have to turn the lights on or off each day. The plants won't suffer from irregular hours or your weekend vacations. Set the timer so that the plants get about 16 to 18 hours of light a day, and leave it on this setting until the plants are well grown (three to six months) and you decide to trigger flowering.

During the seedling and vegetative stages of growth, the plants may be subjected to light during their night period. During flowering, however, the night period must be completely dark.

The plants grow more slowly with less than 16 hours of artificial light a day, and they may flowers prematurely. Some growers leave the lights on up to 24 hours. A cycle longer than 18 hours, may increase the growth rate, especially if the plants are not saturated with light. A longer cycle is helpful in small gardens, such as under standard four-foot fixtures.

No matter what the light source, place the lights as close to the tops as possible without burning the plants. Pay no attention to the manufacturer's
instructions for the distance of the plants from the lights; these instructions don't apply to a high-energy plant such as Cannabis. With standard-wattage tubes, keep the lights from two to six inches above the plant tops. With VHO tubes, allow four to eight inches. Maintain the lights at these distances throughout the life of the garden. In most cases you will have to raise the lights once or twice a week as the plants grow.

Standard fluorescents don't get hot enough to burn the plants unless they are in direct contact with leaves for several hours. VHO tubes will burn leaves before they touch them. But you do want to keep the lights as close to the plants as possible. This encourages stocky, robust growth. Incandescents and floodlights get very hot; place them at a greater distance from the plants. Test the distance by feeling for heat with your hands. Place the bulb at the distance where you begin to feel its heat. For a 75-watt incandescent lamp, this is about eight inches.

7.4 Water

Water, the fluid of life, makes up more than 80 percent of the weight of the living plant. Within the cells, life processes take place in a water solution. Water also dissolves nutrients in the soil, and this solution is absorbed by the roots. About 99 percent of the water absorbed passes from the roots into the conduits (xylem) of the stem, where it is distributed to the leaves via the xylem of the leaf veins. Transpiration is the evaporation of water from the leaves. The flow of water from the soil, through the plant to the air, is called the transpiration stream. Less than one percent of the water absorbed is broken down to provide electrons (usually in the form of hydrogen) which, along with carbon dioxide, are used to form carbohydrates during photosynthesis. The rest of the water is transpired to the air.

Watering

Water provides hydrogen for plant growth, and also carries nutrients throughout the plant in the transpiration stream. However, it is not true that the more water given a plant, the faster it will grow. Certainly, if a plant is consistently under-watered, its growth rate slows. However, lack of water does not limit photosynthesis until the soil in the pot is dry and the plant is wilting.

The amount of water, and how often to water, varies with the size of the plants and pots, soil composition, and the temperature, humidity, and circulation of the air, to name a few variables. But watering is pretty much a matter of common sense.

During germination, keep the soil surface moist. But once the seedling are established, let the top layer of soil dry out before watering again. This will eliminate any chance of stem rot. Water around the stems rather than on them. Seedlings are likely to fall over if watered roughly; use a hand sprinkler.

In general, when the soil about two inches deep feels dry, water so that the soil is evenly moist but not so much that water runs out the drainage holes and carries away the soil's nutrients. After a few trials, you will know approximately how much water the pots can hold. Marijuana cannot tolerate a
soggy or saturated soil. Plants grown in constantly wet soil are slower-growing, usually less potent, and prone to attack from stem rot.

Over-watering as a common problem; it develops from consistently watering too often. When the plants are small, they transpire much less water. Seedlings in large pots need to be watered much less often than when the plants are large or are in small pots. A large pot that was saturated during germination may hold enough water for the first three weeks of growth. On the other hand, a six-foot plant in a six-inch pot may have to be watered every day. Always water enough to moisten all the soil. Don't just wet the surface layer.

Under-watering is less of a problem, since it is easily recognised. When the soil becomes too dry, the plant wilts. Plant cells are kept rigid by the pressure of their cell contents, which are mostly water. With the water gone, they collapse. First the bottom leaves droop, and the condition quickly works its way up the plant until the top lops over. If this happens, water immediately. Recovery is so fast, you can follow the movement of water up the stem as it fills and brings turgor to the leaves. A plant may survive a wilted condition of several days, but at the very least some leaves will drop.

Don't keep the pots constantly wet, and don't wait until the plant wilts. Let the soil go through a wet and dry cycle, which will aerate the soil and aid nutrient uptake. Most growers find that they need to water about once or twice a week.

When some soils get particularly dry, the water is not absorbed and runs down the sides and out the bottom of the pot. This may be a problem the first time you water the soil, or if you allow the soil to get very dry. To remedy, add a couple of drops of liquid detergent to a gallon of water. Detergent acts as a wetting agent and the water is absorbed more readily. First water each pot with about one cup of the solution. Allow the pots to stand for 15 minutes, then finish watering with the usual amount of pure water.

Use tepid water; it soaks into the soil more easily and will not shock the roots. Try to water during the plant's morning hours. Water from the top of the pot. If you do want to water from the bottom with trays (not recommended), place a layer of pebbles or gravel in the trays to insure drainage. Don't leaves the pots sitting in water until the pot is heavily saturated. The water displaces the soil's oxygen, and the plants grow poorly.

Tap water in some areas highly chlorinated, which does not seem to harm Cannabis; and many fine crops are raised with water straight from the tap. But chlorine could possibly affect the plants indirectly, by killing some beneficial micro-organisms in the soil. Chlorine also makes the water slightly acidic. However, neither effect is likely to be serious. Some growers have asked whether they should use pet-shop preparations that are sold to remove chlorine from water in fish tanks. These preparations generally add sodium, which removes the chlorine by forming sodium chloride (table salt). This solution does not harm the plants, although repeated use may make the soil too saline. Probably the best procedure is to simply allow
the water to sit in an open container for a few days. The chlorine is introduced to water as the gas Cl₂, which dissipates to the air. The water temperature also reaches a comfortable level for the plants.

Hard (alkaline) water contains a number of minerals (e.g., Ca++, Mg++, K+) which are essentially nutrients to the plants. Water softeners remove these minerals by replacing them with sodium, which forms slightly salty water. It is much better to water with hard water, because artificially softened water may prove harmful after some time. Occasionally, water may be acidic (sulphurous). Counteract this by mixing one teaspoon of hydrated lime per quart water and watering with the solution once a month.

Water and Potency

We've seen no studies that have evaluated potency in relation to water. A few studies have mentioned the fact that plants that received less water were slightly more potent. Water stress has been practiced by several marijuana-growing cultures. In parts of India, watering is kept to a minimum during flowering.

To limit watering, water with the usual amounts but as infrequently as possible. To encourage good growth, yet keep watering to a minimum, wait until the plants are a few months old before you curtail watering. Give the plants their normal water and note the number of days before they begin to wilt. As the plants get larger, the water needs increase, but this generally stabilises by the time of flowering.

7.5 Air

The properties of the air seldom present any problems for indoor gardeners. The plants grow well under the ordinary conditions that are found in most homes and can withstand extremes that are rarely found indoors. The plants can survive, in fact thrive, in an atmosphere many house plants can't tolerate. For plant growth, the most important properties of the air are temperature, humidity, and composition.

Temperature and Growth Rate

Temperature control should be no problem. The plants can withstand temperatures from freezing to over 100°F. Plant growth is closely related to temperature. Marijuana varieties are, in general adapted to warm if not hot climates. Different varieties will reach their maximum rate of photosynthesis at different temperatures. For almost all marijuana varieties, the rate of photosynthesis will increase sharply with increases in temperatures up to about 70°F. Some strains reach their peak rate of growth at about 65°F. Others, especially from areas near the equator, such as Colombia, may not reach their peak rate until the temperature is about 90°F. However, for all varieties, increases in the growth rate will be slight with increased temperatures over 75°F. The average temperature for maximum is about 75 to 80°F. In other words, normal household temperatures are fine for growing marijuana and no special temperature control is necessary for most gardens.

Don't set up the garden right next to, or in contact with, a heat source.
such as a radiator or furnace. If the garden is nearby, the plants should do quite well. The plants are most susceptible to cool temperatures during germination and the first few weeks of growth. In basement gardens, the floor temperature is often lower than the air. It is a good idea to raise the pots off the floor with pallets or boxes. The seeds will germinate quicker, and the plants will get off to a faster start.

If heating is necessary, propane catalytic heaters work well, are safe and clean, and increase the carbon-dioxide content of the air. Electric and natural gas heaters also work well. Do not use kerosene or gasoline heaters. They do not burn cleanly, and the pollutants they produce may harm the plants. Any heater that burns a fuel must be clean and in good working order. Otherwise, it may release carbon monoxide, which is more dangerous to you than to the plants.

Temperature and Potency

Since marijuana varieties are most often grown in semi-tropical and tropical areas, the idea that high temperatures are necessary for potent marijuana is firmly entrenched in marijuana lore. This myth, like many others, is slowly disappearing as marijuana farmers and researchers accumulate more experience and knowledge. There are only a few published papers on the effects of temperature on potency. The best study we've seen grew four different varieties in a controlled environment under artificial lights on a 15-hour day-length. Two temperature regimes were used: a "warm" regime, with temperatures of about 73F during the day and 61F at night (about average for most homes); and a "hot" regime, set at 90F daytime and 73F at night. In all four varieties, the concentration of THC and of total cannabinoids was higher under the "warm" regime. For instance, a Nepalese strain was 3.4 times higher in concentration of total cannabinoids, and 4.4 times higher in THC, when grown under the "warm" regime than the same strain grown under the hot regime. Although we agree with the findings in principle, these figures are higher than our experience tells us.

Interpretation of the data does show one point clearly. In all four varieties, the amount of THC lost as CBN was higher under the "hot" regime (see Table 16 - currently excluded from this guide), even though the concentration of THC was higher under the "warm" regime.

Another research group in France has looked at the relationship of potency to temperature. The most recent paper compared four temperature regimes, given in descending order of potencies found: 75F day, 75F night (highest potency); 72F day, 54F night; 81F day, 81F night; and 90F day, 54F night (lowest concentration of THC). In each, the day period was 16 hours and the night period eight hours.

Interestingly, this same research group in an earlier paper reported that the concentration of THC was higher for male plants grown at 90-72F then for those grown at 72-54F. For the female plants, the differences in THC concentration were small. The variety used was a propyl variety (type IV) containing about half as much THCV as THC. For both the male and female plants, the concentration of THCV were high under the 90-72F regime.

The simplest interpretation of all these results is that mild temperatures
seem to be optimum for potency. Temperatures over 90F or below 60F seem to
decrease the concentration of THC and total cannabinoids. Also, at higher
temperatures, much more THC will be lost as CBN. And last, propyl varieties
may produce less THCV under a cool regime. Bear in mind that none of these
papers accounted for all of the many variables that could have affected the
findings. For instance, the concentration of THC was 18 times higher at
75-75F than at 90-54F. We've never seen differences of this magnitude, and
sampling error undoubtedly influenced the findings.

In terms of growth rate and potency, daily temperatures of about 75F, give
or take a few degrees, are roughly optimum. Normal household temperatures
are in the low 70's during daytime and the low 60's at night. The heat from
a light system will raise the garden's temperature a few degrees. In most
gardens temperatures will be near 75F during the day. Night-time
temperatures drop about 10 to 15 degrees. When night-time temperatures drop
into the 50's or below, set the light cycle to turn on during the early
morning, when the temperature will be lowest. In a small room, the light
system will generate enough heat to warm the garden without any need for a
heater. Whenever you wish to raise the temperature by, say, five or 10
degrees, it is better to add more lights than a heater. The plants will
benefit from the additional light, as well as from the heat they generate.
And an electric heater, watt for watt, doesn't generate much more heat than
a lamp and its fixture.

Composition of the Air

Air provides two essential ingredients for the living plant: oxygen and
carbon dioxide. The plant uses oxygen for respiration in the same way we do.
The oxygen is used to burn carbohydrates (CH2O) and other food, yielding
energy (ATP; see section 4) for the organism, and releasing carbon dioxide
and water into the environment.

During photosynthesis, CO2 is used to form carbohydrates. As part of
photosynthesis, light energy is used to split water molecules, releasing
oxygen into the environment. In plants, the net result from respiration and
photosynthesis is that much more oxygen is released than consumed, and more
carbon dioxide is consumed than released. The oxygen in the Earth's
atmosphere is formed by photosynthetic organisms.

The similarity between plant and animal respiration ends at a cellular
level. Plants don't have lungs to move the air. The passage of gases,
whether oxygen or carbon dioxide, is primarily a passive process. The gases
diffuse through microscopic pores called stomata, found in Cannabis on the
undersides of the leaves. The plants can open and close their stomata,
allowing moderate control of the flow of air. However, for good exchange of
gases, the plants require adequate ventilation for air circulation.
{Cannabis is a C3 plant}

Cannabis is not particularly susceptible to a stuffy or stagnant atmosphere.
A garden in the corner of a room that is open to the house will be
adequately ventilated. Ventilation is not a problem unless the garden is
large and fills a quarter or more of the space in a room. Gardens in small,
confined spaces such as closets, must be opened daily, preferably for the
duration of the light period. Plants growing in a closed closet may do quite
well for the first month, but they'll need the door opened as the plants begin to fill the space. The larger the plants get, the greater the need for freely circulating air.

When the weather is mild, an open, but screened, window is the best solution for ventilation. In large indoor gardens where there isn't much air circulation, a small fan is helpful. After germination, make spaces in the surrounding reflectors to allow air to circulate freely. Leave the spaces at the bottom, ends, and the tops of the garden. The higher the temperature or the humidity, the more the plants need good ventilation.

CO2

CO2 is a natural, non-poisonous gas present in the atmosphere, which plants absorb and use during photosynthesis to synthesise sugars and organic compounds for energy and growth. Plants can effectively use CO2 up to about .15 percent concentration, about five times the concentration (.03) naturally present in the atmosphere. Increasing the CO2 dramatically increases the growth rate, often up to twice the rate of growth in plants in a natural atmosphere. Supplemental CO2 systems are an inexpensive way serious gardeners dramatically increase a garden's yield. (And decrease fire risk.) {Picture Common emitter systems are safe, inexpensive, easy to setup, and may double the rate of growth in a garden.}

There are two good ways to increase the concentration of CO2. Greenhouse growers use CO2 generators which produce CO2 by burning a clean-burning fuel such as propane or butane. The problems with CO2 generators are that they require a fuel, operate with an open flame, and produce a lot of heat. These are not necessarily problems if the grow room needs to be heated, and if the room is constantly monitored.

For home-growers, the emitter system is more efficient, relatively cheap, safe, and easy to use. Many suppliers who advertise in High Times and Sinsemilla Tips offer complete emitter systems that come with a regulator, solenoid valve, flow-meter, timer, (sometimes distribution tubing), and detailed, yet simple instructions. You must rent compressed CO2 gas tanks from a local compressed gas supplier or beverage company. The setup is not complicated or expensive, and a walk through the Yellow Pages should show several suppliers.

Since the CO2 in the atmosphere is about .03 percent, and the maximum CO2 concentration that your plants use is about .15 to .2 percent, set your emitter system to regulate a concentration of .12 to .17 percent CO2 in the room. Don't worry if you don't understand. All systems are easy to install and come with easily understood instructions.

7.6 Humidity

Marijuana flourishes through a wide range of relative humidity. It can grow in an atmosphere as dry as a desert or as moist as a jungle. Under ordinary household conditions, the humidity will rarely be too extreme for healthy growth. The effects of the humidity on plant growth are closely tied to temperature, wind speed, and the moisture of the soil.
The relative humidity affects the rate of the plant's transpiration. With high humidity, water evaporates from the leaves more slowly; transpiration slows, and growth slows also. With low humidity, water evaporates rapidly; the plant may not be able to absorb water fast enough to maintain an equilibrium and will protect itself from dehydration by closing its stomata. This slows the transpiration rate and growth also slows. There is a noticeable slowing of growth because of humidity only when the humidity stays at an extreme (less then 20 percent or over 90 percent).

Cannabis seems to respond best through a range of 40 to 80 percent relative humidity. You should protect the plants from the direct outflow of a heater or air conditioner, both of which give off very dry air. During the first few weeks of growth, the plants are especially susceptible to a dry atmosphere. If this is a problem, loosely enclose the garden with aluminum foil, white sheet plastic, or other materials. This will trap some of the transpired moisture and raise the humidity in the garden. Once the seedlings are growing well, the drier household atmosphere is preferred.

Where the humidity is consistently over 80 percent, the plants may develop stem rot or grow more slowly. Good air circulation from open windows or a small fan is the best solution.

As long as the air is freely circulating, the plants will grow well at higher humidities. Dehumidifiers are expensive (over $100) and an extravagance.

Humidity and Potency

As far as we know, there has been little work done correlating the relative humidity with potency. In the two related cases we've seen, 85, 117 neither study was intended to examine the effects of relative humidity and potency. However, a lower humidity (50 to 70 percent) produced slightly more potent plants than a higher relative humidity (80 percent and over).

A dry atmosphere seems to produce more potent plants. When the humidity is about 50 percent or less, plant development is more compact, and the leaves have thinner blades. When the atmosphere is humid, growth is taller and the leaves luxuriant with wider blades. The advantage to the plant is that wider blades have more surface and hence can transpire more water. The converse is that thinner blades help conserve water. Higher potency may simply be due to less leaf tissue for a given amount of cannabinoids and resin glands.

The temperature also influences the form and size of the leaves. At higher temperatures, the leaves grow closer together; under a cool regime, the leaves are larger, have wider blades, and are spaced farther apart 77. Possibly, cool temperatures yield slightly lower potency for much the same reason that a moist atmosphere does.

However, differences in potency caused by any of the growth factors (light nutrients, water, temperature, humidity, etc.) are small compared to differences caused by the variety (heredity) and full maturation (expression of heredity). For example, the humidity in Jamaica, Colombia, Thailand, and many other countries associated with fine marijuana is relatively high and averages about 80 percent.
However, try to keep the atmosphere dry. The atmosphere in heated or air-conditioned homes is already dry (usually 15 to 40 percent). For this reason, many growers sow so that the plants mature during the winter if the home is heated or in mid-summer if it is air-conditioned. As we mentioned, there should be no need to use dehumidifiers. Good air circulation and raising the temperature to 75 to 80F are the simplest means of dealing with high humidity.

Chapter Eight
GARDENING TECHNIQUES

8.2 Thinning

 Depending on the viability of the seeds, there should be several plants growing in each pot. Most growers thin to one plant per pot, but the plants don't have to be thinned until they crowd each other and have filled the garden with foliage. The longer you let them grow, the more potent they'll be.

It is virtually impossible to tell the gender of the plants when they are young. The normal ratio of males to females in Cannabis is one to one. Some farmers end up with more male plants because of their thinning practices. When the plants are less than a month old, the male plants often appear taller and better developed than the females. The male seedling uses more of its energy to develop its aboveground parts than the female. The female devotes more energy to establishing a strong root system. During the first few weeks, don't thin the plants by leaving only the tallest, or you'll wind up with a higher ratio of males. Try to leave seedling that are healthy and vigorous and that are roughly at the same point of development.

To thin your garden, remove any plants with yellow, white, or distorted leaves. Remove the less vigorous and those that lag far behind in development. Cut the unwanted plants near the base; the root system can remain in the pot.

These harvested seedlings will be your first taste of homegrown grass. Usually they produce a mild buzz, but if you separate the growing tips from the large leaves, they may be more potent.

8.3 Transplanting

However you transplant, try to disturb and expose the roots as little as possible. If you transplant carefully, the plants will not exhibit delayed or slowed growth due to transplant shock.

Transplanting Seedlings

When the plants are a week to two weeks old, transplant to any pot that has no plants. First, moisten the soil in the pot from which you will remove the transplant and let is sit for a few minutes. Take a spade or a large spoon, and insert it between the transplant and the plant that will be left to
grow. Try to leave at least one inch of space from spoon to stem. Lever the spoon toward the side of the pot, in order to take up a good-size wedge of soil. Place the transplant in a prepared hole at the same depth that it was growing before. Replace the soil in both pots and moisten lightly again to bond the new soil with the original. If you are careful, a wedge of soil can be removed intact. The root system will not be disturbed and the plant will survive with little or no transplant shock. Do not fertilise a transplant for two weeks.

To prevent possible drop-off and wilting from shock, you may want to use Rootone or Transplantone. These safe powders, available at nurseries, contain root-growth hormones and fungicides. They won't be necessary if you transplant carefully.

Transplanting to Large Pots

Transplanting from smaller to larger pots is a simple procedure. The marijuana root system quickly fills small pots. To transplant, moisten the soil and let it sit to become evenly moist. Pick the potted plant up, and, while holding the base of the stem, rap the pot sharply against something solid. You might cover the soil surface with a piece of newspaper or aluminium foil, which makes the job cleaner. When it is done at the right time, the root system, with all the soil adhering, will pop out of the pot intact.

An approximate time guide for transplanting is shown in Table 17 (currently excluded from this guide). At these times, give or take a week, the plants should be root-bound and all the soil will adhere to the roots, making the transplanting clean and easy.

If the root system has not filled the pots by this time, wait a few weeks and the process will be easier. If the root system comes out in a small ball and much of the soil is empty of roots, then soil conditions are poor (usually poor drainage and over-watering) or you are transplanting much too seen.

If the root system doesn't easily pop out, run a knife around the sides of the pot. Sometimes the roots stick to the sides, particularly is paper and clay containers. Check to see if the drainage holes are plugged. Plugged holes stop air from displacing the soil, and the vacuum pressure prevents the soil from sliding out of the pot.

<table>
<thead>
<tr>
<th>Table 17</th>
<th>Guide for Transplanting</th>
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</thead>
<tbody>
<tr>
<td>Transplant</td>
<td>During</td>
</tr>
<tr>
<td>Six-ounce cups</td>
<td>Second to third week</td>
</tr>
<tr>
<td>Four-inch pots</td>
<td>Third to fourth week</td>
</tr>
<tr>
<td>Six-inch pots (half gallon)</td>
<td>Fourth to fifth week</td>
</tr>
<tr>
<td>Eight-inch pots (one gallon)</td>
<td>Seventh to eighth week</td>
</tr>
<tr>
<td>Two-gallon containers</td>
<td>About the tenth week</td>
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</table>

Transplant into a soil mixture that is the same as (or is very like) the one in the original pots. Otherwise, the soils may have different osmotic
properties, and the water may not disperse evenly. (This doesn't apply to small pots that are used for germination and are filled with vermiculure, Jiffy Mix, or other mediums.) Don't bury the stem. Keep the stem base at the same depth that it was growing. (Figure 47. Transplant when the plant is root-bound.)

Transplanting in Plastic Bags

To transplant plants that are in plastic bags, place the old bag into the larger-size bag. Put some soil mixture underneath, to bring the base of the stem to where the new soil surface will be. Cut the old plastic bag away and fill the side spaces with soil mixture. Two people make the job easier.

8.4 Supports for Plants

Under natural conditions, stems undergo stress from wind, rain, and animals. These stresses, which indoor plants do not ordinarily face, strengthen the stem. Indoor stems grow sturdy enough to support their own weight and not much more. Plant energy is used to produce more light-gathering leaf tissue, rather than wind-resistant stem tissue. Stems remain slender, usually about one-half to three-quarter inches at maturity. Since you are growing the plants for their leaves and flowers, this does not present a problem.

Healthy plants do not ordinarily need support. If many of your plants have weak or spindly stems, there is a deficiency in either light or nutrients (notably potassium). Simply not having enough light will cause the plants to elongate, with sparse foliage and weak growth. Too much red light will cause elongation, too, so make sure you include a strong blue light, if you are using incandescents or floodlights.

Hanging the lights higher than the recommended distances will cause the plants to elongate by rapidly growing up to the lights. Unlike sunlight, the intensity of artificial light diminishes dramatically with the distance from the lights. The plants respond by growing toward the light, seeking the higher intensity.

Under artificial light, some plants may need support during the seedling stage or because of accident. Depending on plant size, use straws, pencils, dowels, or standard plant stakes such as cane sticks. Set them in the soil and affix the stem with string, masking tape, or wire twists such as those that come with plastic trash bags. Do not tie string or wire tightly around the stem; make a loose loop. The stem will grow in girth and can be injured by a tight loop.

Probably the simplest method of support is to take a rigid piece of wire, form a "C" at one end and bend it to a right angle to the stem. Set the straight end in the soil and place the stem inside the "C." Pipe cleaners are ideal for seedlings. With larger plants, straighten a coat hanger and use the same method.

A common practice in greenhouses where tree seedlings are raised is to shake each plant once or twice daily. This practice simulates natural vibrations from the wind, and the plant reacts by increasing the growth around the stem. The stem grows thicker and stronger, and the tree can better fend once
it is transplanted. It works the same way with marijuana. A fan blowing on
the plants will also work. These practices are useful if you plan to move
your plants outdoors. Otherwise, healthy indoor plants that will remain
indoors need no special stem strengthening.

8.5 Uniform Growth

The light intensity from artificial lights drops dramatically as the
distance from the light source increases. When the plants are not of equal
height, the shorter ones receive less light and consequently grow slower
than the taller ones. This compounds the situation and, left to themselves,
the shorter plants will stop growing and eventually die from lack of light.

It is important to keep all of the plants close to the lights. (Figure 48.
Hang the fixture at an angle corresponding to that of the tops of the
plants.) This encourages stocky, full growth and can make the difference
between harvesting stems and harvesting smoking material.

One way to deal with uneven height is to line the plants up to the line of
the plant tops. As the plants grow, move them to different spots in the
garden to accommodate their different sizes. Or raise the shorter plants up
to the lights by placing them on milk crates, tin cans, bricks, etc.

The quality and quantity of light emitted by a fluorescent is strongest in
the middle and weaker toward the ends of the tube. Female plants require
more light than males. Once the genders of the plants become clear, move the
males to the ends of the system, thus leaving the stronger middle light for
the females.

8.6 Pruning

Probably the easiest way to deal with uneven growth is to cut back the
taller plants to the average height. You may find this emotionally
difficult, but pruning will not harm the plant. Cutting off the growing
shoot forces the plant to develop its branches. Some growers cut back all of
their plants when they are three to four weeks old. Any horizontal space is
quickly filled with growing branches and the plants grow full and robust.

The growing shoots are the most potent plant parts until the flowers appear.
Generally, the potency increases with growth. By three months' age, most
shoots will be high-quality smoke. You can cut shoots at any time; just
don't overdo it. Give the plant a chance to grow and fill out to a good
size. Severe pruning will slow growth. New growth may be distorted and
abnormal, with a drop in potency.

Each time you cut a growing shoot, whether it is the stem tip or a branch
tip, two shoots being to grow from the nearest leaf axils. However, don't
think that cutting all the growing shoots of a plant twenty times over the
course of a season will yield a plant bearing over a million new shoots, or
even that the plants will double their size if pruned. Pruning simply allows
the plant to develop its branches earlier. The branches present more area to
gather light and, hence, can grow to fill a larger space. However, the
plant's size is basically determined by the seed's potential within the
limitations of the environment.
Cutting the growing shoots or removing some leaves does not harm the plants. Plants are well adapted to the loss of parts to predators, wind, etc., in the natural world. When leaves are damaged or lost, the plant plugs the wound. The leaf isn't replaced or repaired, but new leaves are continually being formed from the growing shoots. The stem, since it connects all parts of the plant, is more important to the plant as a whole. When the stem breaks or creases, it is capable of repair. You can help the plant repair its stem by splinting the wound or somehow propping the stem up straight. Stems take about four or five days to heal.

When you cut the stem or leaves, you may see the plant's sap momentarily spurt before the wound is plugged. The sap contains primarily the products of photosynthesis, in the form of sucrose (table sugar). Smaller amounts of materials associated with the living organism such as minerals, amino acids, and enzymes are also present. In marijuana, the sap is usually colourless, although a bright red colour - it looks like blood - is not uncommon in later life. The red colour is due to haematin compounds and anthocyanin pigments that naturally build up in some varieties. The red colour may also indicate a nutrient deficiency, notably of nitrogen, phosphorus, potassium, or magnesium.

8.7 Training

Plants grow from the tips of their stems and branches. The growing tip (apical meristem) of the plant contains a hormone that acts as a growth inhibitor. This prevents the branches (lateral buds) from growing. The further a branch is from the growing tip, the less effect of the inhibitor. This is why some species of plants form a cone or Christmas-tree shape with the longest branches toward the bottom of the stem. This is also why the branches grow from the top of the plant when the tip is removed. Once the growing tip is removed, the next highest growing shoot(s) becomes the source of the inhibitor. Under artificial light, the bottom branches may not receive enough light to grow even though they are far away from the inhibitor. Usually the longest branches are toward the middle of the plant.

Some growers hate to cut the growing shoots on the main stem, since it forms the largest and most potent buds by harvest. But you can neutralise the effects of the inhibitor, without cutting the growing shoot, by bending the tip. This allows you to control the height of the plants, and forces them to branch. The top two to six inches of the stem are flexible. Bend it in an arc and secure it to the stem with a wire twist or string. Remove the wire twist in a few days so that the growing tip does not break itself as it twists up to the light. Don't bend the stem too far down. Keep it in the strong light or else it will stop growing. If you accidentally break the tip, you can splint it with matchsticks or ice-cream sticks secured with wire twists or tape until it heals. {Figure 49. The flexible tip is held in place with a wire twist.}

To develop large, full plants with well-developed branches, secure the growing tip once or twice for a few days while the plants are young (one to three months).

It is possible to train the tip so that the stem will form a series of “S”
shapes or even circles. During flowering, train the tips so that they grow horizontally. This method encourages thick, dense growth. The branch tips can also be trained. Keep bending any tips that grow above the others. This creates a garden filled with a cubic layer of vigorous flower clusters rather than a lot of stems.

We want to emphasise that when you get the knack of training the tips, you can more than double the yield of the most potent plant parts. {Figure 50. Stem trained in an "S" shape.} {Figure 51. Tops trained horizontally during flowering.}

Chapter Nine
NUTRIENTS AND FERTILISING

9.2 Nutrients

There are about 15 elements known to be essential to plant life. Carbon, hydrogen, and oxygen are absorbed from air and water. The remaining 12 elements are absorbed primarily from the soil, in mineral (inorganic) forms such as NO3- and K+. They constitute a natural part of soil that becomes available to the plant as organic matter decays and soil particles such as sand and clay dissolve.

Soil elements that are necessary for normal growth are called nutrients. The elements nitrogen (N), phosphorous (P), and potassium (K) are considered major nutrients. The three numbers that appear on all fertiliser packages give the available percentage of these three nutrients that the fertiliser contains; and always in the order N-P-K. For example, 10-2-0 means 10 percent N, 2 percent P (actually, 2 percent P2O5), and no K (actually, no K2O). Fertility is often measured by the amounts of major nutrients a soil contains. Relatively large amount of N-P=K are needed for lush growth.

Three other elements - calcium (Ca), sulphur (S), and magnesium (Mg) - are called secondary nutrients. Plants require less of these nutrients, and most cultivable soils contain adequate amounts for good growth.

Six remaining elements are called trace elements or micronutrients. As their name implies, they are needed in very small amounts. Commercial soils contain enough trace elements to sustain normal growth. The trace elements are also present in manures, humus, ash, and limestone.

Nitrogen

The amount of nitrogen a soil can supply is the best indication of its fertility. Nitrogen, more than any other soil nutrient, is inextricably linked with the living ecosystem. Nitrogen is continually cycled through living systems: from soil to plants and back to the soil, primarily by the activity of soil microorganisms. Nitrogen is essential to all life. Nitrogen is a key element in the structure of amino acids, the molecules which make up proteins. These, and all other biomolecules, are synthesised by the plant. Chlorophyll, genetic material (for example, DNA), and numerous enzymes and plant hormones contain nitrogen. Hence, N is necessary for many
of the plant's life processes.

Cannabis is a nitrophile, a lover of nitrogen. Given ample N, Cannabis will outgrow practically and plant. Ample nitrogen is associated with fast, lush growth, and the plant requires a steady supply of nitrogen throughout its life. Marijuana's requirements for N are highest during the vegetative growth stages.

Phosphorous

P is a constituent of energy-transfer compounds such as NADP and ATP, and molecular complexes such as the genes. The energy compounds are necessary for photosynthesis, respiration, and synthesis of biomolecules. Cannabis takes up large amounts of P during germination and seedling stages. During flowering and seed set, Cannabis' need for phosphorous is also high.

Potassium

K influences many plant processes, including photosynthesis and respiration, protein synthesis, and the uptake of nutrients. Just as with P, K uptake is highest during the earliest growth stages. K is associated with sturdy stems and resistance to disease in plants.

Calcium

Ca functions as a coenzyme in the synthesis of fatty compounds and cell membranes, and is necessary for normal mitosis (replication of cells). Plants take up much more Ca than the small amount necessary for normal growth. Ca is not added to soil as a nutrient; is added to adjust the soil's chemistry or pH.

Sulfur

S is a constituent of certain amino acids and proteins. It is an important part of plant vitamins, such as biotin and thiamine, which are necessary for normal respiration and metabolism. (Plants synthesise all vitamins they need.) Most soils suitable for growing marijuana contain plenty of S.

Magnesium

Mg is involved in protein synthesis and metabolism of carbohydrates. Mg is the central element in the structure of chlorophyll molecules and hence has an important role in photosynthesis. Most mineral soils and commercial soils have a good supply of Mg.

Trace Elements

The trace elements (Fe, Mn, Mb, B, Cu, Zn) are particularly important in the coenzymes and catalysts of the plant's biochemistry. Many life processes, particularly the synthesis and degradation of molecules, energy transfer, and transport of compounds within the plant, depend on trace elements. Trace elements are not used in large quantities to spur growth, but are necessary in minute amounts for normal growth. Indoor soils rarely require an addition of trace elements.
All the nutrients are needed for normal growth. However, most of them are supplied by the potting soil. Ca, S, and the trace elements rarely present any problems. For most growers, fertilising will simply require periodic watering with a complete fertiliser, one that contains N, P, and K.

9.3 Application: Fertilising

To grow to a large size, marijuana requires a steady supply of nutrients. These can be added to the soil before planting or anytime during growth. Bulk fertilisers are added while the soil is mixed, as described in section 6. These include manures, composts, humus, and concentrated fertilisers, such as rose food. Once the plants are growing, never condition or mulch indoor soils with bulk fertilisers. they promote moulds and fungi and attract other pests to the garden. Concentrated fertilisers can damage the plants if they come in direct contact with the stem or roots.

While the plants are growing, nutrients are given in solution; they are dissolved in water, and the plants are watered as usual. Soluble fertilisers can be either organic or inorganic (chemical), and come in a wide range of concentrations and proportions of nutrients. Two organic fertilisers are liquid manure (about 1.5-1.0-1.5) and fish emulsion ((Some fish emulsion may contain whale by-products.)) (about 5-1-1). Chemical fertilisers commonly may have 20-20-20 or 5-10-5, or may contain only one nutrient, such as 16-0-0.

A 10-5-5 fertiliser is 20 percent soluble nutrients and 80 percent inert ingredients. a 30-10-10 has 50 percent available nutrients and 50 percent inert ingredients. There is approximately the same amount of N in one tsp. of 30-10-10 as in three tsps. of 10-5-5.

Actually, you can almost use any fertiliser, but the nitrogen content should be proportionately high, and there should be some P and L also present. For example, a 20-20-20 would work fine, as would a 12-6-6 or a 3-4-3, but not a 2-10-10 or a 5-10-0.

How much fertiliser to use and how often to fertilise depend primarily on the fertility of the soil and the size of the container relative to the size of the plant. Small plants in large pots usually do not need to be fertilised. Even in small pots, most plants do not need to be fertilised for at least the first month.

As the plants grow, they take nutrients from the soil, and these must be replaced to maintain vigorous growth. During the vegetative stage, even plants in large pots generally require some fertilising, particularly with N.

The rate of growth of indoor plants is usually limited by the amount of light and space, once adequate nutrients are supplied. At this point, an increase in nutrients will not increase growth. Your goal is to supply the plants with their nutritional needs without overfertilising and thus toxifying the soil.

Most fertilisers are designed for home use and have instructions for
fertilising houseplants. Marijuana is not a houseplant, and it requires more nutrients than houseplants. The extra nutrients that it needs may be supplied by the use of large pots and a fertile soil mixture. In many cases, you will need to fertilise only in the dosages recommended on fertiliser packages for houseplants. For instance, Rapid-Gro (23-19-17) is popular among marijuana growers; use one tablespoon per gallon of water every two weeks.

A typical program for fertilising might be to fertilise during the fifth week of growth and every two weeks thereafter until flowering. Then discontinue fertilising (or give at one-half concentration) unless the plants show a definite need for nutrients. It is better to fertilise with a more diluted solution more often than to give concentrated doses at longer intervals. (For instance, if instructions call for one tablespoon of fertiliser per gallon once a month, use one-quarter tablespoon per gallon once a week.)

Make sure that a fertiliser is completely dissolved in the water before you apply it. Put the recommended amount of fertiliser in a clear glass bottle and mix with about one cup of water. Shake vigorously and then allow it to settle. If any particles of fertiliser are not dissolved, shake again before adding the rest of the water. If you have difficulty getting all the fertiliser to dissolve, first add hot tap water. If the fertiliser still does not completely dissolve, you should use another fertiliser.

Never fertilise a dry soil or dry Soilless medium. If the medium is dry, first water with about one-half quart of plain water per pot. Let the pots sit for about 15 minutes so that the water is evenly dispersed in the pot. Then fertilise as usual.

It is difficult to give instruction for fertilising that will cover all garden situations. You want to supply the plant with its nutritive needs, but overfertilising can toxify the soil. Fertilising according to instructions for houseplants (both in frequency and concentration) should not toxify the soil. However, the plants may sometimes require more frequent or more concentrated fertilising. A good way to judge the plant's needs is not to fertilise one plant, double the fertiliser of another plant, and give the rest of the plants their normal dose. If the unfertilised plant grows more slowly, or shows symptoms of deficiencies, then probably all the plant are depending on soluble fertilisers and must be fertilised regularly. If the plants receiving the double dose grows faster than the other plants, increase the other plants' supply also. On the other hand, if there is little difference among the plants, then the soil is providing the plants with enough nutrients, and they either should not be fertilised or should be fertilised with a less-concentrated solution.

Because they are grown in a relatively small area, it is easy to overfertilise indoor plants. When plants are vigorous, look healthy, and are growing steadily, don't be anxious to fertilise, particularly if you have already fertilised several times with soluble fertilisers. Slow growth or symptoms of deficiencies clearly indicate the need for fertilising.

Overfertilising
In an effort to do the best for their plants, some people actually do the worst. Overfertilising puts excessive amounts of nutrients in the soil, causing toxic soil conditions. Excessive amounts of one nutrient can interfere with the uptake of another nutrient, or change normal plant-soil relations. Since it takes time for a build-up to occur high concentrations of nutrients generally encourage excellent growth until the toxic level is reached.

It takes less N than other nutrients to toxify the soil; hence there is less margin for error when using N. Too much N changes the osmotic balance between plant and soil. Instead of water being drawn into the plant, water is drawn away and the plant dehydrates. The leaves feel limp even though the plant is well watered. The plant will soon die. This tips of the leaves die first and very rapidly the leaves change colour, usually to gold, but sometimes to a brown or green-grey. This change in the plants is faster, more dramatic, and more serious than for any kind of nutrient deficiency.

You can save the plants by immediately leaching the pots as soon as the condition is recognised. Place the pots outdoors or in a sink or bathtub. Discard the top inch or two of loose dirt. Run lukewarm water through the soil until a gallon of water for each two gallons of soil has passed through each pot. The leaves recover turgor in one or two days if the treatment works.

Foliar Feeding

Foliar feeding (Nitrogen fertilisers are usually NO3 (nitrate) or NO2 (nitrite), substances which are also used to preserve food. They have been shown to undergo reactions to form carcinogenic substances (nitrosamines). As with eating food treated with nitrates and nitrites (hot dogs, sandwich meats, etc.), there is a possibility that such substances might be ingested by eating or smoking foliar-fed plants.) (spraying the leaves with fertiliser) is a good way to give the plants nutrients without building up the amount of soluble substances in the soil. After the first month, foliar feed the plants with, for example, fish emulsion or a chemical fertiliser. Use any fertiliser that states it can be used for foliar feeding even if it says "not recommended for foliar feeding houseplants." Use a fine-mist sprayer, such as a clean Windex or Fantastik bottle. Dilute the fertiliser according to directions (fish emulsion at one tablespoon per gallon) and spray both sides of the leaves. When foliar feeding, you should spray the plants with plain water the next day, to dissolve unabsorbed nutrients and clean the plants.

Foliar spraying is also a good way to treat plants suffering from nutrient deficiencies. Some nutrient deficiencies actually are caused by the soil's chemistry, rather than by the absence of the nutrient in the soil. Addition of the necessary nutrient to the soil may not cure the plants’ problem, because the nutrient becomes locked in the soil, or its uptake may be limited by high concentrations of other elements present in the soil. Foliar feeding is direct, and if the plant's deficiency symptoms do not begin to clear up, then the diagnosis is probably incorrect.

9.4 Nutrient Deficiencies
Before Diagnosing

Before you assume the plant has a nutrient deficiency, make sure the problem is not due to other causes. Examine the plant leaves, and along the stem and in the soil.

Even under the best conditions, not all leaves form perfectly or remain perfectly green. Small leaves that grew on the young seedling normally die within a month or two. Under artificial lights, bottom leaves may be shielded from the light, or be too far away from the light to carry on chlorosynthesis. These leaves will gradually turn pale or yellow, and may form brown areas as they die. However, healthy large leaves should remain green at least three to four feet below the plant tops, even on those plants under small light systems. Under low light, the lower-growing shoots as well as the large leaves on the main stem are affected. Some symptoms of nutrient deficiencies begin first at the bottom of the plant, but these symptoms generally affect the lower leaves on the main stem first, and the progress to the leaves on the branches.

Although some deficiency symptoms start on the lower, older leaves, others start at the growing shoots or at the top of the plants. This difference depends on whether or not the nutrient is mobile and can move from the older leaves to the active growing shoot. Deficiency symptoms of mobile nutrients start at the bottom of the plant. Conversely, deficiency symptoms of immobile nutrients first appear on the younger leaves or growing shoots at the top of the plant. N, P, K, Mg, B, and Mb are mobile in the plant. Mn and Zn are less mobile, and Ca, S, Fe, and Cu are generally immobile.

A dry atmosphere or wet soil may cause the blade tips to turn brown. Brown leaf tips also may indicate a nutrient deficiency, but in this case, more tissue will turn brown than just the end tips.

Chlorosis and necrosis are two terms which describe symptoms of disease in plants. Chlorosis means lacking green (chlorophyll). Chlorotic leaves are pale green to yellow or white. Chlorotic leaves often show some recovery after the necessary nutrient is supplied. Necrosis means that the tissue is dead. Dead tissue can be gold, rust, brown, or grey. It is dry and crumbles when squeezed. Necrotic tissue cannot recover.

Symptoms of deficiencies of either N, P, or K have the following in common: all involve some yellowing and necrosis of the lower leaves, and all are accompanied by red/purple colour in stems and petioles. The simplest way to remedy these deficiencies is to fertilise with a complete fertiliser containing nearly equal proportions of three nutrients.

Nitrogen

N is the most common deficiency of Cannabis indoors or out. Nitrogen deficiencies may be quite subtle, particularly outdoors, where the soil may continuously provide a small amount of nitrogen. In this case the opt of the plant will appear healthy, and the plant will grow steadily, but at a slow pace. The deficiency becomes more apparent with growth, as more and more of the lower leaves yellow and fall. The first sign is a gradual, uniform yellowing of the large, lower leaves. Once the leaf yellow, necrotic tips
and areas form as the leaves dry to a gold or rust colour. In small pots, the whole plant may appear pale (or lime colour) before many bottom leaves are affected to the point that they yellow or die. Symptoms that accompany N deficiency include red stems and petioles, smaller leaves, slow growth, and a smaller, sparse profile. Usually there is a rapid yellowing and loss of the lower leaves that progresses quickly to the top of the plant unless nitrogen is soon added.

Remedy by fertilising with any soluble N fertiliser or with a complete fertiliser that is high in N. If your diagnosis is correct, some recovery should be visible in three or four days. Pale leaves will regain some colour but not increase in size. New growth will be much more vigorous and new stems and petioles will have normal green colour.

Indoors, you should expect plants to need N fertilisation a few times during growth. Once a plant shows N deficiency, you should fertilise regularly to maintain healthy and vigorous growth. Fertilise at about one-half the concentration recommended for Soilless mixtures. Increase the treatment only if the plants show symptoms again. Once the plants are flowering, you may choose not to fertilise if the plants are vigorous. They will have enough N to complete flowering and you don't want to chance toxifying the soil at this late date.

Phosphorous

P deficiency is not common indoors, but may appear outdoors, particularly in dry, alkaline soils or in depleted soils, or during cool weather. Phosphorus deficiency is characterised by slow and sometimes stunted growth. Leaves overall are smaller and dark green; red colour appears in petioles and stems. The leaves may also develop red or purple colour starting on the veins of the underside of the leaf. Generally the tips of most of the leaf blades on the lower portion of the plant die before the leaves lose colour. Lower leaves slowly turn yellow before they die. Remedy with any soluble P-containing fertiliser. Affected leaves do not show much recovery, but the plant should perk up, and the symptoms do not progress.

Potassium

K deficiencies sometimes show on indoor plants even when there is apparently enough supplied for normal growth. Often, potassium-deficient plants are the tallest ((Potassium is associated with apical dominance in some plant species.)) and appear to be the most vigorous. Starting on the large lower leaves, the tips of the blades brown and die. Necrotic areas or spots form on the blades, particularly along the margins. Sometimes the leaves are spattered with chlorotic tissue before necrosis develops, and the leaves look pale or yellow. Symptoms may appear on indoor plants grown in a soil rich in organic material. This may be due to high salinity (Na) of some manures or composts used in the soil. Red stems and petioles accompany potassium deficiencies. K deficiencies that could seriously affect your crop rarely occur with indoor soils. However, mild symptoms are quite common. Usually the plants grow very well except for some necrotic spotting or areas on the older leaves. (This condition is primarily and aesthetic problem, and you may choose not to fertilise. See 19.3.)
K deficiencies can be treated with any fertiliser that contains potassium. Wood ashes dissolved in water are a handy source of potassium. Recovery is slow. New growth will not have the red colour, and leaves will stop spotting after a couple of weeks. In a K-deficient soil, much of the added potassium is absorbed by the soil until a chemical balance is reached. Then additional potassium becomes readily available to the plant.

Calcium

Ca deficiencies are rare and do not occur if you have added any lime compound or wood ash. But calcium is added primarily to regulate soil chemistry and pH. Make sure that you add lime to soil mixtures when adding manures, cottonseed meal, or other acidic bulk fertilisers. An excess of acidic soil additives may create magnesium or iron deficiencies, or very slow, stunted growth. Remedy by adding one teaspoon of dolomitic lime per quart of water until the plants show marked improvement. Periodically fertilise with a complete fertiliser. Foliar feeding is most beneficial until the soil's chemistry reaches a new balance.

Sulfur

S is plentiful in both organic and mineral soils. Liming and good aeration increases S availability. Hence S deficiencies should not occur in soils that are suitable for growing marijuana. However, sulfur deficiencies sometimes can be confused with N deficiencies and may also occur because of an excess of other nutrients in the soil solution. Sulfur-deficiency symptoms usually start at the top of the plant. There is a general yellowing of the new leaves. In pots, the whole plant may lose some green colour. Both sulfur and Mg deficiencies can be treated with the same compound, epsom salts (MgSO4). Epsom salts, or bathing salts are inexpensive and available at drug stores.

Magnesium

Mg deficiencies are fairly common. They frequently occur in Soilless mixtures, since many otherwise all-purpose fertilisers do not contain Mg. Magnesium deficiencies also occur in mixtures that contain very large amounts of Ca or Cl. Symptoms of Mg deficiency occur first on the lower leaves. There is chlorosis of tissue between the veins, which remain green, and starting from the tips the blades die and usually curl upward. Purple colour builds up on stems and petioles.

A plant in a pot may lose much of its colour in a matter of weeks. You may first notice Mg symptoms at the top of the plant. The leaves in the growing shoot are lime-coloured. In extreme cases, all the leaves turn practically white, with green veins. Iron deficiency looks much the same, but a sure indication of Mg deficiency is that a good portion of the leaf blades die and curl. Treat Mg symptoms with one-half teaspoon of epsom salts to each quart of water, and water as usual. The top leaves recover their green colour within four days, and all but the most damaged should recover gradually. Continue to fertilise with epsom salts as needed until the plants are flowering well. If you are using soilless mixtures, include epsom salts regularly with the complete mixture. Because Mg deficiencies may indicate interference from other nutrients, foliar-spray with Mg to check your
diagnosis if the plants are not obviously recovering.

Iron

Fe deficiency rarely occurs with indoor mixtures. Iron is naturally plentiful in most soils, and is most likely to be deficient when the soil is very acid or alkaline. Under these conditions, which sometimes occur in moist eastern soil outdoors, the iron becomes insoluble. Remedies include adjusting the pH before planting; addition of rusty water; or driving a nail into the stem. Commercial Fe preparations are also available. If the soil is acidic, use chelated iron, which is available to the plants under acidic conditions.

Symptoms of iron deficiency are usually distinct. Symptoms appear first on the new growing shoots. The leaves are chlorotic between the veins, which remain dark green and stand out as a green network. To distinguish between Mg and Fe deficiencies, check the lower leaves for symptoms. Iron symptoms are usually most prominent on the growing shoots. Mg deficiencies will also show in the lower leaves. If many of the lower leaves have been spotting or dying, the deficiency is probably Mg. Mg deficiencies are much more common than iron deficiencies in marijuana.

Other Trace Elements

The following deficiencies are quite rare. Trace elements are needed in extremely small amounts, and often enough of them are present as impurities in fertilisers and water to allow normal growth. Many houseplant fertilisers contain trace elements. Trace-element deficiencies are more often caused by an extreme pH than by inadequate quantities in the soil. If a deficiency is suspected, foliar-spray with the trace element to remedy deficiencies. Our experience has been that trace-element deficiencies rarely occur indoors. We advise you not to add trace elements to indoor soils, which usually contain large amounts of trace elements already because of the addition of organic matter and liming compounds. It is easy to create toxic conditions by adding trace elements. Manufacturers also recommend using amounts of trace elements that may be too high for indoor gardens; so use them at about one-fourth of the manufacturer's recommended dose if an addition is found to be necessary.

Manganese

Mn deficiency appears as chlorotic and the necrotic spots of leaf tissue between the veins. They generally appear on the younger leaves, although spots may appear over the whole plant. Manganese deficiencies are not common. Manganese is present in many all-purpose fertilisers. Mn deficiencies may occur if large amounts of Mg are present.

Boron

B deficiency may occasionally occur in outdoor soils. The symptoms appear first at the growing shoots, which die and turn brown or grey. The shoots may appear "burned," and if the condition occurs indoors, you might think the lights have burned the plant. A sure sign of boron deficiency is that, once the growing tip dies, the lateral buds will start to grow but will also die. B deficiency can be corrected by application of boric acid, which is
sold as an eyewash in any drugstore. Use one-fourth teaspoon per quart of water. Recovery occurs in a few days with healthy growth of new shoots.

Molybdenum

Mb deficiency occurs in outdoor soils, but rarely indoors. Mb is readily available at neutral or alkaline pH. Mb is essential for nitrogen metabolism in the plant, and symptoms can be masked for a while when N fertilisers are being used. Usually there is a yellowing of the leaves at the middle of the plant. Fertilising with nitrogen may remedy some of the yellowing. However, Mb symptoms generally progress to the growing shoots and new leaves often are distorted or twisted. Mb is included in many all-purpose fertilisers.

Zinc

Zn-deficiency symptoms include chlorosis of leaf tissue between the veins. Chlorosis or white areas start at the leaf margins and tips. More definite symptoms are very small, new leaves which may also be twisted or curled radially. Zn deficiencies may occur in alkaline western soils. Galvanised nails can be buried or pushed into the stem. Commercial preparations of zinc are also available.

Copper

Cu deficiencies are rare; be careful not to confuse their symptoms with the symptoms of overfertilisation. The symptoms appear first on the younger leaves, which become necrotic at the tips and margins. Leaves will appear somewhat limp, and in extreme cases the whole plant will wilt. Treat by foliar-spraying with a commercial fungicide such as CuSO4.

9.5 Soilless Mixtures

Soilless mixtures are an alternative to using large quantities of soil. Their main advantage is complete control over the nutrients that your plants receive. Soilless mixtures are also inexpensive and easy to prepare. They have a near-neutral pH and require no pH adjustment.

Soilless mixtures are made from soil components such as vermiculite, sand, or perlite. Soilless mixtures should be blended in such a way that they hold adequate water, but also drain well and do not become soggy. A good general formula is two parts vermiculite to one part perlite. About 10 percent coarse sand or gravel can be added to give weight and stability to the pots. Instead of vermiculite, you can use Jiffy-Mix, Metro-Mix, Ortho-Mix, Pro-Mix and other commercial soilless mixtures, which are fortified with a small amount of necessary nutrients, including trace elements. You can also substitute coarse sand for perlite.

Potting

It is best to use solid containers with soilless mixtures rather than plastic bags. Grow the plants in one- to three-gallon containers. There won’t be much difference in the size of the plants in one-gallon or in three-gallon sizes, but you will have to water a large plant every day in a one-gallon container. (The plants can always be transplanted to a larger
Germinating

Plants may have problems germinating in soilless mixtures. The top layer of mixture often dries rapidly, and sprouts may die or not germinate. Young seedlings also seem to have difficulty absorbing certain nutrients (notably potassium), even though adequate amounts of nutrients are being added. Since this difficulty may retard growth, it is best to start the plants in small pots with soil. Use eight-ounce paper cups, tin cans, or quart milk containers cut in half. Mix three parts topsoil or potting soil to one part soilless mixture. Fill the starting pots and germinate as usual. When the plants are two to three weeks old, transplant to the soilless mixture. First moisten the soil, and then remove the soil as intact as possible. You might handle the transplant like making castles, by carefully sliding the moist soil out of the pot. Or you can cut away the sides of the container while you place the transplant in the soilless mixture. When watering, make sure you water around the stem to encourage roots to grow into the soilless mixture.

Peat pellets that expand are also good for starting seedling. Plant several seeds in each pellet, and place it in the soilless mixture after the sprouts appear.

Fertilising

Soilless mixtures can be treated with a trace-element solution. We have grown crops with no special addition of trace elements, and the plants completed their lives without showing symptoms of trace-element deficiency. In these cases there were apparently enough trace elements in the lime and the fertilisers that were used to provide the major nutrients. Many all-purpose fertilisers also contain trace elements. However, it is a good idea to treat soilless mixtures with a mild solution of trace elements before planting. Large plants can be treated a second time during the third or fourth month of growth. Do not use trace elements more often unless plants show definite trace-element deficiencies.

Iron is the only trace element that is needed in more than minute quantities. Iron can be supplied by mixing a few brads or nails into the soilless mixture.

Use any soluble fertiliser that is complete, that is, that contains some of each of the major nutrients. Choose one with a formula that is highest in N but contains a good portion of both P and K. For example, Rapid-Gro is 23-19-17 and works well for soilless mixtures.

Table 18 gives a formula that has worked well for us. The figures in it are a guide for estimating the amounts of fertiliser to use. When choosing a fertiliser by means of this chart, use N for a guide. For example, suppose the only fertiliser you can find that has good proportions of the major nutrients as a 20-15-15. Divide 5 (the figure for N in the table) by 20 (the figure for N in the fertiliser), and get the result 1/4. That is, the
fertiliser if four times as concentrated in N as you need; so you would use one-fourth the amount of fertiliser shown in Table 18. For instance, during the vegetative stage, you would give the plants one-half to three-fourths of a level teaspoon of fertiliser per gallon of water each time you water.

Table 18 - Guidelines for Fertilizing Soilless Mixtures

<table>
<thead>
<tr>
<th>Growth Stage</th>
<th>N</th>
<th>P2O5</th>
<th>K2O</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seedling</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>1.5 to 2 tsp/gal</td>
</tr>
<tr>
<td>Vegetative</td>
<td>5</td>
<td>2</td>
<td>3</td>
<td>2 to 3 tsp/gal</td>
</tr>
<tr>
<td>Flowering</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>0.5 to 1.5 tsp/gal</td>
</tr>
</tbody>
</table>

It is also not necessary to fertilise in these ratios. You could use a 10-10-10 fertiliser throughout growth; you would use half the amounts listed in Table 18. The most important point is that the plant receive enough of each element, not that they receive specific proportions.

Fertilising according to volume of fertiliser is not very accurate, and also does not take into account other variables (such as variety, light, temperature, etc.) that determine the amounts of nutrients your plants can use. However, it is a simple and useful way of estimating the plant's needs. You can more accurately gauge the plants' needs by giving a sample plant twice the concentration of fertiliser, and another half the concentration. Their performance will give you an idea of whether you are using too much or too little fertiliser. Too much fertiliser is the most damaging condition; so when in doubt give the plants less rather then more. Do not continue to give the plants the recommended amounts of fertiliser if the sample plant that is receiving less nutrients is growing as well as the other plants.

Another way of monitoring the plant's growth is to grow a few plants in a standard soil mixture. This will show you whether the plants in the soilless mixture are growing as fast as they should, and will give you a reference for diagnosing deficiencies.

Besides providing N, P, K, and the trace elements, you must also give your plants secondary nutrients. Ca is added by mixing a tablespoon of lime or two tablespoons of wood ash when preparing the soilless mixture. (Calcium is usually present in water and in many fertilisers as part of the salts that contain nutrients, for example, Ca(NO3)2.) Magnesium and sulfur are both found in common epsom salts, MgSO4. Use one-eighth teaspoon of epsom salts to each teaspoon of 5 percent N. For example, if you are using a 20 percent N fertiliser, you would use half a teaspoon of MgSO4 to each teaspoon of fertiliser. (Actually, enough sulfur is often present, either as part of the soilless mixture or as part of nutrient salts to allow growth.) Magnesium can also be supplied by using dolomitic limestone.

Soilless mixtures are something between soil mixtures and water cultures (hydroponics). With hydroponics, the plants are grown in a tank of water. The fertilisers are added in solution, and the water solution is periodically circulated by a pump.

Another variation on soilless mixtures is to add a small amount of soil or humus to the soilless mixture. Some examples are:
1. 4 parts soilless mixture to 1 part soil;
2. 8 parts soilless mixture to 1 part humus;
3. 15 parts soilless mixture to 1 part limed manure.

Overfertilising is less a problem with soilless mixtures than with soil, because of higher concentrations of salts are tolerable in soilless mixtures and because excess salts are easily flushed out of the mixture. A good idea is to flush each pot once after two months of growth, again after four months. Any time the plants show symptoms of overfertilisation, leach the pots immediately. Flood each pot with plain water so that it runs out the drainage holes. Continue flooding the pots until a couple of gallons of water have run through the pot. Don't fertilise for at least a week. Then fertilise with a more dilute solution that was used before. (Figure 51a. Over fertilisation. Leaves turn bright gold and die, starting at the top of the plant.)

Chapter Ten
DISEASES AND PLANT PESTS

Plants are considered diseased when their health or development is impaired enough that the adverse effects become visible to the eye. Disease may be caused by infectious microbes, such as bacteria or viruses, by pests such as insects, or by nutritional deficiencies or imbalances. However, for diseases that might affect your plants, there should be no need for a plant doctor. You'll be able to diagnose the symptoms after careful observation.

Leaves naturally drop from plants during the course of their lives. Not every leaf will develop perfectly or so. The small leaves that are formed during the first few weeks of growth normally die within three months. Leaves at the bottom of healthy plants often die because they are shielded by the upper instance, in a garden receiving only 80 watts of fluorescent light, the plants may stay green only up to three or four feet away from the lights. Lower leaves may turn pale and yellow and then dry to gold or rust colours.

10.2 Microbial Diseases

Because Cannabis is not native to the Americas, most of the microbial diseases that attack the plant are not found in this country. Homegrown Cannabis is remarkably free of diseases caused by microbes, and there is little chance of your plants suffering from these diseases. Fungal stem and root rots seem to be the only ones of consequence. These occur only because of improper care. Watering too often, coupled with a stagnant, humid atmosphere, encourages stem rot to develop. Stem rot appears as a brown or black discoulouration at the base of the stem and is soft or mushy to the touch. Allow the soil to dry between waterings, and be sure to water around the stem, not on it. Wipe as much of the fungus and soft tissue away as possibly. If the rot doesn't disappear in a few weeks, treat it with a fungicide.

10.3 Nutrient Diseases

Diseases due to nutrient deficiencies (see section 9), are common indoors,
and their symptoms usually worsen with time, affecting more and more of the plant. Whole leaves may be pale, or turn yellow or white; the condition may first afflict the bottom, or top, or the entire plant at once. Deficiency symptoms often appear as spots, splotches, or areas or chlorotic (lacking green) tissue. Sometimes necrotic (dead) tissue appears that is copper, brown, or gray. However, before you search to section 9, carefully inspect the plants for any signs of plant pests.

10.4 Plant Pests

The indoor garden is an artificial habitat where the plants live in isolation from the natural world. For this reason, few of you will have any problems with plant pests. However, indoor plants are particularly susceptible to pests once contaminated. In nature, the pest populations are kept in check by their natural enemies, as well as by wind, rain, and changing temperatures. Without these natural checks, pests can run rampant through the indoor garden.

The most common and destructive pests are spider mites and whiteflies. Spider mites are barely visible to the naked eye; they are ovoid-shaped. Juvenile mites are transparent and change to green as they suck the plant's tissue. Adults are tan, black, or semitransparent. False spider mites are bright red. Mites are usually well-established before you discover them, because they are so difficult to see.

Whiteflies are white (obviously) but look like tiny moths rather than flies. The adults are about 1/16 inch long, and you may not see one unless if flutters by the corner of your eye. Then shake the plants. If the result looks like a small snowstorm, the plants are infested with whiteflies. {Figure 52. Left: Spider mite (x16). Right: A match head dwarfs tiny spider mites.}

The symptoms of infection by mites and whiteflies are similar. Symptoms usually appear on the lower leaves and gradually spread to the top of the plant. The first indications are that the plant loses vigour; lower leaves droop and may look pale. Look closely at the upper surfaces of the leaves for a white speckling against the green background. The speckles are due to the pests sucking the plant's chlorophyll-rich tissue. With time, the leaf loses all colour and dies.

Pests are easiest to find on the leaves that are beginning to show some damage. You can usually see mites and whitefly larvae as tiny dots looking up at the lights through the undersides of the leaves.

To find out which pest you have, remove some damaged leaves and inspect the undersides under bright daylight. With spider mites, if you discover them early, a leaf may show only one or two tiny dots (adults) and a sprinkling of white powder (eggs) along the veins. In advanced cases, the undersides look dusty with the spider mites' webbing, or there may be webbing at the leaf nodes or where the leaflets meet the petioles. With whiteflies, you usually see the adults first. On the undersides of the leaves the whitefly larvae look like mites, but there is no webbing, and there are tiny golden droplets of "honeydew" excreted by the adult whiteflies. {Figure 53. Mites appear as black specks when you look up to the lights from the undersides of
Take quick action once you discover plant pests. If the plants are less than a month old, you will probably be better off to clean out the garden, in order to eliminate the source of the pests, and start over. As long as the plants are healthy they can withstand most attacks. The more mature the plants are, the less they are affected by pests. Whiteflies and mites sometimes disappear from flowering plants, particularly the female flowers. Mites are difficult to eliminate completely. Often a holding action will save a good crop.

If only a few plants in your garden are infected, remove them. Or else, remove any leaves that show damage. If the plants are three or more months old, you might consider forcing them to flower while they are still healthy. Plants that are good-sized and still vigorous will usually stand up well to mites once they are flowering.

If you don't want to use insecticides, there are several alternative ways to keep the pests in check until flowering. Mix 1/8 to 1/4 pound of pure soap (such as Ivory flakes) thoroughly in one gallon of lukewarm water. Then cover each pot with foil or newspaper, invert it, and dip and swish the plant around several times in the soapy solution. Let is drip dry and rinse with clear water. Use the dunking procedure every week or two until the plants are larger. This is often enough to get the plants growing well and into flowering before the pest population can become a serious problem.

Two homemade sprays that can be effective are dormant oil sprays (See Insects and Pests in the Outdoor Section.) and hot pepper sprays.

To make hot pepper spray, mix four hot peppers with one medium onion and one clove garlic (213). Grind or chop and mash them along with some water. Cover the mash with water and allow it to stand a day or two. Add enough water to make two quarts. Strain through a coffee filter or paper towels in a funnel. Add one-half teaspoon of detergent and spray as you would an insecticide.

No one wants to use insecticides; yet they seem to be the only way to eliminate mites. There are a number of insecticides on the market that are relatively safe. Insecticides such as pyrethrum, rotenon, and malathion are relatively non-toxic to warm-blooded animals when used as directed. These are effective against many different plant pests besides mites and whiteflies. Additionally, they break down into harmless compounds such as carbon dioxide and water in a matter of days; so they do not persist in the environment.

Safe insecticides are used for vegetables. Follow all the package precautions. Do not use more, or more often, than recommended. Overuse can kill the plant. The label will list the number of days to wait before you can safely ingest the plant, usually from two to 35 days after spraying.

Both mites and whiteflies generally complete their brief life cycles in about one to two weeks. Because sprays are not effective against the eggs, repeat the spraying about once a week for three successive weeks to completely eliminate the pests. Since their generations are short-lived, some pests may become resistant to the spray. This can be a problem with
whiteflies. Try a different insecticide if the first one does not seem to be working.

Add a couple of drops of liquid detergent to each quart of insecticide solution. Detergent acts as a wetting agent and helps the insecticide to contact the pests and stick to the plant. Small plants can be dunked directly in the solution, the surest way to kill pests.

To spray the plants, start at the back of the garden so that you are working away from the plants already sprayed. Spray the entire plant and soil surfaces, paying special attention to the undersides of the leaves where pests tend to congregate. Stay out of the garden and keep the room closed that day.

Sulfur dusts can also be effective against mites and many other pests, and are safe to use. The easiest way to apply them is with a plastic "squeeze" bottle which has a tapered top. Make sure you dust the underside of the leaves.

Before using any insecticide, remove all damaged leaves. Do not use any insecticide during flowering. Rinse the plant with a clear water spray about one week after applying any insecticide, and once more before you harvest. Otherwise there may be residues left which will affect the taste of the grass.

There are several other pests that can be a problem, although they rarely seriously affect marijuana. Aphids are about 1/16 inch long and are black, green, red, or pink. They have roundish bodies with long legs and antennae. Some species have wings. They congregate on the undersides of leaves which may then lose colour and become curled or distorted. Aphids excrete honey-dew droplets on the undersides of the leaves which can attract ants. If ants are also present, set out ant traps, because the ants will spread the aphids to other plants. A few successive washings in soapy water or one or two sprayings of the insecticides mentioned above should eliminate aphids.

Mealy bugs are white, about 3/16 of an inch long, and look like small, flat sowbugs. They don't seem to like marijuana and avoid it if other plants are present. Mealy bugs can be removed individually with cotton swabs and alcohol.

Gnats are attracted to moist soil that is rich in partially decayed organic matter such as manures. To discourage gnats when using manures, cover the top few inches in the pot with the soil mixture and no manure. Drench the soil with malathion solution for gnats or any other soil pest. Flypaper will also help against gnats as well as whiteflies.

Some people don't mind having a few pests on their plants. Whether you want to eliminate the pests completely or simply keep them in check may come down to whether you mind hearing the snap, crackle, and poop as their little bug bodies heat and explode when the harvest is smoked. Commercial marijuana, or any marijuana grown outdoors, will contain innumerable bugs and other small lifeforms.
Prevention

Whiteflies and spider mites are extremely contagious. Mites can be carried to the plant on hands, clothing, or an animal's fur. Many houseplant pests can fly or float to the garden through open windows. Mites crawl through cracks in walls and foundations during autumn, seeking warmth.

Many houseplants are popular because they can withstand abuse and infections by common plant pests. Your houseplants may harbor mites for years without your knowledge. You can find out if your houseplants have mites by placing some marijuana seedlings among the houseplants. Mites seem to enjoy young marijuana plants so much that the plants show symptoms of mites in a matter of weeks of any are nearby.

Hopefully, you'll never have to deal with pests. Prevention is the best policy. Use soil that has been pasteurised or sterilised to avoid bringing pest eggs and larvae into the garden. Keep the garden isolated from other plants. Use separate tools for the marijuana garden and for other plants. Screen windows in the garden with wire screen or mesh fabrics such as nylon.

Chapter 11
MAINTENANCE AND RESTARTING

To start a new crop, it is best to begin with a fresh soil. This is especially true if the plants were in small pots or were root-bound.

If you have fertilised regularly, the soil may contain near-toxic amounts of salts. Most of the salts build up in the top two-inch layer of soil. To salvage large quantities of soil, discard the top three-inch layer of soil from each pot. Add fresh soil and bulk fertilisers. Thoroughly mix and repot in clean containers.

It is generally not advisable to use the same soil for more than two crops. Although the used soil may not support healthy growth for potted plants, it is an excellent addition to any garden soil. Spread the soil as you would a mulch. The salt concentration is quickly diluted and benefits, rather than harms, garden soil.

Periodically clean the tubes and reflectors to remove dust and grime. As with windows, this dirt substantially decreases the amount of light the plants receive. Fluorescents lose approximately 20 to 40 percent of their original output within a year's use. Generally the higher-wattage tubes decline more rapidly than standard-output tubes. Vita-lite tubes last the longest, followed by standard fluorescents. Gro-tubes are the shortest-lived, and most growers replace them after two crops. Older tubes can be used to start seedlings and during the first month of growth. Since the plants are small and the light system is low, the old tubes generate enough light for healthy growth. Replace incandescent bulbs after 500 light hours.
There are several factors to consider when deciding where to plant, including sunlight, microclimate, availability of water, and condition of the soil. But the garden's security should be your first consideration. No matter what size your garden, rip-offs and confiscation are constant threats. But these risks can be minimised by careful planning and common senses.

In some countries, law-enforcement agencies take a tolerant attitude toward small gardens, and people grow Cannabis in their backyards. In other areas, police are not as enlightened and place an emphasis on cultivation busts. In either case, the larger the garden, the greater the potential danger.

In Hawaii and California, where marijuana growing has become a booming business, helicopters have been a problem for commercial growers. Aircraft outfitted with visual or infrared equipment, dogs, and finks have all been used to seek out illicit plots. Aircraft equipment is least effective on steep slopes and where the vegetation is lush and varied. Where aircraft are a problem, growers prune marijuana to obscure its distinctive shape. The plants are difficult to detect from a distance when intercropped with bamboo, sunflowers, sugar cane, soybeans, or tall weeds (see Figure 60). Commercial growers often plant several small dispersed stands or many single plants, which are more difficult to detect and serve as insurance against total loss.

But rip-offs rather than the law are more of a problem for marijuana growers. From every section of the United States, reports confirm that marijuana theft has reached epidemic proportions, and even well-hidden plant fall prey to unscrupulous people. These lowlifes often search near hippie communities and popular planting areas. Their best ally is a loose lip; so keep your garden on a "need to know" basis.

12.2 Where to Grow

Given the value of marijuana, many people think they'll grow an acre or two. But it is much harder to find spots suitable for large-scale farming than to find small garden plots. Large gardens require more planning and commitment, and usually a remote area. They may need a lot more time, energy, and investment in materials and labor-saving machinery than smaller gardens.

A small but well-cultivated garden, say, ten by ten feet, can yield over four pounds of grass each crop. By planning realistically, you'll harvest a good stash of potent grass rather than a lot of disappointment.
Moat people who grow marijuana plant it in their backyards. They hide the plants from curious neighbours and passers-by with walls, fences, arbor, or similar enclosures. Some people plant Cannabis as part of their vegetables garden, pruning the plants to make them less conspicuous.

Gardeners often use ingenious ideas to keep their gardens secret. A woman on Long Island grows over thirty large plants in containers in her drained swimming pool. Although some of the plants reach a height of 12 feet, they can't be seen over the enclosing fence.

A couple living near Nashville, Tennessee, took the roof off their three-car garage and painted the walls white to create a high-walled garden. Other growers use sheds with translucent roofs.

Guerilla Farming

Many growers feel safer planting away from their property. Should the garden be discovered, they are not in jeopardy. On the negative side, they usually lose the close contact and control that a home gardener has.

Urban gardeners use makeshift greenhouses, rooftops, vacant lots, and city dumps. Vacant lost that are overgrown with lush weeds can support a good crop, if the marijuana plants get a head start on the indigenous weeds.

Fields, forest clearings, railroad rights-of-way, stream banks, runoff and irrigation ditches, clearings beneath high-tension lines, deserted farms and quarries, overgrown fields, and abandoned houses have all been used as garden spots. In areas where hemp is a problem weed, people plant seeds from high-potency marijuana in the same fields where the weedy hemp grows. Growers harvest the plants in late July before they flower and before the fields are watched or destroyed by law enforcers.

Larger growers often look for rough, unpopulated terrain that is accessible only by plane, helicopter, four-wheel-drive vehicles, or long hikes. They avoid areas which hunters and hikers are likely to use before harvest.

Serious growers often find unusual places to start gardens. A grow in Chico, California, hacks through two hundred yards of dense underbrush and bramble to reach his clearing. In Oregon some growers maintain fields which are a gruelling eight-hour uphill hike from the nearest road. Some Florida farmers commute to their island and peninsula gardens by boats. A master gardener in Colorado lowers himself by rope to a fertile plain 50 feet below a cliff.

A farmer in Hawaii wrote, “The main concern is to grow in an undetectable place where the plants can still get enough sun. This is becoming very difficult to find and some very elaborate subterfuges have been developed. People on Maui are growing plants suspended from trees and on tree platforms! Around here some people carry small plants in buckets far out on the lava fields where there is a light shading from Ohia trees and you don't leave tracks. Also people go into the sugarcane fields, tear out some cane, and put in their plants. I am sure many other things are being done."

12.3 Light
Marijuana is a sun plant. The plants will grow in partially shaded areas, but about five hours of direct sunlight are needed for development into a lush bush. Marijuana does best when it has direct sunlight all day. If it grows at all in a heavily shaded area, it will be dwarfed and sparse - a shadow of its potential.

Try to choose a place that maximises light. Flat areas get the most sunlight, but many growers prefer to use slops and hillsides which help to hide the plants. Southern slops usually receive more sun and stronger light than eastern and western slops, which are shaded in the afternoon and morning, respectively. Northern slopes are rarely used, since they get the least sunlight and are also the coldest. Steeper slops are shaded sooner than gradual slopes, and lower areas are shaded earlier than high ones.

Sunlight at high altitudes is more intense, because of the thinner atmosphere and the usually lower pollution. The atmosphere and pollutants at lower elevations absorb and scatter some of the solar radiation.

Backyard gardeners usually compromise between the need for maximum light and the need for subterfuge. An area that gets several hours of direct sunlight and bright unobstructed daylight for the rest of the day will do well. A garden exposed to the south usually gets the strongest light and is the warmest. Overhanging vegetation should be pruned so that the plants are shaded as little as possible.

Most marijuana strains are acclimated to tropical and semitropical latitudes, where the daytime is relatively short (10 to 14 hours, depending on season), but the sunlight is quite strong. At latitudes in the United States, the sun is not as intense (although in the summer the difference is small), but the days are longer, and the plants can grow extremely fast. It is not true that intense sunlight is needed to grow great marijuana. However, a summer characterised by clear sunny weather will usually produce a larger and slightly more potent crop than if the season is cloudy and rainy.

Sunlight can be maximised by adequate spacing and orientation of the garden. This is covered in section 14.

Chapter 13
SOIL

Of all the factors involved in growing plants, soil is the most complex. It has its own ecology, which can be modified, enriched, or destroyed; the treatment it receives can ensure crop success or failure.

There is no such thing as the perfect soil for Cannabis. Each variety can grow within a wide range of soil conditions. Your goal is garden soil within the range for healthy growth: well-drained, high in available nutrients, and with a near neutral (7.0) pH. Cannabis grows poorly, if at all, in soils which are extremely compacted, have poor drainage, and low in fertility, or have an extreme pH.

There are several soil factors that are important to a grower; these include soil type, texture, pH, and nutrient content. We will begin this chapter by
discussing each of these topics in succession, and will then turn to discussion of fertilisers, soil-preparation techniques, and guerilla farming methods.

13.2 Types of Soil

Each soil has its own unique properties. These properties determine how the soil and plants will interact. For our purposes, all soils can be classified as sands, silts, clays, mucks, and loams. Actually, soils are usually a combination of these ingredients. If you look carefully at a handful of soil, you may notice sand granules, pieces of organic matter, bits of clay, and fine silty material.

Sandy Soils

Sands are formed from ground or weathered rocks such as limestone, quartz, granite, and shale. Sandy soils may drain too well. Consequently, they may have trouble holding moisture and nutrients, which leach away with heavy rain or watering. Some sandy soils are fertile because they contain significant amounts (up to two percent of organic matter, which also aids their water-holding capacity. Sandy soils are rich in potassium (K), magnesium (Mg), and trace elements, but are often too low in phosphorous (P) and especially nitrogen (N). N, which is the most soluble of the elements, is quickly leached from sandy soil. Vegetation on sands which is pale, yellowed, stunted, or scrawny indicates low nutrients, usually low N.

Sandy soils can be prepared for cultivation without much trouble. They must be cleared of ground cover and treated with humus, manure, or other N-containing fertilisers. In dry areas, or areas with a low water table, organic matter may be worked into the soil to increase water-holding capacity as well as fertility. Sandy soil does not usually have to be turned or tilled. Roots can penetrate it easily, and only the planting row need be hoed immediately before planting. Growers can fertilise with water-soluble mixes and treat sandy soil almost like a hydroponic medium.

Sandy soils are also good candidates for a system of sheet composting (spreading layers of uncomposted vegetative matter over the garden), which allows nutrients to gradually leach into the soil layers. Sheet composting also prevents evaporation of soil water, since it functions as a mulch.

Silts

Silts are soils composed of minerals (usually quartz) and fine organic particles. To the casual eye, they look like a mucky clay when wet, and resemble dark sand or brittle clods when dry. They are the result of alluvial flooding, that is, are deposits from flooding rivers and lakes. Alluvial soils are usually found in the Midwest, in valleys, and along river plains. The Mississippi Delta is a fertile alluvial plain.

Silts hold moisture but drain well, are easy to work when moist, and are considered among the most fertile soils. They are frequently irrigated to extend the length of the growing season. Unless they have been depleted by faulty farming techniques, silts are rich in most nutrients. They often support healthy, vigorous vegetation. This indicates a good supply of N.
Mucks

Mucks are formed in areas with ample rainfall which supports dense vegetation. They are often very fertile, but may be quite acidic. They usually contain little potassium.

Mucks range from very dense to light sandy soils. The denser ones may need heavy tilling to ensure healthy root development, but the lighter ones may be cleared and planted in mounds. Mucks can support dense vegetation, and are often turned over so that the weeds thus destroyed form a green manure.

Clay Soils

Clays are composed of fine crystalline particles which have been formed by chemical reactions between minerals. Clays are sticky when wet, and can be moulded or shaped. When dry, they form hard clods or a pattern of square cracks along the surface of the ground. Clays are usually hard to work and drain poorly. Marijuana roots have a hard time penetrating clay soils unless these soils are well-tilled to loosen them up. Additions of perlite, sand, compost, gypsum, manure, and fresh clippings help to keep the soil loose. Clay soils in low-lying areas, such as stream banks, may retain too much water, which will make the plants susceptible to root and stem rots. To prevent this, some growers construct mounds about six inches to one foot high, so that the stems and tap roots remain relatively dry.

Clay soils are often very fertile. How well marijuana does in clay soils usually depends on how well these soils drain. In certain areas "clay" soils regularly support corn cotton. This type of soil will support a good crop of marijuana. Red colour in clay soil (red dirt) indicates good aeration and a loose soil that drains well. Blue or gray clays have poor aeration and must be loosened in order to support healthy growth.

A typical schedule for preparing a heavy clay soil In the late fall, before frost, turn soil, adding fresh soil conditioners, such as leaves, grass clippings, fresh manure, or tankage. Gypsum may also be added to loosen the soil. Spread a ground cover, such as clover, vetch, or rye. In early spring, making sure to break up the large clods, and add composts and sand if needed. At planting time, till with a hoe where the seeds are to be planted.

As the composts and green manure raise the organic level in the soil, it becomes less dense. Each year, the soil is easier to work and easier for the roots to penetrate. After a few years, you may find that you only need to turn under the cover crop. No other tilling will be needed.

Loams

Loams are a combination of about 40 percent each of sand and silt, and about 20 percent clay. Organic loams have at least 20 percent organic matter. In actuality, a soil is almost always a combination of these components, and is described in terms of that combination, e.g., sandy silt, silty clay, sandy clay, or organic silty clay. Loams range from easily worked fertile soils to densely packed sod. Loams with large amounts of organic matter can support a good marijuana crop with little modification.
13.3 Humus and Composts

Humus and composts are composed of decayed organic matter, such as plants, animal droppings, and microbes. Their nutrient contents vary according to their original ingredients, but they most certainly contain fungi and other microorganisms, insects, worms, and other life forms essential for the full conversion of nutrients. As part of their life processes, these organisms take insoluble chemicals and convert them to soluble forms, which plant roots can then absorb. Humus and composts hold water well and are often added to condition the soil. This conditioning results from the aerating properties and water-holding capacity of humus and composts, as well as balanced fertility.

Humus and composts have a rich, earthy smell, look dark brown to black, and may contain partially decayed matter, such as twigs or leaves. They are produced naturally as part of the soil's life process or can be manufactured at the site by gathering native vegetation into piles. Composts cure in one to three months, depending on both ingredients and conditions. Decomposition can be speeded up by turning and adding substances high in N. Composts are frequently acidic and are sweetened with lime when they are piled. This also shortens curing time, since the desirable microbes prefer a neutral medium.

13.4 Texture

Soil texture refers to density, particle size, and stickiness, all of which affect the soil's drainage and water-holding characteristics. The most important quality of the soil for marijuana is that it drains well - that is, water does not stand in pools after a rain, and the soil is not constantly wet. In a well-drained soil, the roots are in contact with air as well as water.

Cannabis does best on medium-textured soils: soils that drain well, but can hold adequate water. Loams, silts, and sands usually drain well and are loose enough to permit good root development. Some clays and most mucks are too compact to permit the lateral roots to penetrate and grow. In addition, they often drain poorly, and when dry they may form hard crusts or clods, a condition marijuana cannot tolerate.

Several simple tests will indicate the consistency and drainage qualities of your soil. Test when the soil is moist but not wet. First, dig a hole three feet deep to check the soil profile. In a typical non-desert soil, you will find a layer of decaying matter on the surface, which evolves into a layer of topsoil. Most of the nutrients available to the plant are found at this level or are leached down from it. The topsoil layer is usually the darkest. It may only be an inch thick or may extend several feet. When in good condition, the topsoil is filled with life. Healthy topsoil contains abundant worms, bugs, and other little animals, and is interlaced with roots. If you can easily penetrate the underlying topsoil with your hands, its texture is light enough for healthy root growth.

The next layer, or subsoil, may be composed of a combination of sand, clay, and small rocks, or you may hit bedrock. Sandy, rocky, and loamy subsoils
present no problems as long as the topsoil is at least six inches thick. Clay or bedrock often indicates drainage problems, especially if the spot has a high water table and stays wet.

Next scrape up a handful of soil from each layer. Press each handful in your fist, release it, and poke the clump with a finger. If it breaks apart easily, it is sandy or loamy. Clods that stick together, dent, or feel sticky indicate clay or muck.

To test for drainage, fill the hole with water. Wait half an hour to let the moisture penetrate the surrounding soil; then fill the hole with water again. If the water drains right through, you are working with sandy soil. If it doesn't drain completely within 24 hours, the soil has poor drainage.

13.5 pH

The pH is a measure of how alkaline (bitter) or acid (sour) the soil is. The pH balance affects the solubility of nutrients, and helps the plant regulate metabolism and nutrient uptake. The scale for measuring pH runs from 0 to 14, with 7 assigned as neutral. A pH below 7 is acid; a pH above 7 is alkaline.

Marijuana grows in soils with a pH range from 5 to 8.5, but it thrives in nearly neutral soils. Relative to other field crops, it has high lime requirements, similar to those for red or white clover or sunflower. But it does well in fields where plants with medium lime requirements, such as corn, wheat, and peanuts, are grown.

The solubility of nutrients is affected by soil type as well as by the pH. In soils with a high content of organic matter, all nutrients are soluble between 5.0 and 6.5. Phosphorous, manganese, and boron are less soluble at pH values above 6.5. Acid soils are usually found in the United States east of the 100th meridian and along parts of the West Coast, and a deep topsoil layer. Marijuana does best in acid soils when the pH is adjusted to a range of 6.3 to 7.0. {Figure 58. Map of pH for US.}

Mineral soils in the dry western states may be slightly acid to highly alkaline. Most nutrients are very soluble in these soils, as long as the pH ranges from 6.0 to 7.5. Some of these soils are too alkaline (over 8.5); so their pH must be adjusted to near neutral to ensure healthy growth.

Adjusting the pH

First test the soil pH in the garden area. Previous gardeners may have adjusted native soils, or your yard soil may have been trucked in to cover poor native soils, so that the pH of your garden soil may be different from that of other soils in the area. Different soils vary in the amount of material needed to adjust the pH. Sandy soils do not require as much as loam, and loam requires less than clays, partly because of the chemistry, and partly because of the density and physical qualities of the soils' particles.

Adjusting Acid Soils
Acidic soils are treated with limestone, which is expressed as an equivalent of calcium carbonate (CaCO₃). Limestone is usually quarried and powdered, contains large amounts of trace elements, and comes in different chemical forms: ground limestone, quicklime, and hydrated lime (which is the fastest acting form). Dolomitic limestone is high in magnesium and is often used to adjust magnesium-deficient soils, such as those found in New England. Marl (ground seashells) is also mostly lime and is used to raise soil pH. Eggshells are another source of lime. They should be powdered as finely as possible, but even so, they take a long time to affect the soil. Wood ashes are alkaline and very soluble; so they have an almost immediate effect.

Every commercial lime has a calcium carbonate equivalent or neutralising power which is listed on the package. To find out how much to use, divide the total amount of limestone required by the pH test (see Figure 59) by the calcium carbonate equivalent. For instance, a field requires fifty pounds of limestone, but the calcic limestone you are using has an equivalent of 1.78. Divide the 50 by 1.78. The resulting figure, about 29 pounds, is the amount required. Commercial limes also list the grade or particle size of the powder. In order of fineness they are: superfine, pulverised, agricultural grade, and fine meal. The finer the grade, the faster the action. {Figure 59. Approximate amount of lime required to adjust pH of a 7" layer of different types of soil.}

For best results, lime should be added at least four or five months before planting. In this way, the lime has a chance to react with the soil. But acid soils can be limed profitably and time before planting, or after, as long as the lime does not come into direct contact with the plants. Most growers add lime at the same time that they fertilise and turn the soil. That way, tilling and conditioning are handled in one operation. The lime should be worked into the soil to a depth of ten inches. Lime can also be added by spreading it before a rain. Make sure that the soil is moist enough to absorb the rain, so that the lime does not run off. Growers who have not adjusted the pH can dissolve lime in water before they irrigate. However, this is not advised if the water runs through a hose or pump, because mineral buildup may occur in the equipment.

Adjusting Alkaline Soils

Most alkaline soils have a pH no higher than 7.5, which is within the range for optimum growth. Soils that are too alkaline can be adjusted by adding gypsum, which frees insoluble salts, and include iron, magnesium, and aluminium sulphate. Marijuana has a low tolerance for aluminium; so marijuana growers should use iron or magnesium sulphate in preference to aluminium sulphate. Sulphur and gypsum are worked into the soil in the same manner as lime.

{Table 19.}

Some growers correct alkaline soils by adding an organic mulch or by working acidic material into the soil. Cottonseed meal, which is acidic and high in nitrogen, can also be used. As it breaks down, cottonseed meal neutralises the soil. Pine needles, citrus rinds, and coffee grounds are all very acidic, and can be used to correct alkaline conditions. The addition of soluble nitrogen fertilisers aids the breakdown of these low-nitrogen
additives. (See Table 22 in the section on "Fertilisers" in this section.)

Adjusting Alkali Soils

Alkali soils (pH usually above 8.5) are hardpacked and crusty, and sometimes have an accumulation of white powdery salts at the surface. They may not absorb water easily and can be extremely difficult to work. To prepare alkali soils with a permeable subsurface for cultivation, farmers leach them of their toxic accumulation of salts. The soils is thoroughly moistened so that it absorbs water. Then it is flooded so that the salts travel downward out of contact with the roots. Gypsum can be added to free some of the salts so that they leach out more easily. Gypsum can be added at the rate of 75 lbs per 100 sq.ft., or 18 tons per acre. Leaching requires enormous quantities of water, an efficient irrigation system, and several months.

Plate 1. Skylights are a good source of bright, unobstructed light. Thai plant (closest) and Colombian plants reached over 14 feet in six months.

Plate 2. Top: A hidden garden using fluorescent light, foil reflectors, and bag containers. Plants are ten weeks old. Bottom: Simple to construct dome greenhouse in southern California. At two months, some of these plants are six feet tall.


Plate 4. Marijuana does well in most gardens. Top: Here a female plant is in early bloom at five months. The main stem was clipped at three months (Berkeley). Middle: Lower branches are spread out to catch the sun. Bottom: A female bud about two weeks before harvest. Leaves show some damage from leafhoppers (insects shown).

Plate 5. A giant sinsemilla cola grown from Mexican seed in northern California.

Plate 6. Top: Purple colours often appear late in life, when vigour is waning. Lower left: Resin glands glistening on a purple, female flowering shoot. Lower right: Yellow male flowers and purple leaves against a normal green leaf.

Plate 7. Top: Male flowers at different stages in development. A line of resin glands can be seen on the anthers of the open flowers. Lower left: Resin glands lining the pollen slit of an anther (x40). Middle right: Male flowers in full bloom. The leaves are covered with fallen pollen. Lower right: Gland heads may fall with the pollen grains. Mature grains are spherical in field of focus (x40).

Plate 8. Top: Resin glands on the lower (adaxial) surface of a small, fresh leaf blade. Integrals are one millimetre (x16). Middle and lower left: Stalked glands are concentrated along the veins of the lower leaf surface (x40). Lower right (x100).

Plate 9. Top: Upper (adaxial) fresh leaf surface. Left of picture, from
left to right: Sharp-pointed cystolith hair, stalked gland, and tiny bulbous gland (x40). Lower left: Upper surface of a Thai leaf (x16). Lower right: Upper surface of fresh homegrown Colombian leaf (x40).

Plate 10. A young female flower (homegrown Colombian). Resin glands are not yet fully developed (x16).

Plate 11. Top left: A mature female flower from the same plant is in Plate 10. The flower bract is swollen from the ripe seed it contains. Notice the well-developed resin glands (x25). Top right: A mixture of seeds from common marijuana varieties shows comparative size. Bottom: The tip of a sinsemilla flower at harvest. Notice cream-coloured stigmas to the left and the fresh, clear resin glands (x40).

Plate 12. Upper and lower left: An overly ripe sinsemilla flower bract. Many gland heads are brown or missing (top, x16; bottom, x40). Upper and lower right: Carefully handled Thai weed with intact glands. Notice the high concentration of glands and very long stalks on this bract (top, x16; bottom, x40).

Plate 13. Upper and lower left: A Colombian Gold. Gland contents are brown and stalks have deteriorated on this bract (top, x16; bottom, x40). Top right: Hawaiian; well-handled and showing little deterioration (bract x40). Middle right: Gland heads easily detach from stalks when overripe (leaf vein x40). Lower right: Stalked glands on both upper and lower leaf surfaces beginning to brown (leaf margin x40).

Plate 14. Top: Whitefly larvae and their honeydew excretions on the lower surface of a leaf. Middle left: Leaf showing whitefly damage and a tiny adult. Lower left: White speckles on leaves indicating mite damage. Lower right: An overdose, or overuse of pesticide, can kill the plant.

Plate 15. Upper left: Healthy green plant next to a N-deficient plant. Middle left: Ultraviolet burn. Plant was moved outdoors without conditioning. Lower left: "Bonsai" marijuana grown from a cutting. Upper right: Mg-deficient plant has chlorotic leaves dying from their tips. Lower right: Afghani variety, with characteristically wide leaf blades, show minor symptoms of N deficiency (pale leaves and red petioles).

Plate 16. Upper left: Male flowers lose some green and turn "blond" during slow drying. Upper right: Cigar joints made with undried marijuana, which is wrapped with lone blades of fan leaves before drying. Bottom: Sequence shows change in colour in one day from sun curing. {Unfortunately, all the plates are in black and white.}

Another method of reclaiming alkali soils is by adding a thick mulch and letting it interact with the soil during the winter. The mulch should be about nine inches thick, or 130 lbs or more per 100 sq.ft. This thick layer neutralises the salts and also helps to retain moisture.

Nutrients

Marijuana is a high-energy plant which grows quickly to its full potential in a fertile soil that is rich in available nutrients. Nutrients are found
in the soil's parent materials: sand, clay, humus, minerals, rocks, and water. Nutrients dissolve in soil water (soil solution), which is then absorbed by the plant. In complex chemical processes, roots release ions in exchange for nutrients that are dissolved in the soil solution.

The soil acts as a reservoir for the nutrients. Most of them are in non-exchangeable forms: that is, they do not dissolve, or dissolve only slightly in water. Only a small percentage of the total reserve is free at any time as the result of chemical processes or microbial action. Healthy soils maintain a balance between free and unavailable nutrients, so that the plants they support continually receive the right amounts of required nutrients. Alkali soils have large supplies of compounds which are extremely soluble. The solution is so concentrated that alkali soils are often toxic to plants.

There are three primary nutrients, N (nitrogen), P (phosphorus), and K (potassium). These are the nutrients that gardeners are most likely to be concerned with and which most fertilisers supply. Soils are most likely to be deficient in one of these nutrients, especially N.

In addition to the primary nutrients, soil supplies plants with three secondary nutrients, Ca (calcium), Mg (magnesium), and S (sulfur), and seven micronutrients: iron, boron, chlorine, manganese, copper, zinc, and molybdenum. Although deficiencies of all the secondary and micronutrients are reported from various parts of the United States, serious deficiencies do not occur often. ((For a discussion of the symptoms of nutrient deficiencies is marijuana, see section 9.))

Marijuana absorbs nutrients primarily through a fine network of lateral roots which grow from the taproot. Lateral roots may spread over an area with a diameter of five feet, and may go as deep as the roots can penetrate. Plants in deep sandy soils or in soils that have porous mineral subsoils may grow roots as deep as even seven feet. Roots which can absorb nutrients from a larger area are more likely to fulfil the plants' needs than are shallow roots which result in shallow topsoil layers over compacted subsoils. When the roots have a large area from which to absorb nutrients, the soil does not need to be as fertile as when the roots are restricted to a small area by poor soil or by being grown in pots.

You can get a good indication of soil fertility by observing the vegetation that the soil supports. If the vegetation is varied, has a lush look to it, is deep green, and looks vigorous, it is probably well-supplied with nutrients. If the plants look pale, yellowed, spindly, weak, or generally unhealthy, the soil is probably deficient in one or more nutrients.

Testing

Agricultural colleges, County Extension Agents, and private companies perform soil analyses for a small fee from a sample you mail to them. The tests include nutrient, pH, and texture analyses, and are very accurate. There are also simple-to-use test kits available at nurseries and garden shops which give a fair indication of soil fertility and pH. Test results include a suggested fertiliser and lime program catered to the soil's individual requirements for the crop to be planted. Marijuana has nutrient
requirements similar to those for corn, wheat, and sugarcane, and prefers just a little more lime (a more alkaline soil) than those crops; so soil can be fertilised as it would be for those crops.

Soil tests are one indication of soil fertility. They test for available nutrients, but not for reserves that are held in the soil. Test results may also vary because of recent rainfall, changes of moisture content, and seasonal changes. Most soil tests do not measure the ability of the soil to make nutrients available. This is a very important factor when considering a fertiliser program and should not be overlooked. As an example, an uncultivated field showed only moderate amounts of N available, and indicated a need for N fertiliser. The vegetation - tall grass, weeds, and bush - had a healthy look and was dark green, and the lower leaves remained healthy. Obviously, the soil was able to supply an adequate amount of N to the plants, which withdrew it from the soil solution as it became available. The soil and plants had reached a balance, and the soil solution slowly became more dilute over the course of the season.

To a great extent, the soil's ability to maintain a constant and adequate supply of nutrients depends on the soil's humus content. Humus can support dense populations of microorganisms. As part of their life processes, microorganisms decompose organic matter in the humus. Nutrients contained in the organic matter are released by microbes as simply inorganic molecules (e.g., NO₃) which can dissolve in soil water. Generally, soils with a high humus content can keep plants supplied with more nutrients than soil tests indicate.

The Primary Nutrients

If you look at any fertiliser package, you will note three numbers on the package. They stand for N-P-K, always in that order. Marijuana does best in a soil which supplies high amounts of N and medium amounts of P and K.

Nitrogen

The availability of N is the factor most likely to limit the growth of marijuana. For fast healthy growth, marijuana requires a soil rich in available N. Nitrogen is constantly being replaced in the soil solution by microbial breakdown of organic matter. Some microorganisms can use N directly from the atmosphere. They release N as waste in the form NO₃, which is the primary form in which plants absorb N. A small amount of N is also dissolved in falling rainwater. When the soil is moist, it loses N through leaching and to plants. In its available form (NO₃, NO₂, NH₄), N is very soluble and may be carried away with runoff or may drain into the subsoil.

Probably the most accurate method of measuring a soil's ability to produce N is by the percentage of organic matter in the soil (see Table 20). Organic matter releases N at a rate that is determined by the type of soil, the temperature, and the moisture. Generally, the more aerated and warmer the soil, the faster organic matter decomposes and releases N. Most professional testing services report the percentage of organic matter, and some sophisticated kits can also test for it.

In its available state, N is tested in two compounds, ammonium (NH₄) and
nitrate (NO₃). Test results are converted into PPM (parts per million) of N and then added to arrive at the total amount of N available in the soil. The formulas to convert nitrate and ammonium to N are: \((\text{NO₃}) \times 0.226 = N\), \((\text{NH₄}) \times 0.78 = N\). Each PPM indicates 10.7 pounds of N per acre available in the top 7.87 inches. If the soil level is deeper, there is probably more N available. If it is shallower, less is available. But a test for available N gives only a fair approximation of the soil's ability to feed the plant. An individual test may be untypical because of recent leaching or depletion during the growing season.

An intensively cultivated crop of hemp takes about 250 pounds of N per acre or six pounds per 1,000 square feet from the soil during the growing season. When the plants are spaced well apart, the crop does not require as much N.

Fields which have more than 200 lbs of available N per acre (or 4.5 lbs per 1,000 sq.ft.) at the start of the growing season require no additional fertilisation. Soils with less available N will probably yield a larger crop if they are given additional N. Actually, the amount of N that can profitably be used depends on the soil and its potential to produce N as well as on other factors: how fast N is lost, the soil depth, and moisture content.

One way to calculate the amount of N to add to the soil is to build your soil to an "ideal" level. For example, an Iowa silt loam may test about 1.6 pounds of N per 1,000 sq.ft. and an organic content of 3 percent. Together, the available and potential N total about 3.2 lbs per 1,000 sq.ft. To increase the available N to 4.5 per 1,000 sq.ft., you would need to add 1.3 lbs of N.

Phosphorus

P is an important nutrient which is used directly by the soil bacteria as well as by the plant, so that an increase in the amount of P in the soil often results in an increase of N. Because of P's low solubility, it is rarely leached from the soil. It is usually found in the greatest concentration in the soil's top layers, where it accumulates as a result of decomposition of organic matter.

In slightly acid organic soil, up to one percent of the total P is available at any time. The total amounts of P in soils range from 1,000 to 10,000 lbs per acre. For example, a typical Kansas prairie soil has 3,000 lbs per acre. In soils with a lower pH, more of the P is tied up in insoluble compounds of iron or aluminium. In highly alkaline soils, the P forms insoluble compounds with calcium.

Insoluble P reacts with the dilute acids that are released during decomposition of organic matter. These compounds are available to the plants. Both the chemical processes in which P is released and the organic processes of decomposition occur faster in warm soils.

If P is available, young plants absorb it rapidly, and may take in 50 percent of their lifetime intake by the time they are only 25 percent of their adult size. Young plants grown outdoors in cold weather may grow slowly until the soil warms up and more P is available. Older plants grown
out of season in cold weather sometimes exhibit purple leaves. This condition may result from a P deficiency, because of the unavailability of P at low temperatures.

Most soil-test kits test available P, but the nutrient value of P is usually expressed as phosphoric acid (P2O5), which is converted using the formulas P * 2.3 = (P2O5), (P2O5) divided by 2.3 = P. Any soil that has available P of 25 lbs per acre (0.58 lbs per 1,000 sq. ft.) or more is well-supplied with P. Stated in terms of phosphoric acid, this is 25 * 2.3 = 57.5 lbs per acre (1.33 lbs per 1,000 sq. ft.).

Most inexpensive soil kits test available P. Soil that test less than 1 PPM or 10.7 lbs per acre (0.25 lbs per 1,000 sq. ft.) of available P should be tested to make sure there are adequate reserves, or can be fertilised to assure maximum yield. Soil-test kits give only a fair indication of the P available. A low reading may indicate the plants are absorbing P as fast as it breaks down from its unavailable form, especially during early growth! The main factors affecting the rate at which P becomes available are the total amount of reserve P in the soil and the pH.

Most professional soil analyses include a report of reserve P. Generally soils with reserve P of 3,000 lbs per acre (70 lbs per 1,000 sq. ft.) do not need additional P. Intensively cultivated and cropped fields may have had their reserve supply depleted, and will lock up available P that is supplied as fertiliser until a balance is reached.

Potassium

K is found in adequate quantities in most soils which have a pH within the range needed for growing marijuana. K is held in soils in three forms: unavailable, fixed, and readily available. Most K is held in the unavailable form as part of the minerals feldspar and mica. But a small percentage of the total K in any soil is held in fixed, slightly soluble forms. Some of these can be absorbed and used directly by the plant. The exchangeable K is equal to a fraction of the fixed K. Each soil maintains a balance or ratio of unavailable to fixed and to exchangeable forms. Organic soils have a higher percentage of K in the fixed or available form than mineral soils. As K is used by the plants, some of the unavailable K goes into the more available forms. Plants can use K in both the soluble and the fixed forms.

Most clays and soils that are well-limed have adequate reserves of K. Acidic soils generally have low K reserves. Mucks, silts, and peats have low reserves of K, and have little capacity to hold it chemically when it is applied. Sands have K reserves, but little capacity to convert it to a fixed or available form. Most western soils have adequate reserves or K. The exchangeable K in soils becomes fixed if the soil dries out; so the available K of a recently dried soil is usually low.

K is tested in its elementary state, but when described as a nutrient, it is given as potash (K2O). The formulas for converting are K * 1.2 + (K2O), (K2O) divided by 1.2 + K. Soils with 180 lbs or more of available potash per acre (4 lbs per 1,000 sq. ft.) have an adequate supply. The total reserve K should test no lower than 900 lbs per acre (21 lbs per 1,000 sq. ft.).
The Secondary Nutrients

Magnesium (Mg), calcium (Ca), and sulfur (S) are usually found in adequate quantities in soils suitable for growing marijuana. However, some New England soils do have Mg deficiencies. Soils which have a neutral or near-neutral pH almost always have adequate Ca and sulfur levels.

Magnesium deficiencies are corrected by adding 50 to 100 lbs of Mg per acre (2.25 lbs per 1,000 sq.ft.). The most inexpensive way to add Mg is to use a dolomitic limestone for adjusting soil pH. Dolomitic limestone is about 12 percent Mg (see Table 21); so 800 lbs of it are needed to supply 100 lbs of Mg. Dolomitic limestone releases Mg to the soil gradually. For faster action, epsom salts (magnesium sulfate, MgSO4) can be used. Five hundred lbs of epsom salts are required to supply soil with 100 lbs of Mg. Mg deficiencies can also be corrected by using foliar sprays. Dissolve one ounce of epsom salts in a gallon of water and spray all foliage.

{Picture The relationship between soil pH and relative plant nutrient availability. The wider the bar, the more the availability. This chart is for soil types recommended in this book..

{Nitrogen - pH of 6.3 to 8
Phosphorus - 6.5 to 7.5
Potassium - 6.5 to 9
Sulfur - 6 to 9
Calcium - 6.7 to 8.5
Magnesium - 6.5 to 8.5
Iron - <4 to 6
Manganese - 4.7 to 6.5
Boron - 5 to 7 or 9
Copper and Zinc - 5 to 7
Molybdenum - 7}}

Micronutrients

Micronutrients are used by plants in minute quantities, and most soils contain enough of them to meet plant requirements. Home gardeners and guerilla farmers seldom encounter any micronutrient deficiencies. But heavily cropped lands sometimes develop a deficiency of one or more micronutrients because of crop depletion. Micronutrients are made available to the plants only if there is a delicate balance in the soil chemistry, and it is easy to create toxic conditions by adding them to soil when they are not needed. For that reason, soils should be treated with micronutrients only when symptoms occur or when the deficiency is known by analysis or past experience. Only small quantities of additives are required for treatment. Manures, composts, other organic fertilisers, lime, rock powders, and ash contain large quantities of trace elements. Active organic additives quickly release micronutrients in a form that is available to the plants.

Boron

Boron deficiencies in marijuana occur in acid soils as a result of depletion by heaving cropping. The areas most affected by it are vegetable fields in the mid-Atlantic states, alfalfa and clover fields east of the Mississippi, and truck farms and orchards in the Northwest. Boron is found in phosphate
fertilisers, gypsum, and lime, and is the main ingredient of boric acid and borax. When borax or boric acid are used, they are applied at the rate 10 to 20 lbs per acre. They are used as a foliar spray at the rate of 1 ounce per gallon of water.

Chlorine

Chlorine deficiency does not normally occur. Some chemical fertilisers contain chlorine, and toxic conditions occur infrequently. Toxic chlorine conditions are eliminated by leaching.

Copper

Copper deficiencies occur infrequently in truck farms in Florida, California, and the Great Lakes region. Wood shavings and tobacco contain large amounts of copper. A foliar spray composed of 1 ounce each of calcium hydroxide and copper sulfate (a fungicide) per gallon of water is used by commercial vegetable growers.

Iron

Iron deficiencies occur in orchards west of the Mississippi and in Florida, and in alkaline soils in which iron is largely insoluble. Lowering soil pH often solves the problem. Chelated iron, which is water-soluble, is available at most nurseries and quickly supplies iron even when pH is extreme. Humus and seaweed are excellent sources of iron.

Manganese

Manganese deficiencies occur in the Atlantic states, the Great Lakes area, Utah, and Arizona. Manganese is found in manure, seaweed, and some forest leaf mould (especially hickory and white oak). Manganese deficiencies can be corrected by using a foliar spray of manganese sulfate at the rate of 0.5 to 1.0 oz. per gal. Soil is sometimes treated with manganese sulfate at the rate of 20 to 100 lbs per acre. In neutral or alkaline soils, most of the manganese sulfate becomes fixed and unavailable to the plants by the end of the growing season.

Molybdenum

Molybdenum deficiencies occur primarily along the Atlantic and Gulf coasts and in the Great Lakes region. Plants need extremely small amounts of molybdenum, less than 1 PPM in leaf and stem tissue. Molybdenum deficiencies occur when the soil is too acidic. By raising the pH level, one can make molybdenum available.

Zinc

Zinc deficiencies occur in soils throughout the U.S., primarily because of heavy cropping. It is most likely to occur in acid-leached sandy soils, and in neutral and alkaline soils where it is insoluble. In soils with high amounts of available P, zinc is also unavailable. Many deciduous tree leaves and twigs, composts, slag, and rock phosphate contain large amounts of zinc. Zinc sulfate is used as foliar spray at the rate of 3 oz. of zinc sulfate.
per gallon of water, or as a soil treatment at the rate of 100 lbs per acre. Some orchard growers drive galvanised nails into the trees to provide zinc.

13.6 Fertilisers

Most soils can benefit from a realistic soil-conditioning program. Most organic programs build soil, and minimise leaching and runoff. Programs using chemical fertilisers emphasise immediate increase in yield and a minimum of labor. The approach that you use should be tailored to the soil's needs and to your situation and goals. For example, a home gardener interested in building soil quality can easily add manure or compost to his garden. But a guerilla farmer may use concentrated chemical fertilisers, which are easy to transport to a remote area. A farmer cannot use the labor-intensive techniques which a small planter might use as a hobby. Many gardeners use both organic and inorganic fertilisers.

Organic Fertilisers

Organic fertilisers are usually less concentrated than chemical mixes. Their bulk consists of fibrous materials which condition the soil by aiding drainage and increasing the organic content and water-holding capacity. As they are decomposed by microbial action, the nutrients they contain are released in soluble form. Since this is a gradual process, there is little chance of creating toxic conditions.

Manures and composts are basic, all-purpose conditioners. They contain adequate amounts of most of the nutrients that marijuana absorbs from the soil and can be used generously. Uncomposted manures are "active" and should be used only in the fall. Over the winter they compost in the ground. Composts and composted manures can be added in the spring. Table 22 lists some common organic fertilisers which are usually available. Some of them, such as bone meal and granite dust, break down slowly and are available only after a period of time. Others are low or lacking in one or more of the major nutrients. Organic fertilisers can be combined to provide a complete balance.

Chemical Fertilisers

Most chemical fertilisers act quickly because all the nutrients are in soluble form. They are usually more concentrated than organic fertilisers, and can toxify the soil and kill the plants when they are overused. Fertilisers come in various concentrations and ratios of nutrients. All packaged fertilisers list the percentages of N-P-K (actually n-(P2O5)-(K2O)). Also listed is the potential acidity or alkalinity, that is, the number of pounds of lime or sulfur required to counteract pH changes caused by the fertilisers. Chemical fertilisers are often incompatible with each other; so home gardeners who use them should buy them pre-mixed or as a complete component fertiliser set.

Solubility is a major problem with commercial fertilisers. In irrigated areas as well as areas with rainfall during the growing season, they are likely to be leached away; so they must often be applied several times during the growing season. A typical program might be to fertilise at planting and every six weeks thereafter until the beginning of flowering.
When spreading fertilisers during the growing season, do not let them come into direct contact with the roots. An easy way to fertilise during the growing season is to make a small trough between rows with the corner of a hoe. Fertiliser is placed in the depression. Some new chemical formulas release nutrients during the length of the growing season, and therefore need only one application.

Amounts to Use

The amounts of nutrient needed per acre and per 1,000 sq.ft. are shown in Table 23. Soils rich in one nutrient may be average or deficient in another. To calculate the required amount of a specific fertiliser, divide the amount of nutrient required as listed in the chart by the percentage of nutrient in the fertiliser. For instance, to add 5 lbs of N to an area by using bloodmeal, divide 5.00 by 0.15. The total comes to a little more than 33 lbs. Dried cow manure contains about 1.5 percent N. About 333 pounds of it are needed to supply 5 lbs of N. Urea, a chemical fertiliser, contains 46 percent N. Only 11 pounds are required to supply 5 lbs of N.

Planning a Garden Fertiliser Program

Now let's plan some garden fertilisation programs, to help some cultivators in three areas which have different soils and climates: New England, Kansas, and Florida. We'll see how growers with different goals adjust their garden soil.

New England

Most New England soils, and many soils in humid temperate areas, have a thick layer of humus which supplies N. New England soils also contain moderate amounts of P, but they are low in K.

Our first gardener has a typical New England soil in his backyard. From tests and observation he thinks his soil contains moderate amounts of N and P, but is low in K. A test indicated a pH of 5.8. He plans to start preparing his ten-foot-square plot (100 sq.ft.) in the fall, before frost. By planting time, he expects his backyard garden to have a pH of 6.7 and a balanced, fertile soil.

From Figure 59 he finds that the soil requires about 8.1 lbs of lime. He has decided to adjust the pH by using dolomitic limestone (with a calcium carbonate equivalent of 0.45) because farmers in the area sometimes complain of Mg deficiencies. Dividing 8.1 by 0.45, he finds that the soil requires 18 lbs of limestone. (Lime requirements divided by calcium carbonate equivalent equals the amount of limestone needed.)

He guesstimates that the N content of his soil rates between fair and medium, and figures the soil can use almost 0.2 lbs of N. He has decided to spread fresh manure from a nearby stable mixed with lime. In the spring he will turn this into the soil; at the same time, he will add manure composted with hay and table scraps. The fresh horse manure contains about 0.44 percent N. To find out how much manure he needs, he divides 0.2 (the amount of N required) by 0.0044. The total comes to about 45.5 lbs. (Nutrient required divided by percentage in fertiliser equals amount of fertiliser
The manure also contains 0.17 percent phosphoric acid (P2O5) and 0.35 percent potash (K2O), referred to hereafter in this chapter as P and K, respectively. Multiplying 0.17 percent (0.0017) and 0.35 percent (0.0035) by 66 lbs, he finds that he has added 0.11 lbs of P and 0.23 lbs of K. (Lbs of fertiliser times percentage of nutrient in fertiliser equals amount of nutrient in fertiliser.)

BOX F

Chemical fertilisers usually supply P in the form of superphosphate or triple superphosphate. These chemicals are manufactured by mixing rock phosphate with acids. Potassium is supplied by means or muriate of potassium (K and chlorine) or sulfate or potash, which are mined in the Southwest and purified. All these chemicals are soluble and are available to the plant. But a portion of them gradually reacts with the soil and becomes fixed or unavailable. As this portion becomes unavailable, it increases the total reserve in the soil, which reaches a new balance of available to unavailable nutrients than before fertilisation.

Bone meals and rock phosphate, the most commonly used organic sources of P, and granite dust, a source of K, are not readily available, but increase the total reserve of nutrients and gradually increase the total amount of available nutrients. However, there is some time lag before these nutrients are available to the plant. They are usually applied in large amounts, at about three times the weight calculated for fertilisers of that concentration. But one treatment lasts four years or more, because the fertilisers remain fixed in the ground until they are used. {Table 24}

From Table 23 he finds that the soil requires about five ounces of P. How many ounces of P is 0.11 lbs? He multiplies 0.11 by 16, the number of ounces in a pound, and finds that the total is about 1.75 ounces. The soil requires another 3.25 ounces. Bone meal is about 20 percent P. To supply three ounces of P, about a pound of bone meal is required. But bone meal breaks down slowly, and is therefore applied at three times the rate used for other fertilisers; so our cultivator uses 3 lbs.

Since the K content of this New England soil is poor, about 0.3 lbs of K is required. The manure has already supplied 0.2 lbs; so the soil requires another 0.1 lb. Our cultivator decides to use wood ashes from his fireplace. Wood ashes are about 7.0 percent K. He divides 0.1 by 7 percent (0.07) and finds that the soil can use at least 1.4 lbs of ashes. He adds this in the spring just before planting, because the ashes are highly soluble. Over the winter, such highly soluble nutrients would leach away or become unavailable.

Our grower knows that some of the N in the fresh manure that was added in the fall will leach away during the winter. But the manure compost that he adds in the spring will more than make up for any losses.

A New England farmer not far from the cultivator has been rotating his field
from corn and marijuana to alfalfa and pasture for the past ten years. Each fall he adds 7 tons of manure per acre. Except for occasional additions of lime, no other fertilisation is necessary.

A rural New England grower has decided to plant in a remote mixed-forest area. The first 10 inches of soil is a rich compost of humus. It is full of life: insects, worms, and other creatures. The grower has decided to increase the fertility of the soil by using chemical mixes and dolomitic lime. He is cultivating in three clearings with a total area of about 1,000 sq.ft. He guesstimates that the soil is medium in N and P, but poor in K. It is also acid. He applied enough lime to correct the soil's natural acidity and the pH of the fertiliser.

Using Table 23, he decides that he should purchase a mix with a ratio of 50 parts of N, 10 parts of P (reading from the medium line), and 120 parts of K (from the poor line), that is, a ratio of 5-1-12. A local nursery sells commercial fertiliser with nutrient percentages of 10-5-25, close enough to the desired ratio. By taking the total amount of N required for a medium soil as listed in Table 23 (19 ounces), and dividing it by the N in the fertiliser (10 percent or 0.10), the rural grower finds the total amount of fertiliser required (190 ounces, or a little less than 12 lbs). The other nutrients are automatically added in the same ratio.

Kansas: A cultivator in Kansas decides to plant along a hidden stream bank. The banks are covered with lush vegetation as a result of runoff that contains soluble fertilisers used on nearby farms. The cultivator feels that additional fertilisers are not necessary, since the vegetation is so lush.

Another grower in Kansas found that her soil was very low in N and P, but high in K, typical of dry midwestern and western soils that support scrub vegetation. It had a nearly ideal pH. She started to prepare her 200 sq.ft. garden in the spring after the rain season ended. Using Table 23, she found that it required 3.5 lbs of N, 6 ounces of P, and no K. Activated sludge (5-3-0) was available at the local garden centre. To find out how much sludge her garden required, divide 3.5 by 5 percent (or 0.05). The total comes to 70 lbs.

Florida: A grower planting 500 sq.ft. on a deserted ranch in central Florida started with a very sandy soil whose pH was 4.9 because of sulphurous water in the ground. From Figure 59, she found that the soil required about 35 lbs of lime. To adjust the pH, she used 14.0 lbs of a limestone with a calcium carbonate equivalent of 2.5.

The soil had virtually no organic matter, and she was not sure she could use the same location next year; so she decided to apply soluble mixes throughout the growing season. From Table 23, she found that "poor" required 28 ounces of N, 4 ounces of P, and 24 ounces of K. A chemical fertiliser with nutrient percentages of 15-5-10 was on sale at a local discount store. To find out how much fertiliser is needed to supply 28 ounces of N, divide 28 by 15 percent (or 0.15); the result is about 186 ounces of N, or about 11.5 pounds. Since the other nutrients are supplied at the same proportions or at higher proportions than are required, no supplements are needed at planting time. But additional feedings will be required periodically during the growing season.
13.7 Techniques for Preparing Soils

Each garden situation is unique, and many factors help determine which garden techniques you should use. These include the soil’s condition, the size and location of the garden, commitment, and personal preferences. Each technique affects the microecology in its own way. Home gardeners may use techniques that are impractical for a farmer or guerilla planter. But all growers have the same goal when they prepare soil for planting: to create a soil environment conducive to growing a healthy, vigorous plant.

BOX G Fertilising Cannabis Depends on the Crop

Historically, Cannabis is known to require high fertility. In a fertile soil, Cannabis can outgrow practically any annual plant. Cannabis also is a known depleter of soils. This is true particularly with marijuana, since seeds, flowers, and leaves comprise the harvest. Hence it’s necessary to fertilise the plants each year. Hemp, on the other hand, comes from the Cannabis stem, and the fibre consists primarily of cellulose (C6H10O5)n. When hemp is grown, all plant parts except the fibre are returned to the soil; so the nutrients are also returned. Moderate fertilisation, if any, is all that's required for hemp farmers.

If you are already growing a vegetable garden, the chances are that your soil is in pretty good shape for growing marijuana. However, vegetable gardens may be a little acidic, particularly east of the 100th meridian. The soil should be prepared in much the same way that it is prepared for corn cultivation, with the addition of lime to raise the pH to near neutral.

Tilling

Gardens which may not have been planted recently (in the last three or four years) require more work. It is best to begin preparing the soil in the fall, before the first frost. This can be done using a spade or shovel. The ground is lifted from a depth of six or eight inches and turned over so that the top level, with its grass and weeds, becomes the bottom layer. Large clumps are broken up with a blade or hoe. Larger areas can be turned with a power hoer or rototiller. Conditioners, such as fresh leaves, composts, mulching materials, pH adjusters, and slow-release fertilisers are added and worked into the soil, so that they begin to decompose during the winter. It is especially important to add these materials if the soil is packed, mucky, or clay-like. Soluble fertilisers should not be added in the fall, since they leach to the subsoil with heavy rains.

In the spring, as soon as the ground is workable, turn it once again. If the soil still feels packed, add more conditioners. If you are using manure or other organic materials, make sure that they are well decomposed and small clean and earthy. Fresh materials tie up the N in the soil while they cure, making this nutrient unavailable to the plants. Commercial fertilisers and readily soluble organics, such as blood meal and wood ash, are added at this time.
The ground can also be seeded with clover or other legumes. Legumes (alfalfa, clover, vetch, etc.) are plants which form little nodules along their roots. The nodules contain bacteria which live in a symbiotic relationship with the plant. As part of their life processes, these bacteria absorb gaseous nitrogen from the air and convert it into a chemical form the plant can use. During its life cycle, clover uses up most of the N, although some leaks into the surrounding soil. But when the plant, or any of its leaves, die, the contents become part of the soil. The process of growing a cover crop and turning it into the soil is sometimes called green manuring.

After the last threat of frost, at about the same time that corn is planted, the soil should be worked into rows or mounds, or be hoed. At this time, the seeds should be planted. If any concentrated fertiliser is added to the soil, it should be worked into the soil and should not come into direct contact with the seeds.

The actual amount of tilling that a given soil requires depends on soil condition. Sandy soils and light loams may need no turning, since they are already loose enough to permit the roots to penetrate. Turning may break up the soil structure, damaging its ecology. These soils are easily fertilised, by using soluble mixes or by the layering technique described below. Soils which are moderately sandy can be adjusted by "breaking" and levered or pushed, but the soil is not raised. This is done about every six inches, and can be accomplished quickly. Farmers can loosen sandy soil by disking at five or six inches.

Some gardeners mulch the soil with a layer of leaves or other materials to protect it from winter winds and weather. This helps keep the soil warm so that it can be worked earlier in the spring. In states that border west of the 100th meridian, this helps prevent soil loss due to erosion from dry winds. Soil often drains well in these areas, and the ecology of the soil is better served when it is left unturned. At season's end, marijuana's stem base and root system are left in the ground to help hold topsoil. The next year's crop is planted a cover crop, such as clover, or alfalfa, which holds the soil and also enriches the nitrogen supply.

Layering

Layering is another method of cultivation. The theory behind this program is that in nature the soil is rarely turned, but builds up, as layer after layer of compostable material falls to the ground. This material, which contains many nutrients, gradually breaks down, creating a rich humus layer over a period of years.

The layering method speeds up the natural process. Since gardens are more intensely cultivated than wild fields, new material is required to replenish the soil nutrients. Gardeners like Ruth Stout "sheet compost," that is, they lay down layers of uncomposted material and let it decompose at the same time that it serves as a mulch. But most gardeners prefer to use material which is already composted. The compost shrinks and builds the topsoil layer about an inch for every six inches of compost. After several years, the soil level will be raised considerably, and the top layers will be an extremely rich, porous medium which never needs turning. In order to prevent a spillover of the soil, gardeners usually construct simple beds (using
boards) to contain the garden areas.

Layering is most successfully used on porous soils, especially sands, which contain little organic matter. It can also be used with clay soils. However, experienced growers say that clays should be turned several times before the technique is used, or the first couple of harvests will be small.

Planting a cover crop such as clover will give the soil structure. As more compost is added, the clover is covered and the new seed planted. The clover, with its N-fixing properties, remains a permanent cover crop. When marijuana seeds are to be planted, a planting row is easily tilled with a hoe. The clover protects the soil from sun-baking and its resulting water loss, and makes it harder for weed seeds to get started.

Tilling and layering are basic methods which are used with many variations. In some ways, there almost seem to be as many gardening techniques as there are gardeners. For instance, one gardener bought three cubic yards of topsoil and a cubic yard of composted steer manure. He mixed the material and filled raised beds with it to a depth of 18 inches, and had an instant high-power garden. Another grower made compost piles in his raised troughs during the winter. By planting time, the compost was complete and filled with earthworms. The beds became warmer earlier, and he could plant sooner.

A midwestern gardener used marijuana as a companion crop in much the same way Indians used corn. In between the marijuana, she planted beans and squash. She didn't get many stringbeans and only a few squash. But she believes that the beans gave the plants extra N, especially during the first six weeks, and the broad squash leaves protected the soil from the hot August sun.

A gardener in Georgia had such a sticky clay soil that a shovel once got stuck in it. He dug holes two feet deep and two feet wide with a power auger and filled them with a fertile mix of two parts sand, one part clay, three parts topsoil, and one part chicken manure. He claimed that his plants grew six feet in 10 weeks. Filling holes with a rich soil mixture is popular with guerilla farmers, who often must plant in poor native soils.

Mulching

Mulching is a labor-saving technique that many gardeners and farmers use for a multitude of reasons. A mulch placed on the ground before fall frosts helps the soil retain heat and protects it from winds and freezing temperatures. In the spring the mulched soil becomes warmer earlier in the season, and can be planted several weeks sooner than usual. A mulch cover keeps the seedlings' roots warm and eliminates a lot of weeding, since most weed seedlings cannot pierce the cover.

During the summer, mulches keep the ground cooler and more moist by absorbing and reflecting light and reducing surface evaporation. These are important points for farmers in dry areas. The water savings can be 50 percent or more.

Any plant or animal material will do for mulch. Gardeners use hay or straw, leaves, composts, manures, sawdust, bark, or plant clippings in two-
six-inch layers. A barber in Palo Alto uses hair. Baled hay is inexpensive and easy to use as a mulch. Round hay bales unroll in a long sheet that is easy to spread over the ground, and square bales can be pulled apart into tile-like squares.

Mulches create an ideal environment for earthworms and microorganisms which condition and enrich the soil. These organisms require a relatively cool, moist, dark environment. The mulch develops a dry outer crust which reflects light, keeping the underlayers cool and moist. Materials such as leaves, bark, and sawdust decay slowly because they do not contain enough nitrogen to maintain dense populations of decomposing microorganisms. Manures and composts contain more nitrogen and decay more quickly.

With few exceptions, mulches can be applied practically any time of the year, but the best time is probably in the fall, after the crop is harvested and before the ground has frozen. Leaves, plant clippings, and straw are applied in a thick layer from six to ten inches deep. Hay is layered two to six inches deep. Denser substances, such as manures and composts, should be mixed with straw and leaves to aid decomposition. This mixture is spread in an even layer, about two to four inches deep, over the entire surface of the garden. If winds pose a problem by blowing the mulch away, you can cover it with newspapers or sheets of plastic held down with rocks. If your area is dry, give the mulch a good soaking once before frosts.

By the spring, much of the material will seem to have disappeared. But underneath the top layer, you will find a soft-textured, earthy-smelling humus, teeming with worms, insects and other small animals. This is a sign of a healthy ecosystem and a fertile soil.

Some people apply mulch in the spring, placing it between rows as they sow the seeds. The mulch keeps weeds from competing with the seedlings, absorbs the sun's warmth, and releases nutrients to the soil.

In cold areas, such as Montana, New England, and Alaska, growers place black plastic sheets over the soil. These absorb the sun's heat, allowing the soil to be planted sooner. The seedlings develop quickly in the warmer soil. The plastic is removed once the seedlings are well-established.

Newspapers and white plastic can be used to decrease water loss during the summer. They also reflect light back to the plants.

One innovative grower from western Colorado placed a sheet of white plastic over her garden and cut out holes wherever she plant the seeds. Though it is quite dry where she lives, she didn't need to water the plants until late July. And she had no problems with any weeds.

Containers

Containers are another option open to grower. Plants can be grown full-size in containers which are at least five gallons (larger would be better). Fill them with high-grade topsoil, or a plating mixture as described in section 6. Planters are a convenient compromise where the soil is particularly poor or for the home gardener who does not wish to get into large-scale gardening. But remember, eight good-sized plants can yield over four pounds
of grass.

Plants in pots need to be watered frequently, but require much less total water than a garden. The gardener can also move the plants. Some gardeners use this technique to maximise the amount of sun the plants get during the day, or as the sun's position changes with the season. And growers can easily induce early flowering by moving the plants to a darkened area. Figure 61. Containers are convenient for outdoor gardens.

Almost any large container that can withstand the weight of moist soil and which has holes for drainage is suitable. Containers which held toxic chemicals, herbicides, insecticides, or other possibly harmful substances should be avoided.

We have seen all kinds of ingeniously made containers. Some growers use old bathtubs, and others use wooden packing crates or bushel baskets. A simple wood container 18 inches wide, eight feet long, and 18 inches deep was made by a New Jersey grower, who grew six plants in it. Trash cans, plastic containers, barrels, and even rubber tyres have been used. One grower grew plants in one-cubic-foot bags of soil by cutting a five-inch-diameter hole in the top and poling holes for drainage. To assure drainage, growers sometimes fill the bottom of each container with a six-inch layer of stones or gravel; if you are planning to move such container, lightweight perlite would be more suitable.

13.8 Guerilla Farming

Guerilla growers often use the same techniques as home gardeners. But the soil that they start with is sometimes marginal, and the gardens are in remote, hard-to-get-to areas; so they modify the techniques to fit their needs. When it is impractical to carry bulky organic fertilisers to the growing site, guerilla farmers use highly concentrated commercial mixes. Compost and soil adjusters are gathered from the surrounding area, and the simplest, most light-weight tools are used. Some growers use horses or mules to carry equipment and material, and then use the animal to plough. The animals are quiet and, naturally, require no external power source. Experienced growers say that the animals can work as fast as or faster than a rototiller.

It is hard to generalise about details of guerilla farming, since much depends on the specific circumstances, which can vary greatly. For instance, a grower who plants along the fertile bank of a midwestern stream may not need to do more than pull out weeds and till the actual planting area. But a grower planting on a mountain slope may have to "build a soil," since soil and nutrients are washed from the slopes and down to the valleys by rainfall. For this reason, we will cover several situations separately: forest; washed-out steep areas; swamps and marshes; stream banks; grasslands and fields; and arid soils.

Forest Clearings

Clearings in forests have always been popular places to plant because they offer security from detection. They vary greatly in drainage qualities, fertility, and pH. The drainage qualities of forest soils depend on the
depth of the humus layer and the structure of the underlying subsoil. But most of the forest remaining in the U.S. is sloped, and water that is not absorbed by the soil runs off.

Soils are created in forests from the leaves, branches, animal droppings, etc., which accumulate on the forest floor. The first trees to grow are long-leaf pines, such as jack pines, which can grow in relatively infertile soils. Their roots penetrate deep into the subsoil to obtain some nutrients. Short-leaf pines, conifers, and firs appear as the humus accumulates, since they require a more fertile soil than long-leaf pines. Pine-forest soils vary in fertility from poor to fair, and are usually quite acidic. In the Northeast their pH may be as low as 3.5, but generally the pH ranges from 5.0 to 6.0. In order to support a high-energy, lime loving crop like marijuana, they require fertilisation and liming. Long-leaf pines sometimes grow in compacted clay soils, which also requires tilling.

As the soil evolves, deciduous trees (tree that drop their leaves each winter), such as oak and maple, may begin to grow. Deciduous forests, sometimes called broad-leaf or hardwood forests, have the best soils. These forest floors are covered with bushes, grasses, mosses, and other small plants. They have an adequate rainfall and a humus-rich soil, which is porous, holds water well, and can support a healthy marijuana crop, although additions of nitrogen fertilisers would probably spur growth. Hardwood forest soils have a pH range from 6.0 to 7.5. The soil in timbered forest land has a much smaller humus content, especially if it has been clearcut.

Mountain Soils and Washed-Out Steep Areas

Mountain slops characteristically have little soil matter; their surface is composed largely of rocks, gravel, and sand. For longterm use they could be terraced so the newly formed soil in not washed away, but most growers are interested in more immediate results. These "soils" do not provide much of an anchor for marijuana's taproot and do not permit a network of lateral roots to form. Many of these soils also suffer from a low water table, since they drain rapidly. But there may be some sand and a bit of organic matter built up along gullies or in depressions or other natural traps. Such soil has usually had most of its nutrients leached out, but may contain some phosphates and potassium and considerable amounts of trace elements. The easiest way to adjust these soils is to use a well-balanced, slow-release, concentrated fertiliser. Bloodmeal, with its high N, works well with these soils.

One grower in the badlands of North Dakota used a timed-release 32-9-26 fertiliser in his "rock garden." He spread it just below the surface at the beginning of the growing season. Every time that it rained, his plants received nutrient-rich water. Toward the middle of the season, he noticed the lower leaves begin to pale, so he fertilised them periodically with urea. Heavy rains leach soluble fertilisers away, and in rainy areas they need to be applied three to four times during growth.

Containers can also be used in this environment. Growers use plastic bags or folded milk cartons instead of backpacking with a column of containers. When they get to the site, they fill the bags with a mixture of sand, as much as they can find, and gravel. The greater the ratio of sand to gravel, the
longer the container will hold water.

One grower doublelayers heavy-duty polyethylene bags, and lines them with heavy-duty paper cement sacks or burlap bags. He fills the bag with gravel, then pours in sand and shakes it. He says that the mix is just about right when it looks like a can filled with gravel with sand in the spaces. He carries on a watering and feeding program much as he would for any hydroponic system.

Swamps, Marshes, or Bogs

These soils are very high in fibrous organic material, but are low in calcium and in available N, P, K, and Mg, which are leached from the soil or are insoluble because of the low soil pH. Since these soils are constantly wet, Cannabis roots cannot come in contact with air; as a result, the plant's growth is stunted, and the lower stem becomes susceptible to stem rot. These soils need to be adjusted to support a healthy crop of marijuana; they must be drained, fertilised, and limed. On a small scale, the easiest way to modify them is by constructing raised mounds, hills, or rows, at least one foot wide at the top and two feet high. The raised areas drain well, leaving relatively dry soil. Wood chips, chopped brush, sawdust, or perlite may be added to keep the mound light and the soil loose and aerated.

Wet soils are usually highly acid and should be limed. Once the lime interacts with the soil, nutrients which were locked up become available to the plants. Since these soils are rich in organic matter and have a high rate of microbial action after they are loosened and limes, they may need little fertilisation.

Grasslands and Fields

These soils are usually fairly fertile and can support a worthwhile crop with little effort. They are usually well-drained, although they may be a little too dry or too wet. (If they have unusually large numbers of earthworms, they are probably a little too wet.) Their pH is usually between 5.5 and 6.5, although it may range up to 7.0. These soils are usually loams, which need only tillling in a two-foot radius, three or four inches deep, around each plant. All weeds and grass should be pulled from the area. Some growers mulch the cultivated area with newspapers, leaves, or dead grass. A grower in the Midwest adds crushed eggshells and a commercial timed-release fertiliser when he plants. He feels that this "extra boost" makes the difference between an adequate crop and a bountiful crop. Other growers periodically fertilise with soluble mixes. Some of these soils have to be irrigates during the long summer droughts. If they aren't, the plants won't die, but they will not grow to full size.

Stream Banks and Canal Ditches

These are some of the most convenient areas for growers to plant, since they provide an ample supply of water, which may contain fertiliser runoff. Stream banks are an area that marijuana naturally colonises, and the planter usually needs only to cultivate the area to be sown, and cut surrounding bush so that the young plants can compete with established plants. It the surrounding vegetation looks pale and stunted rather than lush green and
vigorous, the soil should be fertilised. These soils are sometimes low in calcium, which dissolves readily in water. Lime should be added to correct for acidity.

Sometimes the ground is a little too wet early in the growing season, although it dries out later on. Planting on hills or mounds is often used to solve this problem.

Arid Areas

Soils which have a low water table and dry out by June or July need to be irrigated to grow marijuana successfully. When irrigation is not feasible, growers plant along drainage ditches, streams, and canals, or look for green spots which indicate springs or underground reservoirs. Other growers use containers to minimise water loss. One grower in Arizona dug holes two feet wide and three feet deep, and lined the sides with thin polyethylene. He said that when he watered during the summer drought, he did not lose much water to the surrounding soil.

Arid soils usually have little organic matter, and drain quickly with extensive runoff. Some of them have a subsurface layer of clay, and therefore hold water on the surface until it evaporates. In any case their texture can be improved greatly by working in organic matter. The soil should be loosened at least two feet down. This loosening allows the taproot to develop deeply so that it can reach underground water during the drought.

Arid soils more often drain well, are alkaline, and contain P, K, and trace elements, but are low in N. Fish meal, cottonseed meal, blood meal, or manure may be the only additive the soil needs.

Chapter 14
PLANTING AND TRANSPLANTING

After the soil is adjusted, you are ready to prepare it for planting the seed. Sowing is an important process, since the post-germination or seedling stage is the most critical for Cannabis. You can increase the seedlings' chance of survival by sowing the seeds properly.

14.2 When to Plant

Most hemp-growing manuals advise that the seeds should be planted about two weeks after the last threat of frost, which is the same time that corn is planted. As a rule of thumb, you need not plant until this time in areas that have a growing season of five months or more. These areas include most of the United States, except for Zone One (see Figure 62) and mountainous areas of the country.

Growers in northern areas report that plants have survived light evening frosts with little or no damage. We think of marijuana as a tropical plant, experiencing no chills in its native climes. But the mountainous areas of marijuana cultivation in Mexico and Colombia often have frosts during the growing season. One grower, describing spring (April) conditions in
Nebraska, reported "plants (from tropical seed) three and four inches tall were covered with snow in the evening. By midafternoon all the snow had melted, and those little sprouts were healthy as could be."

Early-season sprouts do face more risks than later-germinating plants do. A lingering freeze or chill can weaken or kill them. Sometimes seeds or seedlings get washed away by heavy rains or flooding, or become infected from wet soil. They are also prey to hungry herbivores, who savour the tender young shoots, especially in the early spring, before the native plants have sprouted. These predators include rabbits, groundhogs, rats, mice, and possibly squirrels and cats, as well as large animals, such as deer, cattle, and sheep. Birds frequently eat the seeds and young shoots, especially if the ground looks planted. Snails and insects, such as cutworms and leafhoppers, also eat seedlings. Don't let this impressive list of dangers dim your enthusiasm. Although these problems do occur, they can be controlled or prevented with a little but of planning (see section 16).

As you can see in the Spring Thaw map (Figure 62), the last date of expected frost varies from early February in parts of Florida, Louisiana, Texas, California, and Nevada to mid-June in the coldest regions of New England and the Midwest. Planting time varies locally, as well as regionally. Fields which receive direct sun warm faster than partially shaded ones. Fields covered with a layer of compost or fresh manure, or with black plastic sheets, retain more heat and are ready to plant sooner than other fields. Mountainous areas often vary considerably in planting time. Higher ground usually stays cold longer than low-lying areas. Since soil is dark, it heats quickly when exposed to sunlight. Soil is usually warmer in the late afternoon.

The time that the soil warms also depends on the weather. During severe winters, a deeper layer of soil becomes frozen than during mild winters; so it will take longer to thaw. Soil below this layer is insulated by the ice and remains unfrozen. Spring weather, rainfall, flooding, and cloud cover also affect the soil's temperature.

Actually, the only way to know whether or not a field is ready to plant is to feel it and look at it. Examine the soil in early morning. It should be easy to work, rather than hardened from ice. There should be no large frozen clods of soil or other organic matter. There should also be no fine crystalline ice particles which glimmer in sunlight.

For fall harvest, sow outdoors after March 21, the first day of spring and the turn of the Equinox, when there are equal lengths of sun-up and sun-down. There are an additional 20 to 30 minutes of light before dawn and after sunset, for a total of 13 hours of daylight. When plants are started earlier, they may flower prematurely because of the short days. The plants may also be subject to sex reversal, and more males may develop.

There is little advantage to starting Cannabis before April. Each plant has a certain genetically defined potential for growth and size. As long as the plants have enough time to grow and develop, usually five or six months, this potential is realised (some Colombian and Asian varieties may need longer to develop). Plants started before spring grow no larger in size than
plants started during April. The younger plants are virtually
distinguishable from the older ones by harvest, and plants which are
started earlier face more risks of detection and destruction. {Figure 63.
Average date of earliest expected fall frosts for the US. Information about
Australia can be found in an Atlas.}

However, if you are faced with a short growing season, you can get a head
start by germinating the seeds a week to six weeks before the local planting
time, and transplanting the seedlings outdoors at about the same time seeds
would be planted in your area. You can also hasten planting time by covering
the area to be sown or planted with a clear (or black) plastic sheet, which
will warm the ground by the greenhouse effect.

14.3 Preparing to Sow

Growers sue three basic techniques to sow marijuana: rows, hills, and
broadcast. Each method is suitable within a certain range of conditions and
has its own advantages and disadvantages.

Rows

Rows are convenient to use, especially for large areas. They are constructed
easily using a how, plough, or tiller.

Rows facilitate the care of gardens and fields by setting up an organised
space in which the plants and surrounding area can be reached easily by the
gardener. Weeding, watering, thinning, pruning, and harvesting can be
accomplished very quickly. Larger fields are planted in roes to accommodate
ploughs, planters, and cultivators. They are essential when fields are
flood-irrigated. Furthermore, they provide a way to use space in the most
efficient possible manner. But rows make detection easier, since they have
an orderliness that plants do not exhibit in nature.

On sloping and hilly ground rows are a major factor in soil conservation:
such soil is easily carried away in windstorms and in the runoff after rain.
For this reason, rows on hilly and sloping ground are contoured: curved to
run perpendicular to the slope.

Space rows two to six feet apart; plant seeds every four to eight inches
((In any description of planting which we give, we refer to 100 percent
viable seeds. In this case, for example, if seeds are tested (see section 3)
and have a viability of 50 percent, sow the seeds two to four inches apart.
If they have a viability of 33 percent, sow them one to two inches apart.))
(See Box H.)

To construct a row, break up any large clods on the surface of the soil. In
a garden-size area this is easily done by striking them with the tongs of a
rake. In larger areas a tiller or externally powered cultivator can be used.
Then level the soil.

If you need to irrigate or have problems with excessive moisture, use a hoe
to raise the soil in alternate rows of hills and trenches. Pat the crests of
the hills with the hoe or a shovel so that they are an inch or wider at the
top, and four to eight inches high than the trenches.
BOX H Plant Size and Spacing

Plants vary tremendously in size and branching habits because of many factors, including variety, soil fertility, length of growing season, amount of light received by the plant, water, spacing, and pruning. As a result, one can have no firm rule about how far apart plants should be spaced.

An individual full-grown plant may have a diameter at its base as wide as ten feet or as small as 18 inches. Most conical-shaped varieties (Colombian and Jamaican) grow between seven and 12 feet tall, and have a width between four and six feet. Mexican plants are somewhat taller and thinner, with a base diameter of three to five feet. Some exotic Indian, Central Asian, and Central African plants may have a diameter only one or two feet across. The descriptions are generalisations; there are many varieties within each country, and much variation within each variety.

Pruned plants have a much wider base than unpruned ones. Plants pruned at the fourth internode and again a month later sometimes grow twice as wide as an unpruned plant.

In order to catch as much sun as possible, rows should be orientated along a north-south axis, perpendicular to the course of the sun. The advantage of lush rows is more pronounced in southern than northern latitudes, but the solar-energy differential in north-south versus east-west rows is significant at all latitudes in the United States, and becomes more important on steep slops. Another factor is the orientation of the garden as a whole. Plants sown in a square plot whose sides point northeast and southeast get about 10 percent more light than ones in a plot whose sides point due north and due east.

Hills

Hills and mounds are especially convenient for small plots. Low hills are often camouflaged to look like natural or wild stands, and are very useful in areas in which the land is too wet in the spring, because the hills drain above the ground level. They are easily adapted to meet unusual requirements. For example, a grower in New Mexico planted a doughnut-shaped hill eight feet in diameter and two feet thick, leaving a centre hole four feet in diameter. He placed a portable plastic tub in the hole after punching pinholes around the edges. To water he just filled the tub. In the swampy Everglades, two industrious farmers constructed a giant hill-row three feet thick and three feet high. The hill had such a good drainage that it kept the plant roots well-drained even during the rainy season.

Hills are usually constructed between two and five feet in diameter. Small hills are usually planted with 15 to 20 seeds, and large ones may be sown with as many as a hundred. The hills are spaced three to 10 feet apart, so that each groups of plants gets a maximum amount of light. Hills can grow more than you would at first suspect. For instance, if you were to grow a hill three by three feet, you could harvest six to nine large plants. Their foliage would extend two and a half feet beyond the hill, for a total of about thirty square feet of foliage space.
Broadcast Seeding

Broadcast seeding is the fastest and easiest way to sow, but is not an efficient way to use seed. Seeds are simply tossed or shaken onto the prepared ground, at the rate of about forty per square foot, and are then usually pressed into the soil with a light roller or by foot. This method is most effective in moist soils. Many of the seeds never germinate or die immediately after germination. The faster growing ones naturally stunt the others by shading them. This method is often used by guerilla farmers who want the stands to look natural and who wish to plant large areas quickly. An experienced grower can sow several acres a day by hand using this method.

Seed Count

There are approximately 2,300 medium-sized seeds in an ounce, or about 85 per gram. An acre is about 43,000 sq. ft., or a square 208 feet on side. To plant an acre in rows two feet apart with a seed every four inches requires about 90,000 seeds or 39 ounces (1,100 grams, or two pounds, seven ounces). At this rate, a ten-by-ten plot requires about 2.5 grams of seed.

A typical hill field has four-foot-wide hills spaced about seven feet apart. A typical hill and surrounding area accounts for approximately 100 square feet. There are approximately 430 hills in an acre. If each of these is planted with 100 seeds, the field requires about 43,000 seeds, which weigh about 18 ounces.

Broadcasting requires a lot more seed. At the rate of 40 seeds per square foot, a grower uses about 2.3 ounces in a ten-by-ten plot. An acre requires about 47 pounds, or 21 kilograms of seed.

How to Plant

Finally, after the soil is adjusted, and the rows or hills are built, it is time to actually plant the seeds and watch your garden begin to grow. If you are growing with clover as a cover or companion plant, dig it up to a depth of four inches and chop up the soil. Water the soil to the point that it feels almost wet. Drill a hole with a seed drill, stick, or pencil, then drop one seed into the hole, cover it gently, and pat the soil down again. Marijuana seeds are large enough to handle individually; so each one can be planted separately.

How deep one digs the holes depends on the kind of soil in which one is planting. Light woody or organic soils are planted 1/2 to 3/4 inch deep, so that the stem is held firmly in an upright position. Sands and light loams are planted 1/2 inch deep. Heavy loams and clay are planted 1/4 to 1/2 inch deep, so that the sprout's energy is not expended before it breaks through the soil.

If you are broadcast seeding, you can increase the germination rate tremendously by screening a layer of soil over the seeds to help keep them moist. Seeds that dry out weaken or die.

In a garden that has been mulched, lift away the mulch cover at each place you plant, and sow the seed in the underlying soil.
In soft-textured soils, instead of digging or poking holes, press each seed to the desired depth, and cover or pat the soil smooth.

14.4 Germination

The seeds need constant moisture in order to germinate. Therefore, the ground should be well-watered. Keep the soil moist by watering it with a light spray whenever it begins to feel dry. This may mean watering the immediate area once a day. You can keep the soil moist and hasten germination by covering the planted area with transparent glass or plastic. Most of the seeds should sprout in a period ranging from three days to two weeks. This variation depends on variety, age and condition of seed, and soil temperature; the warmer the soil, the faster the rate of germination.

Once they have germinated, the seedlings should be kept moist until the roots grow deep enough to absorb an adequate supply of water from the subsoil. If the ground is still moist from spring rains, as it is in many of the eastern regions, you may not have to water at all. On the other hand, there are sections of the West which are completely dependent on irrigation.

When the seedlings are only an inch or two tall, you can protect them from heavy rains or frosts by using drinking glasses, jars, or paper or plastic cups. You can protect larger plants with containers from which the bottoms have been removed. Transparent containers warm the soil by the greenhouse effect, capturing light and turning it into heat. In warm weather, use white or translucent containers, which prevent burn by reflecting some light and diffusing the rest. Containers also keep the soil moist, serve as plant markers, and protect the plants from some enemies. A grower in Berkeley, California, used cracked fish tanks to protect plants in the early spring. A guerrilla farmer in the Poconos puts up four posts, one at each end of a row. She uses them as a frame for clear polyethylene covering, creating a small greenhouse.

Growers in Zone Five sometimes harvest a spring crop by transplanting indoor-grown, two-month-old plants outdoors right after the last frost date. The naturally short days and long nights trigger the plants into flowering. (See Transplanting below, and the discussion of the photoperiod in section 3.)

If started after May 15, marijuana may not have time to reach its full size or flower. This problem mainly affects growers in Zone One and in mountainous areas. But even if the plants do not grow to full size or flower, you can still harvest a potent crop of preflowering tops, which may be almost as potent as ripe buds. The harvest is not as large as a crop of buds, but it is more than worth the effort.

14.5 Transplanting

Seedlings and young plants are transplanted after the last threat of frost. If the growing season in your area is less than five months, you may want to start the plants indoors, or in cold frames, transplanting when the weather permits. A 10-by-four foot cold frame can easily hold 60 two-month-old plants. The cold frame can be constructed with two-by-two's or branches
gathered at the site. Cover the frame with a double layer of six- or eight-mil polyethylene plastic or similar material. Attach the plastic to the frame with tacks or staple-gun tacks. If the area is unprotected from the elements, slant the roof so that rain will run off. If the area is windy, place rocks or branches along the frame to add weight. Orient the cold frame to face the south.

In areas with a growing season of six months or more, plants will not necessarily get larger if they are started earlier than normal. Plants started at normal planting time catch up to the older plants by season's end. It serves no purpose to start plants before about March 21, the spring equinox.

Where there is no threat of frost (in Hawaii, southern Florida, and parts of Texas, Louisiana, and California), growers can raise a winter crop. Grow the plants for two or three months under artificial light. Plant get off to a faster start under artificial lights than natural light during the winter months. Move or transplant them before the beginning of March. Most strains will flower because of the short days (less than 12 hours of light) and fill out to well formed plants by the end of May when they are ripe.

For the normal summer crop, seedlings should be transplanted after the last threat of frost. The best time to transplant is on a rainy or cloudy day, which allows the plants to adjust to the new environment without the strain of intense sunlight. Plants grown in a cold frame or sunny window adjust more easily than plants grown under fluorescent lights. Plants grown under artificial light usually show evidence of shock when they are moved to sunlight. Near sea level they may lose some of their green colour and appear pale or yellowed. At high altitudes, such as mile-high Denver, the leaves may actually burn, turn brown, and fall. Healthy plants usually recover quickly by adjusting the new growth to the changed conditions. However, plant can be conditioned to the new environment by being placed in a partially sunny area, preferably where they are shaded during the middle of the day and receive either morning or late-afternoon sunlight. The plants need about a week to adjust.

Seedlings grown in planting pellets for up to 10 days after germination can be placed directly in the soil. Peat pots should be scored with a knife so that the lateral roots can penetrate the pot more easily. Seedlings started in milk cartons or flower pots should be removed from the container so that the roots are disturbed as little as possible. Plan on using a pot size which is root-bound by the time that you transplant. (For the relationship between pot size and number of weeks, see Table 17.) To transplant, water the area to be transplanted and the plant. Then dig a hole a bit larger than the pot and loosen the surrounding and underlying soil. Place the plant in the hole, and pack the soil so that the stem base is at the same depth that it was growing at before. Firm the soil and water the area.

In areas where ripoffs are expected, such as parts of Hawaii and California, some guerrilla farmers transplant individual plants (one to each site) to sites which are widely spaced over the countryside. In this way they may lose some, but at least not all, of their plants to ripoffs.

Each plant (one to three months old) is transplanted to a cone-shaped hole,
two to three feet deep by two feet across the top. This strategy is well-suited to areas with poor soil. Since much of the hole is taken up by rootbound soil, it is easy to gather enough topsoil and sand to fill the hole. The gathered soil should also be mixed with organic or slow-release fertilisers which provide ample N and P.

Chapter 15
CARING FOR THE GROWING PLANTS

15.2 Weeding

Marijuana is a fast-growing annual whose survival depends on its ability to compete with other fast-growing weeds. At the end of each season, plants growing in a wild stand may cover the ground with thousands of seeds per square foot. Many of these are relocated by wind, runoff, and birds, and some are destroyed or die. Other never receive the conditions they need to germinate; and of those that do germinate, many die as seedling. The remaining plants compete with each other and with other weeds for the available light, nutrients, and water. Even so, wild stands may be as dense as forty plants per square foot. In order to survive the competition, Cannabis expends a great deal of its energy during the first two month growing a main shoot which is taller than the surrounding vegetation. Then it develops lateral branches which shades the shorter plants. With their source of energy - light - cut off, the shaded plants stop growing and often die.

When you cultivate - that is, eliminate weeds - the rate of germination and survival of your plants is increased enormously. Growers using clover, sheet composting, or mulch as ground cover can expect very little interference from weeds during seedling development. But plots of fertile, aerated, and cleared soil are open to colonisation by a wide range of plants; so you may have to weed several times before the marijuana's dominance is assured.

When you weed, make sure not to pull out any weed seedlings which may have roots in the same area as the Cannabis roots. Instead, cut the weeds slightly below the surface with a clipper, scissors, or your fingernails. Weeds more than six inches away can be safely pulled. Leave them to dry right on the soil. As they dry and decay, they return the soil's nutrient to it.

Growers plagued with weeds can cover the soil with mulch, paper, or polyethylene sheets. One grower found that two computer sheets fit exactly between the rows. Another used torn drapes as a temporary ground cover.

Once Cannabis has established dominance over an area, the other weeds are not able to interfere with its growth. But if there is wide spacing between the plants, the weeds may have open space and start to grow rapidly. Keep these weeds clipped short if water or nutrients are scarce.

15.3 Watering

Marijuana requires an ample supply of water to live and grow. The actual
quantities that it needs depend on the plant's size, the gardening techniques, type of soil, temperature, wind, humidity, and intensity of light. A vigorous plant may transpire several gallons of water a day during the hot summer months. If it receives less water than it needs, it stops growing, wilts, and then dries out. {Figure 66 Areas with less than 30 inches of rain usually require some irrigation.}

Seedlings

Marijuana germinates best in a moist soil. Within a week, it grows a taproot three or four inches long. By the end of the first month, the root system may stretch over an area a foot and a half in diameter and go more than one foot down. Until then, the soil should not be allowed to dry out. Plants which have germinated during warm, sunny weather may need to be watered until the roots have grown deep enough to reach sub-soil moisture. When the soil three inches below the surface feels dry, seedlings should be watered, preferably by using a watering can or the spray setting on a hose. Gently water the soil, making sure not to disturb the seedlings or the soil surrounding. The soil should be thoroughly saturated so the moisture percolates down, encouraging the roots to grow deep. If the surface is only lightly watered, the roots may grow near the surface, leading to water problems as the soil gets drier during the summer.

After the first month, Cannabis does best when the soil goes through alternating moist and dry periods. This alternation allows the lateral roots to come into contact with air. By the end of the growing season, the root system may penetrate the soil to a depth of six feet or more. As long as they are not blocked by solid rock or dense clay, the roots grow by following a trail of moisture. If the trail leads deep, the roots follow. The deeper layers of soil are less likely to dry out during hot, dry weather.

Older Plants

As a rule of thumb, Cannabis over a month old should be watered when the soil about six inches deep feels dry. But this rule provides only a rough indication that the plants need water, because there may be deeper sources of water that are not apparent. The most obvious indication of a problem is wilting. A more subtle one is slow growth during the (ordinarily fast-growing) vegetative stage.

Since you want to wet the lower layers, you should thoroughly saturate the soil. If the soil is completely saturated, it should hold water for a minimum of a week. Usually only two or three waterings a month are required by a garden that is completely dependent on irrigation.

The most efficient way to water is to let the water slowly seep into the soil, so that all the organic particles which hold the water are saturated. If the soil is very dry, and the water beads or runs off and is not absorbed, add household laundry detergent at the rate of one or two grams per gallon of water. It acts as a wetting agent, which breaks the surface tension. Once the soil is treated with a wetting agent, it usually absorbs water throughout the growing season.
In drier areas where corn, cotton, and other deep-rooted crops are irrigated, marijuana also requires an additional source of water. But in areas where there are patches of wild hemp or where deep-rooted crops grow by using available ground water, marijuana does not need to be watered, although additional water may increase its growth.

Box I
Water in General

Deep soil layers retain water much longer than the top layers. To encourage the development of a deep root system, saturate the ground when you water. The roots follow the moisture trail.

Water conditions also vary from field to field. For instance, many mid-western farmers plant along the banks of meandering streams. Even in dry areas, these plants have a natural source of water. Mountainous areas are usually well-drained and dry out before valleys do. Low-lying fields remain moist later, and are saturated by runoff from higher ground. In browned areas, farmers look for green spots which indicate underground streams, springs or runoff. Planters look for deserted wells or active watermains with leaks. Fields high in organic matter retain moisture longer than other fields, and mulching may cut water evaporation by 50 percent.

Watering Techniques

Gardeners may supply water by using a bucket, can, or water-hose. But growers with larger plots often rely on waterpumps to deliver river, lake, or well water to their gardens. Irrigation canals, drainage pipes and ditches, and water mains are sometimes convenient sources of water. The two most efficient methods of watering are the drip hose, which seeps water around the plant, and hand watering into an enclosed area around the plant's stem.

There are several kinds of drip hoses. Some have perforations every three to six inches along their length. These are useful when marijuana is planted in rows or large hills. Another kind is actually a kit, consisting of a main feeder hose and several side hoses two to four feet long. Each side hose has a metal bulb at the end which can be adjusted to regulate water flow. The bulb lies near the plant stem. A drip bottle was invented by a grower in the dry area of Nebraska who was only growing a few plants. He punched pinholes in the bottom of several one-gallon milk jugs and placed a jug near each plant. The jugs slowly watered the garden. Every few days, he refilled the jugs from a nearby irrigation ditch. As the plants grew larger, he placed more jugs around them. The drip method moistens the soil slowly, but does not flood it; so the soil and its nutrients are not washed away. Since this method allows you to decide exactly where the water goes you need not waste any on non-productive land.

Growers sometimes use elaborate setups, such as battery-electric, hand- or foot-powered, ram- or windmill-driven pumps. Foot-powered pumps are probably the most convenient for small plots. They are extremely lightweight (just a little heavier than a bicycle), inexpensive, easy to construct and disassemble, and virtually silent. Since you have much more power in your legs than in your arms, foot-powered pumps can do more work, and do it
faster, than hand-powered pumps.

Electric pumps are relatively quiet and pump and enormous amount for their small size. But they require a source of electricity. They cannot be used unless there is a power line available, although there are car alternators available which produce 110-volt current.

Gasoline pumps and electric generators are heavy and noisy. Even with a muffler, they can be heard for miles in some country areas. They require a source of fuel, and often an elaborate setup, including rigid feed tubing, fuel tank, and platform. But once they are in place, the can deliver a tremendous amount of water. They are usually used by farmers growing large plots. Sometimes growers dig a hole in which they store and run the equipment. This setup helps muffle the sound and keeps the machinery in good working order.

Ram- and windmill-powered pumps use running-water and wind energy, respectively. They come in many sizes and are often used to fill water tanks for later use. They can also be used to generate electricity to run electric pumps. They require no fuel, are usually silent, and can be constructed inexpensively.

But some farmers have devised other methods for getting water to their plants.

A farmer growing near Tucson, Arizona, trucks water to her plants twice a week using a pickup truck and four 55-gallon barrels. She attaches a garden hose to her tanks, and siphons the water to her garden, 200 feet downhill.

Two foresighted farmers in Texas carried twenty 30-gallon plastic trash cans and lids to their garden. During the spring rains, they filled the containers from nearby gullies. By the end of the rainy season, the had collected enough water to carry them through the summer drought.

A homesteader in Oregon's dry eastern section dammed a gully by using and earth stabiliser, plastic, wood and cement, and pipe. During the winter his private reservoir filled.

Farmers near Atlanta tapped into a city water main. The pressure from the water main allowed them to pipe water uphill.

15.4 Thinning

If the soil is kept moist during germination, most of the viable seeds that you planted will germinate and the seedlings will soon start to crowd each other. This happens frequently when the plants grow on their own. Then they grow into a dense hedge-like mass dominated by a few plant. The dominant plants typically have long internodes and a long sturdy stem with little branching. The shorter, bushier plants are shaded by the taller ones and become stunted from the lack of light. By thinning, you give the plants that are left enough room to grow to their full potential, and you choose the ones that you think will grow to be the best for smoking. Leave the plants that have dense foliage, are branching, and, later in the season, the ones that are the most potent.
Thin the plants as soon as they begin to touch or crowd each other. This should be repeated as often as necessary. Seeds sown six inches apart in rows two feet wide require thinning several times during the season. But guerilla farmers sometimes let the plants compete so that the garden looks more like a wild stand.

There are two methods used to thin: cutting the stem at the base so that the entire plant is destroyed, and cutting just the tops so that the plant's growth is thwarted, and the uncut plants shade it. The cut plants remain relatively inactive, and do not use much water or nutrients, but they do shade the ground and use otherwise wasted space.

15.5 Staking

Outdoor-grown plants rarely need staking. When the stem bends from the wind or rain, tiny tears in the structure develop. These are quickly mended by the plant: it grows new cells which increase the girth of the stem and make it stronger. But plants which are suffering from nutrient deficiencies or are top-heavy because of competition may need to be staked. Heavy rain sometimes cause the plants to fall over, especially if they have shallow root systems which cannot hold the added weight.

To stake, drive a sturdy rod six inches from the stem and deep enough into the ground to be able to give the plant support. Then tie the stem to the stake with wirer twists or string.

If the stem or the branch is cracked, pinched, or bent at the base, its position should be corrected and held firmly with a splint. The splint can be held with masking tape. In a few days the plant grows tissue to support the damaged area.

15.6 Pruning

Growers prune (clip or top) their plants to increase productivity, prevent detection, or to harvest early smoke. In the near future, new laws will decriminalise or legalise marijuana cultivation. These laws will probably limit legal cultivation either by the total gardening area or by the number of plants an individual or group may cultivate. Gardeners limited by space will maximise yield by cultivating a dense stand of tall, unclipped marijuana. Growers permitted to grow only a few plants will grow the largest, most productive plants possible. This is done by giving the plants the best possible growing conditions and a lot of space between plants to maximise light and minimise competition for water and nutrients.

Unpruned marijuana develops in one of three classic shapes, depending on variety. Many Mexican and Thai varieties develop into a tall, narrow bush no wider then three feet and shaped like a poplar tree. Colombian, Cambodian, Indian, and some south Mexican and Vietnamese varieties are Christmas-tree shaped. Some Moroccan and Afghani varieties have complex branching and naturally grow into small, dense bushes, about five feet tall. Marijuana usually grows to its full height by early September. Most of the marijuana plants you are likely to cultivate will grow to between eight and fifteen feet tall. Some Hawaiian and Thai varieties average between twelve and
Increasing Yield

When marijuana is clipped to increase the number of growing shoots, the total yield at season's end may not be increased. Provided that soil and water are not limiting to growth, each plant can reach a maximum size when given enough room. The more surface area the plant presents to light, the closer it will get to its maximum potential. Where the plants are grown with much space between them, clipped plants can yield more than unclipped plants, especially if the branches are spread out to maximise the light on the plant. When the plants are grown close together, the taller a plant is, the more sunlight it will receive, and hence the larger the possible yield.

Some growers prefer to harvest a top stem that is thick with buds (colas). The largest colas form on the main growing shoot of unclipped plants. When the growing shoot is clipped from a plant, the new shoots and leaves grow slower and smaller than the main shoot of an unpruned plant because the capacity for growth is spread out over several shoots. When a plant is clipped early in the season, most of the difference in lead and bud size is made up by harvest time.

Marijuana can be pruned at any time during the seedling or vegetative growth stage, but you should prune plants when they are young if you plan on harvesting growing shoots during the season. A seedling clipped anywhere from the fourth to sixth node will usually form at least six strong growing shoots that can be harvested during the third or fourth month. If these shoots are cut again while the plant is still young, marijuana often develops into a small, very compact, hedge-like bush.

Yield can be increased by spreading the plant's branches so that more light reaches the inner growth. Cannabis stems are bent most easily when they are still green and fleshy, nearer to the new growth, but the whole plant can be bent to form a gentle arch with the top of the main stem in a horizontal position. Within a few days the side branches along the top will begin to grow vertically, competing with the main stem. They will soon develop their own horizontal side branches. To bend a plant, tie the main stem loosely with a cloth or heavy string. Tie the other end of string to a heavy weight or anchor on the ground. Don't put too much pressure on the stem as this tears some of the roots and weakens the plant. You can bend the plant a little each day until the plant is in the desired position.

You may also increase yield by bending only the growing tip. This encourage the side branches to develop sooner than they naturally would. Only the flexible part (about the last foot) is bent. To bend the top, use stiff wire or wire twists used for plastic bags and wrapping vegetables. Fasten the other end of the wire lower in the stem to hold the tip in position. {See Figure 49.}

A common mistake that cultivators make is pulling off the large leaves on the main stem (sun or fan leaves), when the plants are young. These leaves are removed by cultivators who believe that their removal will cause the undeveloped side shoots to grow. But fan leaves are net producers of sugar and energy, which are used by the side shoots to begin growth. Rather than
encouraging new growth, the removal of fan leaves slows growth. The plant will also be more susceptible to attacks from pests and predators.

When the plant is several weeks old and growing well, the difference between plants with their leaves removed and those left intact may not be large. The biggest difference can be seen when leaves are removed from branches just prior to, or during, flowering. The buds that form from leaf axils with leaves removed are noticeably smaller than those where the leaves have been left on the branch.

Detection

Cannabis can be detected from both the ground and the air. From the ground, marijuana is revealed by its familiar shape, unmistakable leaves, and odour. Tall plants are usually more conspicuous than shorter ones. From the air, stands may have a different colour than the surrounding vegetation, especially where natural vegetation is not as lush as marijuana. Individual plants usually have a circular profile when viewed from above; this can be altered by bending or pruning the plant. Varieties which are naturally tall-growing may need to be cut several times during the season to keep them hidden.

Plants are sometimes cut back severely, to much as half their height when they get too tall, but this may damage the plant. A less drastic topping technique is to remove the top foot of growth. Whenever new shoots get too tall they are clipped. But the plants should not be severely pruned late in the season when the growth rate has slowed (preflowering), because there will be fewer branches left on which buds can develop.

If you are trying to conceal plants behind a fence or wall, start bending or pruning the plants early, at about one month of age. By starting early and continuing to prune during the vegetative growth stage, you will train the plant to branch and fill up the area. If you wait until the plants are already tall, you may have to cut the plants back severely or clip shoots continuously.

15.7 Gardening Tips

Transplant Older Plants

A friend of ours was warned that his garden had been spotted by local authorities. Rather than cut down his four-month-old plants, he decided to transplant them. He dug the plants out, leaving a ball of soil about two feet square around the roots of each one. He wrapped each soil ball tightly in a plastic bag to transport it, and placed the plants in newly dug holes in a different spot. He kept the plants well-watered. After a few days, they recovered from transplant shock and started to grow once again. Transplanting large plants is not easy to do, but it could save a crop. The marijuana root system is not very extensive when the plants are in fertile soil with plenty of water; the tap root may only be six inches long on a ten-foot plant.

Wind Protection
Hemp Cannabis planted closely together has been used by farmers to form a windbreak to protect other crops. If you are growing in an especially windy area such as the Midwest, you may wish to plant a perimeter if tightly spaced Cannabis to protect your garden. Construct a rope and stick fence against the windbreak to hold the plants upright and prevent them from falling into the central garden. Simply keeping the plants clipped short is a simpler approach.

Inducing Flowering

Growers may wish to induce their plants to flower early, especially in the North, where the growing season is short. Plants in containers can be moved to a dark area for 12 hours of darkness or more per day. Black sheets of polyethylene film, dark plastic bags, and large appliance cartons can be used to provide periods of uninterrupted darkness. Use the dark treatment nightly until the plants are flowering (usually after one to two weeks of long-night treatments).

Winter and Spring Crops

In southern parts of the U.S., Hawaii and parts of California, you can grow more than one crop in a season. Greenhouses that stay above freezing can also be used for year-round growing. Plants started during the winter or early spring get naturally long nights and flower early, when they are relatively small, usually no more than four feet tall. Flowering can be postponed by breaking the long nights with short periods of light. This extends the vegetative growth period, yielding older, larger plants at flowering. Start breaking the night period with artificial light when the plant is about a month old. Continue the treatment until you want the plants to flowers. (See the discussion of photoperiod in section 3.)

Spring crops can be trimmed of buds when mature. The plant is left in the ground, and as the daylength increases, the plant will renew vegetative growth and flower once more in the fall. Plants can also be started in November or December indoors under lights and planted outdoors in February for harvest in April or May. The plants will grow faster under lights than they would outdoors under the weak winter sun. When they are placed outdoors, the long nights will induce flowering. By April the sunlight gets much stronger, perfect for flower development. Plants placed outdoors in February adjust easily to sunlight. Even so, they should be conditioned so that they do not suffer severe burn, as described in the Transplanting section in section 14.

Rejuvenation

Plants grown in areas where the weather is mild can survive winter when there are no heavy freezes. During the winter the plants will grow very slowly, but as soon as the weather warms, and the light gets more intense, the plants respond. This technique can also be used to obtain a second growth crop during Indian summers. The second growth is not as vigorous as the original, but is does increase the total harvest.

To prepare plants for rejuvenation, leave three or four pairs of lowers branches with leaves on the plant when you harvest. The leaves need not be
large, but they must be green. Water and fertilise the plants. Within a few
days the plants will show new growth.

The authors observed an outdoor container composed entirely of plants which
survived a mild San Francisco Bay Area winter. These developed healthy
second growth the following summer and flowered again in the fall. Some
growers in Hawaii claim that their plants are three years old and that the
plants have yielded as many as six crops of buds. Perennial marijuana plants
also grow in Jamaica and Thailand.

Water Deprivation

Many cultivators begin to limit the amount of water their plants receive as
soon as the flowers start to appear. Other growers give their plants as
little water as possible after the middle of the plant's life. The plants
are given small amounts of water only when they begin to wilt. (See section
9 on the reasons for stressing the plants.)

Under water stress many of the leaves may die and fall from the plant.
Sometimes the plants appear "burned," and turn brown or gold. At harvest,
water-stressed plants may only have buds left on them and these may have the
colour, resin, and harshness typical of Colombian grass. These plants yield
less grass at season's end. Not only are they smaller overall, but many of
the leaves will have fallen away.

Water stress can be difficult to control in areas with heavy summer rain.
Water-stressed plants often make up for their smaller size by a raped burst
of growth after a heavy rain. One method of control is to cover the ground
with plastic sheets when it rains so that most of the water runs off.

Tacks and Nails

Some growers hammer nails or tacks into the stems of plants several weeks
before harvest. Many growers use long thick nails; others prefer to use
several half-inch-long tacks. The nails are usually placed at the base of
the stem. This is supposed to "increase potency." {Figure 72. Wilted plant.
Unless watered it will die.}

Stem Splitting

This is a popular way to stress used by cultivators in the United States.
The stem is split (not cut) at the base to from a space through the stem.
Growers place a rock, small piece of wood, an old Cannabis stem, or piece of
opium (in Africa) in the split. Sometimes the wound is bound with cloth or
plastic. We don't recommend this procedure, and advise you to be careful not
to kill the plants and ruin the harvest.

Varieties

Outdoor growers are well-advised to plant several varieties of marijuana,
because some varieties adapt to their new environment better than others.
Also, each variety (and to small extent, each plant) has its own bouquet. By
planting several varieties, cultivators assure themselves a varied selection
of smoking material.
In areas with short growing seasons, many tropical varieties do not have a chance to flower. But immature material from these varieties may be more potent than mature flowers of a plant grown from seed of lower-quality grass. For instance, compare a flowering Mexican with a Colombian that doesn't. The Colombian may be better because the difference in varieties is so great. On the other hand, the Mexican may be better because it is flowering and has reached its full potential.

Intercropping

It is well-known that certain plants may be antagonistic to other species of plants, and that there are also beneficial relationships between species. Cannabis is known not to grow well among spinach 222. Although tomatoes and tobacco have been recommended as crops to avoid when growing marijuana, because of pests and diseases that these plants may harbor 67, marijuana grows very well in healthy tomato patches. Growers have also commented on how well marijuana grows when planted with corn, sugarcane, and beets.

Chapter 16
INSECTS AND OTHER PESTS

Outdoors, where it functions as part of an ecological system, marijuana is less susceptible to insect attacks than it is indoors. In an outdoor environment, insects are subject to the vagaries of the weather, food supply, and predators. And marijuana grows so fast that insects usually do little damage. Plants, plant eaters, and predators usually maintain an equilibrium which minimises damage. But this balance is disturbed by tilling and gardening, and may take a while to re-establish itself.

The soil surrounding your plants may be teeming with insects, and it would be unnatural not to see some on your plants. Most insects do not eat marijuana. The few that do are the food which helps to keep a small population of their predators alive. Insects in the garden need to be controlled only when there is a real threat of damage.

Marijuana is most vulnerable in its early stages. After the plant increases production of the cannabinoids and resins at the eighth or ninth week, most insects are repelled. When the plants are small, an occasional munch affects a relatively larger part of the plant. That same bite affects a relatively smaller part when the plant is larger.

The insects that infect marijuana indoors - aphids, mealy bugs, mites, and whiteflies - do best in humid conditions with constantly warm temperatures. Outdoors they rarely inflict much damage on marijuana. The pests that are most likely to damage marijuana are leafhoppers, treehoppers, cucumber beetles, thrips, flea beetles, several kinds of caterpillars, snails, and slugs. The younger the plants are, the more susceptible they are to attack. Your prime goal is to protect the plants during the first two vulnerable months. You need to keep the pest population low, so that the damage is relatively light. The pests don't have to be eliminated, only kept under control.
There are many ways to keep pests from damaging your crops. These fall into one or more of several categories: biological control; capture traps and barriers; home remedies; and chemical insecticides.

16.2 Biological Control

The theory behind biological controls is that methods for control of pests can be found within nature. These methods are safer to humans and less damaging to the environment than commercial insecticides. Gardeners have many forms of biological control at their disposal, including companion planting, use of predators, and sprays made from plant extracts or ground-up insects.

Companion Planting

Some plants, including marijuana in its later stages, produce resins or essences which repel or kill plant pests. Some of them are general repellents that affect a broad range of plant pests; others affect specific species. Generally, the heavily scented plants, such as spices, mints, and other herbs, are most likely to have these qualities.

Some of the more familiar plants used to protect gardens are the Alliums, or onion family, with garlic, chives, green onions, and other oniony-type plants as members. This group repels a broad range of plant pests such as aphids, spider mites, flea beetles, potato bugs, bean beetles, and many other insects, as well as rabbits and some deer. They are easily planted around the garden or between the marijuana plants. Just plant onion bulbs or the cloves from a garlic bulb so that the top of the bulb is about one inch deep. One garlic bulb yields quite a few cloves; so a large garden requires only a few bulbs.

Geraniums are reputed to repel leafhoppers and many kinds of beetles. These plants prefer a dry soil, thrive in full light, and usually grow two feet tall. Geraniums should be interspersed with the marijuana, or potted geraniums can be set out if problems develop. Tansy (Tanaetum vulgare) is a tall, fragrant, woody perennial which grows five feet tall. It protects against cut-worms, beetles, cucumber beetles, and other eaters and borers.

Mints repel many insects and are sometimes used as mouse repellents. They are especially useful for the control of the flea beetle. They thrive in semi-shaded areas with rich soil.

Marigolds can be planted to eliminate nematodes. They are fast-growing annual plants which flower profusely. They come in many varieties, ranging in height from six to 30 inches. They grow in a wide range of soils and do best in the sun. The scented varieties - usually nonhybrids - offer the most protection.

All companion plants must be planted close to the plants to be protected, since their repellent qualities spread only a short distance beyond their circumference. They are effective when they are planted before the damage is apparent, and offer long-term protection. They are used when a pest is expected. For instance, growers in the San Francisco Bay Area expect rose
leafhoppers to attack their plants. Since geraniums grow in the area as perennial plants, some growers plant them permanently in the garden. As the geraniums develop into small bushes, the hoppers leave, never to return.

Predators

Many of the insects in your garden are called beneficials, because they perform a useful service in the garden. Some of them eat decaying matter; others help in the pollination process; and some prey on insects which damage crops. Almost everyone is familiar with the ladybug, which eats aphids and insect eggs and has a voracious appetite. They are available commercially by the pint. The praying mantis eats slow-moving insects. When it first hatches, it starts out on aphids and mites. But as it grows larger, it eats bigger insects and worms. Mantis-egg cases are foam-like, straw-coloured masses which contain 100 to 300 eggs. These cases are sold commercially but can also be found in the late fall in bushy areas. Another insect which is sold commercially as a plant protector is the green or brown lacewing. It has golden eyes, looks fragile, and flies erratically. But in their larval state, lacewings eat thrips, mites, caterpillar eggs, scale, leafhopper nymphs, aphids, and mealybugs. The trichogramma wasp is an egg parasite which lays its eggs in the eggs of over 200 species of insects, including many moths and butterflies which hatch into worm pests. Cryptolaemus is used to destroy mealybugs. Adults are released when mealybugs appear in the spring. They seek out the mealybug colonies and lay their eggs. When the eggs hatch the larvae wander around the infested area and eat the young mealybugs.

The use of commercially bred or gathered predators is most feasible in large gardens or fields. The insects may not have much effect on small gardens, since they wander off to find food and may never return. Try to buy from manufacturers who intentionally do not feed their product before shipping. Hungry predators are more likely to stay and eat the pests.

Insects are just one group of predators. Birds such as purple martins, robins, blue jays, chickadees, and even starlings and English sparrows eat large quantities of insects and other small pests. They can be attracted to the garden by placing a feeder, bird houses, and water in the area. When plants get larger, some gardeners let chickens, ducks, or geese run through the garden. In a short time, they pick it clean of pests and weeds. Reptiles and amphibians, including frogs, toads, snakes, lizards, and turtles, all eat garden pests and should be encouraged to make a home in the garden.

Homemade Repellents and Insecticides

Another way to control garden pests is to make sprays from plants which repel insects by using a juicer or blender or by baking a tea. Ingredients can be found in most kitchens. Chile pepper, garlic, coffee, horseradish, radish, geranium, and tobacco are the usual mainstays of herbal sprays, although most strong-smelling herbs and spices have some repellent qualities. Many gardeners experiment to see what works in their garden. For instance, if an insect which bother marijuana stays clear of a nearby weed, a tea or blended spray made form that plant may control the pest. But try it on only one plant (or part of a plant) first, because the spray may also be harmful to the marijuana.
Garlic is probably the most popular ingredient for general-purpose sprays made from kitchen ingredients. A typical formula is to soak three ounces of chopped or minced garlic in a covered container of mineral oil for a day. Then, slowly add a pint of lukewarm water in which a quarter ounce of real soap (Ivory will do) has been dissolved. Stir and let stand several hours, than strain. Use as a concentrate, adding between 20 to 100 parts water to one part concentrate.

Other recipes call for boiling the garlic or for grinding or juicing it. Some brewers add other spices to the basic formula. One recipe calls for one clove garlic, three cayenne peppers, one onion, a quarts ounce of soap, and sufficient water to blend. Let it sit for three or four days before using, and use one part concentrate to 20 parts water. Homemade tobacco teas are sometimes used as insect sprays. Use one cigarette in a quart of water. Let it brew 24 hours before using.

Snails and slugs are attracted by yeast solutions, which are easily prepared from cooking yeast, sugar, and water. This is also why gardeners have success trapping these leaf munchers in bowls of stale beer. Place deep-sided containers at the soil level. The pests slide in and drown.

Gardeners should not overlook handpicking as a viable method of pest control. The foot or a quick thumb and forefinger can eliminate large numbers of pests and can keep a small garden pest-free. Collect the bugs and drop them in a tin can with some alcohol to kill them. Early morning is the best time to collect pests, since they are slower-moving until the sun warms them.

Snails, slugs, earwigs, and some other insects gather in cool, moist areas during the heat of the day. By providing just such a space in a garden, many of these pests can be located and destroyed. Place pieces of cardboard or boards around the garden; look under them each day.

Home Remedies

Gardeners and farmers have discovered and invented ingenious ways to control insects without harming the environment. Some of the more popular ones are listed here, but there are many more, each suited to a particular situation.

Soap and water is an effective control measure for mealybugs, mites, leafhoppers (nymph stage), leaf miners, and aphids. Simply wash the plants thoroughly with a solution of two tablespoons of soap dissolved in a gallon of water. Rinse the soap off thoroughly. (Some growers feel that the addition of kerosene or alcohol makes the solution more effective, but these can harm the plants and dissolve THC.) This treatment does not eliminate all of the pests, and may need to be repeated weekly, but it does keep them under control.

Sprays are sometimes made from healthy insects, which are caught, ground up, and then sprayed back onto the plants. When the pests come in contact with the spray, they become infected with the pathogen and get sick. This method is very effective, and is considered safe, but it is not easy to capture sick insects. A variation in this technique was described in the October 1976 Organic Gardening and Farming Magazine, in which a spray was made from
healthy insects. In a followup article in the May 1977 issue, the authors theorised that any population of insects contains pathogens. If enough insects are collected, some of them are sure to be sick, and they contain enough germs to spread the disease. To make an insect spray, capture about a hundred pests. (Make sure not to include any beneficial insects or the spray may also work against them.) Using a blender, mix them with a cup of spring water, strain, and dilute with enough water to spray your garden.

Whenever making or storing sprays, use a glass container. Metal or plastic ones may react with the chemicals that the liquids contain.

Another home remedy for the control of mites and aphids is a mixture consisting of a half cup of milk in four cups of wheat flour, added to five gallons of water. When it is sprayed on the undersides of the leaves, it suffocates the insects and then flakes off as it dries.

Some growers use mulches to control insects. Cedar chips repel beetles, moths, mites, and mealybugs. Aluminium foil is used for aphid and thrip control on small plants; the reflected light disorients them and they do not land on the plants. A sprinkling of cream of tartar eliminates ants, and boric acid kills roaches. Sulfur powders, available at nurseries, are used to control mites and fungus infections.

Organic Insecticides

Pyrethrum, rotenone, and ryania are effective insecticides which come as powders (dusts) or sprays. They are concentrated form of naturally occurring plant substances, and are considered harmless to warm-blooded animals when used as directed.

Ryania, which is found in the roots of a tropical shrub, is most effective against chewing insects, worms, and larvae, which it incapacitates, rather than kills.

Rotenone is a general-purpose insecticide with little residual effect; that is, it breaks down soon after application, and is therefore one of the safest insecticides. Two or three dustings during the seedling stages afford protection against most insects and bugs.

Pyrethrum is one of the most powerful natural insecticides, and is effective against a wide range of pests. It is also relatively nontoxic to bees and ladybugs. Pyrethrums are found in the pyrethrum plant as well as in chrysanthemums. They are non-persistent, and in small doses may make the insects sick without killing them. These insecticides are available at many nurseries and may provide the surest, easiest form of protection against serious insect attack.

Barriers and Traps

In gardens and small farms, insects and other pests are sometimes controlled by the use of traps and barriers that prevent them from reaching the marijuana. When the plant are young, they can be protected from cutworms, caterpillars, snails, and slugs by a collar that is buried an inch into the ground and is six inches high. Some growers face it with aluminium foil,
which many insects seem to dislike. One ingenious grower painted collars with molasses to capture the crawlers. She also caught a significant number of leafhoppers. Commercial stickums such as Tanglefoot can also be used to trap insects.

Snails, slugs, and some crawling insects are repelled by a border perimeter of lime, potash (wood ash), sulfur, sharp sand, or cinders. Place a thin layer, six inches wide, around the perimeter of the garden, or around each plant. Flea beetles and some other flying insects are repelled by wood ashes dusted on the leaves. The powders are water-soluble; so they should be replaced after a heavy rain. Crawling pests sometimes have a hard time reaching plants grown in containers or raised beds.

Flying insects, such as leaf and treehoppers, can be prevented from getting to plants by barriers made from cheesecloth. Other growers place cardboard sticky with glue between plants, and then shake the plants. The cardboard catches a good proportion of them. One innovative grower in Palo Alto, California, placed a furniture crate, with the top cut off and with Tanglefoot spread on the inside, around each of his six plants. He said that by shaking the plants, he eliminated leafhoppers in four days.

16.3 Chemical Insecticides

Insecticides were developed as an easy way to control pests. They have an immediate dramatic effect, but the long-range damage that they do to the entire ecological system is sometimes overlooked. The chlorinated hydrocarbons, such as DDT, DDC, Aldrin, Kelthane, and Dieldrin, were the most dangerous commercial insecticides. They affect warm-blooded animals and are no longer available. (In no case should any of these by used.)

Diazinon, Sevin, and Malathion are three insecticides which are often soil in nurseries to protect vegetable crops. They are considered safe for warm-blooded animals and have a limited residual effect, since they break down in a few days. But these insecticides are not too selective and may kill beneficials as well as pests. Sevin is the most toxic and kills the widest range of insects, including bees.

These chemicals come as sprays, powders, and baits, formulated for specific pests. They should be used only when an intolerable situation has developed. Plants should be harvested only after the required safety period has passed since application. This period is from two to 35 days, and is specifically listed on all insecticides that can be safely used. Insecticides should be used and handled carefully, following instructions, wearing protective clothing, with no children or pets around. It is advisable to use a mask when applying dusts and to work upwind.

16.4 Common Pests

Cucumber Beetles

Cucumber beetles are about a quarter-inch long and look a lot like ladybugs. There are several species of cucumber beetles. The striped beetle is found east of the Rocky Mountains. It is yellow, has two or three black stripes running down its back, and has a black head. The spotted cucumber beetle has
a yellow-green back with 11 or 12 black spots and a black head. There are related species, such as the banded cucumber beetle, throughout the United States. The larvae of all varieties are white, turning brownish at the ends, slender, about one-third inch long.

Cucumber beetles do the most damage in the early spring, when the adults come out of hibernation and begin to eat the new growth and leaves. These leaf-eating adults damage young marijuana, especially when there is a scarcity of other food. They also transmit bacterial diseases and viruses to the plants. Within a few weeks after they come out of hibernation, they lay their eggs at the base of plant roots. The larvae of the striped cucumber beetle feed only on melon- and cucumber-type plant roots. The spotted-beetle larvae are fond of corn, and are known as the "Southern cornroot worm" in some places.

The best way to prevent cucumber-beetle attacks is to keep the areas that you plant isolated from corn and melon plantings. Heavy mulching or tilling destroys the pests when they are hibernating. Late plantings minimise damage inflicted by cucumber beetles.

Cucumber beetles can be controlled by use of Rotenone or Malathion. Dust several times during seedling growth. These beetles are also prey to many insects, including the common garden soldier beetle, predator flies, wasps, and nematodes. Hand picking is also an effective control for cucumber beetles.

Thrips

Thrips are slender, yellow or brownish, winged insects about 1/25 inch long. They have fragile wings which keep them aloft while they are blown by the wind. Thrips have a cone-shaped mouthpart, which they use to cut stems in order to suck plant juices. The larvae look like adults, but are smaller and wingless. Most thrips feed on a range of plants, especially onion and other bulbs, and marijuana is at most a marginal part of their diet. A well-cultivated marijuana plant can outgrow and damage that thrips are likely to inflict.

Thrips hibernate in plant debris during the winter and begin sucking in early spring. They lay eggs during warm weather, and can produce a new generation every two weeks. Since thrips eat a varied diet, keeping the garden area clear of weeds is an effective control. Thrips can also be controlled by turning debris under, so that their nesting sites are destroyed.

Thrips can be controlled by use of tobacco sprays. Rotenone, or Malathion. Aluminium-foil mulches are effective thrip repellents. The light reflected from the foil confuses their sense of direction.

Flea Beetles

There are many species of flea beetles. The adults range in size between one-twentieth and one-fifth of an inch, and are usually black or metallic green or blue. They are called flea beetles because they use their enlarged hind legs to jump like fleas when disturbed. Many flea beetles are
Flea beetles hibernate in plant debris. By ploughing the debris under, their hibernation places are eliminated, and there should be few pests the following spring. Flea beetles are repelled by a mixture of equal parts of wood ashes and limestone sprinkled on foliage every few days. Containers of the mixture may also be placed around the plants. Garlic sprays also repel flea beetles. The chemical poisons used specifically for flea beetles are stomach poisons, which break down slowly and may not be safe to inhale. Home remedies are best for flea beetles.

16.5 Vertebrate Pests

Mammals Until it develops a hard fibrous main stem, usually at about two months, the young marijuana plant attracts rodents, including mice, rabbits, moles, squirrels, groundhogs, and rats, as well as raccoons. Cats are probably the best means of rodent control. They stalk small prey, go after any movement, and are active at night, when most of these animals forage. Young plants are often protected from rodents by placing a coffee can with top and bottom removed around each plant. When the plants get bigger, they can be protected from rabbits and other animals with a wire fence three feet in height. A double layer of one-inch chicken wire is most effective. But many animals can climb or burrow; so more ingenious methods are needed to protect the plants. Rodents, especially moles, are repulsed by castor beans and castor oil. A formula that gardeners sometimes use is two parts castor oil, one part detergent, mixed to a consistency of shaving cream in a blender. Use a tablespoon of concentrate per gallon of water. Spray or mist the solution on the plants.

Rabbits shy away from blood, bloodmeal, and tankage. To use, sprinkle the powder around the perimeter of the plot in a band about a foot wide. They can also be mixed into a concentrated solution and applied as a spray. However, the small of blood may attract mongoose or other predators, which dig up the garden in search of flesh. Noise from radios, chimes, and bells deter some animals, and human smalls such as hair and urine may also deter some animals. In dry areas, a half-filled bucket of water is an effective rodent trap. The animals fall in and drown.

Deer seem to go out of their way to munch on tender marijuana leaves, but generally don't bother marijuana after it has grown for a few months. Gardeners and farmers use many ingenious techniques to keep them away from crops. Sturdy fences are the best deterrent. The fences should be about 10 feet high: the bottom five feet should be made up of single strands of wire string at two-foot intervals. The wire strands prevent deer from jumping the fence. Some growers use fresh blood, dried blood, or bloodmeal to deter them, placing it in either powder or liquid form around the perimeter of the garden. Other growers claim that human hair, or manure from predators such as wolves, bears, lions, and even dogs, keeps them out. Lion urine (glans extract) is available commercially, and is said to be an effective deterrent against many animals. {Figure 73. Tin cans protect against cutworms and many other plant eaters.}

{Figure 74. Fat rat munching marijuana.}
{Figure 75. Problem solved; or, never underestimate the power of a peanut.
Birds

On the whole, birds are beneficial, rather than harmful, in the garden. Most of the common species, including English sparrows, robins, swallows, wrens, finches, bluejays, bluebirds, and starlings, eat insects and other garden pests as a substantial portion of their diet. The only time that birds may be harmful is during planting, when they sometimes feed on the planted seed. The main culprits seem to be starlings, sparrows, and crows. They can be kept off the planted areas physically, by means of plastic netting or fencing, which is sold commercially for the purpose, or by using scarecrows, aluminium strips, or noise makers. Once the plants have germinated, birds are no longer a threat and should be encouraged to nest in the area, since they are an ideal biological control for plant pests.

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Chapter 17
GENETICS AND SEX IN CANNABIS

Sex is an inherited trait in Cannabis, and can be explained in much the same terms as human sexuality can. Like a human being, Cannabis is a diploid organism: its chromosomes come in pairs. Chromosomes are microscopic structures within the cells on which the genes are aligned. Cannabis has 10 pairs of chromosomes (n=10), for a total of 20 chromosomes (2m=20).

One pair of chromosomes carries the primary genes that determine sex. These chromosomes are labelled either X or Y. Male plants have an XY pair of sex chromosomes. Females have XX. Each parent contribute one set of 10 chromosomes, which includes one sex chromosome, to the embryo. The sex chromosome carried by the female ovule can only be X. The one carried by pollen of the male plant may be either X or Y. From the pollen, the embryo has a 50/50 chance of receiving an X, likewise for Y; hence, male and female progeny appear in equal numbers (in humans, the sperm carries either an X or a Y chromosome.)

17.2 Flowering

Male Plant

Under natural light, males usually start to flower from one to four weeks before the females. Where the photoperiod is artificially controlled, as with electric lights, males respond quickly (in about a week) to a change to short photoperiods and usually show flowers sooner than the females.

Male flowers develop quickly, in about one to two weeks on a vigorous plant, not uniformly. Scattered flowers may open a week or more before and after the general flowering, extending the flowering stage to about four weeks.

The flowering stage continues to demonstrate the male's tall, relatively sparse growth. Most of the flowers develop near the top of the plant, well above the shorter females. The immature flower buds first appear at the tips of the main stem and branches. Then tiny branches sprout from the leaf
axils, bearing smaller clusters of flowers. The immature male flowers are closed, usually green, and develop in tight clusters of knob-like buds. The main parts of the male flowers are five petal-like sepals which enclose the sexual organs. As each flower matures, the sepals open in a radiating pattern to reveal five pendulous anthers (stamens).

Inside the ovoid, sac-shaped anthers, pollen grains develop. Initially, pollen sifts through two pores near the top of the anther; then, starting from the pores, longitudinal slits slowly open (zipperlike) over the course of a day, releasing pollen to the wind. Once a flower sheds pollen, it shortly dies and falls from the plant. Normally, male plants begin to die one to two weeks after the bulk of their flowers have shed pollen. Healthy males may continue to flower for several more weeks, but secondary growth seldom has the vigour of initial bloom.

Female Plant

The female plant generally starts to flower later than the male, under either natural light or an artificially controlled photoperiod. Female marijuana plants flower when the average daily photoperiod is less than about 12 to 13 hours. However, some varieties and individuals may flower with a photoperiod of over 14 hours. Some Colombian varieties may not respond until the photoperiod falls below 12 hours for a period of up to three weeks.

The duration of flowering also depends on the particular rhythm of the variety, as well as growing conditions, and whether or not the plant is pollinated. Within these variables, females maintain vigorous growth and continue to rapidly form flowers for a period that ranges from 10 days to about eight weeks.

Females generally do not grow much taller during flowering. Growth emphasises a "filling out," as flower clusters develop from each leaf axil and growing tip. Normally, the flowers arise in pairs, but the pairs form tight clusters of 10 to over 100 individual flowers that are interspersed with small leaves. These clusters are the "buds" of commercial marijuana. Along the top of the main stem and vigorous branches, "buds" may form so thickly that the last foot or more of stem is completely covered. Usually the leaves that accompany the flowers tend toward simpler structure, until each leaf has one to three blades. {Figure 76. Female in full bloom.}

The visible parts of the female flower are two upraised stigmas, one-quarter to one-half inch long, usually white or cream, sometimes tinged with red, that protrude from a tiny, green, pod-shaped structure called the floral bract. This consists of modified leaves (bracts and bracteoles) which envelop the ovule or potential seed. The mature bract is a tiny structure, about 1/8 inch across and 1/4 inch long. When fertilised, a single seed begins to develop within the bract, which then swells until it is split by the mature seed.

Bracts are covered more densely with large resin glands than is any other part of the plant, and are the most potent part of the harvest. Resin glands may also be seen on the small leaves that are interspersed among the flowers.
The differences between male and female Cannabis become more apparent as the plants mature. The same can be said of the differences between varieties. Often, two varieties may appear to be similar, until they actually flowers and fill out to different forms. These appear in many ways: some varieties maintain opposite phyllotaxy with long internodes throughout flowering; bud sizes vary from about one-half inch to about three inches, with a norm of about one to two inches; buds may be tightly arranged along the stem, yielding a "cola" two feet long and four inches thick; and some varieties only form buds along their main stem and branch tips, with a few "buds" forming along the branches.

{Figure 77. Upper left: Buds form thickly into colas along the top of the main stem and branches (full bloom). Upper right: A cola about two feet long. Lower left: A huge leafy cola. Lower right: Long, slim buds form late in the year when light is weak. (these four colas are from Mexican plants.)

When a female is well-pollinated, growth slows and the plant's energy goes into forming seeds and thus into the continuation of the species. Some plants (but only the more vigorous ones) will renew flowering even when pollinated. Females that are not well-pollinated continue to form flowers rapidly. This extends the normal flowering period, of 10 days to four weeks, up to eight weeks or more.

Individual flowers are pollinated by individual pollen grains. In a matter of minutes from its landing on a stigma, the pollen grain begins to grow a microscopic tube, which penetrates the stigma and reaches the awaiting ovule wrapped within the bracts. The pollen tube is a passageway for the male's genetic contributions to the formation of the embryo (seed).

The union of the male and female complements of genes completes fertilisation and initiates seed formation. The stigmas, having served their purpose, shrivel and die, turning rust or brown colour. On a vigorous female, the seeds reach maturity in about 10 days. When growing conditions are poor, the seed may take five weeks to ripen to full size and colour. Naturally, all the flowers do not form, nor are they pollinated at the same time - and there will be seeds that reach maturity weeks before others do. Although each flower must be individually fertilised to produce a seed, a single male plant can release many millions of pollen grains. A large female plant can produce over 10,000 seeds.

17.3 Sexual Variants in Cannabis

Cannabis has been studied for many years because of its unusual sexuality. Besides the normal dioecious pattern, where each plant bears exclusively male or female flowers, it is not uncommon for some plants to have both male and female flowers. These are called hermaphrodites, or monoecious plants, or intersexes. Hermaphroditic plants form normal flowers of both sexes in a wide variety of arrangements, in both random and uniform distributions.

Natural Hermaphrodites

Some hermaphrodites seem to be genetically determined (protogenous). That
is, they naturally form flowers of both sexes given normal growing conditions. Possibly genes carried on the autosomes (the chromosomes other than the sex chromosomes) modify the normal sexual expression. Monoecious varieties have been developed by hemp breeders in order to ensure uniform harvests.

It is also possible that these particular are polyploid, which means they have more than the usual two sets of chromosomes. This kind of hermaphrodite may have XXY (triploid), or XXYY or XXXY (tetraploid) sex chromosomes. However, no naturally occurring polyploids have ever been verified (by observation of the chromosomes) in any population of Cannabis. Polyploids have been induced in Cannabis by using mutagens, such as the alkaloid colchicine.

Whatever then genetic explanation may be, one or more of these natural hermaphrodites may randomly appear in any garden. They are sometimes faster-maturing, have larger leaves, and are larger in overall size than their unisexual siblings. They usually form flowers of both sexes uniformly in time and distribution, and in some unusual patterns. For example, from Mexican seed, we have seen a plant on which separate flowering cluster consisted of both female and male flowers: and upper section of female flowers had upraised stigmas, and a lower section of male flowers dangled beneath the female flowers. In other plants from Mexican seed, the growing tips throughout the plant have female flowers; male flowers sprout from the leaf axils along the main stem and branches. Plants from "Thai" seed sometimes form male and female flowers on separate branches. Branches with female flowers tend to predominate, but branches having mostly male flowers are located throughout the plant.

Abnormal Flowers, Intersexes, Reversals

Gender is set in the new plant at the time of fertilisation by its inheritance of either the X or the Y chromosome from the male (staminate) plant. With germination of the seed, the environment comes into play. Heritage sets the genetic program, but the environment can influence how the program runs. (Sexual expression in Cannabis is delicately balanced between the two.) The photoperiod, for example, controls the plant's sequence of development. Also, the plant's metabolism and life processes are dependent on growing conditions. When the environment does not allow a balance to be maintained, the normal genetic program may not be followed. This is mirrored by abnormal growth or sexual expression.

{Figure 78. Upper left: Abnormal flowers.  Lower left: Male flowers on a female plant.  Upper right: Sexes on separate branches.  Lower right: Male flower in female bud (reversing).}

Abnormal Flowers

Abnormal sexual expression includes a whole range of possibilities. Individual flowers may form abnormally, and may contain varying degrees of both male and female flower parts. For instance, a male flower may bear a stigma; or an anther may protrude from the bracts of a female flower. Abnormally formed flowers are not often seen on healthy plants, although if one looks hard enough, a few may be found in most crops. When many of the
flowers are abnormal, an improper photoperiod (coupled with poor health) is the most likely cause. Abnormal flowers sometimes form on marijuana grown out of season, such as with winter or spring crops grown under natural light.

Intersexes and Reversals Much more common than abnormally formed flowers is for the plant's sex to be confused. One may find an isolated male flower or two; or there may be many clusters of male flowers on an otherwise female plant, or vice versa. These plants are called intersexes (also hermaphrodites or monoecious plants). Intersexes due to environment causes differ from natural hermaphrodite in having random distributions and proportions of male and female flowers. In more extreme cases, a plant may completely reverse sex. For example, a female may flowers normally for several weeks, then put forth new, sparse growth, typical of the male, on which male flowers develop. The complete reversal from male flowering to female flowering also happens.

All other things being equal, the potency of intersexes and reversed plants is usually less than that of normal plants. If there are reversals or intersexes, both of the sexes will usually be affected. Female plants that reverse to male flowering show the biggest decline. Not only is the grass less potent, but the amount of marijuana harvested from male flowers is negligible compared to the amount of marijuana that can be harvested from a normal female. Plants that change from male to female flowering usually increase their potency, because of the growth of female flower bracts with their higher concentration of resin. Female flowers on male plants seldom form as thickly or vigorously as on a normal female. Between the loss in potency and the loss in yield because of females changing to males, a crop from such plants is usually inferior, in both yield and potency, to one from normal plants.

Environmental Effects

Many environmental factors can cause intersexes and sexual reversals. These include photoperiod, low light intensity, applications of ultraviolet light, low temperatures, mutilation or severe pruning, nutrient imbalances or deficiencies, senescence (old age), and applications of various chemicals (see bibliography on sex determination).

The photoperiod (or time of planting using natural light) is the most important factor to consider for normal flowering. In 1931, J. Schaffner (105) showed that the percentage of hemp plants that had confused sexual characteristics depended on the time of year they were planted. Normal flowering (less than five percent of the plants are intersexes) occurred when the seeds were sown in May, June, or July, the months when the photoperiod is longest and light intensity is strongest. When planted sooner or later in the year, the percentage of intersexuals increased steadily, until about 90 percent of the plants were intersexual when planted during November or early December.

Marijuana plants need more time to develop than hemp plants at latitudes in the United States. Considering potency, size, and normal flowering, the best time to sow for the summer crop is during the month of April. Farmers in the south could start the plants as late as June and still expect fully
developed plants.

If artificial light is used, the length of the photoperiod can influence sexual expression. Normal flowering, with about equal numbers of male and female plants, seems to occur when the photoperiod is from 15 to 17 hours of light for a period of three to five months. The photoperiod is then shortened to 12 hours to induce flowering. With longer photoperiods, from 18 to 24 hours a day, the ratio of males to females changes, depending on whether flowering is induced earlier or later in the plant's life. When the plants are grown with long photoperiods for six months or more, usually there are at least 10 percent more male than female plants. When flowering is induced within three months of age, more females develop. Actually, the extra males or females are reversed plants, but the reversals occur before the plants flower in their natural genders.

Some plants will flower normally without a cutting of the photoperiod. But more often, females will not form thick buds unless the light cycle is cut to a period of 12 hours duration. Don't make the light cycle any shorter than 12 hours, unless the females have not shown flowers after three weeks of 12-hour days. Then cut the light cycle to 11 hours. Flowers should appear in about one week.

Anytime the light cycle is cut to less than 11 hours, some intersexes or reversed plant usually develop. This fact leads to a procedure for increasing the numbers of female flowers indoors. The crops can be grown for three months under a long photoperiod (18 or more hours of light). The light cycle is then cut to 10 hours. Although the harvest is young (about five months) there will be many more female flower buds than with normal flowering. More plants will develop female flowers initially, and male plants usually reverse to females after a few weeks of flowering.

Of the other environmental factors that can affect sexual expression in Cannabis, none are as predictable as the photoperiod. Factors such as nutrients or pruning affect the plant's overall health and metabolism, and can be dealt with by two general thoughts. First, good growing conditions lead to healthy plants and normal flowering: female and male plants occur in about equal numbers, with few (if any) intersexes or reversed plants. Poor growing conditions lead to reduced health and vigour, and oftentimes to confused sex in the adult plant. Second, the age of the plants seems to influence reversals. Male plants often show female flowers when the plant is young (vigorous) during flowering. Females seven or more months old (weaker) often develop male flowers after flowering normally for a few weeks.

Anytime the plant's normal growth pattern is disrupted, normal flowering may be affected. For instance, plant propagated from cuttings sometimes reverse sex, as do those grown for more than one season.

17.4 Sexing the Plants

The female plant is more desirable than the male for marijuana cultivation. The female flowering clusters (bus) are usually the most potent parts of the harvest. Also, given room to develop, a female generally will yield twice as much marijuana as her male counterpart. More of her weight consists of top-quality buds.
Because the female yields marijuana in greater quantity and sooner you can devote your attention to nurturing the females. Where space is limited, such as in indoor gardens and small outdoor plots most growers prefer to remove the males as soon as possible, and leave all available space for the females. To harvest sinsemilla (seedless female buds), you must remove the male plants before they mature and release pollen.

Differences in the appearance of male and female Cannabis become more apparent toward maturation. During the seedling stage, gender is virtually impossible to distinguish, although in some varieties the male seedling may appear slightly taller and may develop more quickly.

We know of no way to discover gender with any certainty until each plant actually forms either pollen-bearing male flowers or seed-bearing female flowers. However, certain general characteristics may help. Using guidelines like the following, growers who are familiar with a particular variety can often predict gender fairly accurately by the middle stage of the plant's life.

Early Vegetative Growth

After the initial seedling stage, female plants generally develop more complex branching than the male. The male is usually slightly taller and less branched. (Under artificial light, the differences in height and branching are less apparent throughout growth.)

Some plants develop a marked swelling at the nodes, which is more common and pronounced on female plants.

Middle Vegetative Growth

In the second to fourth months of growth, plants commonly form a few isolated flowers long before the actual flowering stage begins. These premature flowers are most often found between the eighth and twelfth nodes on the main stem. Often they appear near each stipule (leaf spur) on several successive nodes, at a distance two to six nodes below the growing tip. These individual flowers may not develop fully and are often hard to distinguish as male or female flowers. The fuzzy white stigmas of the female flower may not appear, and the male flowers seldom opens but remains a tightly closed knob. However, the male flower differs from the female; it is raised on a tiny stalk, and the knob is symmetrical. The female flower appear stalkless and more leaflike.

The presence of premature female flowers does not assure that the plant is a female, but premature male flowers almost always indicate a male plant. Unfortunately, it is much less common for male plants to develop premature male flowers than for female flowers to appear on either plant. For example, in one garden of 25 mixed-variety plants, by age 14 weeks, 15 plants showed well-formed, premature female flowers with raised stigmas. Eight of these plants matured into females and seven became males. Only two plants showed premature male flowers and both of these developed into males. The eight remaining plants did not develop premature flowers or otherwise distinguishable organs until the actual flowering stage at the age of 21.
weeks. From these eight, there were four females, three males, and one plant bearing both male and female flowers (hermaphrodite). It does seem, however, that plants bearing well-formed female flowers, on several successive node, usually turn out to be females.

Preflowering

In the week or two prior to flowering and throughout flowering, many common marijuana varieties follow two general growth patterns which depend on gender. With these varieties, you can tell gender by the spacing between the leaves (internodes). For the female, the emphasis is on compact growth. Each new leaf grows closer to the last, until the top of the plant is obscured by tightly knit leaves. The male elongates just prior to showing flowers. New growth is spaced well apart and raises the male to a taller stature. This may be the first time the male shows its classic tall, loosely arranged profile.

{Figure 79. Premature flowers are found on the main stem next to the leaf spurs. Upper left: Early female flower without stigmas. Lower left: Undifferentiated (indistinguishable). Centre: Early male flower. Upper and lower right: Well-formed female flowers on successive nodes usually indicate a female.}

17.5 Sinsemilla

Sinsemilla ((The word "sinsemilla" comes from the Spanish, and means without seeds. It is also spelled "sansimilla.")) is any marijuana consisting of seedless female flower buds. Sinsemilla is not a variety of marijuana; it is the seedless condition that results when the female flowers are not fertilised with pollen.

In the United States, most sinsemilla comes in the form of Thai sticks that are imported from Southeast Asia and Japan. Thai sticks are made up of seedless buds wrapped around a sliver of bamboo or a long wooden matchstick. The buds, which may be on one or more stems, are secured with a hemp fibre wound around the stick. A growing amount of fine sinsemilla now comes from domestic sources, such as Hawaii and California. The grass is usually boxed or bagged with pure buds that are manicured (extraneous leaf removed). Infrequently sinsemilla comes from Mexico and, rarely, from Colombia.

Sinsemilla has a reputation as high-potency marijuana, with a sweet taste and mild smoke. It doesn't have the harsh, gagging qualities of the usual Colombian and Mexican grasses. These qualities, however, have nothing to do with sinsemilla as such. The potency of any grass depends primarily on the variety and development of the plant, and the taste and mildness of the smoke depend on the condition of the plant when harvested and the cure. Heavily seeded grass can be as mild and sweet-smoking as sinsemilla when it is properly handled.

When buying grass, remember that sinsemilla indicates a conscientious effort on the grower's part to bring you the best possible product. Sinsemilla is almost pure smoking material with no wasted weight in seeds. An ounce of sinsemilla has about twice as much smoking material as a typical seeded ounce. Also, any marijuana that is fresh, with intact buds, indicated less
deterioration of cannabinoids. {Figure 80. Thai Sticks.}

Sinsemilla is becoming a preferred form of grass with homegrowers, many of whom believe that a seedless female is more potent than a seeded one, reasoning that the plant's energy goes to the production of resin rather than seed. There seem to be no scientific studies on this point. Many experienced growers believe the difference is small, perhaps 10 percent.

From observing the resin glands on the bracts, one sees that they continue to develop in size after pollination. Any difference from the unseeded state is not apparent. Whether pollination does indeed hamper or lessen resin production or potency is questionable, but the effect on the plant as a whole can be dramatic. Usually when the female is well-pollinated, growth noticeably slows, and the plant enters the last phase of life, which is seed set. Seed set is a period of incubation, in which the seeds grow and reach their mature state. New growth forms more slowly and lack the vitality of the bloom before pollination. The plant's reaction to pollination is relative. The more thoroughly pollinated the female is, the more pronounced the change in rhythm from vigorous to incubation. A plant on which only a few flowers have been fertilised continues to actively form flowers as sinsemilla.

Not all plants react alike to pollination. When the weather is good and the plant vigorous, even a well-seeded plant may bloom a second or third time before the rate of growth starts a final decline.

To put this in perspective, the main advantage to growing sinsemilla is that the plant remains in a flowering state for a longer period of time. Flowers may rapidly form for four to ten weeks. The flower buds develop larger and more thickly along the stems, yielding more top-quality grass (more buds) than in the seeded condition.

Anyone can grow sinsemilla. Simply remove the male plants before they release pollen. Given a normal spring planting, males usually flowers in August and September, but may begin to flower as early as mid-July. Under artificial lights, males sometimes flower after only three months, and before the grower has shortened the photoperiod. Even though the females are not flowering, remove the males from the room before any flowers open. Indoor, the pollen will collect as dust and can fertilise the females weeks later.

Male flowers mature quickly, in about one to two weeks after the immature buds are first visible. Check each plant about twice a week to make sure you harvest all the males before any shed pollen. If you can't visit your garden consistently, then thin the garden, using the preceding section on "Sexing" as a guide. Even though you may not get all the males, the females will be more lightly seeded. Actually, even in carefully watched gardens, the females may have a few seeds. Pollination may come from occasional male flowers on a basically female plant, or a female may reverse and form male flowers. And pollen may come from a neighbour's garden, a problem that is becoming more common. But in practical terms, an occasional seed makes no difference. The female can form thousands of flowers, and when only a few are pollinated, there is little impact on the plant's growth.
Chapter 18
PROPAGATION AND BREEDING

18.2 Producing Seeds

Marijuana is naturally prolific. It has been estimated that a single male plant can produce over 500 million pollen grains. A large female plant can bear tens of thousands of seeds. In nature, pollen is carried from the male flowers to the stigmas of the female flowers by air currents or the wind. Indoors or out, if the plants are simply left on their own, most gardens produce many more seeds than are needed for the next crop.

Seeds usually become viable within two weeks after pollination, although they may not have developed good colour by this time. The colour can take several more weeks to develop, particularly indoors or late in the year, when the light is not as strong. Once seeds are plump, well-formed, and of a mature size, most of them will be viable. When seeds have also developed good colour, their viability should be over 90 percent.

Pollination may also be carried out artificially. Pollen can be collected and the transferred to the female flowers with a cotton swab or artist's brush, or shaken directly over the flowers. Store pollen in a clean, open container and keep in a dry area at moderate temperature. Remove any flowers or vegetative matter from the pollen, because they encourage fungal attack.

Once advantage of artificial pollination is that only the flowers on certain plants need be pollinated. This allows you to harvest most of your grass as sinsemilla, while developing seed on part of the plant. If you have only a few plants, pollinate a single branch, or perhaps only a few lower buds, in order to leaves the most potent buds seedless.

A good way to insure a thorough pollination, and to avoid contaminating other females, is to loosely tie a transparent bag containing pollen directly over individual buds, branches, or whole plants. Shake the bag to distribute the pollen and carefully remove it from several hours to a few days later.

To avoid contaminating a sinsemilla crop, you must remove any males from the garden before their flowers open. Males in pots can simply be moved to another area or room if you want to keep them growing. Male plants can complete development even in low light; so they do not need artificial light. Otherwise, the best procedure is to harvest the males intact by cutting them at their base after some flowers have formed distinct (but unopened) buds. Hang the whole plants upside down in a sheltered area where there is moderate light and where temperatures and humidity are not extreme. Place clean plates or sheet plastic beneath the plants to catch falling pollen. Generally there is enough stored water in the plant for the unopened flowers to mature and drop pollen. Well-formed flowers may open the next day. Usually all the flowers that are going to open will do so within two weeks.

Pollen gradually loses viability with time, but pollen that is about three
weeks old generally has sufficient viability for good seed production. However, the age of the pollen may influence the sex ratio of the next generation.

For instance, in a 1961 study with hemp plants 97, the percentage of females in the next generation was 20 percent higher than in the control plants (natural pollination) when pollen 14 to 17 days old was used. A small increase in female-to-male ratios also occurred when pollen was fresh (six hours or less). The age of the stigmas appeared not to affect the sex ratio.

18.3 Producing Female Seeds

If it were possible to know which seeds are female and which are male, marijuana growing would be even simpler than it is. There is not practical way to discern the gender of a seed - but there is a simpler procedure for producing seeds that will all grow into female plants.

To produce female seeds, the plants are fertilised with pollen with male flowers that appear on a basically female plant. Such flowers appear on intersexes, reversed females, and hermaphrodites (see section 17). Female plants have an XX complement of sex chromosomes; therefore, the pollen from the male flowers that form on female plants can only carry an X chromosome. All seeds produced from flowers fertilised with this "female" pollen will thus have an XX pair of sex chromosomes, which is the female genotype.

Although the male Cannabis plant can produce female flowers, it cannot produce seed; so there is no chance of mistakenly producing seed on a male plant. It is possible to use pollen from an intersexual plant that is basically male (XY); the resulting crop of seeds will have the normal 1:1 ratio of males to females. For this reason, choose a plant that is distinctly female as a pollen source. A female plant with a few random male-flower clusters, or a female plant that has reversed sex are both good pollen sources. The seed bearer can be any female, female intersex, or reversed-female plant.

In most crops, careful inspection of all the females usually reveals a few male flowers. And often, when females are left flowering for an extended period of time, some male flowers will develop. If no male flowers form, you can help to induce male flowers on female plants by severe pruning. One such procedure is to take the bulk of the harvest, but to leave behind some green leaves to maintain growth (as described in the section on "Double Harvests" in section 20). Most of the plants will continue to form female flowers, but male flowers are also likely to form. At times, the plants may not grow particularly well, and may in fact form distorted and twisted leaves, but they will produce viable seeds as long as some stigmas were white when pollinated. (Remember, it only takes a few fertile buds to produce hundreds of seeds.) Pollinate the female flowers by hand as soon as pollen becomes available.

{Figure 82. A solitary male flower on a female plant provides "female" pollen. (Also see Figure 84 for a female reversing sex.)}

{Figure 83. Growth may not be vigorous, but seeds will form if stigmas are white when pollinated.}
Under artificial lights, turn the light cycle down to eight hours after cutting the plants back. The short cycle helps to induce male flowers on female plants.

Male-free seed can also be produced by pollen from a natural hermaphrodites. The progeny, however, may inherit the hermaphroditic trait, resulting in a crop with some hermaphrodites as well as females. This could be a problem if you want to grow sinsemilla the next crop.

18.4 Breeding

Breeding Cannabis is done simply by selecting certain plants to be the pollinators and the seeds bearers. Characteristics such as fast growth, early maturation, and high potency might be the reasons for choosing one plant over another. Selection can be by means of the male plants, the females, or both. A simple procedure would be to harvest all male plants, sample each for potency, and use the most potent plant for the pollen source. At harvest, compare the seeded females for potency, and use seeds from the most potent plant for the pollen source. At harvest, compare the seeded females for potency, and use seeds from the most potent plant for the following generation.

There are two basic approaches to breeding. One is inbreeding, and the other is outbreeding. Inbreeding involves starting with a single variety and crossing individuals to produce seeds. In this way, certain desirable characteristics that the parents have in common will probably be perpetuated by the offspring.

Certain variants with unusual characteristics, such as three leaves to a node instead of the usual two leaves, can be inbred continuously until all progeny carry the trait. One problem with inbreeding is that other desirable characteristics may be lost as the new population becomes more homogeneous. Inbreeding plants indoors seems to lead in a loss in potency by the fourth generation. (Preceding generations were considered comparable to the original imported grass.)

Outbreeding is crossing two different varieties. Offspring from parents of two different varieties are called hybrids. Cannabis hybrids exhibit a common phenomenon on plants called "hybrid vigour." For reasons not wholly understood, hybrids are often healthier, larger, and more vigorous than either of their parents. {Figure 84. Upper left: An old female reversing to male flowering. Lower left: Three leaves to a node (trifoliate). Upper right: A plant with three leaves to a node alternating with one leaf on next node. Lower right: Three-leafed plants sometimes split into two growing shoots.}

A reference to cannabinoid content of hybrids from crosses between chemotypes was made in a 1972 study by the Canadian Department of Agriculture: "The ratio of THC to CBD in hybrids was approximately intermediate between the parents ... there was also occasionally a small but significant deviation toward one of the parents - not necessarily the one with the higher or lower ratio of THC to CBD." 51 This means that a cross between a midwestern weedy hemp (type III) and a fine Mexican marijuana (type I) would yield offspring with intermediate amounts of THC and CBD, and
which hence would be considered type II plants.

Homegrowers have mentioned that inbreeding plants often led to a decrease in potency after several generation. Outbreeding maintained potency, and sometimes (some growers claimed) led to increases in potency.

One area in which breeding can be useful for homegrowers is the breeding of early-maturing plants for northern farmers. Farmers in the north should always plant several varieties of marijuana. Mexican varieties generally are the fastest to mature. Individual plants that mature early and are also satisfactorily potent are used for the seed source in next year’s crop. This crop should also mature early. Some growers cross plants from homegrown seed with plants from imported seed each year. This assures a maintenance of high-potency stock.

**Potency Changes Over Generations**

It is well-established that plants of the P1 generation (parentals, or the first homegrown plants from imported seed) maintain their chemical characteristics. (For example, type I plants yield type I progeny whose cannabinoids are about equal both quantitatively and qualitatively to those in their native grown parents.) This fact is shown by Table 25.

In the study 66 from which Table 25 has been adapted, individual plants within varieties differed by more than four times in CBD content and by more than three times in THC content. The researchers also noted that illicit marijuana samples contained proportionately less leaf material and proportionately more stem and seed material than samples grown in Mississippi. (Mississippi samples may be more dilute.) New Hampshire and Panama samples were nearly equal in terms of the sum of THC plus CBN.

One of the questions that persists in marijuana lore is what effect if any a change in latitude has on the plant chemotype over a period of generations. Non-drug types of Cannabis usually originate above 30 degrees latitude in temperate areas. Drug types of Cannabis usually originate in tropical or semitropical areas below the 30-degree parallel. Whether this is due entirely to cultural practices is questionable. More likely, the environment (natural selection) is the prime force, and cultural practices reinforce rather than determine chemotype.

Cannabis is notorious for its adaptability. Historically, there are many statements that the drug type of Cannabis will revert to the "fibre" type when planted in temperate areas, whereas the fibre type will revert to the drug type after several generations in a tropical area. That a change in chemotype is actually caused by transfer between tropical and temperate areas has not been verified scientifically. (Such studies are ongoing in Europe.) If such changes occur, it is also not known whether the change is quantitative (the plant produces less total cannabinoids) or whether it is qualitative (succeeding generations, for example, change from being high in THC and low in CBD to being high in CBD and low in THC).

We believe that qualitative changes can occur within a few generations, but can only guess what environmental factor(s) might be responsible for such a change. Probably the change has more to do with adaption of general growth
and developmental characteristics than with particular advantages that production of either CBD or THC may bestow upon the plants.

The reason we suspect a change in chemotype is that these changes occur rapidly in evolutionary terms, in a matter of several generations. This rapidity implies that some very strong selective pressure are acting on the plant populations. Also, changes in the chemotype seem to occur globally, which implies that the selective pressures responsible are globally uniform rather than local phenomena. Such globally uniform pressures might be light intensity, daylength, ambient temperatures, and the length of the growing season. For example, in populations adapting to temperate areas, those plants that are able to grow well under relatively lower light intensity and cooler temperatures, and which are able to complete development in a relatively short growing season, would be favoured over siblings with more tropical characteristics.

Adaption acts on populations by means of whole organisms which are reacting to a total environment. Shifts in the chemotype of the population are probably linked genetically to the strong selective pressures exerted on the populations by the need to adapt general growth and maturation to either northern (temperate) or southern (tropical) conditions. {From the northern hemisphere.}

18.5 Cuttings

Marijuana growing often transcends the usual relationship between plant and growers. You may find yourself particularly attached to one of your plants. Cuttings offer you a way to continue the relationship long beyond the normal lifespan of one plant.

To take a cutting, use scissors or a knife to clip an active shoot about four to six inches below the tip. Cannabis does not root easily compared to other soft-stemmed plants. Cuttings can be rooted directly in vermiculite, Jiffy-MIX, a light soil, or in a glass of water. The cutting is ready to plant when roots are about an inch long, in about three to four weeks. A transplant compound such as Rootone can be used to encourage root growth and prevent fungi from forming.

Keep the mixture consistently moist but not too saturated. Roots need oxygen as well as water in order to grow. Change the water daily if the cutting are in a glass of water. Cuttings root best in moderate light, not in intense light (HID's) or direct sunlight. The best light is fluorescent set on constant light (24 hour photoperiod).

{Picture. Comparing rooting mediums. Left to right: One, roots both in and removed from rockwool cube; two, perlite; three and four, perlite vermiculite mixture; five, vermiculite; not shown: cuttings died in peat-pellets. Best rooting was in perlite-vermiculite mixture. Pure vermiculite also worked well.}

Cuttings taken from the same plant are genetically identical and are clones. Clones eliminate genetic differences between individuals, and hence are particularly useful in scientific experiments. By using clones, one can attribute variations between individuals specifically to outside factors.
This would be particularly useful when testing, for example, the affect of fertilisers on potency. In the 1980's, scientists finally began to use this useful tool in Cannabis experiments.

18.6 Grafting

One of the most persistent myths in marijuana lore concerns grafting Cannabis to its closest relative, Humulus, the hops plant of beer-making fame. The myth is that a hops scion (shoot or top portion of the stem) grafted to a marijuana stock (lower stem and root) will contain the active ingredients of marijuana. The beauty of such a graft is that it would be difficult to identify as marijuana and, possible, the plant would not be covered under marijuana statutes. Unfortunately, the myth is false. It is possible to successfully graft Cannabis with Humulus, but the hops portion will not contain any cannabinoids.

In 1975, the research team of Crombie and Crombie grafted hops scions on Cannabis stocks from both hemp and marijuana (Thailand) plants 205. Cannabis scions were also grafted to hops stocks. In both cases, the Cannabis portion of the graft continued to produce its characteristic amounts of cannabinoids when compared to ungrafted controls, but the hops portions of the grafts contained no cannabinoids. This experiment was well-designed and carried out. Sophisticated methods were used for detecting THC, THCV, CBD, CBC, CBN, and CBG. Yet none of these were detected in the hops portions.

The grafting myth grew out of work by H.E. Warmke, which was carried out for the government during the early 1940's in an attempt to develop hemp strains that would not contain the "undesirable" drug 58. The testing procedure for the active ingredients was crude. Small animals, such as the water flea Daphnia, were immersed in water with various concentration of acetone extracts from hemp. The strength of the drug was estimated by the number of animals killed in a given period of time. As stated by Warmke, "The Daphnia assay is not specific for the marijuana drug ... once measures any and all toxic substances in hemp (or hop) leaves that are extracted with acetone, whether or not these have specific marijuana activity." Clearly it was other compounds, not cannabinoids, that were detected in these grafting experiments.

Unfortunately, this myth has caused some growers to waste a lot of time and effort in raising a worthless stash of hops leaves. It has also led growers to some false conclusions about the plant. For instance, if the hops scion contains cannabinoids, the reasonable assumption is that the cannabinoids are being produced in the Cannabis part and translocated to the hops scion, or that the Cannabis root or stem is responsible for producing the cannabinoids precursors.

From this assumption, growers also get the idea that the resin is flowing in the plant. The myth has bolstered the ideas that cutting, splitting, or bending the stem will send the resin up the plant or prevent the resin from going down the plant. As explained in our discussion of resin glands in section 2, these ideas are erroneous. Only a small percentage of the cannabinoids are present in the internal tissues (laticiferous cells) of the plant. Almost all the cannabinoids are contained and manufactured in the resin glands, which cover the outer surfaces of the above-ground plant.
parts. Cannabinoids remain in the resin glands and are not translocated to other plant parts.

We have heard several claims that leaves from hops grafted on marijuana were psychoactive. Only one such case claimed to be first hand, and we never did see or smoke the material. We doubt these claims. Hops plants do have resin glands similar to those on marijuana, and many of the substances that make up the resin are common to both plants. But of several species and many varieties of hops tested with modern techniques for detecting cannabinoids, no cannabinoids have ever been detected.

The commercially valuable component of hops is lupulin, a mildly psychoactive substance used to make beer. To our knowledge, no other known psychoactive substances has been isolated from hops. But since these grafting claims persist, perhaps pot-heads should take a closer look at the hops plant.

Most growers who have tried grafting Cannabis and Humulus are unsuccessful. Compared to many plants, Cannabis does not take grafts easily. Most of the standard grafting techniques you've probably seen for grafting Cannabis simply don't work. For example, at the University of Mississippi, researchers failed to get one successful graft from the sixty that were attempted between Cannabis and Humulus. A method that works about 40 percent of the time is as follows. (Adapted from 205)

Start the hops plants one to two weeks before the marijuana plants. Plant the seeds within six inches of each other or start them in separate six-inch pots. The plants are ready to graft when the seedling are strong (about five and four weeks respectively) but their stem has not lost their soft texture. Make a diagonal incision about halfway through each stem at approximate the same levels (hops is a vine). Insert the cut portions into each other. Seal the graft with cellulose tape, wound string, or other standard grafting materials. In about two weeks, the graft will have taken. Then cut away the unwanted Cannabis top and the hops bottom to complete the graft. Good luck, but don't expect to get high from the hops leaves. (Smoking any plant's leaves will give a short, slight buzz.)

18.7 Polyploids

H.R. Warmke also experimented with breeding programs during the war years. Polyploid Cannabis plants were produced by treatment with the alkaloid colchicine. Colchicine interferes with normal mitosis, the process in which cells are replicated. During replication, the normal doubling of chromosomes occurs, but colchicine prevents normal separation of the chromosomes into two cells. The cell then is left twice (or more then) the normal chromosome count.

Warmke's experiments concluded that polyploids contained higher concentrations of the "active ingredient." However, the procedure for measuring that ingredient was much the same is described for grafting, with probably similar shortcomings.

Polyploid Cannabis has been found to be larger, with larger leaves and flowers. Recent experience has shown that polyploids are not necessarily
higher in potency. Usually they are about equal to diploid siblings.

Colchicine is a highly poisonous substance. The simplest and safest way to induce polyploids is to soak seeds in a solution of colchicine derived from bulbs of winter or autumn crocus (Colchicum). Mash the bulbs and add an equal part of water. Strain through filter paper (or paper towels). Soak seeds in the solution and plant when they start to germinate. Cultivate as usual.

Only some of the seeds will become polyploid. Polyploid sprouts generally have thicker stems, and the leaves are often unusually shaped, with uneven-sized blades. Leaves also may contain more than the usual number of blades. As the plant grows, leaves should return to normal form, but continue to be larger and with more blades.

If no polyploids sprout, use less water in preparing the solution.

Colchicine is also a prescribed drug for treatment of gout and is taken in pill form. These usually contain .6 mg per tablet. Use 10 tablets per ounce of water, and soak the seeds as described above.

Colchicine is also sold by mail-order firms which advertise in magazines such as Head or High Times.

Because colchicine is a poison, it should be handled carefully. It is not known if plants from seeds treated with colchicine will contain a harmful amount of colchicine when plants are grown. Harm is unlikely, because the uptake by the seed is so small, and because the colchicine would be further diluted during growth, as well as diminished by smoking. But we cannot guarantee that you can safely smoke colchicine-treated plants.

Chapter 19
EFFECTS OF THE ENVIRONMENT ON POTENCY

This chapter deals only with the influence of the environment on the potency of your crop. Differences or changes in potency can also result from inherent differences between plants, such as in their variety or growth stage, from chemical degradation of the harvested marijuana, and from genetic processes that take place over several generations of plantings. (For discussion of these other causes of differences in potency, see the following sections: "Cannabis Chemotypes" in section 2; "Inherent Variations" in section 3; "Breeding" in section 18; "Potency and Decomposition" in section 20; and "Storage" in section 21.)

We have emphasised the heredity is the most important factor that determines potency. Potent marijuana grows from seeds of potent marijuana. A healthy, mature plant bears an abundance of flowers, guaranteeing you a potent harvest.

Some researchers have investigated the impact of the environment on relative potency, since this question is of interest to officials concerned with marijuana control as well as to marijuana growers. Their primary goal has
been to discover the gross effects of different environments rather than to single out the effects of any particular factor. A consensus is that the impact of environment on potency is small relative to that of the plant's heredity. Nevertheless, where scientists have commented on this question, the common denominator for higher potency has been stress.

19.2 Stress

Stress in anything that detracts from the plant's health or vigour. Environmental factors such as competition from other plants, low water availability, and poor soil conditions are examples of stress factors.

In many marijuana-growing cultures, farmers have practices that are stress-related; splitting the base, severe pruning, bending or contorting the stem, and water deprivation are common examples. Of course, the fact that marijuana-growing cultures have such practices does not mean that these practices actually increase potency, or that this is, or ever was, their intent. This original meaning may well have been forgotten centuries ago. For instance, cultivation of sinsemilla has been practiced for centuries, not for potency, but because the seedless product is easier to process or smoke.

There does seem to be some underlying relationship between stress and higher potency. Stress factors may slow growth in general, but at the same time, may not slow the synthesis of cannabinoids. Potency may be affected in much the same way by growth factors that are not considered stressful. As described previously, marijuana plants grow more compactly and have smaller leaves under conditions of relatively warm temperatures, or strong sunlight, or a dry atmosphere; they grow taller and have larger leaves when grown under cool temperatures, moderate light, or a humid atmosphere. Higher relative potency seems to correlate with conditions which favour compact development of the plant and its parts.

The rate of cannabinoids synthesis relative to photosynthesis may be affected in ways not apparent. Sunlight, for instance, is a growth factor. In almost all cases, the more sunlight the plants receive, the faster and larger they will grow. Yet plants grown with intense sunlight seem to maximise potency. Intense sunlight can raise plants' internal temperatures to levels that interfere with the photosynthesis cycle. Absorption of light energy and conversion to biochemical energy continues unimpeded, but the synthesis of sugars is impeded. (Under a midday sun, this phenomenon has been observed in other field crops. (206)) In marijuana, cannabinoids synthesis may continue unaffected at these higher temperatures. This might account, in part, for the slightly higher potency of plants grown in tropical zones.

The subject of potency is mired in confusion and mystery, largely because of fertiliser and soil ads, marijuana-growing books, and individuals who promise ways of increasing potency or growing super grass. There are no magic formulas or secrets to divulge that will make or break the potency of your crop. We have tried to play down this type of thinking throughout this book. Choice of seed, and a harvest of well-developed buds, far outweigh any other factors in determining potency.
We know of no one who has demonstrated that manipulation of any particular environmental factor leads to higher potency. This lack of demonstration probably exists for two reasons: (1) environmental effects on potency are relatively small compared to the effects of inheritable traits, and hence are not easy to discern; and (2) "increased potency" is difficult to prove. Most scientific experiments are observations, and test effects or compare results rather than try to prove something.) The variations in potency within any variety, and within each plant, require stringent methods of sampling for comparative tests. And since potency also changes with time, meaningful comparisons can be difficult to make. Scientific papers reflect this difficulty.

An experiment on potency must account for inherent variations in potency before environmental effects can be analysed. Samples would need to be equivalent in terms of variety, growth stage and development, sex, plant part, and the position of the part on the plant. A simple way to do this would be to harvest females when each reached full bloom and then compare the uppermost buds from each plant.

Most of the research on potency done to date either has not reported sampling techniques or did not account for certain inherent variations. In the extreme case, all vegetative matter from one plant was mixed together, and the THC concentration in a sample of this matter was compared with that in a similar sample of mixed marijuana from another plant. Such practices can give misleading results. Consider the fact that an unhealthy plant will have dropped many of its lower, less-potent leaves. A healthy plant has more leaf overall and retains more of its lower leaves. There is a good chance that the unhealthy plant will test higher in average THC content, because proportionately shoots, which are relatively more potent. Such a sampling error could create the impression that stress is positively correlated with potency.

Marijuana scientists have recognised the need for testing equivalent samples and for setting standards for testing. In 1974, the English scientist John Fairburn (68) published a number of well-controlled experiments concerning potency and light. This is a hopeful sign that more meaningful experiments will be forthcoming.

We have said that the common denominator for increasing potency is stress. Let's put that in perspective.

You cannot go wrong if you grow the largest and healthiest plants possible. Our experience has been that the most potent plants are more often the healthiest and most vigorous in the garden.

Factors that limit growth rate are probably related to potency, and if growth rate is relatively slower, cannabinoids concentrations may be higher. Plants whose average yield is six ounces may be slightly more potent than plants whose average yield is eight ounces. Factors related to potency affect growth rate rather than ruin the plant's health. When a plant is so traumatised that it is barely surviving, potency as well as growth rate declines.

Obviously, if the growth rate is slower, the harvest will be smaller. Any
difference in potency due to stress is quite small, but the difference in yield can make the difference between harvesting an ounce and harvesting several pounds (i.e., don't get carried away with the practice of stressing the plants). If you wish to stress the plant, wait until it is firmly established and growing well.

Outdoors, don't stress the plant until at least the middle of its life. You want the plant to be large enough to bear a good harvest of buds. Water deprivation is a good method of limiting growth outdoors. However, wilted plants must be watered, or they will die.

Competition from other weeds has been correlated with higher potency in two recent studies (71,74). You might prefer not to weed your patch after the seedling stage. (Initially, weeding is necessary because indigenous weeds generally outgrow marijuana seedlings.)

Another safe way of applying stress is to remove all large leaves from the plant once it has begun to flower.

Indoors, the plants are already in a delicate state. We advise indoor growers to grow the largest and healthiest plants possible for best results.

19.3 Nutrients

Most growers show a keen interest in fertilising, since it is one factor over which they have some control. Most growers also feel that nutrients, which play such an important part in plant growth, probably have a relationship to the potency, and this is a reasonable assumption. In marijuana lore, potency is sometimes attributed to particular soil types (for instance, red dirt, which is iron-rich) or to presence or lack of certain nutrients (for examples, nitrogen or potassium deficiency).

The relationship of potency to soil conditions, in particular the nutrient content, has been looked at recently by several research groups. In two such studies, (71,74) the cannabinoid content of naturalised weedy hemp stands in the Midwest was examined. Variations in potency were then correlated to soil properties, such as N, P, and K content. The two papers came to similar conclusions. First, stands growing in areas where they were under stress tended to produce less biomass (yield) but were more potent overall. Second, when nutrients or other growth factors, such as height and weight of plants or root size, were correlated with potency, potency was almost always correlated positively with positive growth factors. That is, higher potency occurred when the plants were growing with adequate or high amounts of nutrients present, not when nutrients were inadequate.

What appears to be a contradiction (stress leads to higher potency, or good growing condition lead to higher potency) may be explainable in terms of what these experiments actually measured.

A basic assumption in these studies was that all the plants were relatively homogeneous genetically, since they may have originated from a single stock of hemp grown during World War II. Assuming this is true, then variations between stands would be due to differences in local environmental factors. However, since environmental condition differed locally for separate stands,
one cannot tell whether variations in potency between stands are due to present environmental factors (phenotypic responses) or reflect thirty years of adaption by each stand to its local environment (genotypic shifts).

It may be that positive growth factors are associated with higher potency in phenotypes (plants now growing), whereas stress leads to higher potency in succeeding generations, because of selective pressure. It is interesting that both papers reported strong positive correlations between higher potency and competition from other weeds, since competition between plants does exert strong selective pressures.

The following list of possible effects of nutrients on potency has been adapted from these four studies. (63,71,74,231)

Nitrogen

Nitrogen was positively correlated with higher potency. Once controversy in marijuana lore is whether a nitrogen deficiency during flowering increases potency. We have grown plants with N deficiencies, and they seemed no more potent than those grown with high amounts of nitrogen available. However, the N-deficient plants did produce a much smaller harvest.

Phosphorus

P has been correlated positively with higher potency in all studies that have examined this factor. Phosphorus is necessary for good flower development and seed production. Give the plants a steady supply of phosphorus throughout growth and in particular during flowering.

Potassium

K has been correlated both positively and negatively with potency. More often, it has been found to be negatively correlated. As discussed previously, plants that show some potassium deficiencies may grow well; so you may choose not to treat minor symptoms of K deficiency often grows vigorously with little harm other than the spotting and the loss of some lower leaves. It should not be necessary to fertilise with potassium during flowering unless deficiency symptoms are severe and the plant has ceased growing.

Calcium

Abundant Ca levels have been consistently correlated with higher potency.

Magnesium

Mg has been negatively correlated with potency. However, this may have been due to the interaction of Ca and Mg, and may reflect Ca's strong positive correlation to potency, rather than the negative effects of Mg per se. Plants that show Mg deficiencies must be fertilised, or they will quickly lose most of their leaves and barely remain alive.

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Figure 30 is a hypothetical plot of the increase in potency of a male plant and a female during the course of their growth. (Potency is measured by the percentage by weight of THC in a dried sample of the uppermost leaves or growing shoots until flowers appear.) It shows that generally potency increases as the plant develops. Cues such as phyllotaxy changes and rate of growth are helpful indicators to changes in development and the chronological age of the plant has little significance.

The development of the cannabinoids, resin glands, and, in practical terms, the potency in the living plant is not clearly understood. We believe that, for the most part, potency does not increase steadily throughout the entire plant. Rather, each plant part reaches a point of maximum potency as it individually develops. A leaf that is formed when the plant is four weeks old does not increase in potency during the rest of the season. To say that potency is increasing means that the leaves that are now forming are more potent than those previously formed.

We also believe that cannabinoid formation is very fast as each plant part forms. Once matured (for example, when a leaf is fully expanded), cannabinoids are decomposing. This is one reason why the potency can decrease as well as increase during growth, especially late in the season, after the flowers have formed. The practical aspects of these points are detailed in the following sections.

20.2 Harvesting During Growth: Leaves and Growing Shoots

Leaves

We have emphasised that you should harvest grass during the course of the season. One reason is to assure yourself a return for your efforts. It is a sad commentary on our times that the greatest danger in growing marijuana outdoors is that the plants may be ripped off. On a more positive note, vegetative shoots and leaves can be surprisingly potent and should be sampled.

The potency of each new set of leaves is higher than the last pair until a plateau is reached, usually during the middle of vegetative growth. Thereafter potency of new leaves stays about the same as in those preceding. Often there is a noticeable decline in potency just prior to flowering. Leaves that form during flowering are usually more potent than those formed during the vegetative plateau. Leaves that form after the bloom are less potent.

Of course, not all varieties or individual plants will follow this rhythm. Faster-developing plants may reach the plateau sooner, and slower plants later. Potency of plants that have a longer life cycle may stay at the vegetative plateau for several months. Some plants do not seem to experience any drop in potency before flowering. Potency of these plants continues to increase gradually after the initial quick increase during early vegetative growth.
Whenever you harvest green leaves during growth, you should always take the uppermost leaves, since these are the most potent. Also, the smaller leaves that form on the branches are more potent than the large leaves on the main stem. These large stem leaves (fan, shade, or sun leaves) are often the first leaves that growers pick. But these are the least potent of all leaves, and the may not get you high at all. As long as these leaves are healthy and green, let them stay on the plant for the plant's growth. Many growers simply use these leaves for mulch or compost as they die.

Don't think that you should harvest each leaf as soon as it appears; this procedure would seriously affect normal growth and result in a small harvest of buds. The potency of individual leaves does not increase during the course of the season, but the decrease in potency is not great. Some of the loss in potency may even be made up for by the loss in tissue weight that a leaf experiences as it dies. Many growers prefer to harvest leaves during growth only after they lose colour, preferring the taste of the smoke to that of green leaves.

Leaves should always be harvested if they die; with indoor gardens, remove any leaves that show signs of insects or other pests.

Do keep yourself supplied with grass (that is the reason you are growing the plant); just don't overdo it. The main harvest is made up of buds, and you want a large, healthy plant that can support vigorous flowering. The larger and healthier a plant is, the more leaf you can harvest without seriously affecting the plant.

Growing Shoots

You may prefer not to clip the growing shoot of the main stem. This forms the largest and most potent cola by harvest time. Plants grown close together usually are not clipped, so that the plants may grow as tall as possible. Where there is much space between plants, the main shoot is clipped to encourage the plant to develop its branches, which fill the available space.

The potency of growing shoots follows the rhythm described for new leaves. However, growing shoots can be the most potent parts of the harvest when picked at the right time. Shoots sometimes reach a very high peak of potency during the middle of vegetative growth. Outdoor gardens should be samples from mid-June through July, since this is the period in which shoots usually reach their peak.

Potency also fluctuates according to local weather conditions. Try to harvest after a period of clear, sunny weather. Potency may declining for several days after a period of cloudy weather or heavy rainfall. After a heavy rain, harvest the shoots a week or two later, since the shoots often peak in potency during a burst of fast growth.

Growing shoots can be harvested from each plant at least twice during growth. The first clipping may not give you much worthwhile grass, but it is done when the plants are young (roughly six weeks old) to force the plant to develop several growing shoots which are harvest about six to eight weeks later. The main shoot is clipped, leaving about four or five nodes below the
Two shoots should start to grow from each node, the strongest at the top of the plant and the weakest at the bottom. (This difference is more pronounced under artificial light, since the light is strongest on the top of the plants.) Each plant should produce at least six strong growing shoots after this first clipping. The yield from growing shoots can be considerable (especially during the summer marijuana drought) and will probably keep you supplied until the main harvest.

A third harvest of shoot can be made later if the plants have a long growing season or are indoors. You don’t want to clip shoots from the plants just prior to or during flowering, since doing so cuts down on the harvest of buds. Each plant should have at least twelve growing shoots after being clipped twice previously. You might harvest only a few shoots from each plant if the time for flowering is near.

20.3 Male Plants

Male plants usually do not have the dramatic increase in potency during flowering that the females do. Male flowers take about two weeks to mature, from the time they are first visible as tiny knob-like buds. New flowers continue to appear for several weeks.

When male flowers open and are about to release pollen, they reach their maximum potency. Since all flowers do not mature at the same time, for maximum potency the plants should be harvested after the first few flowers have opened.

Male flowers actually make up little of the total weight of the harvest, and few new leaves form once flowering begins. There is no significant loss in either potency or yield if the male is harvested before its flowers open. Once male flowers appear, there is little change in their potency. Also, once the flowers do open and release pollen, they shortly fall from the plant and are lost to the harvest.

Males should therefore be harvested before any flowers open unless you want the females to produce seeds. In a small garden, male flower clusters can be individually harvested as they mature. Most growers treat male flowers more as a novelty. Potency of male flowers is quite variable, and seldom are they as good as the female flowers. To remove male plants, cut them near the base of the stem. Don’t rip them up by the roots if they are near females that will be left to grow.

Male plants normally begin to lose their vigour after the initial bloom. When the weather is mild, or the plants are indoors, they can be encouraged to bloom a second and sometimes a third time before they finally die.

20.4 Harvesting Female Buds

The decision of when to harvest females can be simplified by understanding that you want to pick the buds after they have developed fully, but before degradation processes begin to lower potency. There are two criteria you can use to tell when the plants have reached full bloom. The first is recognising the rhythm, with which the plants are blooming. A second is the condition of the flowers as judged by the health of the stigmas and the
colour of the resin.

Sinsemilla

Since sinsemilla flowers are not pollinated, the flowering period may last for many weeks. The most common rhythm for sinsemilla is that plants go through a stage of rapid bud formation, and the plants do indeed bloom. This bloom often lasts four to five weeks. The bloom ends when the rate at which new flowers form noticeably declines. At this time you should be able to sense that the bloom is completed. Buds are at their peak potency about one week after flower formation slows. This is the time to harvest. True, the plant may continue to grow slowly, but the main harvest is ready and should be taken.

With sinsemilla, some marijuana varieties have an extended bloom that may last more than two months. With this rhythm, the rate at which the buds form is drawn out, and progresses at a slower but steadier pace. The point at which the bloom is essentially over may not be as obvious as in the first case. Here, use the condition of the buds to make your decision. Stigmas wither first at the base of the buds (older flowers). Those stigmas at the top of the buds (younger) will still be white and healthy, although their tips are often brown. Harvest the plants when about half the stigmas in the buds have withered. The coating of resin glands should still be clear or white, with only a few golden or browned gland heads.

A third type of flowering rhythm is sometimes seen on plants from Thai seed. Flower buds bloom and ripen at different times. These plants also have an extended flowering stage that can last for over two months. You may choose to harvest individual buds, colas, or branches as they ripen.

Seeds

If your primary interest is seeds, the plant should be harvested after the seeds have developed their mature colour. Mature seeds can be seen splitting their sheaths or bracts. When enough seeds have ripened, the plants should be harvested. If the plants are left in the ground and die, many of the seeds will fall from the plant.

For most growers, potency will be of primary interest, seeds only a secondary. With seeded marijuana, flowering is initially rapid until the plant is well-pollinated. If pollination occurs early in flowering, the plants often bloom for another week or two. Generally, you want the plants to flower for at least four weeks before picking, and usually longer, about six to seven weeks.

With seeded marijuana, the bloom is of shorter duration than with sinsemilla. Once growth slows, wait another two to three weeks before harvesting. All the seeds may not be matured, particularly at the top of the bud. But potency of the buds should be about maximum at this time.

20.5 Weather

Because of such variables as variety and growing conditions, there can be so much variation in the ripening process that no one criterion for judging
when maximum potency is reached will be reliable for all cases.

Warm, sunny weather encourages rapid flowering and a long period of receptivity by the stigmas. Cool, rainy weather can wither the stigmas and dampen the vigour of the bloom.

If brief frost or long, cool rain has withered the stigmas, use the plants' growth as a guideline, because ultimately this is the most important criterion. You want the buds to reach a mature size, and to ripen for about another week. You do not want the buds to be left on the plant longer than necessary.

Ideally, harvesting should follow a period of warm, sunny weather. In northern and mountainous parts of the country, many tropical varieties will note flower until late in the season, when the weather has cooled and night-time frosts are threatening. Most mature plant can withstand mild frosts and continue to grow well if daytime temperatures are mild. In this case, let the plants mature, since formation of the buds is more important than the weather in determining potency. Watch the plants carefully, and harvest when the buds reach mature size. Marijuana killed by frost may smoke harshly, but potency does not seem affected. Well-formed buds should be picked if heavy rains are expected. Cannabinoids are not water-soluble, but gland heads will be washed away.

Barring a catastrophe, such as a long frost, death to Cannabis is usually not sudden. The plants will continue to grow, and may in fact rejuvenate the next year if the stalks are left in the ground. But after the main bloom, the growth that follows is usually much less vigorous and sometimes forms abnormally. Leaves at this time are simplified, and have one blade. Later leaves are smaller, and tend to have entire margins (no serrations). Sometimes they are twisted or misshaped, as are the flowers that form along with them. This slow growth that follows the initial bloom will contribute little to the weight of the harvest. Additionally, this post-bloom growth is much less potent than the original bloom. Resin glands on these plant parts are feeble and poorly developed. When this abnormal growth forms, the time for harvesting is past. {See Figure 83.}

When a plant seems to persist in growing, and you are not sure bloom is past, the best procedure to follow is to try for a double harvest.

Double Harvests

Most marijuana plants take at least five months to reach maturity. Once the plant has reached maturity, it is forming its most potent marijuana, and should not be cut down completely. You can often induce the females to flower a second (and sometimes a third) time, especially if the plants are indoors or if the weather is expected to stay mild for several more weeks.

To encourage a second bloom, first take the bulk of the harvest: all but the smallest buds, and most of the leaf. Some green leaves should be left on the plant to maintain the plant's growth. After harvesting, give the plants a thorough watering, and water with a soluble, complete fertiliser that provides a good supply of both N and P. This will encourage new growth and continued flowering.
Indoors, the best procedure is to treat the plants like a hedge. Cut all the plants back to equal heights, about two to three feet tall. Remove most of the grass, but again leave a few green leaves on the plant. Don't remove lower branches even if they are leafless, since these will sprout again. Lower the light system to the tops of the plants, and maintain the daily cycle at about 12 hours. The second crop of buds will be ready for harvest in four to eight weeks. With this system, the plants appear like dense hedges of buds. If the second crop of buds forms quickly, you should try for a third crop. Continue to fertilise the plants regularly, and watch for signs of magnesium deficiencies, which often show up when the plants have been growing for an extended time.

Double and triple harvests are one of the benefits of indoor growing. Although plants are relatively small indoors, the original harvest of buds can be triples in the next four months.

20.6 Potency and Decomposition

We have said that when buds are picked too late, the potency may decline because of decomposition of the cannabinoids, especially THC.

In section 21, Tables 26-29 give measured rates of decomposition of the major cannabinoids due to exposure to light and air. Light rapidly decomposes THC into unknown products (possibly polymers (122,164)). Light also converts CBD to CBS and CBC to CBL. Air (oxygen) slowly converts THC to the less active CBN. Conversion to CBN is hastened by higher temperatures.

Degradative processes do not occur as quickly in the living plant as when the cannabinoids are purified or in solution, as is shown by the data in Tables 27-30 in section 21 {Tables on disk only}. Resin glands seem to function well in storing the cannabinoids in dried plant material. However, the rates of decomposition in Tables 27 and 28 are for samples exposed to north light and a maximum of 80F temperatures. Temperature would be higher, and light stronger, under full sunlight.

Studies with fresh plant material usually show negligible CBN content in fresh marijuana from immature plants. When mature buds are tested, their CBN content is generally equal to at least five percent of their THC content. When growing temperatures are higher, such as in the tropics, CBN content can account for more than 20 percent of the original THC. Even if we assume a low figure, such as five percent conversion of THC to CBN, there is actually a much greater decline in THC content because of the simultaneous degradation of THC by light.

When the slow rate at which THC oxidises to CBN is considered, five percent decomposition in a period of less than two months represents considerable exposure of the THC to air, and most of this exposure occurs in the last critical weeks when the resin glands begin to degenerate. Plates 8 and 11-13 show the condition of the resin glands on several different kinds of marijuana.

Stalked glands that cover the female flower bracts sometimes rupture or secrete cannabinoids through pores in the glands head. Secretion is not a
continuous flow, but more of an emptying of the glands' contents. At this time, gland heads may dehisce. Also, because of their abundance and raised positions, resin glands on the female bracts are exposed to strong sunlight and possible physical damage. These conditions may explain the significant decline in potency of buds that are overripe.

Leaves are also affected by decomposition of the cannabinoids, but not as quickly or seriously as the buds, probably because the resin glands on the leaves are most numerous on the undersurface, where they are somewhat protected from light. These glands rarely rupture or secrete cannabinoids. Often they are intact, clear, and apparently unchanged for many weeks on the living plant.

As the plates show, one can, with the naked eye, see the glands change colour, from colourless or white to golden, and then to reddish or brown. THC is colourless. If the colour changes of the resin do indicate decomposition of THC, then decomposition in the stalked glands that cover the buds can be considerable.

We have smoked buds that seemed to lose about half their potency when left on the plant for an addition three weeks. Colour changes are after the fact. If many of the glands are beginning to brown, the grass should be harvested.

20.7 Timing the Harvest

Many growers will disagree with us on when the best time is to harvest the buds (female plants). When the plants are left in the ground, and are alive but past the main bloom, the resinous qualities of the plant may become more apparent. The bracts and tiny leaves may swell in size, and the leaves feel thicker. The coating of resin glands will change colour. Leaves often yellow and fall form the plant. Much of the green colour in the flowering buds may also be lost. Harvests of these buds more closely resembles commercial Colombian grass than typical homegrown. The resin content of the dried buds may be higher, and the grass will smoke more harshly than if the buds were younger when picked. You may prefer these qualities in your grass, and some growers insist this grass is stonier. We feel that the grass will give you the highest high when it is picked as described previously. Smoking is a personal experience, and you should try different approaches and come to your own conclusions.

The first time you grow marijuana is largely a learning experience. Most growers can't wait to start their second crop, because they are certain that they'll improve on both the quantity and the quality of their crop, and this is usually true. The wise grower will not put all his proverbial eggs in one basket. It is a good idea to monitor potency by taking samples every few days when harvest time is drawing near, just as such monitoring is for deciding when to harvest growing shoots during vegetative growth.

In any garden, some of the plants will mature sooner than others. Use the plant(s) that is earliest to mature to decide at what point in its development the plant reaches maximum potency. This finding then serves as a guide for harvesting the rest of the plants.

Try to use buds from approximately the same position on the plant each time
you sample. Take only enough to make a joint or two. The more you standardise your testing (and this includes your smoking evaluation), the more accurate your results may be.

20.8 Final Harvesting

The time of harvest is a time of joy. It is also a time for caution. Unless the safety of your garden is assured, you will want to harvest quickly, quietly and as efficiently as possible. Ideally, each plant is harvested as it matures, but some of you will have to harvest all at once.

It is best to take cardboard boxes or large, sturdy bags to carry the harvest. You want to harvest the plants with as little crushing or damage to the flowers as possible.

Bring a strong knife, heavy shears, or clippers for cutting the stalks. The quickest way to harvest is to cut each plant at its base. Once the plants are on the ground, cut the stalks into manageable lengths for boxing or bagging. Separate large branches as needed for packing.

The bagged or boxed material should be moved to the curing or drying area as soon as possible. If you let the plants sit in the trunk of a car or in plastic bags, they will start to ferment and small in less than a day.

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Chapter 21
AFTER THE HARVEST

Once the marijuana plant is harvested, it ceases to produce cannabinoids and resins, and the main changes in potency that occur are degradative. However, when the material is handled carefully, dried or cured properly, and then stored well, little degradation will occur. During drying or curing, the resin content may seem to increase, as the plant's tissues shrink away from their resinous coating.

More than 70 percent of the fresh weight of the plant is water. Drying is done to evaporate most of this water, so the marijuana will burn evenly and smoke smoothly. Additionally, the cannabinoids in fresh plant material are mostly in the acid forms, which are not psychoactive. The acid cannabinoids decarboxylate (they lose the gas, carbon dioxide) during the drying or curing processes, which convert them to their psychoactive neutral forms. Decarboxylation is complete if the marijuana is actually smoked. For this reason, no special procedures are needed to decarboxylate the marijuana unless it will be eaten. In that case, the recipe should include a period of dry heating. The heat converts the cannabinoids to their psychoactive neutral forms, and also melts the sharp-pointed cystolith hairs that cover leaves, stems and petioles. Cystolith hairs can cause stomach pains if you eat uncooked marijuana or chew on raw marijuana, which we strongly advise you not to do.

Commercial marijuana is usually composed of just the flower tops (colas), which have been stripped, manicured, cured, and dried. Homegrowers often do not cure their crop before drying, and if the smoke is smooth, there is no
reason not to dry it directly. But harsh-smoking marijuana can be cured so that the smoke is smoother. Curing has little affect on potency when done properly.

21.2 Stripping

Stripping, the removal of large leaves, is usually done soon after harvesting. Fan leaves are stripped because they are much less potent than the colas that they cover, and do not cure as well as the prime material. In commercial growing areas, the fan leaves are often stripped in the field and form a green manure. But fan leaves are sometimes quite potent, especially if they are recent growth. The lower leaves are usually weak, but they can be used in cooking or concentrated in an extract.

The easiest time to strip fan leaves is after they have wilted, because they are easier to pull off when they are limp then when they are turgid. Wilting takes place in less than an hour if the plants are in a well-ventilated space. Plants placed in a plastic bag in a cool area may take a day or more to wilt.

Some growers leave the fan leaves on until the plants have dried. After the buds are removed, they strip the remaining leaves by running their (gloved) hands from the base of stems and branches toward their tips. The fan leaves disintegrate into shake.

21.3 Grading and Manicuring

Grading and manicuring are important steps in preparing fine grass. Grading is done by separating the plants according to variety, sex, and the particular stash uniform, and the quality of the better grades is not diluted. Plant parts are usually graded as follows: main top colas, small side colas, immature buds, leaves accompanying flowers, and fan and stray leaves. This is important, because the differences in potency will be considerable. For instance, the buds on a Colombian homegrown will be top quality, but the lower leaves will be more like a low-grade commercial Mexican.

Manicuring is done to remove the extraneous leaf from the colas. First the large fan leaves are stripped. The exposed colas are then trimmed with scissors to remove the ends of leaves that stick out from the colas. Plants should be manicured and (usually) graded before drying, since dried material crumbles into shake when handled. Also, leaves dry much more quickly than buds, and different plant parts cure at their own rates.

Male flowers are often treated as a novelty by growers, who make individually rolled sticks from them, as follows. Hang the plants upside down; the leaves will wilt and hang down, covering the male flower clusters. Then roll each cluster within its leaves between the palms of your hands, to compress the cluster into a joint-shaped mass. Dry the "stick" in a warm dark place. Rolling the grass ruptures many of the glands; so dried sticks should be stored carefully until each is used.

Hashish
When you handle your crop, you may notice a resin build-up on your hands and the tools you are using. This resin can be collected by rubbing and scraping it into a ball. It makes a quality hash that is several times as concentrated as the grass.

Small quantities of hash can be made by rubbing resinous plant parts across a thin, fine mesh screen. The resin is then scraped off the screen and rolled into finger shapes. Hash can also be made by thrashing fresh plants over a mesh screen inside an enclosed box whose floor is lined with sheet plastic. A box about one yard square is a suitable size. On one side of the box a hole is made large enough for the colas to be shaken by hand. In this way, the resin glands are knocked loose, but are contained by the box and settle on the plastic.

Plastic or paper should be placed beneath the marijuana during manicuring, grading, or drying. Besides fallen grass, a considerable amount of glands and fine shake can be caught and compressed to a hash-like mass.

21.4 Curing

Curing is a process employed to naturally enhance the bouquet, flavour, and texture of marijuana. Curing does not lower potency when done correctly, although poor curing methods often result in some less of THC.

Curing is not an essential procedure, and many growers prefer the "natural" flavour of uncured grass. Sweet sinsemilla buds usually are not cured.

Curing is most successful on plants which have "ripened" and are beginning to lose chlorophyll. It is less successful on growing tips and other vigorous parts which are immature. These parts may only lose some chlorophyll.

Curing proceeds while the leaf is still alive, for until it dries, many of the leaf’s life processes continue. Since the leaf’s ability to produce sugars is thwarted, it breaks down stored starch to simple sugars, which are used for food. This gives the grass a sweet or earthy aroma and taste. At the same time, many of the complex proteins and pigments, such as chlorophyll, are broken down in enzymatic processes. This changes the colour of the leaf from green to various shades of yellow, brown, tan, or red, depending primarily on the variety, but also on growing environment and cure technique. The destruction of chlorophyll eliminates the minty taste that is commonly associated with green homegrown.

There are several methods of curing, most of which were originally designed to cure large quantities of tobacco. Some of them can be modified by the home grower to use for small marijuana harvests as well as large harvests. The methods used to cure marijuana are the air, flue, sweat, sun, and water cures.

Air Curing

Air curing is a technique developed in the United States for curing pipe and cigar tobacco. It was originally done in specially constructed barns made with ventilator slats which could be sealed; a small shed or metal building
can easily be adapted for this use. However, this method of curing works only when there is enough material to keep the air saturated with moisture.

Wires are strung across the barn, and the marijuana plants or plant parts are hung from them, using string, wire twists, or the crooks of branches. The plants material should be closely spaced, but there should be enough room between branches (a few inches) so that air circulates freely. The building is kept unventilated until all the material loses some chlorophyll (green colour). This loss occurs rapidly during warm sunny weather because heat builds up, which hastens the cure. In wet or overcast weather, the temperature in the chamber will be cooler, and the process will proceed more slowly. If these conditions last for more than a day or two, unwanted mould may grow on the plants. The best way to prevent mould from forming is to raise the temperature to 90F by using a heater.

After the leaves have lost their deep green and become pale, the ventilator or windows are opened slightly, so that the temperature and humidity are lowered and the curing process is slowed. The process then continues until all traces of chlorophyll are eliminated. The entire process may take six weeks. Then the ventilators are opened, and an exhaust fan installed if necessary, to dry the material to the point that it can be smoked but still is moist, that is, bends rather than crumbles or powders when rubbed between thumb and forefinger.

Flue Curing

Flue curing differs from air curing in that the process is speeded up by using an external source of heat, and the air circulation is more closely regulated. This method can be used with small quantities of material in a small, airtight curing box constructed for the purpose. Large quantities can be hung in a room or barn as described in Air Curing.

A simple way to control the temperature when curing or drying small amounts of marijuana is to place the material to be cured in a watertight box (or a bottle) with ventilation holes on the top. Place the box in a water-filled container, such as a pot, fish-tank, or bathtub. The curing box contains air and will float. The water surrounding the box is maintained at the correct temperature by means of a stove or hotplate, fish-tank or water-bed heater, or any inexpensive immersible heater. Temperature of the water is monitored.

With the marijuana loosely packed, maintain water temperature at 90 degrees. After several days, the green tissue turns a pale yellow-green or murky colour, indicating yellow or brown pigments. Then increase temperature, to about 100 degrees, until all traces of green disappear. Raise the temperature once again, this time to 115 degrees, until a full, ripe colour develops. Also increase ventilation at this time, so that the marijuana dries. Plants dried at high temperature tend to be brittle; so lower the temperature before drying is completed. This last phase of drying can be done at room temperature, out of the water bath. The whole process takes a week or less.

Marijuana cured by this technique turns a deep brown colour. Immature material may retain some chlorophyll and have a slight greenish cast. Taste is rich yet mild.
Sweat Curing

Sweat curing is the technique most widely used in Colombia. Long branches containing colas are layered in piles about 18 inches high and a minimum of two feet square, more often about ten by fifteen feet. Sweat curing actually incorporates the fermenting process. Within a few hours the leaves begin to heat up from the microbial action in the same way that a compost pile ferments. Then change in colour is very rapid; watch the pile carefully, so that it does not overheat and rot the colas. Each day unpack the piles, and remove the colas that have turned colour. Within four or five days, all the colas will have turned colour. They are then dried. One way to prevent rot while using this method is to place cotton sheets, rags, or paper towels between each double layer of colas. The towels absorb some of the moisture and slow down the process.

Sweat curing can be modified for use with as little marijuana as two large plants. Pack the marijuana tightly in a heavy paper sack (or several layers of paper bags), and place it in the sun. The light is converted to heat and helps support the sweat.

Another variation of the sweat process occurs when fresh undried marijuana is bricked. The bricks are placed in piles, and they cure while being transported.

A simple procedure for a slow sweat cure is to roll fresh marijuana in plastic bags. Each week, open the bag for about an hour to evaporate some water. In about six weeks, the ammonia smell will dissipate somewhat, and the grass should be dried. This cure works well with small quantities of mediocre grass, since it concentrates the material.

Sun Curing

A quick way to cure small quantities of marijuana os to loosely fill a plastic bag or glass jar, or place a layer between glass or plastic sheets, and expose the material to the sun. Within a few hours the sun begins to bleach it. Turn the marijuana every few hours, so that all parts are exposed to the sun. An even cure is achieved in one to two days {(see Plate 16)}. Some degradation of THC may occur using this method.

Water Cure

Unlike other curing methods, the water cure is performed after the marijuana is dried. Powder and small pieces are most often used, but the cure also works with whole colas. The material is piled loosely in a glass or ceramic pot which is filled with luke-warm water. (When hot water is used, some of the THC is released in oils, which escape and float to the top of the water.) Within a few hours many of the non-psychoactive water-soluble substances dissolve. An occasional gentle stirring speeds the process. The water is changed and the process repeated. Then the grass is dried again for smoking.

THC is not water-soluble; so it remains on the plant when it is soaked. By eliminating water-soluble substances (pigments, proteins, sugars, and some
resins), which may make up 25 percent of the plant material by weight, this
cure may increase the concentration of THC by up to a third.

Marijuana cured by this method has a dark, almost black colour, and looks
twisted and curled, something like tea leaves. The water cure is frequently
used to cure dried fan leaves and poor-quality grass.

21.5 Drying

Living marijuana leaves are 80 percent water; colas are about 70 percent
water. Marijuana dried for smoking contains only eight to 10 percent water,
or about 10 percent of the original amount. There are several methods used
to evaporate water; these have little effect on potency, but can affect the
taste, bouquet, and smoothness of the smoke. Generally, the slower the dry,
the smoother the taste. Excess drying and drying methods that use heat will
evaporate some of the volatile oils that give each grass its unique taste
and aroma.

Grasses which are dried as part of the curing process usually have a smooth,
mild taste, because of the elimination of chlorophyll and various proteins.
Cured marijuana may also be a little sweeter than when first picked, because
the curing converts some of the plant's starch to simple sugars.

Some grasses are tasty and smooth-smoking when they are dried without
curing, especially fresh homegrown buds which retain their volatile oils and
sugar. Many homegrowers have acquired a taste for "natural" uncured grass,
with its minty chlorophyll flavour; such marijuana is dried directly after
harvesting. {Figure 89, Male plants drying on a tree. Cheesecloth holds
loose leaf for drying.}

Slow Drying

Slow drying is probably the method most commonly used to dry marijuana.
Because of the slowness of the dry, a slight cure takes place, eliminating
the bite sometimes associated with quickly dried grass.

There are many variations of the technique, but most commonly whole plants
or separated colas are suspended upside down from a drawn string or from
pegs on a wall in a cool dark room, closet, or other enclosed space. A large
number of plants may take a week or two to dry. The drying time for small
numbers of plants can be increased (for a slight cure) by placing the plants
in large, open paper sacks that have ventilation holes cut in their sides.
The drying room should have no heavy drafts, but mould may form on the
plants if the air is stagnant. If weather is rainy or the air humid,
increase ventilation and watch for any mould. Plants should be dried quickly
under moderate heat if any mould appears.

Many experienced growers prefer slow drying to curing. There is little
chance of error with this method, and buds usually smoke smooth and develop
a pliable consistency. Slow-dried ripe buds retain their delicious, sweet
aroma and taste.

Fast Drying
The fast dry-method produces a harsher smoke than slow drying, but it is often the most convenient method to use. The plants are suspended in the same way as for slow drying, but the temperature in the drying area is increased to between 90 and 115 degrees, often by means of electric or gas heater. The drying area is kept well-ventilated with a fan. As the plants dry, they are removed from the drying area. By this method, plants in a tightly packed room can be dried in less than four days, but the exhaust will contain the deliciously pungent odour of drying marijuana.

Indoor growers often hang plants to dry over radiators or stream pipes. Leaves are dried by placing them on a tray over a radiator or on top of the light fixture.

Marijuana that is fast-dried retains its original green colour and minty taste.

Oven Drying

Oven drying is often used by gardeners to sample their crop. Small quantities of material can be quickly dried by being placed in a 150 to 200 oven for about 10 minutes. Larger quantities can be dried in trays that contain a single layer of material or in a dehydrator. Oven-dried and dehydrator-dried marijuana usually has a harsh taste and bite, and loses much of its bouquet. The method is often used to dry marijuana which has been cured and dried but is too moist to smoke, or to dry marijuana which is to be used for cooking or extractions. It is an adequate method for obtaining dry material for testing and emergencies, but the main harvest should not be dried in this way. Oven drying works best with leaves. When leaves are dried together with buds or shoots, remove the material from the oven periodically, to separate the faster-drying leaf material (before it burns) from the slower drying buds. One way to do this is to place all the material on a wire screen over a tray. Every few minutes rub the material across the screen. Dried material falls unto the tray and is removed from the oven. Repeat until all the material has dried.

Oven curing works well when closely watched. Dried marijuana that is left in the oven will lose potency quickly. Any time the marijuana begins to char, most of the potency will already have been lost. This should not be a problem unless you are careless, or allow the temperature to go above 200 degrees.

Sun Drying

Some growers dry their crops right in the field. There are many methods of sun drying. In Oregon, some growers break the main stem about two feet from the ground. The leaves and buds dry gradually, since they are still partly attached to the plant. Other growers spread burlap and cover it with plants left to dry. Fan leaves are left on the plants to protect the drying buds from the sun. The grass is manicured after drying. Growers in Arizona shade drying plants with cheesecloth.

Sun-dried marijuana usually has a taste similar to that of oven-dried. Often the sun bleaches it slightly but also destroy some of the delicate bouquet. Prolonged exposure to the sun will decrease potency, although there is no
noticeable loss if drying is done quickly.

Dry Ice

Many homegrowers have written to us that the dry-ice cure increases the potency of marijuana considerably, and we would be remiss not to mention it.

Dry ice is frozen carbon dioxide. When it melts (sublimates), it turns from a solid directly into a gas. This gas absorbs some moisture from the frozen marijuana and partially dries it.

There are many variations of the dry-ice method. Fresh or partially dried material is usually used, although some enthusiasts claim that the cure also works with dried material. The marijuana is placed in a coffee can or similar container with a lid, along with at least an equal volume of dry ice. Puncture the lid so that the gas can escape as it evaporates. Place the can in a freezer to prolong the evaporation process. When the dry ice is gone, the grass is dried, but still moist.

Some growers claim that simply freezing the grass increases potency. They often freeze fan leaves or other less-potent material for a couple of months before smoking it. This is said to work only with fresh (wet or dried) grass.

21.6 Fermentation

When vegetation dries, the individual cells which maintained life processes die. But marijuana can still be conditioned by means of fermentation. Fermentation is the process in which microbes and plant enzymes break down complex chemicals into simpler ones, mainly starch and sugars into alcohol and simple acids. In the process chlorophyll is destroyed, giving the material a more ripened appearance. If the fermentation is stopped early, the marijuana has a sweeter taste because of the sugars which the ferment produced.

Fermentation occurs when the moisture content of the marijuana is raised above 15 percent and the temperature is above 60 degrees. The more tightly packed the material, that faster the ferment proceeds. The rate of ferment is controlled primarily by varying the moisture content, but each batch proceeds at its own rate because of differences between plants in nitrogen content. (Nitrogen is necessary to maintain fermenting bacteria.) The process is delicate; should the ferment proceed too rapidly, the marijuana may be converted to compost. Watch the fermentation closely. After the desired colour or flavour (from a dried sample) is reached, dry the grass quickly to stop the process.

During fermentation, flavourings can be added to give the marijuana a spicy aroma. Such spices as cinnamon, cloves, ginger, mace, sage, or vanilla are placed between the fermenting material. Orange, lemon, or lime peels are also used. About half an ounce of spice or four ounces of peel are used for each cubic foot of material to be fermented. The spices are wrapped in cloth sachets. The citrus peels are strung. They can be placed between the layers of marijuana.
There are two types of fermentations: self-generating and forced. They are best used with leaves or immature plants.

Self-Generating Fermentation

Self-generating fermentation proceeds rapidly only when there is enough material to make a heap at least one cubic yard large. When smaller quantities are used, too much of the heat generated by the bacteria is dissipated, so that the process is slow and is more properly considered aging.

Place the material in a large container or in a pile with a tarpaulin placed over it, and lightly spray it with a mister if it is dry. Let the pile heat up for a few days, and then break it down. If it is repacked, the marijuana will develop a dull matte appearance and lose its sugars. If the process is allowed to proceed even further, the marijuana will disintegrate.

Forced Fermentation

Forced fermentation can be used with small quantities of material. It requires an enclosure chamber in which heat and humidity can be regulated.

Pack the marijuana loosely in a kiln or other chamber, and raise the temperature to 135 degrees. Maintain humidity at 75 percent. Check the progress of the ferment periodically. Within a week the ferment should be completed. During this ferment there is a release of ammonia compounds, resulting in some foul odours, but upon completion of the ferment and drying, the marijuana should smoke sweet and mellow.

21.7 Storage

THC is degraded by both heat and light. Table 26 shows results of an experiment conducted at the University of Mississippi, in which marijuana was stored under varying temperature conditions. These results indicate that marijuana stored at room temperature (72) or below, and in darkness for up to two years will lose only an insignificant amount of its original potency; whereas marijuana stored in darkness at 97 or above will lose almost all its potency within two years.

In another experiment, Fairbairn stored dried marijuana at different temperatures in both light and dark conditions. The samples in light were exposed to a north-facing windows (no direct sunlight). The results are shown in Table 27.

Fairbairn also performed an experiment to discover the effect of air on THC. Freshly prepared Cannabis resin was stored as a loose powder, a compressed powder, and an unbroken lump for one year at 68 degrees F (about room temperature). Samples were stored under two conditions: in light and air, and in darkness and air. The results are shown in Table 28.

Fairbairn experimented further with pure cannabinoids and extracts of marijuana dissolved in petroleum ether, chloroform, and ethanol (alcohol). The results, in Tables 29 and 30, show that the THC and CBD in solution are much more unstable than when they are left in marijuana,
especially if they are held by the plant in undamaged glands, where they are protected from exposure to air and, to some degree, light. Crude extracts seem more stable than highly refined cannabinoids, especially CBD, which is very unstable in refined solutions.

Extract makers and purchasers should limit the exposure of the solution to light and heat as well as to air. Oils and extracts should be kept refrigerated in opaque, sealed container. Notice that THC is almost completely degraded in a few weeks when it is held in solution and exposed to light. Red oil, hash oil, and honey oil must be stored in light-tight containers to preserve potency.

From the tables, you can see that light is the primary factor that causes decomposition of THC. The decomposition products are unknown, but are suspected to be polymers or resins. We also do not know whether the rate of decomposition would be faster in direct sunlight.

Air (oxygen) acts much more slowly to convert THC to CBN. Decomposition of THC to CBN is not significant unless temperatures are in the nineties or higher. However, such high temperatures can occur in grass that is packed before it is properly dried. The moisture that is left supports microbial activity, which heats the grass internally, as occurs during certain types of curing. Potency of cured grass is not lowered significantly when the cure is done properly and when the buds are left intact during the process.

The figures for powdered and compressed grass in Table 28 show that both light and air cause rapid decomposition when the resin is exposed through breaking of the resin glands. Intact resin glands appear to function well in storing the cannabinoids. For this reason, it is important to handle fresh and dried grass carefully, in order not to crush the material and thus break the glands, especially in the buds, which have a cover of raised resin glands. Most well-prepared marijuana will have intact, well-preserved buds.

The best place to store marijuana is in a dark container in a refrigerator or freezer. Cannabis should be stored uncleaned, so that the glands containing the THC are not damaged, since damage causes their precious contents to be exposed to light and air. Marijuana should be cleaned only when it is about to be smoked.

Many growers place a fresh lemon, orange, or lime peel in with each lid of stored grass. The peel helps to retain moisture, which keeps the buds pliable, and also gives the grass a pleasant bouquet.

Most growers take well-earned pride in the quality of the marijuana that they grow. By supplying yourself with an herb which may play an important role in your life, you gain a feeling of self-sufficiency that can be infectious.

Since your homegrown is well-tended and fresh, it has a sweet flavourful taste, far superior to that of commercial grass. And there need be no fear of contamination from herbicides, pesticides, adulterants, or other foreign matter. By growing your own, you come to the pleasant realisation that you are free from the vagaries and paranoia of the marijuana market - not to mention how little a home garden costs. All of these feelings can add up to a
very heady experience.

In a time of quiet contemplation, you might also reflect on the experiences that brought you this wondrous herb from a tiny seed. There is a tradition of mutual nurture and support between humanity and this plant that goes back 10,000 years.

You are now part of this continuing tradition.

As you probably realised while reading this book, some of the practical information came to us through letters from growers. We appreciate these letters and will continue to refer to them when we update and improve future editions of the Marijuana Grower's Guide. We would also like to hear ideas, criticisms, and feedback from our readers. Other research material and copies of professional research are also welcome.

Wishing you a Happy Harvest,
Mel Frank
Ed Rosenthal

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Chapter 1 - Sinsemilla Life Cycle of Cannabis

Cannabis is a tall, erect, annual herb. Provided with an open sunny environment, light well-drained soil, and ample irrigation, Cannabis can grow to a height of 6 meters (about 20 feet) in a 4-6 month growing season. Exposed river banks, meadows, and agricultural lands are ideal habitats for Cannabis since all offer good sunlight. In this example an imported seed from Thailand is grown without pruning and becomes a large female plant. A cross with a cutting from a male plant of Mexican origin results in hybrid seed which is stored for later planting. This example is representative of the outdoor growth of Cannabis in temperate climates.

Seeds are planted in the spring and usually germinate in 3 to 7 days. The seedling emerges from the ground by the straightening of the hypocotyl (embryonic stem). The cotyledons (seed leaves) are slightly unequal in size, narrowed to the base and rounded or blunt to the tip. The hypocotyl ranges from 1 to 10 centimeters (1A to 3 inches) in length. About 10 centimeters or less above the cotyledons, the first true leaves arise, a pair of oppositely oriented single leaflets each with a distinct petiole (leaf stem) rotated one-quarter turn from the cotyledons. Subsequent pairs of leaves arise in opposite formation and a variously shaped leaf sequence develops with the second pair of leaves having 3 leaflets, the third 5 and so on up to 11 leaflets. Occasionally the first pair of leaves will have 3 leaflets each rather than 1 and the second pair, 5 leaflets each.

If a plant is not crowded, limbs will grow from small buds (located at the intersection of petioles) along the main stem. Each sinsemilla (seedless drug Cannabis) plant is provided with plenty of room to grow long axial limbs and extensive fine roots to increase floral production. Under favorable conditions Cannabis grows up to 7 centimeters (21A inches) a day in height during the long days of summer.

Cannabis shows a dual response to daylength; during the first two to three months of growth it responds to increasing daylength with more vigorous growth, but in the same season the plant requires shorter days to flower and complete its life cycle.

LIFE CYCLE OF CANNABIS I Juvenile Stage

Cannabis flowers when exposed to a critical daylength which varies with the strain. Critical daylength applies only to plants which fail to flower under continuous illumination, since those which flower under continuous illumination have no critical daylength. Most strains have an absolute requirement of inductive photoperiods (short days or long nights) to induce fertile flowering and less than this will result in the formation of undifferentiated primordia (unformed flowers) only.

The time taken to form primordia varies with the length of the inductive photoperiod. Given 10 hours per day of light a strain may only take 10 days to flower, whereas if given 16 hours per day it may take up to 90 days. Inductive photoperiods of less than 8 hours per day do not seem to accelerate primordia formation. Dark (night) cycles must be uninterrupted to induce flowering (see appendix).

Cannabis is a dioecious plant, which means that the male and female flowers develop on separate plants, although monoecious examples with both sexes on one plant are found. The development of branches containing flowering organs varies greatly between males and females: the male flowers hang in long, loose, multi-branched, clustered limbs up to 30 centimeters (12 inches) long, while the female flowers are tightly crowded between small leaves.

Note: Female Cannabis flowers and plants will be referred to as pistillate and male flowers and plants as staminate in the remainder of this text. This convention is more accurate and makes examples of complex aberrant sexuality easier to understand.

The first sign of flowering in Cannabis is the appearance of undifferentiated flower primordia along the main stem at the nodes (intersections) of the petiole, behind the stipule (leaf spur). In the prefloral phase, the sexes of Cannabis are indistinguishable except for general trends in shape.

When the primordia first appear they are undifferentiated sexually, but soon the males can be identified by their curved claw shape, soon followed by the differentiation of round pointed flower buds having five radial segments. The females are recognized by the enlargement of a symmetrical tubular calyx (floral sheath). They are easier to recognize at a young age than male primordia. The first female calyxes tend to lack paired pistils (pollen-catching appendages) though initial male flowers often mature and shed viable pollen. In some individuals, especially hybrids, small non-flowering limbs will form at the nodes and are often confused with male primordia.

Cultivators wait until actual flowers form to positively determine the sex of Cannabis.

The female plants tend to be shorter and have more branches than the male. Female plants are leafy to the top with many leaves surrounding the flowers, while male plants have fewer leaves near the top with few if any...
leaves along the extended flowering limbs.

*The term pistil has developed a special meaning with respect to Cannabis which differs slightly from the precise botanical definition. This has come about mainly from the large number of cultivators who have casual knowledge of plant anatomy but an intense interest in the reproduction of Cannabis. The precise definition of pistil refers to the combination of ovary, style and stigma. The informal sense is used throughout the book since it has become common practice among Cannabis cultivators.

The female flowers appear as two long white, yellow, or pink pistils protruding from the fold of a very thin membranous calyx. The calyx is covered with resin exuding glandular trichomes (hairs). Pistillate flowers are borne in pairs at the nodes one on each side of the petiole behind the stipule of bracts (reduced leaves) which conceal the flowers. The calyx measures 2 to 6 millimeters in length and is closely applied to, and completely contains, the ovary.

In male flowers, five petals (approximately 5 millimeters, or 3/16 inch, long) make up the calyx and emerge, consisting of slender anthers (pollen sacs), splitting upwards from the tip and suspended nearly spherical slightly yellow, and 25 to 30 microns in diameter. The surface is smooth and entire.

Before the start of flowering, the phyllotaxy (leaf arrangement) reverses and the number of leaflets per leaf decreases until a small single leaflet appears below each pair of calyxes. The phyllotaxy also changes from decussate (opposite) to alternate (staggered) and usually remains alternate throughout the floral stages regardless of sexual type.

The differences in flowering patterns of male and female plants are expressed in many ways. Soon after dehiscence (pollen shedding) the staminate plant dies, while the pistillate plant may mature up to five months after viable flowers are formed if little or no fertilization occurs. Compared with pistillate plants, staminate plants show a more rapid increase in height and a more rapid decrease in leaf size to the bracts which accompany the flowers. Staminate plants tend to flower up to one month earlier than pistillate plants; however, pistillate plants often differentiate more quickly and flower up to two weeks before the staminate plants.

Many factors contribute to determining the sexuality of a flowering Cannabis plant. Under average conditions with a normal inductive photoperiod, Cannabis will bloom and produce approximately equal numbers of pure staminate and pure pistillate plants with a few hermaphrodites (both sexes on the same plant). Under conditions of extreme stress, such as nutrient excess or deficiency, mutilation, and altered light cycles, populations have been shown to depart greatly from the expected one-to-one staminate to pistillate ratio.

Just prior to dehiscence, the pollen nucleus divides to produce a small reproductive cell accompanied by a large vegetative cell, both of which are contained within the mature pollen grain. Germination occurs 15 to 20 minutes after contact with a pistil. As the pollen tube grows the vegetative cell remains in the pollen grain while the generative cell enters the pollen tube and migrates toward the ovule. The generative cell divides into two gametes (sex cells) as it travels the length of the pollen tube.

Pollination of the pistillate flower results in the loss of the paired pistils and a swelling of the tubular calyx where the ovule is enlarging. The staminate plants die after shedding pollen. After approximately 14 to 35 days the seed is matured and drops from the plant, leaving the dry calyx attached to the stem. This completes the normally 4 to 6 month life cycle, which may take as little as 2 months or as long as 10 months. Fresh seeds approach 100% viability, but this decreases with age.

The hard mature seed is partially surrounded by the calyx and is variously patterned in grey, brown, or black. Elongated and slightly compressed, it measures 2 to 6 millimeters in length and 2 to 4 millimeters in maximum diameter.

Careful closed pollinations of a few selected female branches yield hundreds of seeds of known parentage, which are seedless and continue to mature on the plant. As the unfertilized calyxes swell, the glandular trichomes grow and secrete aromatic THC-laden resins. The mature, pungent, sticky floral clusters are harvested, dried, and sampled. The preceding simplified life cycle of sinsemilla Cannabis exemplifies the production of valuable seeds without compromising the production of seedless floral clusters.

Chapter 2 - Propagation of Cannabis

Make the most of the Indian Hemp Seed and sow it every where.

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Sexual versus Asexual Propagation

Chapter 2 - Propagation of Cannabis

Make the most of the Indian Hemp Seed and sow it every where.
Cannabis can be propagated either sexually or asexually. Seeds are the result of sexual propagation and vary among seedlings and offspring with characteristics differing from those of the parents. Pollination is the replication of the parental plant without genetic variation. Asexual propagation, in theory, allows sexual trait preservation.

When the difference between sexual and asexual propagation is well understood then the proper method can be chosen for each situation. The unique characteristics of a plant result from the combination of genes in its genome. Genes are the units of heredity that determine the traits of an organism. Each gene is located on a specific chromosome, and chromosomes come in pairs (homologous chromosomes), the plant is homozygous and will "breed true" for that trait if self-pollinated. The traits possessed by the homozygous parent will be transmitted to the offspring, which will resemble each other and the parent. If the genes are different, the offspring may not resemble the parent crop and desirable characteristics may be lost.

Sexual Propagation

Sexual propagation requires the union of staminate pollen and pistillate ovule, the formation of viable seeds. During meiosis, the 10 chromosome pairs fail to replicate, so that each of the two daughter cells will contain 5 chromosomes. The diploid condition is restored upon fertilization resulting in diploid (2n) individuals. From any one parent an unlimited number of clones is produced. The two parents need not be identical; the reciprocal of the cross is always possible and the resultant offspring may not resemble the parental traits and will most probably differ from each other.

To minimize variation in seedlings and ensure preservation of desirable parental traits in offspring, careful procedures are followed. The terms homozygous and heterozygous are useful in describing the genotype of a particular plant. Homozygous plants contain identical genes on both chromosomes of a given pair (homologous chromosomes), the plant is homozygous and will "breed true" for that trait if self-pollinated. Heterozygous plants contain different genes on each chromosome pair, the plant is heterozygous; the parent is heterozygous and will "breed true" for that trait if self-pollinated. Both the homozygous and heterozygous genes are transmitted to the offspring, which will resemble each other and the parent. If the genes are different, the offspring may not resemble the parental traits and will most probably differ from each other.

The Life Cycle and Sinsemilla Cultivation

A wild Cannabis plant grows from seed to a seedling, to a prefloral juvenile, to either pollen- or seed-bearing adults. Pollen grains come from the staminate plant and contain the male gametes necessary to fertilize the ovules in the pistillate plant. The ovules develop into seeds containing seedlings. All individuals from the same parents reproduce the same, while individuals from different parents possess different traits. It is possible to control the genetic makeup of the offspring by choosing parents with desirable traits and crossing them. Self-pollination results in offspring that are genetically identical to each other and the parent. Cross-pollination, on the other hand, results in offspring that are genetically different from each other and the parent. The terms homozygous and heterozygous are useful in describing the genotype of a particular plant. Homozygous plants contain identical genes on both chromosomes of a given pair (homologous chromosomes). Heterozygous plants contain different genes on each chromosome pair. The terms homozygous and heterozygous are useful in describing the genotype of a particular plant. Homozygous plants contain identical genes on both chromosomes of a given pair (homologous chromosomes), the plant is homozygous and will "breed true" for that trait if self-pollinated. Heterozygous plants contain different genes on each chromosome pair, the plant is heterozygous; the parent is heterozygous and will "breed true" for that trait if self-pollinated.

Various theories have arisen to explain the unusually potent psychoactive properties of unfertilized Cannabis. In general these theories have as their central theme the extraordinarily long, frustrated struggle of the pistillate flowers. The careful propagator, however, can produce as many seeds of pure types as needed for future research without risk of pollinating the precious crop. Staminate parents exhibiting favorable characteristics are reproductively isolated while pollen is carefully collected and applied to only selected flowers of the pistillate parents.

Growers of seeded marijuana for smoking or hashish production collect vast quantities of seeds that fall from the flowers during harvesting, drying, and processing. A mature pistillate plant can produce tens of thousands of seeds if freely pollinated. Sinsemilla marijuana is grown by removing all the staminate plants from a patch, eliminating every pollen source, and allowing the pistillate plants to produce massive clusters of unfertilized flowers. Seedless plants continue to produce new floral clusters until late fall, while seeded plants cease floral production. It is also suspected that capitate-stalked trichome production might cease when the calyx is fertilized. If this is the case, then sinsemilla may be higher in THC because of uninterrupted floral growth, trichome formation and cannabinoid production. What actually happens when a pistillate plant remains unfertilized for its entire life and how this ultimately affects the cannabinoid (class of molecules) does not have enough time to accumulate. Hormonal changes associated with seeding definitely affect all metabolic processes within the plant including cannabinoid biosynthesis. The psychoactive compound in Cannabis (THC) does not have enough time to accumulate. Hormonal changes associated with seeding definitely affect all metabolic processes within the plant including cannabinoid biosynthesis. The psychoactive compound in Cannabis (THC) does not have enough time to accumulate. Hormonal changes associated with seeding definitely affect all metabolic processes within the plant including cannabinoid biosynthesis. The psychoactive compound in Cannabis (THC) does not have enough time to accumulate. Hormonal changes associated with seeding definitely affect all metabolic processes within the plant including cannabinoid biosynthesis. The psychoactive compound in Cannabis (THC) does not have enough time to accumulate.
Many cultivators overlook the staminate plant, considering it useless if not detrimental. But the staminate plant contributes half of the genotype expressed in the offspring. Not only are staminate plants preserved for breeding, but they must be allowed to mature, uninhibited, until their phenotypes can be determined.

Biology of Pollination

Pollination is the event of pollen landing on a stigmatic surface such as the pistil, and fertilization follows. Pollination begins with dehiscence (release of pollen) from staminate flowers. Millions of pollen grains are released when the pistil is ripe, the pollen grain will germinate and send out a long pollen tube much as a seed pushes out a root. When the pollen tube reaches the ovule, the staminate haploid nucleus fuses with the pistillate haploid nucleus resulting in diploid conditions. Germination of the pollen grain occurs 15 to 20 minutes after contact with the stigmatic surface (pistil); fertilization may take up to two days in cooler temperatures.

Pollen is a critical element in the life cycle of plants. When a pollen grain contacts a receptive stigma, it germinates and produces a pollen tube that grows toward the ovule at the base of the pistil. When the pollen tube reaches the ovule, the staminate haploid nucleus fuses with the pistillate haploid nucleus and the diploid condition is restored. Germination of the pollen grain occurs 15 to 20 minutes after contact with the stigmatic surface (pistil); fertilization may take up to two days in cooler temperatures.

Pollen may be collected in several ways. If the propagator has an isolated area where staminate plants are growing, then direct collection may be used. A small vial, glass plate, or mirror is held beneath a recently-opened staminate flower which appears to be releasing pollen, and the pollen is collected. Controlled “free” pollinations may also be made if only one pollen parent is allowed to remain in an isolated area of the field and no pollinations are caused by hermaphrodites or late-maturing staminate plants. If the selected staminate parent drops pollen when there are only a few primordial flowers on the pistillate seed parent, then only a few seeds will form in the basal flowers and the rest of the flower cluster will be seedless. Early fertilization might also help fix the sex of the pistillate plant, helping to prevent hermaphrodism. Later, hand pollinations can be performed on the same pistillate parent by removing the early seeds from each limb to be re-pollinated, so avoiding confusion. Hermaphrodite or monoecious plants may be isolated from the remainder of the population and allowed to freely self-pollinate if pure-breeding offspring are desired to preserve a selected trait.

Pollination Techniques

Controlled hand pollination consists of two basic steps: collecting pollen from the anthers of the staminate parent and applying pollen to the receptive stigmatic surfaces of the pistillate parent. Both steps are carefully conducted.

Controlled versus Random Pollinations

The seeds with which most cultivators begin represent varied genotypes even when they originate from imported shipments. If eliminated by random pollinations, the seeds will be reduced to a variety of unimproved genotypes, only a few of which may prove acceptable as parents. If the cultivator allows random pollination to occur again, the population not only fails to improve, it may even degenerate through natural and accidental selection of unfavorable traits. Once the offspring of imported strains are in the hands of a competent breeder, selection and replication of the genotype of future offspring may begin. Only one or two individuals out of many may prove acceptable as parents. If the cultivator allows random pollination to occur again, the population not only fails to improve, it may even degenerate through natural and accidental selection of unfavorable traits.

Data Collection

Keeping accurate notes and records is a key to successful plant-breeding. Crosses among ten pure strains (ten staminate and ten pistillate parents) result in ten pure and ninety hybrid crosses. It is an endless and inefficient task to attempt to remember the significance of each little number and colored tag associated with each cross. The well organized breeder will free himself from this mental burden and possible confusion by entering vital data about crosses, phenotypes, and growth conditions in a system with one number corresponding to each cross.

The single most important task in the proper collection of data is to establish undeniable credibility. Without a record book of numbered pages, a good breeder cannot keep organized records. Numbers and records constitute the data needed to reproduce that strain. Data is always written down; memory is not a reliable record. A record book contains a numbered page for each plant, and each separate cross is tagged on the pistillate parent in a manner that reflects the genotype of future offspring.

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Voucher specimens for later characterization and analysis.

The seeds with which most cultivators begin represent varied genotypes even when they originate from the same floral cluster of marijuana, and not all of these genotypes will prove favorable. Seeds collected from the pistillate parent will constitute the data needed to reproduce that strain. Data is always written down; memory is not a reliable record. A record book contains a numbered page for each plant, and each separate cross is tagged on the pistillate parent in a manner that reflects the genotype of future offspring.
Also, for each of the selected pistillate clusters, a tag containing the same information is made and secured to the limb below the closure of the bag. A warm, windless evening is chosen for pollination so the pollen tube fertilization and embryo development. Since interfering with any part of this cycle precludes seed development, fertilization failure is guarded against by duplicating all steps.

Before the pollen bags are used, the seed parent information is added to the pollen parent data. Included is the number of the seed parent, the date of pollination, and any comments about the phenotypes of both parents.

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Seeds is achieved by pollinating in the peak floral stage. At this time, the seed plant is covered with thick clusters of white pistils. Few pistils are brown and withered, and resin production has just begun. This is the most favourable time for collection. When flowering is at its peak and many flowers have just opened, collection is completed, and the limb, with its bag attached, is cut. If the limb is cut too early, the flowers will not have shed any pollen; if the bag remains on the plant are removed to prevent stray pollinations. Large leaves are left on the remainder of the plant are removed from the pollen parent are saved for later analysis and phenotype characterization.

Now a pistillate plant is chosen as the seed parent. A pistillate flower cluster is ripe for fertilization when the calyxes are a sign that the reproductive peak has long passed. Cannabis plants can be successfully pollinated as soon as the first primordia show pistils and until just before harvest, but the largest yield of uniform, healthy seeds is achieved by pollinating in the peak floral stage. At this time, the seed plant is covered with receptive for time for fertilization, still early in the seed plant’s life, with plenty of time remaining for heat up in the bags as much as buds in the hot sun, and this will help protect the sensitive pistil.s, bags for each seed parent and two clusters of pistillate flowers for each bag, there are four opportunities for fertilization and embryo development. Since interfering with any part of this cycle precludes seed development, the selected pistillate clusters, a tag containing the same information is made and secured to the limb below the closure of the bag.

Any breeze may interfere with collection and cause contamination with pollen from neighboring plants. Any other plant parts present are removed with a screen. A piece of fuel filter screening placed across the top of a mason jar works well, as does a fine-mesh tea strainer. The sealed container is stored in the refrigerator, and time the enclosure was secured, and any useful notes. Room is left to add the date of pollen collection and necessary information about the future seed parent it will pollinate.

The progress of pollen release, a flashlight is held behind the bag at night and the silhouettes of the flowers open and pollen is released. During this period the selected pollen plants are carefully watched, daily or hourly if necessary, for developmental rates vary greatly and pollen may be released quite early in some cases. Clear nylon windows are installed with silicon glue for greater visibility.

Pollen release is fairly rapid inside the bags, and after two days to a week the limbs may be removed to the progress of pollen release, a flashlight is held behind the bag at night and the silhouettes of the flowers open. When flowering is at its peak and many flowers have just opened, collection is completed, and the remains on the plant too long, most of the pollen will be dropped inside the bag where heat and moisture open after the limbs are collected. The bags are collected early in the morning before the sun has become moist, it will germinate and spoil, therefore dry storage is imperative.

After the staminate limbs have dried and pollen release has stopped, the bags are shaken vigorously, could promote mold growth, and the pollen bags are re sealed. The bags may be stored as they are and hand application. Before storing pollen, any other plant parts present are removed with a screen.

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Seed Selection

Nearly every cultivated Cannabis plant, no matter what its future, began as a germinating seed; and the seeds are usually extracted from imported shipments of marijuana. Very little true control can be exercised in seed production. This is not possible for most cultivators or researchers and they usually rely on imported seeds. The distance between source and destination introduces other problems that affect the genetic purity and predictability of collected seed.

1. If a Cannabis sample is heavily seeded, then the majority of the male plants were allowed to mature and release pollen. Since Cannabis is wind-pollinated, many pollen parents (including early and late maturing staminate and hermaphrodite plants) will contribute to the seeds in any batch of pistillate flowers. At least the pistillate or seed parent is the same for all those seeds, though the pollen may have come from many different sources.

2. In very lightly seeded or nearly sinsemilla Cannabis, pollination has largely been prevented by the removal of staminate parents prior to the release of pollen. The few seeds that do form often result from pollen from hermaphrodite plants that went undetected by the farmer, or by random wind-borne pollen from wild plants or a nearby field. Hermaphrodite parents often produce hermaphrodite offspring and this may not be desirable.

3. Most domestic Cannabis strains are random hybrids. This is the result of limited selection of pollen parents, impure breeding conditions, and lack of adequate space to isolate pollen parents from the female flowers.

When selecting seeds, the propagator will frequently look for seed plants that have been carefully bred locally by another propagator. Even if they are hybrids there is a better chance of success than with imported seeds, provided certain guidelines are followed:

1. The dried seeded flower clusters are free of staminate flowers that might have caused accidental pollination with injection.

2. The flowering clusters are tested for desirable traits and seeds selected from the best.

3. Healthy, robust seeds are selected. Large, dark seeds are best; smaller, paler seeds are avoided since these are usually less mature and less viable.

4. If accurate information is not available about the pollen parent, then selection proceeds on common sense and luck. Mature seeds with dried calyxes in the basal portions of the floral clusters along the main stems occur in the earliest pistillate flowers to appear and must have been pollinated by early-maturing pollen parents. These seeds have a high chance of producing early-maturing offspring.

   By contrast, mature seeds selected from the tips of floral clusters, often surrounded by immature seeds, are formed in later-appearing pistillate flowers. These flowers were likely pollinated by later-maturing staminate or hermaphrodite pollen parents, and their seeds should mature later and have a greater chance of producing hermaphrodite offspring. The pollen parent also exerts some influence on the appearance of the resulting seed. If seeds are collected from the same parent, the pollinations represent fewer different gene pools and will produce more uniform offspring.

5. Seeds are collected from strains that best suit the locality; these usually come from similar climates and latitudes. Seed selection for specific traits is discussed in detail in Chapter III.

If only a small quantity of pollen is available it may be used more sparingly by diluting with a neutral material, so only one is needed for fertilization. Diluted pollen will go further and still produce high fertilization rates. Diluting also helps retard the growth of molds in the maturing, seeded, floral clusters.

The bags may remain on the seed parent for sometime; seeds usually begin to develop within a few days. The propagator removes and sterilizes or destroys the bags. This way there is little chance of stray pollination. Any pollen that goes on to remain along with many of the unpollinated pistils. In particularly cool or overcast conditions a week may be needed for pollinations. As soon as the bag is removed, the calyces begin to swell with seed, indicating successful fertilization and nonviable seeds. Seeds develop fastest in warm weather and take usually from two to four weeks to mature completely. In cold weather seeds begin to dry up and the dark shiny perianth (seed coat) can be seen protruding from the drying calyx. Often the perianth (seed coat) is held in by the bag and this will delay the appearance of seed.

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A knowledge of the internal structure of the stem is helpful in understanding the origin of adventitious roots. Rooting along limbs where they droop and touch the ground.

To systemic roots which appear along the developing root system originating in the embryo. In humid conditions (as in the tropics or a greenhouse) adventitious roots occur naturally along the main stalk near the ground.

In propagation by cuttage or layerage it is only necessary for a new root system to form, since the meristematic shoot apex comes directly from the parental plant. Many stem cells, even in mature plants, have the same genotype as the mother plant and will, for all practical purposes, develop identical clones.

The concept of clone does not mean that all members of the clone will necessarily appear identical in all characteristics. The phenotype that we observe in an individual is influenced by its surroundings. Therefore, all the members of that clone equally.

Asexual propagation (cloning) allows the preservation of genotype because only normal cell division takes place. Asexual propagation techniques such as cuttage, layerage, and division of roots can ensure identical populations as large as the growth and development of the parental material will permit. Clones can be multiplied by cloning. Propagation of nearly identical populations of all-pistillate, fast growing, evenly maturing Cannabis is made possible through cloning. Any agricultural or environmental influences will affect all the members of the clone equally.

In Cannabis, mitosis takes place in the shoot apex (meristem), root tip meristems, and the meristematic cambium layer of the stalk. A propagator makes use of these meristematic areas to produce clones that will grow and be multiplied. Asexual propagation techniques such as cuttage, layerage, and division of roots can ensure identical populations as large as the growth and development of the parental material will permit. Clones can be multiplied by cloning. Propagation of nearly identical populations of all-pistillate, fast growing, evenly maturing Cannabis is made possible through cloning. Any agricultural or environmental influences will affect all the members of that clone equally.

The genetic uniformity provided by clones offers a control for experiments designed to quantify the effects of environmental factors on plant growth resulting from sexual propagation. However, clonal uniformity can also invite serious problems. If a population of clones is subjected to a sudden environmental stress, pests, or disease for which it has no defense, every member of the clone is sure to be affected and the entire population may be lost. Since no genetic diversity is found within the clone, no adaptation to new stresses can occur through recombination of genes as in a sexually propagated population.

In propagation by cuttage or layerage it is only necessary for a new root system to form, since the vegetative cell in the plant contains the genetic information necessary for an entire plant. Adventitious roots appear spontaneously from stems and old roots as opposed to systemic roots which appear along the developing root system originating in the embryo. In humid conditions, adventitious roots occur naturally along the main stalk near the ground.

Asexual Propagation

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Grade #1 - Seed parent and pollen parent are known and there is absolutely no possibility that the seeds resulted from pollen contamination.

Seed stocks are graded by the amount of control exerted by the collector in selecting the parents. Grade #2 - Seed parent is known but several known staminate or hermaphrodite pollen parents are involved. Grade #3 - Pistillate parent is known and pollen parents are unknown. Grade #4 - Neither parent is known, but the seeds are collected from one floral cluster, so the pistillate parentage traits may be characterized.

Grade #5 - Parentage is unknown but origin is certain, such as seeds collected from the bottom of a bag of imported Cannabis.

Grade #6 - Parentage and origin are unknown.

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A knowledge of the internal structure of the stem is helpful in understanding the origin of adventitious roots.
The development of adventitious roots can be broken down into three stages: (1) the initiation of meristematic cells into root primordia, and (3) the emergence and growth of new roots by rupturing surface of the stem adjacent to the areas of root initiation. This tissue has no influence on root formation.

As the root initials divide, the groups of cells take on the appearance of a small root tip. A vascular system emerges from the epidermis of the stem. Initiation of root growth usually begins within a week and young roots appear within four weeks. Often an irregular mass of white cells, termed callus tissue, will form on the surface of the stem adjacent to the areas of root initiation. This tissue has no influence on root formation.

The physiological basis for root initiation is well understood and allows many advantageous modifications responsible for the control of root initiation and the rate of root formation. Auxins are considered the most important growth substances, but also cytokinins and indoleacetic acid have been isolated from plants. Naturally occurring auxin is formed mainly in the growing tips of young stems. High concentrations of auxins in rooting solutions will force travel up the vascular tissue. Knowledge of the work by Thimann and Went that auxins promote adventitious root formation in stem cuttings. Since auxin levels are associated with the formation of root initials. Further research by Warmke and Warmke suggests that only high auxin levels promoting root growth and low levels favoring shoots.

Cytokinins are chemical compounds that stimulate cell growth. In stem cuttings, cytokinins suppress auxin levels. The favorable balance of the two may be responsible for regulating normal plant growth. Skoog discusses the use of cytokinins to promote root formation.

Although Cannabis cuttings and layers root easily, variations in rootability exist and old stems may root more easily. Firmness is a sign of high carbohydrate levels in stems but may be confused with older wood. The carbohydrate content cuttings seem to root more poorly than cuttings with medium to low nitrogen content. The cut ends of a bundle of cuttings are immersed in a weak solution of iodine in potassium iodide. Cuttings containing the highest starch content stain the darkest; the samples are rinsed and sorted accordingly. High nitrogen levels promote root growth and low levels favoring shoots.

1 - Reduction of the nitrogen supply will slow shoot growth and allow time for carbohydrates to accumulate. This is achieved by leaching (washing) the soil with large amounts of fresh water, withholding nitrogenous fertilizer, and allowing stock plants to grow in full sun light. Crowding of roots reduces excessive vegetative growth and allows for carbohydrate accumulation.

2 - Portions of the plant that are most likely to root are selected. Lower branches that have ceased lateral growth and begun to accumulate starch are the best. The carbohydrate-to-nitrogen ratio rises as you move away from the tip of the limb, so cuttings are not made too short.

3 - Etiolation is the growth of stem tissue in total darkness to increase the possibility of root formation. As light decreases, vascular tissue is diminished, auxin levels rise, and undifferentiated tissue becomes more similar to the root initials. Whole plants can be subjected to etiolation, but usually single limbs are selected weeks prior to rooting. The etiolated end may then be unwrapped and inserted into the rooting medium.

4 - Girdling a stem by cutting the phloem with a knife or crushing it with a twisted wire may block the downward mobility of carbohydrates and auxin and rooting cofactors, raising the concentration of carbohydrates and reducing auxin levels promoting root growth and low levels favoring shoots.

Making Cuttings

Cuttings of relatively young vegetative limbs 10 to 45 centimeters (4 to 18 inches) are made with thinned leaves. It is essential that the cuttings be placed in water as soon as they are removed or a bubble of air (embolism) may enter the cut end and block the transpiration stream in the cutting, causing it to wilt. If cuttings are exposed to the air they are cut again before being inserted into the rooting medium.
Soil Treatment

and cultivators use them only outside with appropriate protection for themselves. Fumigants such as formaldehyde, methyl bromide or other lethal gases are very dangerous until each cubic foot of soil absorbs 2-4 quarts of solution. Small containers are sealed with plastic bags; large flats and plots are covered with polyethylene sheets. After 24 hours the seal is removed and the soil is allowed to dry for two weeks or until the odor of formaldehyde is no longer present. The treated soil is drenched with water prior to use.

Rooting Media

Aeration is a convenient way to add oxygen to water as it also adds carbon dioxide from the atmosphere. Air from a small pump or bottled oxygen may also be supplied directly to the rooting media through tiny tubes. Oxygen enrichment of irrigation water is accomplished by installing an aerator in the main water line so that atmospheric oxygen can be absorbed by the water. An increase in dissolved oxygen of only 20 parts per million may have a great influence on rooting. Systems achieve this automatically because they deliver a fine mist (high in dissolved oxygen) to the leaves, from where much of it runs off into the soil, aiding rooting. Oxygen enrichment is fairly simple. Since shoot cuttings must be constantly wet, conditions conducive to rooting are also favorable to the growth of fungus. "Cap tan " is a long-lasting fungicide that is sometimes applied in powdered form along with growth regulators. This is done by rolling the basal end of the cutting in the powder before placing it in the rooting medium.

Oxygen and Rooting

The initiation and growth of roots depends upon atmospheric oxygen. If oxygen levels are low, shoots will fail to produce roots in the rooting medium. In addition to natural aeration from the atmosphere, rooting media may be enriched with oxygen (O2) gas; enriched rooting solutions have been shown to increase rooting in many plant species. No threshold for damage by excess oxygenation has been determined, although excessive oxygenation could displace carbon dioxide which is also vital for proper root initiation and growth. If oxygen levels are low, roots will form only near the surface of the medium, whereas with adequate oxygen levels, roots will tend to form along the entire length of the implanted shoot, especially at the cut end. Rooting systems achieve this automatically because they deliver a fine mist (high in dissolved oxygen) to the leaves, from where much of it runs off into the soil, aiding rooting. Oxygen enrichment of irrigation water is accomplished by installing an aerator in the main water line so that atmospheric oxygen can be absorbed by the water. An increase in dissolved oxygen of only 20 parts per million may have a great influence on rooting.

Water is a common medium for rooting. It is inexpensive, disperses nutrients evenly, and allows dry submerged stem, delaying etiolation and slowing root growth. Water also promotes the growth of solution, roots will appear in great profusion at the base of the stem, while in a poorly aerated one, pure water, the solution might be replaced regularly with tap water, which should contain sufficient oxygen; solution does become concentrated by evaporation, and this is watched. Pure water is used to dilute nutrient solutions as needed. IAA and NAA a—e often combined with a small percentage of certain phenoxy compounds and fungicides in commercial preparations. Many growth regulators deteriorate rapidly, and fresh solutions are made up as needed. Treatments with vitamin B1 (thiamine) seem to help roots grow for long on its own reserves. A complete complement of nutrients in the rooting medium conducive to rooting are also favorable to the growth of fungus. "Cap tan " is a long-lasting fungicide that is sometimes applied in powdered form along with growth regulators. This is done by rolling the basal end of the cutting in the powder before placing it in the rooting medium.

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The initiation and growth of roots depends upon atmospheric oxygen. If oxygen levels are low, shoots will fail to produce roots in the rooting medium. In addition to natural aeration from the atmosphere, rooting media may be enriched with oxygen (O2) gas; enriched rooting solutions have been shown to increase rooting in many plant species. No threshold for damage by excess oxygenation has been determined, although excessive oxygenation could displace carbon dioxide which is also vital for proper root initiation and growth. If oxygen levels are low, roots will form only near the surface of the medium, whereas with adequate oxygen levels, roots will tend to form along the entire length of the implanted shoot, especially at the cut end. Rooting systems achieve this automatically because they deliver a fine mist (high in dissolved oxygen) to the leaves, from where much of it runs off into the soil, aiding rooting. Oxygen enrichment of irrigation water is accomplished by installing an aerator in the main water line so that atmospheric oxygen can be absorbed by the water. An increase in dissolved oxygen of only 20 parts per million may have a great influence on rooting.

Rooting Media

Water is a common medium for rooting. It is inexpensive, disperses nutrients evenly, and allows dry submerged stem, delaying etiolation and slowing root growth. Water also promotes the growth of solution, roots will appear in great profusion at the base of the stem, while in a poorly aerated one, pure water, the solution might be replaced regularly with tap water, which should contain sufficient oxygen; solution does become concentrated by evaporation, and this is watched. Pure water is used to dilute nutrient solutions as needed. IAA and NAA a—e often combined with a small percentage of certain phenoxy compounds and fungicides in commercial preparations. Many growth regulators deteriorate rapidly, and fresh solutions are made up as needed. Treatments with vitamin B1 (thiamine) seem to help roots grow for long on its own reserves. A complete complement of nutrients in the rooting medium conducive to rooting are also favorable to the growth of fungus. "Cap tan " is a long-lasting fungicide that is sometimes applied in powdered form along with growth regulators. This is done by rolling the basal end of the cutting in the powder before placing it in the rooting medium.

Soil Treatment

Solid media provide anchors for cuttings, plenty of darkness to promote etiolation and root growth, and germination is often used but the soil must be carefully sterilized to prevent the growth of harmful nutrients and organic complexes and the formation of toxic compounds. Large amounts of soil may be sterilized in a better rooting mix. Formaldehyde is an excellent fungicide and kills some weed seeds, nematodes, to dry for two weeks or until the odor of formaldehyde is no longer present. The treated soil is dry and cultivators use them only outside with appropriate protection for themselves.
It is usually much simpler and safer to use an artificial sterile medium for rooting. Vermiculite and perlite promote the greatest root growth. This results from increased air circulation around the larger pieces of plant material is supplied by these artificial media. Solutions are checked for pH and corrected to neutrality.

Layering

Layering is a process in which roots develop on a stem while it remains attached to, and nutritionally dependent on its own roots, termed a layer. Layering differs from cutting because rooting occurs while the shoot is still feeding flow of photosynthates (products of photosynthesis) from the shoot tip. This causes the accumulation of substances beneficial to the small shoots where the rooting is to take place. The soil surrounding the stem is kept moist at all times and girdling will cause the lateral shoot buds rotting from constant contact with the moist soil surface. Tip layers and serpentine layers may be removed with a sharp razor or clippers after four to six weeks. If the roots have become well established, transplanting may be possible without damaging the tender root system. Shoots on layers continue to grow under the same conditions as the parent, and less time is needed for the clone to acclimatize or harden-off and begin to grow on its own root system.

Making an Air Layer

A recently sexed young limb 3-10 mm (1/8 to 3/8 inch) in diameter is selected. The site of the layer is made woody, it is splinted by positioning a 30 centimeter (12 inch) stick of approximately the same diameter along the bottom edge of the stem. This splint is tied in place at both ends with a piece of elastic plant-tie tape. This enables the propagator to handle the stem more confidently. An old, dry Cannabis stem works well as a splint. Next, the stem is girdled between the two ties with a twist of wire or a diagonal cut. After girdling, the stem is sprayed or dusted with a fungicide and growth regulator, surrounded with plastic florist’s tape or electrician’s tape works well for sealing air layers. Although polyethylene film retains moisture well, the moss will dry out eventually and must be removed, carefully unwrapped, and transplanted with the moss and the splint intact. The layer is removed, carefully unwrapped, and transplanted with the moss and the splint intact.

Techniques of Layering

Almost all layering techniques rely on the principle of etiolation. Both soil layering and air layering benefit from the use of fungicides proved beneficial, and they are usually applied as a spray or powder. Root formation on layers is promoted by etiolation, which takes place at the site of rooting. If the roots have become well established, transplanting may be possible without damaging the tender root system. Shoots on layers continue to grow under the same conditions as the parent, and less time is needed for the clone to acclimatize or harden-off and begin to grow on its own root system.

Serpentine layering may be used to create multiple layers along one long limb. Several stripped sections of the limb are buried in separate trenches, making sure that at least one node remains above ground between each set of roots to allow shoots to develop. The soil surrounding the stem is kept moist at all times and girdling will cause the lateral shoot buds rotting from constant contact with the moist soil surface. Tip layers and serpentine layers may be removed with a sharp razor or clippers after four to six weeks. If the roots have become well established, transplanting may be possible without damaging the tender root system. Shoots on layers continue to grow under the same conditions as the parent, and less time is needed for the clone to acclimatize or harden-off and begin to grow on its own root system.

In air layering, roots form on the aerial portions of stems that have been girdled, treated with growth regulators, and buried with a mound of soil. The buried section of stem may be girdled by cutting, crushed with a loop of wire, or twisted to disrupt the phloem tissue and cause the accumulation of substances which promote rooting. It may also be treated with growth regulators at this time.

The single most difficult problem with air layers is the tendency for them to dry out quickly. Relatively small amounts of rooting media are used, and the position on aerial parts of the plant exposes them to drying winds and sun. Many wraps have been tried, but the best seems to be clear polyethylene plastic sheeting which allows oxygen to enter and retains moisture well. Air layers are easiest to make in greenhouses where humidity is high, but they may also be used outside as long as they are kept moist and don’t freeze. Air layers are most useful to the amateur propagator and breeder because they take up little space and allow the efficient cloning of many individuals.

Making an Air Layer

A recently sexed young limb 3-10 mm (1/8 to 3/8 inch) in diameter is selected. The site of the layer is made woody, it is splinted by positioning a 30 centimeter (12 inch) stick of approximately the same diameter. This splint is tied in place at both ends with a piece of elastic plant-tie tape. This enables the propagator to handle the stem more confidently. An old, dry Cannabis stem works well as a splint. Next, the stem is girdled between the two ties with a twist of wire or a diagonal cut. After girdling, the stem is sprayed or dusted with a fungicide and growth regulator, surrounded with plastic florist’s tape or electrician’s tape works well for sealing air layers. Although polyethylene film retains moisture well, the moss will dry out eventually and must be removed, carefully unwrapped, and transplanted with the moss and the splint intact. The layer is removed, carefully unwrapped, and transplanted with the moss and the splint intact.
Layers develop fastest just after sexual differentiation. Many layers may be made of staminate plants, then to flower profusely, the layers will be rooted and may be cut and removed to an isolated area. Layers often seem rejuvenated when they are removed from the parent plant and begin to be supported under the same conditions. Layers removed from old or seeded parents will continue to produce new off-season seed production.

Grafting

Intergeneric grafts between Cannabis and Humulus (hops) have fascinated researchers and cultivators much drug as leaves from intact hemp plants, even though leaves from intact hop plants are completely transported across the graft to the Humulus tops. Later research by Crombie and Crombie (1975) found that grafts between Cannabis and Humulus, Detailed chromatographic analysis was performed on both factors critical to cannabinoid formation across the grafts.

Grafting of Cannabis is very simple. Several seedlings can be grafted together into one to produce a plant together in the same container, placing the stock (root plant) for the cross in the center of the rest. The stock stem and one of the scion (shoot) seedlings at the same level. The cut portions are slipped from an adjacent seedling may be grafted to the stock higher up the stem. After two weeks, the union must be maintained in a mild environment at all times. As the graft takes, and the plant begins to grow, the union allowed to develop flowers and release pollen.

Pruning

Pruning techniques are commonly used by Cannabis cultivators to limit the size of their plants and method is meristem pruning or stem tip removal. In this case the growing tip of the main stalk or pair of axial growing tips begins to elongate and form two new limbs. The growth energy of one stem is then directed to the newly formed shoots. Auxin produced in the tip meristem travels down the stem and inhibits branching. When the meristem is removed, the auxin is no longer produced and branching may proceed uninhibited. Plants that are normally very tall and stringy can be kept short and bushy by meristem pruning. Removing meristems also removes the newly formed tissues near the meristem that react to changing environmental stimuli and induce flowering. Pruning during the early part of the growth cycle will have little effect on flowering, but plants that are pruned late in life, supposedly to promote branching and floral growth, will often flower late or fail to flower at all. This happens because the meristemic tissue responsible for sensing change has been removed and the plant and develop without interference from pruning. If late maturation of Cannabis is desired, then extra strain is needed to pollinate a late-maturing pistil late plant. The staminate plant is kept immature, allowed to develop flowers and release pollen.

Other techniques are available for limiting the size and shape of a developing Cannabis plant with cases space is available only along a fence or garden row. Posts 1 to 2 meters (3 to 6 feet) long made to 18 inches) intervals, much like a wire fence or grape trellis. Trellises are ideally oriented on an angle they are gradually bent and attached to the wire. The plant continues to grow upward at the stem under the wire when they are 15 to 30 centimeters (6 to 12 inches) long. The plant grows and spreads the floral clusters are allowed to grow up ward in a row from the wire where they receive maximum sun exposure and meristem intact, produce a pattern of growth patterns limits the ultimate size and yield of the plant.

Another method of trellising is used when light exposure is especially crucial, as with artificial light poultry netting which is suspended on a frame 30 to 60 centimeters (12 to 24 inches) from the soil grow through the netting al-most immediately, and the meristems are pushed back down under the frame evenly. Once again, when the plant begins to flower, the floral clusters are allowed to grow since the flat beds of floral clusters could be mechanically harvested. Since no meristem tissues are the floral clusters, since they are growing from a plane perpendicular to the direction of light.

Sometimes limbs are also tied down, or crimped and bent to limit height and promote axial growth
Although it is possible to breed Cannabis with limited success without any knowledge of the laws of inheritance, the full potential of diligent breeding, and the line of action most likely to lead to success, is realized by timely maturation of those products sought by the cultivator, without sacrificing seed or clone production.

Cannabis grows largest when provided with plentiful nutrients, sunlight, and water and left alone to grow and mature naturally. It must be remembered that any alteration of the natural life cycle of Cannabis will affect productivity. Imaginative combinations and adaptations of propagation techniques exist, based on specific situations of cultivation. Logical choices are made to direct the natural growth cycle of Cannabis to favor the reproduction as fast as possible. Although the purpose of leafing is to speed maturation, disturbing the natural progressive growth of a plant probably interferes with its rapid development.

It should be remembered that, regardless of strain or environmental conditions, the plant strives to reproduce, and reproduction is favored by early maturation. This produces a situation where plants are trying to mature and reproduce as fast as possible. Although the purpose of leafing is to speed maturation, disturbing the natural progressive growth of a plant probably interferes with its rapid development.

In actuality, few if any of the theories behind leafing give any indication of validity. Indeed, leafing possibly serves to defeat its original purpose. Large leaves have a definite function in the growth and development of Cannabis. Large leaves serve as photosynthetic factories for the production of sugars and other necessary growth substances. They also create shade, but at the same time they are collecting valuable solar energy and producing foods that will be used during the floral development of the plant. Premature removal of leaves breaks down substances, such as chlorophylls, and translocates the molecular components to a new growing part of the plant, such as the flowers. Most Cannabis plants begin to lose their larger leaves when they enter the flowering stage, and this trend continues until senescence. It is more efficient for the plant to reuse the energy and various molecular components of existing chlorophyll than to synthesize new chlorophyll at the time of flowering. During flowering this energy is needed to form floral clusters and ripen seeds.

Removing large amounts of leaves may interfere with the metabolic balance of the plant. If this metabolic imbalance causes growth inhibitors are removed, the intended effect of accelerating flowering will probably be counteracted, since there is not enough food energy produced in the leaves, the small internal floral clusters will probably be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the plant will proceed to flower, and maturation will be accelerated. Large leaves shade the inner portions of the plant, and therefore the flowering clusters will be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the plant will proceed to flower, and maturation will be accelerated.

Leafing is one of the most misunderstood techniques of drug Cannabis cultivation. In the mind of the cultivator, and therefore the flowering clusters will be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the plant will proceed to flower, and maturation will be accelerated. Large leaves shade the inner portions of the plant, and therefore the flowering clusters will be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the plant will proceed to flower, and maturation will be accelerated. Large leaves shade the inner portions of the plant, and therefore the flowering clusters will be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the plant will proceed to flower, and maturation will be accelerated.

The greatest service which can be rendered to any country is to add a useful plant to its culture. Although it is possible to breed Cannabis with limited success without any knowledge of the laws of heredity, the full potential of diligent breeding, and the line of action most likely to lead to success, is realized by
breeders who have mastered a working knowledge of genetics.

As we know already, all information transmitted from generation to generation must be contained in the genes, a seed forms, and a new generation is begun. Both pollen and ovules are known as gametes, and each plant carries identical sets of genes (2n) in every cell except the gametes, which through reduction division have been halved to n.

In Cannabis, the haploid (n) number of chromosomes is 10 and the diploid (2n) number of chromosomes is 20. Each plant is a true-breeding strain, or line, of plants that have been developed and maintained through many generations of self-pollination, or selfing. Each line carries identical sets of genes and will produce offspring that are all alike. When small-scale growers wish to purchase plants that are all like their parent, they order seeds from a true-breeding strain produced by the breeder. When the breeder wants to obtain large quantities of plants that are all like the parent strain, he will cross-pollinate two of the parent plants or self-pollinate a hermaphrodite plant to produce a new generation of seeds that are identical to the parent plants, and grow these seeds.

If cross-pollination of two plants with a shared genetic trait (or self-pollination of a hermaphrodite) results in offspring that are like both parents, they are true-breeding, or true-breeding, for that trait. A strain that produces two types of offspring must have genetically different parents. The explanation for the predictable ratios of offspring is simple and brings us to Mendel's first law, the first of the basic rules of heredity:

I. Each of the genes in a related pair segregate from each other during gamete formation.

A common technique used to deduce the genotype of the parents is the back-cross. This technique involves crossing one of the F1 progeny back to one of the true-breeding P1 parents. If the resulting ratio of offspring is the expected ratio, especially in small samples.

If we make a cross with one parent from each of the true-breeding strains, we will find that 100% of the offspring are of the compound-pinnate leaf phenotype. (The expression of a trait in a plant or strain is known as the phenotype.) What happened to the genes for webbed leaves contained in the webbed leaf parent? Since we know that there were just as many w genes as W genes combined in the offspring, the W gene must mask the expression of the w gene. We term the W gene the dominant gene and say that the trait of compound-pinnate leaves is dominant over the recessive trait of webbed leaves. This seems logical since the normal phenotype in the strain with compound-pinnate leaves is the expression of the W gene and the webbed leaf strain is the expression of the w gene.

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Warmke's work with polyploids shed light on the nature of sexual determination in Cannabis. He also illustrated that potency is genetically determined by creating a lower potency strain of hemp through selective breeding without any apparent increase in fiber quality or yield.

Strains (in their ability to kill small aquatic organisms). The aim of his research was to "produce a strain of hemp with materially reduced marijuana content" and his results indicated that polyploidy raised the potency of Cannabis. Techniques of bioassay using killifish and small freshwater crustaceans are far from conclusive. He was, however, able to produce both triploid and tetraploid strains of Cannabis with up to twice the potency of diploid individuals.

Colchicine raised drug levels in Cannabis. It is unfortunate that Warmke was unaware of the actual psychoactive ingredients of Cannabis and was therefore unable to extract THC. His crude acetone extract and archaic techniques of bioassay using killifish and small freshwater crustaceans are far from conclusive. He was, however, able to produce both triploid and tetraploid strains of Cannabis with up to twice the potency of diploid individuals. His results indicated that polyploidy raised the potency of Cannabis.

Polyploidy is the condition of multiple sets of chromosomes within one cell. Cannabis has 20 chromosomes in the vegetative diploid (2n) condition. Triploid (3n) and tetraploid (4n) individuals have three or four sets of chromosomes and are termed polyploids. It is believed that the haploid condition of 10 chromosomes was likely derived by reduction from a higher (polyploid) ancestral number (Lewis, W. H. 1980). Polyploidy has not been shown to occur naturally in Cannabis; however, it may be induced artificially with colchicine treatments. Colchicine is a poisonous compound extracted from the roots of certain Colchicum species; it inhibits chromosome segregation to daughter cells and cell wall formation, resulting in larger than average daughter cells with multiple chromosome sets. The studies of H. E. Warmke et al. (1942-1944) seem to indicate that polyploidy raised the potency of Cannabis. It is unfortunate that Warmke was unaware of the actual psychoactive ingredients of Cannabis and was therefore unable to extract THC. His crude acetone extract and archaic techniques of bioassay using killifish and small freshwater crustaceans are far from conclusive. He was, however, able to produce both triploid and tetraploid strains of Cannabis with up to twice the potency of diploid individuals. His results indicated that polyploidy raised the potency of Cannabis.

Summary of Essential Points of Breeding

1 - The genotypes of plants are controlled by genes which are passed on unchanged from generation to generation.
2 - Genes occur in pairs, one from the gamete of the staminate parent and one from the gamete of the pistillate parent.
3 - When the members of a gene pair differ in their effect upon phenotype, the plant is termed hybrid or heterozygous.
4 - When the members of a pair of genes are equal in their effect upon phenotype, then they are termed true-breeding or homozygous.
5 - Pairs of genes controlling different phenotypic traits are (usually) inherited independently.
6 - Dominance relations and gene interaction can alter the phenotypic ratios of the F1, F2, and subsequent generations.

Two gene pairs may interact in varying ways to produce varying phenotype ratios. Suddenly, the simple laws of inheritance have become more complex, but the data may still be interpreted.
The increasing popularity of Cannabis and the requirements of agricultural technology will call for uniform hybrid races that are likely to displace primitive populations worldwide. With long standing cultural patterns, may contain genes not found in the newer commercial varieties. As these older varieties and their corresponding cultures become extinct, this genetic information could be lost forever.

There is hardly a plant more flexible than Cannabis. As climate, diseases, and pests change, the strain evolves and selects new defenses, programmed into the genetic orders contained in each chromosome. There is hardly a species that is more protected a species. There is hardly a plant more flexible than Cannabis. As climate, diseases, and pests change, the strain evolves and selects new defenses, programmed into the genetic orders contained in each chromosome. There is hardly a species that is more sensitive to change.

All of the Cannabis grown in North America today originated in foreign lands. The diligence of our ancestors in their collection and sowing of seeds from superior plants, together with the forces of natural selection, have worked to create native strains with localized characteristics of resistance to pests, diseases, and weather conditions. In other words, they are adapted to particular niches in the ecosystem. This genetic diversity is nature's way of protecting a species.

Colchicine is sold by laboratory supply houses, and breeders have used it to induce polyploidy in Cannabis. Except for changes in leaf shape and phyllotaxy, no outstanding characteristics have developed in these strains and potency seems unaffected. However, none of these strains has been examined to determine if the offspring are actually polyploid by microscopic examination.

Breeding

Changes in agricultural techniques brought on by technological pressure, greed, and full-scale eras containing poorly selected seeds are appearing in North America and elsewhere, the result of attempts with long standing cultural patterns, may contain genes not found in the newer commercial varieties. The increasing popularity of Cannabis and the requirements of agricultural technology will call for...
of flower, fruit, and vegetable crops was the result of his meticulous selection of parents from hundreds of thousands of seedlings and adults from the world over.

A successful breeder also becomes aware of the most minute differences and similarities in phenotype. A sensitive rapport is established between breeder and plants and at the same time strict guidelines are followed. A

With some care the breeder can avoid these hidden dangers of unconscious selection. Definite goals are vital to progress in breeding Cannabis. What qualities are desired in a strain that it does not already exhibit? What

This example illustrates the unconscious selection for undesirable traits. The hypothetical cultivator began well by selecting the best seeds available and growing them properly. The seeds selected for the second season

A grower in northern latitudes selected an ideal spot to grow a crop and prepared the soil well. Seeds were selected from the best floral clusters of several strains available over the past few years, both imported and
domestic. Nearly all of the staminate plants were removed as they matured and a nearly seedless crop of beautiful plants resulted. After careful consideration, the few seeds from accidental pollination of the best flowers

This does not mean that importation of seed and selective hybridization are always detrimental. Indeed these principles are often the key to crop improvement, but only when applied knowledgeably and cautiously. The

Limitation of genetic diversity is certain to result from concerted inbreeding for uniformity. Should drug strains will degenerate and lose potency as they acclimatize to the new conditions. Let me cite an example of a typical grower with good intentions.

Several steps must be taken to preserve our vanishing genetic resources, and action must be immediate:

Seeds and pollen should be collected directly from reliable and knowledgeable sources. Government seizures and smuggled shipments are seldom reliable seed sources. The characteristics of both parents must be

Several steps must be taken to preserve our vanishing genetic resources, and action must be immediate:

The task outlined above is not an easy one, given the current legal restrictions on the collection of genetics of this interesting plant.

Even if a grower has no desire to attempt crop improvement, successful strains have to be protected. Even if a grower has no desire to attempt crop improvement, successful strains have to be protected. Drug strains will degenerate and lose potency as they acclimatize to the new conditions. Let me cite an example of a typical grower with good intentions.

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With some care the breeder can avoid these hidden dangers of unconscious selection. Definite goals are vital to progress in breeding Cannabis. What qualities are desired in a strain that it does not already exhibit? Answers to these

Selection is the first and most important step in the breeding of any plant. The work of the great breeder of flower, fruit, and vegetable crops was the result of his meticulous selection of parents from hun
Back-crossing is another technique used to produce offspring with reinforced parental characteristics. In this case, a cross is made between one of the F1 or subsequent offspring and either of the parents expressing the preserve original parental genes. Also, as a result of gene recombination, F1 hybrids are not true-breeding and must be reproduced from the original parental strains. When breeders create hybrids they try to produce enough seeds to last for several extra-high THC as well as extra-low THC phenotypes. (For example, P1 high-THC X P1 low-THC yields F1 hybrids of intermediate THC content. Selfing the F1 yields F2 hybrids, of both P1 [high and low THC] phenotypes, intermediate F1 phenotypes, and parental traits. From the F2 hybrid generation selections can be made for parents which are used to start new true-breeding strains. Indeed, F2 hybrids might appear with more extreme characteristics than either of the P~ parents. To increase hybrid vigor in offspring, parents of different geographic origins are selected since they will probably represent more diverse gene pools. Hybridization is the process of mixing differing gene pools to produce offspring of great genetic variation from which distinctive individuals can be selected. The wind performs random hybridization in nature. Under cultivation, breeders take over to produce specific, controlled hybrids. This process is also known as cross-pollination, cross-fertilization, or simply crossing. If seeds result, they will produce hybrid offspring exhibiting some characteristics from each parent.

Large amounts of hybrid seed are most easily produced by planting two strains side by side, removing staminate plants as they sprout, and developing for the production of large amounts of hybrid seed without the labor of thinning; however, seedling diversity is greatest. Because of this, the most vigorous, healthy plants are always used for hybrid crosses.

Also, sports (plants or parts of plants carrying and expressing spontaneous mutations) most easily develop hybrid vigor results, because dominant genes tend to carry valuable traits and the differing dominant genes inherited from each parent mask recessive traits inherited from the other. This gives rise to particularly large, healthy individuals. To increase hybrid vigor in offspring, parents of different geographic origins are selected.

Occasionally hybrid offspring will prove inferior to both parents, but the first generation may still produce recessive genes to recombine and express the recessives to produce an F2 generation by crossing or self-pollinating F1 offspring. Since most domestic Cannabis strains are subject to inbreeding domestic hybrid strains. In this way the breeding of the F1 hybrids has already been in progress for years, which means parents. (For example, P1 high-THC X P1 low-THC yields F1 hybrids of intermediate THC content. Select for extra-high THC as well as extra-low THC phenotypes.)

Also, as a result of gene recombination, F1 hybrids are not true-breeding and must be reproduced from appropriate seeds from each parent. Also, as a result of gene recombination, F1 hybrids are not true-breeding and must be reproduced from appropriate seeds from each parent. After initial field tests, undesirable hybrid seeds are destroyed and back-crossing is another technique used to produce offspring with reinforced parental characteristics.
desired trait. Once again this provides a chance for recombination and possible expression of the
an annual, so special care is taken to save parental stock for back-crossing the following year. Indoors
outside all year. In addition to saving particular parents, a successful breeder always saves many
characteristic can be grown and selected for back-crossing at a later time.

Several types of breeding are summarized as follows:

1 - Crossing two varieties having outstanding qualities (hybridization).

2 - Crossing individuals from the F1 generation or selfing F1 individuals to realize the possibilities

3 - Back crossing to establish original parental types.

4 - Crossing two similar true-breeding (homozygous) varieties to preserve a mutual trait and restore

It should be noted that a hybrid plant is not usually hybrid for all characteristics nor does a true-breeding
traits only. The strain may be true-breeding for only a few traits, hybrid for the rest. Monohybrid or
breeding can only produce a plant that is an expression of some gene already present in the total
But the possibilities of recombination are nearly limitless.

The most common use of hybridization is to cross two outstanding varieties. Hybrids can be produced.
These two parents may share only the characteristic of high psycho activity and differ in nearly every other
offspring the breeder selects individuals that express the best characteristics of the parents. As and
content are selected from both parents while other desirable characteristics can be selected from the
size and sweet floral aroma are selected from the Thai pollen parent. Many of the F1 offspring exhibit
are crossed among themselves. The F2 generation is a great source of variation and recessive expression.
Now the process of inbreeding begins, using the desirable F2 parents.

If possible, two or more separate lines are started, never allowing them to interbreed. In this case
parent and the two seed parents result in two lines of inheritance with slightly differing genetics, but

If two inbred strains are crossed, F1 hybrids will be less variable than if two hybrid strains are crossed.
inbreeding. Further independent selection and inbreeding of the best plants for several generations
from any parents in the strain will give rise to seedlings which all exhibit the selected traits. Success

When lack of vigor interferes with selecting phenotypes for size and hardiness, the two separately
with breeding for the selected traits unless two different gene systems control the same trait in the
early maturation, large sweet-smelling calyces, and high THC level. The goal has been reached!

Wind pollination and dioecious sexuality favor a heterozygous gene pool in Cannabis. Through An
needed to create true-breeding strains. Establishing pure strains enables the breeder to make hybrids
in generation. Commercial strains of seeds could be developed that would have to be purchased each
results of breeding, since it would be nearly impossible to reproduce the parents from F2 seeds.

At this time it seems unlikely that a plant patent would be awarded for a pure-breeding strain of Cannabis,
dasmine, and money to produce pure and hybrid strains of Cannabis will apply for patents. It may be
combine to control the quality and quantity of "drug" Cannabis?

Acclimatization

Much of the breeding effort of North American cultivators is concerned with acclimatizing high-THC
irregularly flowering strains like those of Thailand have difficulty maturing in many parts of North

To develop an early-maturing and rapidly flowering 8train, a breeder may hybridize as in the previous
Alternatively, a pure cross is made between two or more Thai plants that most closely approach the

Wind pollination and dioecious sexuality favor a heterozygous gene pool in Cannabis. Through An
variety of a pure Thai strain. This strain may still mature considerably later than is ideal for the particular location unless selective pressure is exerted. If further crosses are made with several individuals that satisfy other criteria such as high THC content, these may be used to develop another pure Thai strain of high THC content. After these true-breeding lines have been established, a dihybrid pure cross can be made in an attempt to produce an F1 generation containing early-maturing, high-THC strains of pure Thai genetics, in other words, an acclimatized drug strain.

Crosses made without a clear goal in mind lead to strains that acclimatize while losing many favorable characteristics. A successful breeder is careful not to overlook a characteristic that may prove useful. It is imperative that original imported Cannabis genetics be preserved intact to protect the species from loss of genetic variety through excessive hybridization. A currently unrecognized gene may be responsible for controlling resistance to a pest or disease, and it may only be possible to breed for this gene by back-crossing existing strains.

Once pure breeding lines have been established, plant breeders classify and statistically analyze the offspring to determine the patterns of inheritance for that trait. This is the system used by Gregor Mendel to formulate the basic laws of inheritance and aid the modern breeder in predicting the outcome of crosses.

1. Two pure lines of Cannabis that differ in a particular trait are located.
2. These two pure-breeding lines are crossed to produce an F1 generation.
3. The F1 generation is inbred.
4. The offspring of the F1 and F2 generations are classified with regard to the trait being studied.
5. The results are analyzed statistically.
6. The results are compared to known patterns of inheritance so the nature of the genes being selected for can be characterized.

Fixing Traits

Fixing traits (producing homozygous offspring) in Cannabis strains is more difficult than it is in many other flowering plants. With monoecious strains or hermaphrodites it is possible to fix traits by self-pollinating an individual exhibiting favorable traits. In this case one plant acts as both mother and father. However, if a trait is required to fix the trait. If this is not possible, the unique individual may be crossed with a plant not exhibiting the trait, inbred in the F1 generation, and selections of parents exhibiting the favorable trait made from the F2 generation, but this is very difficult.

If a trait is needed for development of a dioecious strain it might first be discovered in a monoecious strain and then fixed through selfing and selecting homozygous offspring. Dioecious individuals can then be selected from the monoecious population and these individuals crossed to breed out monoecism in subsequent generations.

Galoch (1978) indicated that gibberellic acid (GA3) promoted stamen production while indoleacetic acid (IAA), ethrel, and kinetin promoted pistil production in prefloral dioecious Cannabis. Sex alteration has several useful applications. Most importantly, if only one parent expressing a desirable trait can be found, it is possible to change the sex of a cutting from the desirable plant, and this cutting used to mate with it. This is most easily accomplished by changing a pistillate cutting to a staminate (pollen) parent, using a spray of 100 ppm gibberellic acid in water each day for five consecutive days. Within two weeks staminate flowers may appear. Pollen can then be collected for selfing with the original pistillate parent. Offspring from the cross should also be mostly pistillate since the breeder is selfing for pistillate sexuality. Staminate parents reversed to pistillate floral production make inferior seed-parents since few pistillate flowers and seeds are formed.

If entire crops could be manipulated early in life to produce all pistillate or staminate plants, seed production and seedless drug Cannabis production would be greatly facilitated.

Sex reversal for breeding can also be accomplished by mutilation and by photoperiod alteration. A cutting is made of a cutting from the desirable plant, and this cutting used to mate with it. This is most easily accomplished by changing a pistillate cutting to a staminate (pollen) parent, using a spray of 100 ppm gibberellic acid in water each day for five consecutive days. Within two weeks staminate flowers may appear. Pollen can then be collected for selfing with the original pistillate parent. Offspring from the cross should also be mostly pistillate since the breeder is selfing for pistillate sexuality. Staminate parents reversed to pistillate floral production make inferior seed-parents since few pistillate flowers and seeds are formed.

Genotype and Phenotype Ratios

It must be remembered, in attempting to fix favorable characteristics, that a monohybrid cross gives rise to four possible recombinant genotypes, a dihybrid cross gives rise to 16 possible recombinant genotypes, and so forth.

Phenotype and genotype ratios are probabilistic. If recessive genes are desired for three traits it is better to raise hundreds of offspring, choosing only the best homozygous individuals for future breeding.
predicted ratios until many more have been phenotypically characterized and grouped than the theoretical minimums.

The genotype of each individual is expressed by a mosaic of thousands of subtle overlapping traits. It is often difficult to determine if the characteristic being selected is one trait or the blending of several traits and whether these traits are controlled by one or several pairs of genes. It often makes little difference that a breeder does not have plants that are proven to breed true. Breeding goals can still be established. The selfing of F1 hybrids will often give characteristics of the original parents of the F1 hybrid are not known. It is in the following generations that nearly approach the ideal described by the breeding goals, the variety can be continuously improved. After five or six generations, strains become amazingly uniform. Vigor is occasionally restored by crossing with other lines or by backcrossing.

Parental plants are selected which most nearly approach the ideal. If a desirable trait is not expressed and not primarily the result of environment and cultivation, acquired traits are not hereditary and not. In addition to the specific traits chosen as the aims of breeding, parents are selected which possess observing the outcome of many crosses, although wild traits often tend to be dominant. This is one line whose seeds reproduce the favorable parental traits. Inbreeding strains also allows weak traits to express themselves and these abnormalities must be diligently removed from the breeding population.

After further simplifying this wonderful system of inheritance, there are additional exceptions which is needed to express this trait. This is known as gene interaction. No particular genetic attribute is transferred in groups instead of assorting independently. This is known as gene linkage. These genes one trait cannot be inherited without another. At times, traits are associated with the X and Y sex chromosomes, and analysis of crosses. Crossing over is the exchanging of entire pieces of genetic material between the chromosomes. All of these processes can cause crosses to deviate from the expected outcome. Breeding attempts the higher are the chances of success.

Variate, isolate, intermate, evaluate, multiply, and disseminate are the key words in plant improvement. The basic nature of Cannabis makes it challenging to breed. Wind pollination and dioecious sexuality, which account for the great adaptability in Cannabis, cause many problems in breeding, but none of these are insurmountable. Developing a knowledge and feel for Heredity is indelibly fixed by repetition.

The first set of traits concerns Cannabis plants as a whole while the remainder concern the qualities of seedlings, leaves, fibers, and flowers. Following this order, basic and then specific selections of favorable characteristics.

List of Favorable Traits of Cannabis in Which Variation Occurs

1. General Traits
   a) Size and Yield
   b) Vigor
   c) Adaptability
   d) Hardiness
   e) Disease and Pest Resistance
f) Maturation

g) Root Production

h) Branching

i) Sex

2. Seedling Traits

3. Leaf Traits

4. Fiber Traits

5. Floral Traits
   a) Shape

   b) Form

   c) Calyx Size

   d) Color

   e) Cannabinoid Level

   f) Taste and Aroma

   g) Persistence of Aromatic Principles and Cannabinoids

   h) Trichome Type

   i) Resin Quantity and Quality

   j) Resin Tenacity

   k) Drying and Curing Rate

   l) Ease of Manicuring

   m) Seed Characteristics

   n) Maturation

   o) Flowering

   p) Ripening

   q) Cannabinoid Profile

6. Gross Phenotypes of Cannabis Strains

1. General Traits
   a) Size and Yield - The size of an individual Cannabis plant is determined by environment factors such as room for root and shoot growth, adequate light and nutrients, and proper irrigation. These environmental factors influence the phenotypic image of genotype.
genes. The sum of these genes produces a certain phenotype for maturation. Although breeders do not know the action of each specific gene, they still can breed for the total of but probably results from incomplete dominance and a combination of genes for separate aspects of maturation. For instance, Sorghum maturation is controlled by four separate plants give rise to offspring of intermediate maturation. This seems to indicate that maturation of Cannabis is not controlled by the simple dominance and recessiveness of one gene early-maturing plants give rise to early-maturing offspring, crosses between late-maturing plants give rise to late-maturing offspring, and crosses between late- and early-maturing breeding for early or late maturation is certainly a reality; it is also possible to breed for fast or slow flowering and even or sequential ripening. In general, crosses between A Cannabis plant may mature either early or late, be fast or slow to flower, and ripen either evenly or sequentially.

f) Maturation - Control of the maturation of Cannabis is very important no matter what the reason for growing it. If Cannabis is to be grown for fiber it is important that the maximum fiber content of the crop be reached early and that all of the individuals in the crop mature at the same time to facilitate commercial harvesting. Seed production requires

b) Vigor - Large size is often also a sign of healthy vigorous growth. A plant that grows quickly or produces a higher yield during the growing season than a sluggish, slow-growing plant. Parents are always selected for vigor, although breeders may unwittingly be selecting parents with weaknesses in overall growth and development are bred out of the population when they are discarded after harvest when the yield can be measured.

c) Adaptability - It is important for a plant with a wide distribution such as Cannabis to be most genotypically diverse and phenotypically plastic plants on earth; as a result, agricultural circumstances also dictate that Cannabis must be grown under a great Plants to be selected for adaptability are cloned and grown in several locations. The most adaptable strain. Adaptability is really just another term for hardiness under various conditions. Plants to be selected for adaptability are cloned and grown in several locations. The most adaptable strain. Adaptability is really just another term for hardiness under various d) Hardiness - The hardiness of a plant is its overall resistance to heat and frost, conditions lead to the death of the rest of a large population. The surviving few not only dominate the majority of the population. Breeding these survivors, subjecting them to result in a pure-breeding strain with increased resistance to drought, frost, or extreme cold.

e) Disease and Pest Resistance - In much the same way as for hardiness a strain infected by damping-off disease and nearly all of them die, the remaining few will be left to subsequent generations by crossing these surviving plants. Subsequent crossing removes the most resistant strain.

Resistance to pest attack works in much the same way. It is common to find stands of Cannabis where one or a few plants are infested with insects while adjacent plants are untouched. Cannabinoid and terpenoid resins are most probably responsible for repelling insect attack in the form of resin-secreting glandular trichomes, which are disagreeable, rarely attack mature Cannabis flowers. However, they may strip the sticky resin glands than the flowers. Non-glandular cannabinoids and other compounds produce resistance of seedlings and vegetative juvenile plants to pest infestation. With the mite, aphid, or white fly infestation. These problems are often so severe that growers, so negligence can rapidly lead to epidemic disaster. Selection and breeding

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Breeding for early or late maturation is certainly a reality; it is also possible to breed for fast or slow flowering and even or sequential ripening. The mechanisms involved but probably results from incomplete dominance and a combination of genes for separate aspects of maturation. This seems to indicate that maturation is determined by the overall production of fiber, seed, or resin and selective breeding is necessary to achieve the desired results.

Inbreeding of a pure strain increases yield only if high yield parents are selected. High yielding plants, staminate or pistillate, are not finally selected until the plants are dried and der Marderosian 1978). Hybrid vigor, however, will influence the size of offspring formed, and it may be impossible to breed for one without the other (gene linkage). Hybrid vigor results from the increased size of offspring formed by hybridization. The increased size of hybrid offspring is often amazing and accounts for much of the success of Cannabis cultivators raising large plants. Individuals really yield more than diploid due to increased chromosome count. The yield is determined by the overall production of fiber, seed, or resin and selective breeding is necessary to achieve the desired results.

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these traits and achieve results more nearly approaching the goal of timely matu

g) Root Production - The size and shape of Cannabis root systems vary greatly. A
pattern and final size and shape of the roots vary considerably. Some plants send
rain. Most Cannabis plants, however, produce a poor taproot which rarely extend
plants. These fine lateral roots offer the plant additional support but their primary
support a large plant. Most lateral roots grow near the surface of the soil where they
may prove beneficial for the production of large rain- and wind-resistant strains.
certain alkaloids have been discovered in the roots of Cannabis that might have
levels in the roots to be used in the commercial production of pharmaceuticals.

As with many traits, it is difficult to make selections for root types until the paren

h) Branching - The branching pattern of a Cannabis plant is determined by the fre
a tall, thin plant with slender limbs made up of long internodes and nodes with little
limbs of short internodes and highly branched nodes (Hindu Kush hashish strains
or resin production. Tall, thin plants with long internodes and no branching are best
branching is best adapted to floral production. Branching structure is selected that
grows in temperate zones with short seasons. Some breeders select tall, limbe
the weight of water without bending.

i) Sex - Attempts to breed offspring of only one sexual type have led to more mis
Schaffner (1928) showed that pure sexual type and hermaphrodite conditions are
hermaphrodites. Since then it has generally been assumed by researchers and be
result in a population of all pistillate offspring. This is not the case. In most cases
for the production of Cannabis other than fiber hemp. This is not to say that there
of some pollen from predominantly pistillate hermaphrodites, along with the conti
shift in sexual ratio in domestic populations of sinsemilla drug Cannabis. It is con
hermaphrodites are not uncommon in these populations.

However, a cross can be made which will produce nearly all pistillate or staminate
pistillate plant is selected as the seed-parent it is possible to produce an F1, and
pollen-parent is one which has grown as a pure pistillate plant and at the end of
If pollen from these few staminate flowers forming on a pistillate plant is applied
to several pistillate hermaphrodites. This will also be the case if the selected pisti
hermaphrodite gives rise to more hermaphrodites, but a selfed pistillate plant thi
should give rise to nearly all pistillate offspring. The F1 offspring may have a slight
used to produce F2 seed. A monocious strain produces 95+% plants with many
plants. A plant from a dioecious strain with a few inter sexual flowers is a pistillate
one of degree, determined by genetics and environment.

Crosses may also be performed to produce nearly all staminate offspring. This is
pistillate flowers due to environmental stress, or selfing the latter plant. It is rea
enough to produce pistillate flowers, and when this does happen the number of se
hermaphrodite, it may produce only a few staminate flowers, but each of these ref
flowers, producing a seed. This is another reason that natural Cannabis populations
can be produced by hormone sprays, mutilation, and altered light cycles. These se

Drug strains are selected for strong dioecious tendencies. Some breeders select
believe this reduces the chances of pistillate plants turning hermaphrodite later i

2. Seedling Traits

Seedling traits can be very useful in the efficient and purposeful selection of future pl
grown for initial selection, as less space is required to raise small seedlings than mat
emergence of the embryo from the soil. Early selection for vigor, hardiness, resistance, and size is the key. Leaf type, height, and branching are other criteria for early selection. These early selections form the basis for plant improvement.

Whorled phyllotaxy is associated with subsequent anomalies in the growth cycle (i.e. if phyllotaxy is hereditary).

3. Leaf Traits

Leaf traits vary greatly from strain to strain. In addition to these regularly occurring variations, leaf shape is correlated with other traits in Cannabis. Broad leaflets might be associated with this trait. Early selection of seedlings by leaflet shape could determine the characteristics as are general leaf characteristics. A breeder may wish to develop a unique leaf shape.

A peculiar leaf mutation was reported from an F1-Colombian plant in which two leaves developed near the intersection of the leaflet array and the petiole attachment, on the adaxial (top) side of the leaf. The mutation is unknown if this mutation is hereditary.

From Afghanistan, another example has been observed with several small floral clusters along the petioles of many of the large primary leaves.

4. Fiber Traits

More advanced breeding has occurred in fiber strains than any other type of Cannabis. Improved fiber quality as regards length, strength, and suppleness. Extensive breeding programs of fiber Cannabis. Tall limbless strains that are monoecious are most desirable. Monoecious fibers will become brittle before the pistillate plants are ready for harvest. The fiber strains can have a longer vegetative period and as a result grow taller and yield more fiber.

5. Floral Traits

Many individual traits determine the floral characteristics of Cannabis. This section will focus on the floral clusters of pistillate floral clusters with occasional comments about similar traits in staminate floral clusters. Pistillate flowering clusters are the seed-producing organs of Cannabis; they remain on the plant and go through many changes that cannot be compared to staminate floral clusters.

a) Shape - The basic shape of a floral cluster is determined by the lengths of the internodes. The internodes are short along a long floral axis and there are short internodes within a stretched floral axis with long internodes between well-branched individual floral clusters.

The shape of a floral cluster is also determined by the general growth habit of the plant. Plants of the creeper phenotype plant will curve upwards at the end, and floral clusters from this position. Some plants have short internodes along the floral axis and long internodes between the well-branched floral clusters. There is a variation in floral clusters. Some plants have short clusters of staminate calyxes on exposed, leafless branches (Thailand).

b) Form - The form of a floral cluster is determined by the numbers and relative proportions of calyx-to-leaf ratio of 1-to-4. It is obvious that strains with a high calyx-to-leaf ratio are advantageous in characterizing plants as future parents of drug strains. At this point it must be noted that pistillate floral clusters are made up of a number of distinct parts. They include stems, occasional seeds, calyxes, inner leaves subtending calyx pairs (small, resinous, 1-3 leaflets), and outer leaves subtending entire floral clusters (larger, little resin, 3-11 leaflets). The ratios (by dry weight) of these various portions vary by strain, degree of pollination, and maturity of the floral clusters. Maturation is a reaction to environmental change, and the degree of maturity reached is subject to climatic limits as well as genetic and environmental control. A thorough knowledge of the way a strain matures is important in separating possible inherited traits from acquired traits. Chapter IV, Maturation and Harvesting of Cannabis, delves into the secrets and theories of maturation. For now, we will assume that the floral traits of a strain are not influenced by environmental conditions.

c) Calyx Size - Mature calyxes range in size from 2 to 12 millimeters (1/16 to 3/8 inch). Calyx size is largely dependent upon age and maturity. Calyx size of a floral cluster from acquired traits. Chapter IV, Maturation and Harvesting of Cannabis, delves into the secrets and theories of maturation. For now, we will assume that the floral traits of a strain are not influenced by environmental conditions.
cluster is best expressed as the average length of the mature viable calyxes. Calyx size and color. At this time, the calyx is relatively straight and has not begun to swell with the production of large calyxes is often as important in determining the psychoactivity of a strain of psychoactive strains, and they are often characterized by large calyxes and seed pods.

Calyx size appears to be an inherited trait in Cannabis. Completely acclimatized plants retain that size when inbred.

Initial selection of large seeds increases the chance that offspring will be of the largest size of which may set seed. This phenomenon is most pronounced in strains from Thailand, Pakistan, and Afghanistan.

d) Color - The perception and interpretation of color in Cannabis floral clusters is subjective and metallic any more than a red strain resembles a fire engine. Cannabis floral cluster colors include various shades. The intense green of chlorophyll usually masks the color of any pigments also contained in the tissues are unmasked and allowed to show through. This expression of color is usually triggered by seasonal change, though expression of color is controlled by environment alone and is not an inherited trait. Metabolic potential to produce anthocyanin pigments coupled with a responsive environment is required for expression of color. This also means that a strain could have the genes for expression of purple coloration or chlorophyll breakdown. Colombian and Hindu Kush strains often show purple coloration upon maturation. Color changes will be discussed in more detail in Chapter IV-Maturation and Harvesting of Cannabis.

Carotenoid pigments are largely responsible for the yellow, orange, red, and brown colors masking green chlorophyll color fades upon maturation. Gold strains are those which resemble gold but are closer to reddish brown in color, although certain carotenoid and anthocyanin pigments may be present in old floral clusters. Red color in pressed, imported tops is often a result of masses of reddish brown dried pistils.

Several different portions of floral cluster anatomy may change colors, and it is possible to mask the green with pigments. The perception and interpretation of color in Cannabis floral clusters is heavily influenced by the imagination of the cultivator or breeder. A gold strain does not appear metallic any more than a red strain resembles a fire engine. Cannabis floral clusters are basically green, but changes may take place later in the season which alter the color to metallic. Purple coloration usually indicates that pistillate plants are overmature and cannabinoid biosynthesis is slowing down during cold autumn weather.

The petioles, adaxial (top) surfaces, and abaxial (bottom) surfaces of leaves, as well as the calyx, leaves are removed during manicuring, the color expressed by the calyxes and leaves is the result of how phosphorus deficiency but in most situations results from unharmonious excesses of one nutrient, resulting in a deficiency. Pistils in Hindu Kush strains are quite often magenta or purple in color, although in old floral clusters. Red color in pressed, imported tops is often a result of masses of reddish brown dried pistils.

Cannabis and Hibiscus use the expression of color to indicate their maturation. Calyx size appears to be an inherited trait in Cannabis. Completely acclimatized plants retain that size when inbred.

Breeding for cannabinoid content and the eventual characterization of varying psychoactive profiles presents a problem when breeding for cannabinoid content. Staminate plants usually express the same ratios of cannabinoids as their pistillate counterparts but in much lower quantities, and they are rarely allowed to reach full maturity for fear of seeding the pistillate portion of the crop. A simple bioassay for THC content of staminate plants is performed by leaving a series of from three to five numbered bags of leaves and tops of various plants in several locations frequented by a pollinator, and then weighing the dry, milled material, calculating the THC content of the samples taken from each plant, and repeating the procedure until the THC content of the desired plants is reached.
steady repeating crowd of marijuana smokers. The bag completely consumed first is impossible for one person to objectively select the most psychoactive staminate plant. An unstructured panel evaluation which averages the opinions of unbiased testers will not create a staminate parent.

It is difficult to say how many genes might control THC-acid synthesis. Genetic control of particular cannabinoid contents, an accurate and easy method is needed for measuring cannabinoid phenotypes is certainly complex.

f) Taste and Aroma - Taste and aroma are closely linked.

As our senses for differentiating taste and aroma are connected, so are the sources of taste and aroma in Cannabis. Aroma is produced primarily by aromatic terpenes produced as the resin secreted by glandular trichomes on the surface of the cannabis plant. The aromatic terpenes are exposed to the air. There is often polymerization (joining together in a chain) of many of the smaller molecules of aromatic terpenes. As Cannabis resins age and mature, both while the plant is growing and while curing, ammonia gas and other gaseous products given off by the curing, fermentation or spoilage of the tissue (non-resin) portion of the floral clusters.

A combination of at least twenty aromatic terpenes (103 are known to occur in Cannabis) and other aromatic compounds control the aroma of each plant. The production of each aromatic compound may be influenced by many genes; therefore, it is a complex control. For example, each gene may have a specific role in the genetic control of aroma. Each strain, however, has several characteristic aroma patterns which may persist through to the offspring. Therefore, cannabinoid levels are in part determined by genes. To accurately characterize highs from various individuals and establish criteria for breeding strains with particular cannabinoid contents, an accurate and easy method is needed for measuring cannabinoid phenotypes.

The aromas of fresh or dried clusters are sampled and compared in such a way that the aroma of fresh or dried clusters is separated to avoid confusion. Each sample is placed in the corner of a twice-folded, labeled piece of unscented writing paper at room temperature (above 650). A light squeeze will release the aromatic principles contained within the resin exuded by the ruptured glandular trichome head. When sampling, never squeeze a floral cluster directly, as the resins will adhere to the fingers and bias further sampling. The folded paper conveniently holds the floral cluster, avoids confusion during sampling, and contains the aromas as a gaseous cloud.

Taste in Cannabis is divided into three categories according to usage: the taste of Cannabis when it is being lighted; the taste of the smoke from burning Cannabis; and the taste of Cannabis when it is consumed orally. These three are separate entities.

Taste is easily sampled by loosely rolling dried floral clusters in a cigarette paper and inhaling to draw a taste across the tongue. Samples should be approximately the same size.

The terpenes contained in a taste of unlighted Cannabis are the same as those sensed in the aroma, but perceived through the sense of taste instead of smell. Orally ingested Cannabis also sensitive to changes in heat and light.

Biosynthetic relationships between terpenes and cannabinoids have been firmly established. It is suspected that changes in aromatic terpene levels parallel changes in cannabinoid levels through a shared biosynthetic pathway. Therefore, cannabinoid levels are in part determined by genes. To accurately characterize highs from various individuals and establish criteria for breeding strains with particular cannabinoid contents, an accurate and easy method is needed for measuring cannabinoid phenotypes.

g) Persistence of Aromatic Principles and Cannabinoids - Cannabis resins deteriorate as they age, and the aromatic principles and cannabinoids break down slowly until they are hardly noticeable. Since fresh Cannabis is only available once a year in temperate regions, an important breeding goal has been a strain that keeps well when packaged.

Packageability and shelf life are important considerations in the breeding of fresh fruit species and will prove equally important if trade in Cannabis develops after legalization.
h) Trichome Type - Several types of trichomes are present on the epidermal surfaces of Cannabis. These include bulbous, capitate sessile, and capitate stalked types. Plants with a high density of capitate stalked trichomes are a logical goal for breeders, as these trichomes are responsible for secreting resin. Recent research by V. P. Soroka (1979) has shown that trichomes are sensitive to environmental conditions, and that a positive correlation exists between the number of glandular trichomes on leaves and the production of resin. This makes observation under a small hand lens (10X to 50X) a valuable tool for breeders.

i) Resin Quantity and Quality - Resin production by the glandular trichomes varies greatly from strain to strain. Resin color also varies from strain to strain. Resin heads may darken and become more amber in color, or they may remain clear and colorless. These differences are due to the conditions inside the resin head, and this may prove to be another important criterion for breeding.

j) Resin Tenacity - For years strains have been bred for hashish production. Hashish production is essentially high resin production that gives up its precious covering of resin heads with only moderate shaking, rather than the customary flailing that also breaks up the plant. This would facilitate hashish production. Strains that are bred for use as marijuana would be selected for early maturation, and others, such as Colombian and Thai, are stubborn in maturing and nearly always finish late, if at all. Imported strains are usually characterized as either early, average, or late in maturing; however, a particular strain may produce some individuals which mature early and others which mature late. Through selection, breeders have, on the one hand, developed strains that mature in four weeks, outdoors under temperate conditions; and on the other hand, they have developed greenhouse strains that mature in up to four months in their protected environment. Early maturation is extremely advantageous to growers who live in areas of late spring and early fall freezes. Consequently, especially early-maturing plants are selected as parents for future early-maturing strains.

k) Drying and Curing Rate - The rate and extent to which Cannabis dries is generally more rapid when the leaves are removed from the plant. Resin is secreted to coat and seal the surface of the calyces and leaves. Resin is secreted by glandular trichomes, which are trapped under a cuticle layer surrounding the head cells of the epidermal layer. There it would rarely if ever have a chance to seal the surface of the epidermal layer and prevent the transpiration of water. It seems that an alternate reason must be found for the great variations in rate and extent of drying. Strains may be bred that dry and cure rapidly to save valuable time.

l) Ease of Manicuring - One of the most time-consuming aspects of commerce is the removal of larger leaves from the floral clusters. These larger outer leaves are not nearly so psychoactive as the inner leaves and calyxes, so they are usually removed before selling as marijuana. Strains with fewer leaves obviously require less time to manicure. There is a marked size difference between very large outer leaves and tiny, resinous inner leaves. It is assumed that resin has a role in preventing desiccation, and high resin content might retard drying. However, it is a misconception that resin heads are transparent amber instead of clear and colorless, and these are often some of the most psychoactive strains. Transparent resins, regardless of color, are a sign that the conditions inside the resin head, and this may prove to be another important criterion for breeding.

m) Seed Characteristics - Seeds may be bred for many characteristics including size, oil content, and protein content. Cannabis seed is a valuable source of drying oils, and the conditions inside the resin head, and this may prove to be another important criterion for breeding.

n) Maturation - Cannabis strains differ greatly as to when they mature and how they respond to selection for early maturation, and others, such as Colombian and Thai, are stubborn in maturing; however, a particular strain may produce some early-maturing plants that mature in four weeks, outdoors under temperate conditions, and others that mature in four months in their protected environment. Early maturation is extremely advantageous to growers who live in areas of late spring and early fall freezes. Consequently, especially early-maturing plants are selected as parents for future early-maturing strains.

o) Flowering - Once a plant matures and begins to bear flowers it may reach peak production in several months. The rate at which a strain flowers is independent of the rate at which it reaches its mature floral clusters in only a few weeks.

p) Ripening - Ripening of Cannabis flowers is the final step in their maturation process. Floral clusters will form and only after a period of apparent hesitation will the flowers begin to produce resin and ripen. Once ripening starts it usually spreads over the entire plant, but it may spread at different rates. Ripening of Cannabis flowers is the final step in their maturation process. Floral clusters will usually mature and ripen in rapid succession, but sometimes large floral clusters may continue to grow and develop for several months.

q) Cannabinoid Profile - It is supposed that variations in the type of high associated with different strains of Cannabis result from varying levels of cannabinoids. THC is the primary psychoactive ingredient which is acted upon synergistically by small amounts of CBD, CBN, and other accessory cannabinoids. We know that cannabinoid levels may be accurately characterized from various individuals and establish criteria for breeding. Various combinations of these traits are possible and inevitable. The traits that we breed for are most easily accomplished by concentrating on the major phenotypes and ideals.
6. Gross Phenotypes of Cannabis Strains

The gross phenotype or general growth form is determined by size, root production, gross phenotypes although there tend to be occasional rare examples of almost every phenotype. Hybrid crosses between imported pure varieties were the beginning of nearly every variety are exhibited in various combinations by the F1 offspring. Nearly all of the offspring are almost true-breeding and the subsequent F2 generation will exhibit great variation, tending to look more like one or the other of the original imported parental varieties, and will also exhibit recessive traits not apparent in either traits in subsequent generations. Enough of the original F1 hybrid seeds are produced

Phenotypes and Characteristics

Following is a list of gross phenotypes and characteristics for many imported strains of Cannabis.

1. Fiber Strain Gross Phenotypes (hemp types)

2. Drug Strain Gross Phenotypes
   a) Colombia - highland, lowland (marijuana)
   b) Congo - (marijuana)
   c) Hindu Kush - Afghanistan and Pakistan (hashish)
   d) Southern India - (ganja marijuana)
   e) Jamaica - Carribean hybrids
   f) Kenya - Kisumu (dagga marijuana)
   g) Lebanon - (hashish)
   h) Malawi, Africa - Lake Nyasa (dagga marijuana)
   i) Mexico - Michoacan, Oaxaca, Guerrero (marijuana)
   j) Morocco - Rif mountains (kif marijuana and hashish)
   h) Nepal - wild (ganja marijuana and hashish)
   I) Russian - ruderalis (uncultivated)
   m) South Africa - (dagga marijuana)
   n) Southeast Asia - Cambodia, Laos, Thailand, Vietnam (ganja marijuana)

3. Hybrid Drug Phenotypes
   a) Creeper Phenotype
   b) Huge Upright Phenotype

In general the F1 and F2 pure-bred offspring of these imported varieties are more similar to each other than they are to other varieties and they are termed pure strains. However, it should be remembered that these are average. Gross phenotypes and recessive varia...
strains for breeding.

1. Fiber Strain Gross Phenotypes Fiber strains are characterized as tall, rapidly maturing, limbless plants that facilitate forming long fibers through even growth and maturation. Monoecious strains interfere with fiber production. Most varieties of fiber Cannabis originate in the northern temperate growing areas and offered commercially over the last fifty years in both Europe and America. They have late-flowered, and low in cannabinoid production. They represent an escaped race of Cannabis sativa.

2. Drug Strain Gross Phenotypes Drug strains are characterized by Delta1-THC as the primary cannabinoid from selective breeding for high potency or natural selection in niches where Delta1-THC biosynthesis may be favored. Most strains have low levels of other cannabinoids such as CBD, CBC, and CBN.

   a) Colombia - (0 to 10 north latitude)

Colombian Cannabis originally could be divided into two basic strains: one from the low-altitude coastal areas and the other from the high-altitude inland from Santa Marta. More recently, new areas of cultivation in the interior plateau of Colombia have been introduced to Colombia just over 100 years ago, and its cultivation is deeply rooted in tradition. The production of "la mona amarilla" or gold buds is achieved by girdling or removing a strip of bark from the main stem of a nearly mature plant, thereby restricting the flow of water, nutrients, and phytosterols. Over several days the leaves dry up and fall off as the flowers slowly die (Partridge 1973). Trade names such as "punta roja" (red tips [pistils] ), "Cali Hills," "choco," "lowland," and "purple" give us some idea of the color of older varieties and the location of cultivation.

In response to an incredible demand by America for Cannabis, and the fairly effective control of Mexican Cannabis importation and cultivation through tightening border security and the use of indoor growing, Cannabis agriculture continues to flourish in Colombia. Cannabis agri-business has squeezed out much of the small farmer to facilitate forming long fibers through even growth and maturation. Colombian Cannabis originally could be divided into two basic strains: one from the low-altitude coastal areas along the Atlantic near Panama, and the other from the more arid mountain areas inland from Santa Marta. More recently, new areas of cultivation in the interior plateau of Colombia have been introduced to Colombia just over 100 years ago, and its cultivation is deeply rooted in tradition. The production of "la mona amarilla" or gold buds is achieved by girdling or removing a strip of bark from the main stem of a nearly mature plant, thereby restricting the flow of water, nutrients, and phytosterols. Over several days the leaves dry up and fall off as the flowers slowly die (Partridge 1973). Trade names such as "punta roja" (red tips [pistils] ), "Cali Hills," "choco," "lowland," and "purple" give us some idea of the color of older varieties and the location of cultivation.

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throughout domestic populations of "drug" Cannabis. Names such as "hash plant" and "skunk weed" have appeared throughout domestic populations of "drug" Cannabis. Names such as "hash plant" and "skunk weed" typify its acrid aroma reminiscent of "primo" hashish from the high valleys near Mazar-i-Sharif, Chitral, and Kandahar in Afghanistan and Pakistan.

This strain is characterized by short, broad plants with thick, brittle woody stems and short internodes. They usually grow in an upright fashion until they are nearly as tall as the central stalk and form very wide, coarsely serrated leaflets in a circular array. The lower leaf surface is often lighter in color than the upper surface. The inner leaves associated with the calyxes are usually liberally encrusted with resin. Early maturation and extreme resin production is characteristic of these strains. This may be the result of acclimatization to northern temperate latitudes and selection for hashish production. The staminate and pistillate individuals and continues throughout the life of the plant. Sweet psychoactivity.

Short stature, early maturation, and high resin production make Hindu Kush strains very popular throughout domestic populations of "drug" Cannabis. Names such as "hash plant" and "skunk weed" typify its acrid aroma reminiscent of "primo" hashish from the high valleys near Mazar-i-Sharif, Chitral, and Kandahar in Afghanistan and Pakistan.

Ganja (or flowering Cannabis tops) has been grown in India for hundreds of years. These strains are in a seedless fashion and are cured, dried, and smoked as marijuana instead of being converted to hashish as in many Central Asian areas. This makes them of considerable interest to Indian farmers. Many Europeans and Americans now live in these areas of India and grow Ganja strains are often tall and broad with a central stalk up to 12 feet tall and spreading frond-like limbs. The large serration arranged in a circular array. The frond-like limbs of ganja strains result from extensive compound branching. This promotes a high yield of floral clusters which in ganja strains tend to be small, slender, and curved. Seeds are usually small and dark. Many spicy aromas and tastes occur in Indian ganja strains and they are extremely resinous and psychoactive. Medicinal Cannabis of the late 1800s and early 1900s was usually Indian ganja.

Jamaican strains were not uncommon in the late 1960s and early 1970s but they are much more common as the "lamb's bread" and is rarely seen outside Jamaica. Most purported Jamaican strains are from Colombia and its position along the routes of marijuana smuggling from Colombia to Florida make it likely that these varieties were not responsible for the original Jamaican strains. Jamaican strains resemble Colombian strains in many ways and it is likely that they are related. Jamaican strains produce a psychoactive effect of a particularly clear and cerebral nature, unlike many Colombian strains. Some strains may also have come to Jamaica from the Caribbean coast of Mexico, and this may account for the introduction of cerebral green strains.

Colombia and its position along the routes of marijuana smuggling from Colombia to Florida make it likely that Colombian varieties now predominate in Jamaica even if these varieties were not responsible for the original Jamaican strains. Jamaican strains resemble Colombian strains in leaf shape, seed type and general morphology but they tend to be a little taller, thinner, and lighter green.

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f) Kenya - Kisumu (5 north to 5 south latitude)

Strains from this area have thin leaves and vary in color from light to dark green. They are late-maturing, tall, sweet strain from Thailand, India, or Nepal. This produces hybrid offspring in northern climates. Many hybrid crosses of this type are made each year and are currently grown throughout domestic populations of "drug" Cannabis. Names such as "hash plant" and "skunk weed" typify its acrid aroma reminiscent of "primo" hashish from the high valleys near Mazar-i-Sharif, Chitral, and Kandahar in Afghanistan and Pakistan.

g) Lebanon - (34 north latitude)

Lebanese strains are rare in domestic Cannabis crops but do appear from time to time. The nearly seedless flowers are spicy in taste and powerfully psycho active. Enthusiastic American and European Cannabis cultivators immediately planted the new strain and it has become a dark green, large plant of medium height and strong limb growth. The leaves are dark green with coarsely serrated, large, slender, narrow leaflets in a circular array. The lower leaf surface is often lighter in color than the upper surface. The inner leaves associated with the calyxes are usually liberally encrusted with resin. Early maturation and extreme resin production is characteristic of these strains. This may be the result of acclimatization to northern temperate latitudes and selection for hashish production. The staminate and pistillate individuals and continues throughout the life of the plant. Sweet psychoactivity.

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h) Malawi, Africa - (10 to 15 south latitude)

Malawi is a small country in eastern central Africa bordering Lake Nyasa. Over the past few years Cannabis from Malawi has appeared wrapped in bark and rolled tightly, approximately four ounces at a time. The nearly seedless flowers are spicy in taste and powerfully psycho active. Enthusiastic American and European Cannabis cultivators immediately planted the new strain and it has become a dark green, large plant of medium height and strong limb growth. The leaves are dark green with coarsely serrated, large, slender, narrow leaflets in a circular array. The lower leaf surface is often lighter in color than the upper surface. The inner leaves associated with the calyxes are usually liberally encrusted with resin. Early maturation and extreme resin production is characteristic of these strains. This may be the result of acclimatization to northern temperate latitudes and selection for hashish production. The staminate and pistillate individuals and continues throughout the life of the plant. Sweet psychoactivity.

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leaves usually lack serration, long internodes, and are made up of large calyxes and relatively few leaves. The large calyx is ovoid in shape with a dark grey or reddish brown, mottled perianth or seed coat. The calyx has an edged lip. Some individuals turn a very light yellow green in the flowering clusters as they mature under exposed conditions. Although they mature relatively late, they do seem to have met with some acceptance in Great Britain and North America as drug strains. Seeds of many strains appear. Phenotypes vary considerably, however, many are similar in appearance to strains from

i) Mexico - (15 to 27 north latitude)

Mexico had long been the major source of marijuana smoked in America until recent years. Efforts by the border patrols to stop the flow of Mexican marijuana into the United States were only minimally effective and many varieties of high quality Mexican drug Cannabis were continuing to arrive. In recent years, however, the Mexican government (with monetary backing by the United States) began an intensive program to eradicate Cannabis through aerial spraying of herbicides such as Paraquat. Their program was effective, and high quality Mexican Cannabis is now rarely available. 

Java strains or "brands" of Cannabis were usually affixed with the name of the state or area where they were grown. "Sinaloan" have geographic origins behind their common names and mean something to this day. All of these areas are Pacific coastal states extending in order from Sinaloa in the north at 27;...through Nayarit, Jalisco, Michoacan, Guerrero, and Oaxaca; to Chiapas in the south at 15 north latitude. Strains from Michoacan, Guerrero, and Oaxaca were the most common and a few common varieties may be found in the offspring of Mexican strains grown in Mississippi as the pharmaceutical research product for chemotherapy and glaucoma patients. In the prime of Mexican marijuana cultivation from the early 1960s to the middle 1970s, strains or "brands" of Cannabis were usually affixed with the name of the state or area where they were grown. "Sinaloan" have geographic origins behind their common names and mean something to this day. All of these areas are Pacific coastal states extending in order from Sinaloa in the north at 27;...

j) Morocco, Rif Mountains - (35 north latitude)

The Rif mountains are located in northernmost Morocco near the Mediterranean Sea and are the origin of some of the highest quality Cannabis used for kif floral clusters and hashish production. Seeds are broad-sown or scarified, harvested in late August and September. Mature plants are usually 1 to 2 meters (4 to 6 feet) tall, the pistillate plant bears only one main terminal flower cluster full of seeds. Few staminate plants (male) have small, slender floral clusters to be mixed with tobacco and smoked as kif, hashish production has begun by shaking the entire plant over a silk screen and collecting the powdery resin that passes through the screen. It is an ancient practice. Strains were grown for seedless flower production and areas of Morocco may still exist with a volunteer tradition. Because of selection for hashish production, Moroccan strains resemble both Lebanese and Hindu Kush strains. Some individuals turn a very light yellow green in the flowering clusters as they mature under exposed conditions. Although they mature relatively late, they do seem to have met with some acceptance in Great Britain and North America as drug strains. Seeds of many strains appear. Phenotypes vary considerably, however, many are similar in appearance to strains from

k) Nepal - (26 to 30 north latitude)

Most Cannabis in Nepal occurs in wild stands high in the Himalayan foothills (up to 3,200 meters), and hashish and marijuana originate. Nepalese plants are usually tall and thin with long, slightly branched stems; the so-called "ball" and "finger" hashish hand-rubbed from wild plants. Resin production is abundant and few strains were grown for seedless flower production and areas of Morocco may still exist with a volunteer tradition. Because of selection for hashish production, Moroccan strains resemble both Lebanese and Hindu Kush strains. Some individuals turn a very light yellow green in the flowering clusters as they mature under exposed conditions. Although they mature relatively late, they do seem to have met with some acceptance in Great Britain and North America as drug strains. Seeds of many strains appear. Phenotypes vary considerably, however, many are similar in appearance to strains from

l) Russian - (35 to 60 north latitude) Cannabis ruderalis (uncultivated)

Short stature (10 to 50 centimeters [3 to 18 inches]) and brief life cycle (8 to 10 weeks), weedy Cannabis and named it Cannabis ruderalis. Ruderalis could prove valuable in breeding old without apparent dependence on daylength. Russian Cannabis ruderalis is nearly always high in CBD and low in THC.
m) South Africa - (22 to 35 south latitude)

Dagga of South Africa is highly acclaimed. Most seeds have been collected from marijuana shipments in Europe. The stretched light green floral clusters and sweet aroma are comparable to Thai strains.

n) Southeast Asia - Cambodia, Laos, Thailand and Vietnam (10 to 20 north latitude)

Since American troops first returned from the war in Vietnam, the Cambodian, Laotian, Thai and Vietnamese strains of Cannabis have been regarded as some of the very finest in the world. Currently most Cannabis cultivation has become a big business in Thailand and many farmers are growing Cannabis brought to Thailand to replenish local strains and begin large plantations, may have hybrid origin.

Strains from Thailand are characterized by tall meandering growth of the main stalk and limbs, leaflets arranged in a drooping hand like array. The Thai refer to them as “alligator tails”

Most Thai strains are very late-maturing and subject to hermaphroditism. It is not understood whether this is genetically controlled (dominant or recessive), but efforts to develop a true-breeding strain have been unsuccessful. The stretching and apparent disregard for changes in photoperiod and weather may have been a development over centuries. Thai strains are very psychoactive and many hybrid crosses have been made with rapidly maturing strain featuring high psychoactivity and characteristic Thai sweet, citrus taste. The calyxes of Thai strains are brown or tan in color. The perianth is never mottled or striped except at the base. Greenhouses prove to be the best way to mature stubborn Thai strains in temperate climes.

The preceding has been a listing of gross phenotypes for several of the many strains of Cannabis occurring worldwide. Although many of them are rare, the seeds appear occasionally due to the extreme mobility of Cannabis populations and the socio-economic displacement of Cannabis cultures worldwide. Collectors and breeders are needed to preserve these rare and endangered gene pools before it is too late.

Various combinations of these traits are possible and inevitable. The traits that we most often see concentrating on the dominant phenotypes for the most important traits. The best breeders set high goals of limited scope and adhere to their ideals.

Chapter 4 - Maturation and Harvesting of Cannabis

To everything there is a season, and a time to every purpose under heaven:
A time to be born, and a time to die;
a time to plant, and a time to pluck up
that which is planted,
Maturation

The maturation of Cannabis is normally annual and its timing is influenced by the age of the plant, two months) and the nights lengthen following the summer solstice (June 21-22), flowering begins. leaves of Cannabis plants form fewer leaflets during flowering until the floral clusters are formed. number through the pre-floral stage.

The staminate and pistillate sexes of the same strain mature at different rates. Staminate plants are only a few pairs of primordial flowers. It would seem more effective for the staminate plant to release, however, it becomes obvious that early pollination is advantageous to survival. Pollinations that take chance of frost damage or predation by herbivores. If conditions are favorable, the staminate plants, month or more of shedding pollen the staminate plants enter senescence. This period is marked by leaves drop, and the spent, lifeless stamens hang in the breeze until fungi and bacteria return the

Pistillate plants continue to develop up to three months longer as they mature seeds. As the calyx flowers are continually produced and fertilized, there are nearly always seeds ranging in maturity conditions throughout several months. The effectiveness of this type of reproduction is demonstrated, multiplies each year, through the timely dehiscence of millions of pollen grains and the fertilization of senesces, the leaves turn yellow and drop, along with the remaining mature seeds. The rest of the

Although the staminate plants begin to release pollen before the pistillate plant has begun to form staminate plants begin to release pollen. This ensures that the first pollen released has a chance to recognizable in a crop, so early selection of seed-parents is quite easy. Often the primordia of staminate weeks. Pistillate plants also may develop vegetative growth in place of the usual primordial calyxes to sinsemilla Cannabis cultivators, since the staminate plants that are hesitant to differentiate sex for staminate plants if they are slow to form calyxes, since vegetative growth at the nodes could a

Latitude and Photoperiod

Change in photoperiod is the factor that usually triggers the developmental stages of Cannabis. Photoperiod is found near the equator, and the most widely fluctuating photoperiods and most radical seasonal variation depending on their distance from the equator or height in altitude. A graph of light cycles adaptations of strains to their native environments.

The wavy lines follow the changes in photoperiod (daylength) for two years at various latitudes. For with a 15-hour photoperiod on June 21 (summer solstice). As the months progress to the right, the and Cannabis plants begin to flower and produce THC. (Increased THC production is represented as and produce more THC until a peak period is reached during October and November. After this time, winter solstice (shortest day of the year, around December 21) if they are protected from frost. At get long (12-14 hours) and warm from March to May. Farther north at 600 latitude the day-length

Light cycles and seasons vary as one approaches the equator. Near 200 north latitude (Hawaii, Increased THC production, between 10 and 14 hours. The light cycle at 200 north latitude starts at the summer finishes later than at higher latitudes. However, because the photoperiod is never too long to induce Strains from these latitudes are often not as responsive to photoperiod change, and flowering seems old if photoperiod does not exceed 13 hours. At 200 latitude, the photoperiod never exceeds 14 h

Equatorial areas gain and lose daylength twice during the year as the sun passes north and south area, but at some locations along the equator it is possible to grow two crops of fully mature Cannabis and dry seasons, the effective growing season may be determined. If an area has too short an eff
For instance, assume a researcher wishes to grow a crop of Cannabis near Durban, South Africa, a maturation of drug Cannabis, exists from October through June. Local weather conditions indicate that frost east in June could damage plants and some sort of storm protection might be necessary. Any estimate made from this chart is generally accurate for photoperiod; however, local weather conditions are always taken into account.

Combination and simplification of the earth’s climatic bands where Cannabis is grown yields an equatorial zone and temperate zones. The maturation cycle for drug Cannabis in each zone follows.

Equatorial Zone - (15 south latitude to 15 north latitude)

At the equator the sun is high in the sky all year long. The sun is directly overhead twice a year at each equinox. As a result, the equatorial zone has two times during the year when floral induction is possible unless the weather forbids, the fields may be used twice a year. Colombia, southern India, Thailand, and any areas of commercial Cannabis cultivation, other than Colombia, lie within the heart of the equatorial zone so it may be impossible to find a dry enough place to grow one crop of Cannabis, much less two. However, cultivation, however, equatorial Cannabis has great potential for drug production.

Northern and Southern Subtropical Zones - (15 to 30 north and south latitudes)

The northern subtropical zone is one of the largest Cannabis producing areas in the world, while the southern subtropical zone, October-December in the northern hemisphere and from September-October through March-June in the northern hemisphere, spanning from 90 to 120 days. In Hawaii, Cannabis cultivators sometimes actually break up the long subtropical season during which some of the world’s most potent Cannabis is grown, during which some of the world’s most potent Cannabis is grown.

North and South Temperate Zones - (30 to 60 north and south latitudes)

The temperate zones have one medium to long season stretching from March-May through September-December. Central China, Korea, Japan, United States, southern Europe, Morocco, Turkey, Lebanon, Iran, Afghanistan, Pakistan, and parts of Russia, Alaska, Canada and northern Europe are usually located in the northern subtropical zone.

Arctic and Antarctic Zones - (60 to 70 north and south latitudes)

The arctic and antarctic zones are characterized by a short, harsh growing season that is not favorable to Cannabis, and continues until the first freezes of September or October. The photoperiod is very long in these areas, but they do not get a long enough season to mature completely and there are very small stands of escaped fiber and drug Cannabis. Rapidly maturing, acclimatized hybrid strains from temperate North America and Russian Cannabis ruderalis could yield very short season drug strains.

It becomes readily apparent that most of the drug Cannabis occurs in the northern subtropical and temperate zones of the world over. It is also readily apparent that the equatorial zone and subtropical zones are quite large in these areas, but they do not get a long enough season to mature completely and there are very small stands of escaped fiber and drug Cannabis. Rapidly maturing, acclimatized hybrid strains from temperate North America and Russian Cannabis ruderalis could yield very short season drug strains.

Strains that have become adapted to their native latitude will tend to flower and mature under different conditions than those in other areas. Strains from Mexico (subtropical zone) will usually completely mature by the end of October, unless the weather forbids, the fields may be selected from latitudes similar to the area to be cultivated so that the chances of growing one crop of Cannabis, much less two. However, cultivation, however, equatorial Cannabis has great potential for drug production.

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Moon Cycles

Since ancient times man has observed the effect of the moon on living organisms, especially his crop yields. This cycle is divided into four one-week phases. It starts as the waning (shrinking) moon. The waning moon is the time when the flower begins to age and mature, the pistils grow longer and the calyx enlarges. The waning moon is the best time to harvest. Exact new moons, full moons, and quarter moons are avoided as these are times of interplanetary stress. Planting, germinating, grafting, and layering are most favored during phases 1 and 2. The best time is a few days before the full moon. Phases 3 and 4 are dedicated to root growth. Root growth seems accelerated at the time of the new moon, possibly as a response to increased gravitational pull from the alignment of sun and moon. Strong, full moonlight is on the borderline of being enough light to cease floral induction entirely. Verma et al. (1997) attribute increased gravitational pull from the alignment of sun and moon to cause a stretched condition in the floral clusters in response to high humidity, high temperatures, lowered light intensity, and restricted air circulation.

Conversely, plants begin floral growth during the dark nights of the new moon. More research is needed to explain the mysterious effects of moon cycles on Cannabis root systems.

Floral Maturation

The individual pistillate calyxes and the composite floral clusters change as they mature. External changes are connected with the invisible internal metabolic changes, then the cultivator is in a better position which can put the process in more objective terms.

The calyxes first appear as single, thin, tubular, green sheaths surrounding an ovule at the basal fold of the calyx. As the flower begins to age and mature, the pistils grow longer and the calyx enlarges. From this point on, the pistils begin to swell and darken slightly, and the flower becomes more likely that it will produce a viable seed if pollinated. Without pollination the calyx begins to swell orange brown. By this time, the swollen calyx has accumulated an incredible layer of resin, but some development of the individual pistillate calyx. The resins turn opaque and the calyx begins to appear a bit thicker. The biosynthesis of cannabinoids and terpenes parallels the developmental stages of the calyx and determines the maturational state of the entire floral cluster. Thus, determination of maturational stage and timing of the harvest is based on the average calyx and resin condition, along with general trends in morphology and development of the plant as a whole.

The basic morphological characteristics of floral maturation are measured by calyx-to-leaf ratio and internode length. The internode length is usually characterized by decreased calyx growth and increased leaf growth. Internode length is usually a good indicator of the internode length may increase in response to increased humidity and lowered light conditions and the possibility of re-growth the following season. At this time nearly all resin secretion has ceased the following season. Greenhouses have been used in temperate latitudes to simulate the localized light cycle particular to a strain may cause a stretched condition in the floral clusters in response to high humidity, high temperatures, and development of the plant as a whole.

Simulation of the native photoperiod of a certain strain is achieved through the use of blackout curtains and supplemental lighting in a greenhouse or indoor environment. The localized light cycle particular to a strain may be estimated from the graph of maturation patterns at various latitudes (p.124). In this way it is possible to reproduce exotic foreign environments to more accurately study Cannabis. Tight clusters of calyxes and leaves are characteristic of ripe outdoor Cannabis. Some strains, however, such as those from Thailand, tend to have longer internodes and appear airy and stretched. This seems to be a genetically controlled adaptation to their native environment. Imported examples from Thailand also have long internodes in the pistillate floral clusters. This condition is furthered as rejuvenation begins during autumn days of decreasing photoperiod.

Cannabinoid Biosynthesis

Since resin secretion and associated terpenoid and cannabinoid biosynthesis are at their peak just before flowering. Harvesting during this time. More subtle variations in terpenoid and cannabinoid levels also take place as the flower ages. The cannabinoid ratios characteristic of a strain are primarily determined by genes, but it must be remembered that along the cannabinoid biosynthetic pathway. These environmental factors can cause an atypical final cannabinoid profile (cannabinoid levels and ratios). Not all cannabinoid molecules begin their journey through the plant as a whole.
grown under artificial lights. Light energy has been collected and utilized by the plant in a long series of reactions resulting in the formation of THC acids. Farther along the pathway begins the formation of degradation

strains is converted directly to THCA as soon as it is formed and no CBD builds up. Also Turner, Hemphill, and Mahlberg (1978) found that CBC acid was contained in the tissues of Cannabis but not in the resin secreted

rearranged before forming CBD acid, CBC acid may be the accumulated intermediate, the reaction may be reversed, and through the symmetric intermediate and the usual allylic rearrangement CBD acid would be formed but

with a very high THC level and no CBD although there are fair amounts of CBC acid present in the strain. Turner* states that he has seen several strains totally devoid of CBD, but he has never seen a strain totally devoid

chemotype, but if a strain has the genetically determined ability to convert CBD acid to THC acid then it is considered a drug strain. It is also interesting to note that Turner and Hadley (1973) discovered an African strain

Aridity favors resin production and total cannabinoid production; however, it is unknown whether arid conditions promote THC production specifically. It is suspected that increased ultraviolet radiation might affect

cannabinoids. Myriad subtle combinations are sure to exist. Also, terpenoid and other aromatic compounds might suppress or potentiate the effects of THCs.

differences in psychoactivity not detected in animals by laboratory instruments, but often discussed by marijuana aficionados, could be attributed to additional synergistic effects of the four isomers of THC acid. Total

carboxyl (COOH) groups on the olivetolic acid portion of the molecule. It is suspected that the psychoactivity of the α and β forms of the THC acid molecules probably does not vary, but this has not been proven. Subtle

acid is about four times more prevalent than Delta6-THC acid in most strains. Also Alpha and Beta forms of Delta1-THC acid and Delta6-THC acid exist as a result of the juxtaposition of the hydrogen (H) and the

some of the products formed in the laboratory experiment do not occur in living specimens. Four types of isomers or slight variations of THC acids (THCA) exist. Both Delta1-THCA and Delta6-THCA are naturally

Conversion of CBD acid to THC acid is the single most important reaction with respect to psychoactivity. Mechoulam has centered around the role of ultraviolet light in the bio-synthesis of THC acids and CBD acid in n-hexane to ultraviolet light of 235-285 nm. for up to 48 hours. This reaction uses atmospheric oxygen molecules (O2) and is irreversible; however, the yield of the conversion is only about 15% THC acid, and

Environmental conditions influence cannabinoid biosynthesis by modifying enzymatic systems and by modifying, for example, terpenoid homo-logs. Other strains from this area of Asia have also exhibited the presence of propyl homo-logs. Aridity favors resin production and total cannabinoid production; however, it is unknown whether increased ultraviolet light might shift cannabinoid synthesis from pentytyl to propyl.

The ratio of THC to CBD has been used in chemotype determination by Small and others. The general association has been that strains with a very high THC level and no CBD although there are fair amounts of CBC acid present in the glands of THC. Also, many early authors confused CBC with CBD in analyzed samples because of the presence of the propyl side chain. CBC acid may be the accumulated intermediate, the reaction may be reversed, and through the symmetric intermediate and the usual allylic rearrangement CBD acid would be formed as soon as it is formed and no CBD builds up. Also Turner, Hemphill, and Mahlberg (1978) found that CBC acid was contained in the tissues of Cannabis but not in the resin secreted.

Returning to the more orthodox version of the cannabinoid biosynthesis, the role of ultraviolet light in the conversion of CBD acid to THC acids. Therefore, the lack *Carlton Turner 1979: personal communication, grown under artificial lights. Light energy has been collected and utilized by the plant in a long series of reactions resulting in the formation of THC acids. Farther along the pathway begins the formation of degradation.
Terpene production is also nearing a peak and the floral clusters are beautifully aromatic. Many cultivators prefer to pick some of their strains during this stage in order to produce marijuana with a clear, cerebral, levels remain stable as the molecules are rapidly converted to THC acids, THC acid synthesis has not been active long enough for a high level of CBN acid to build up from the degradation of THC acid by light and heat.

production increase. The elevated resin heads appear clear, since fresh resin is still being secreted, often being produced in the cellular head of the trichome. At this time THC acid production is at a peak and CBD acid

precious unfertilized ovule. Under wild conditions the pistillate plant would be starting to form seeds and the cycle would be drawing to a close. When Cannabis is grown for sinsemilla floral production, the cycle is

white with many pairs of ripe pistils. Resin secretion is quite advanced in some of the older infertile calyxes, and the young pistillate calyxes are rapidly producing capitate-stalked glandular trichomes to protect the

overlapping spiral. Small reduced mono-leaflet and tri-leaflet leaves subtend each pair of calyxes emerging from secondary stems within the floral clusters. These subtending leaves are correctly referred to as bracts. Outer

Peak Floral Stage

Harvest Timing

With this dynamic picture of the biosynthesis and degradation of THC acids as a frame of reference, to ensure high THC levels modified by just the proper amounts of CBC, CBD and CBN, along with the CBN acid at the same time they are being made from CBD acid, it is important to harvest at a time number of indicating factors and knows when to harvest the desired type of floral clus ters. Some resins are very aromatic and light; the psychoactive effect is characterized as a light cerebral high. marijuana characterized by a more intense body effect and an inhibited cerebral effect (high CBC, gives the cultivator a set of samples at all stages of maturation and creates a basis for deciding when aroma, and relative psychoactivity.

Premature Floral Stage

At this stage floral development is slightly beyond primordial and only a few clusters of immature diameter within the floral clusters is very nearly maximum. The stems are easily visible between the predominate and smaller tri-leaflet leaves are beginning to form in the new floral axis. A few narrow white filaments stretching to test the surroundings. During this stage the surface of the calyxes is trichomes have begun to develop. Resin secretion is minimal, as indicated by small resin heads and production is low, and there is no economic value other than fiber and leaf. Terpene production stands cannabinoid production is low but simple cannabinoid phenotypes, based on relative amounts of THC drug strain. A fiber strain rarely produces more than 2% THC, even under perfect agricultural conditions, a drug strain or produces practically no THC and high CBD and is termed a fiber strain. This is gen

The floral clusters are barely psychoactive at this stage, and most marijuana smokers classify the of CBC and CBD. CBD production begins when the seedling is very small. THC production also begins until the early floral stage and rarely produce a "high" until the peak floral stage.

Early Floral Stage

Floral clusters begin to form as calyx production increases and internode length decreases. Tri-leaf pairs of calyxes appear along each secondary floral axis and each pair is subtended by a tri-leaflet darken as they lose fertility, and some resin secretion is observed in trichomes along the veins of a slight terpene aroma and psychoactivity are detectable. The floral clusters are not ready for harvest (than 3%) are not high enough to produce more than a subtle effect.

Peak Floral Stage

Elongation growth of the main floral stem ceases at this stage, and floral clusters gain most of the overlapping spiral. Small reduced mono-leaflet and tri-leaflet leaves subtend each pair of calyxes leaves begin to wilt and turn yellow as the pistillate plant reaches its reproductive peak. In the prior white with many pairs of ripe pistils. Resin secretion is quite advanced in some of the older infertile precious unfertilized ovule. Under wild conditions the pistillate plant would be starting to form seeds interrupted. Pistillate plants remain unfertilized and begin to produce capitate-stalked trichomes production increase. The elevated resin heads appear clear, since fresh resin is still being secreted levels remain stable as the molecules are rapidly converted to THC acids, THC acid synthesis has Terpene production is also nearing a peak and the floral clusters are beautifully aromatic. Many cu
Resins generally accumulate steadily while the plant matures, but strains may vary as to the stage of peak resin secretion. Seed percentage increases exponentially with time if the crop is well fertilized, but most samples production ceases. Other strains continue to produce calyxes at the expense of leaves, and the calyx percentage increases steadily throughout maturation. In both cases, there is some tendency for calyx percentage to level off in time.

Calyx production follows two basic patterns. In one, the percentage of calyxes climbs gradually and levels out during the peak floral stage. It begins to decline in the late floral stage, and leaf production increases as calyx percentage drops sharply during the peak floral stage and rises again as calyx production slows and leaf production increases. In the other pattern, inner leaves have a sudden increase in stem percentage. The percentage of inner leaves usually starts very low and climbs rapidly as the floral clusters mature. This often reflects increased leaf growth near the end of the season.

It is important to understand differences in the anatomy of floral clusters for each Cannabis strain. Trends in the relative quantity (dry weight) of various parts (such as leaves, calyxes and trichomes) at various harvest dates can be monitored and compared. Terpene secretion changes along with cannabinoid secretion and psychoactive effect. Various terpenes, terpene polymers, and other aromatic principles are produced and ripen at different times in the development of the plant. It is believed that, in peak floral clusters, the low levels of CBD and CBN allow the high level of THC to act without their sedative effects. Also, little polymerization of resins has occurred, so aromas and tastes are often less resinous and tar like than at later stages. Many strains, if they are harvested in the peak floral stage, lack the completely developed aroma, taste and psychoactive level that appear after curing.

This is the point of optimum harvest for some strains, since most additional calyx growth has ceased and metabolism of the plant has begun to decline. The weight yield of floral clusters is usually highest at this point, but strains may begin to mature at this stage, so the period of maximum resin production has passed. If the floral clusters are harvested at this stage after the period of maximum resin production, the resin and terpenes will be less potent and the overall psychoactive effect will be reduced. It is also important to note that the higher THC content of amber resins is a secondary effect, since the THC is better protected from the sun by amber or opaque resin heads than by clear resins. Some late maturing strains develop opaque, white resin heads as a result of terpene polymerization and THC decomposition. Opaque resin heads are usually a sign that the floral clusters are over-mature.

Late floral clusters exhibit the full potential of resin production, aromatic principles, and psychoactive effect. Various terpenes and ketones determine the aroma and flavor of mature Cannabis. The levels of the basic terpenes and ketones in the resins change as the plant matures and ripens. By the late floral stage, a high proportion of ripe resins are present on the mature calyxes and associated leaves. Production of active cannabinoids has ceased, and more THC acid is being broken down into CBN acid than is being produced. The THC-to-CBD ratio in the harvested floral clusters certainly begins to drop as biosynthesis slows, because THC acid levels decrease as it decomposes, and at the same time CBD acid levels remain or rise. It is also characteristic of Cannabis that resin production and maturation. Many areas of North America and Europe have too short a season to fully mature resins unless a greenhouse is used. Specially acclimatized strains are another possibility. They develop very rapidly and begin maturing in time to ripen amber resins while the weather is still warm and dry.

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Senescence or Rejuvenation Stage

After a pistillate plant finishes floral maturation, the production of pistillate calyxes ceases and the plant will sprout new vegetative growth in preparation for the following season. Senescence is often high color from yellow through red to deep purple. Eventually a brown shade pre-dominates and death is near. The senescence is often high color from yellow through red to deep purple. Eventually a brown shade pre-dominates and death is near. The senescence is often high color from yellow through red to deep purple. Eventually a brown shade pre-dominates and death is near. It is as if the plant production completely stopped. Floral clusters left to ripen until the bitter end usually produce inferior marijuana of lowered THC level, especially outdoors in bad weather. In many areas of North America and Europe have too short a season to fully mature resins unless a greenhouse is used. Specially acclimatized strains are another possibility. They develop very rapidly and begin maturing in time to ripen amber resins while the weather is still warm and dry.

Resins generally accumulate steadily while the plant matures, but strains may vary as to the stage of peak resin secretion. Seed percentage increases exponentially with time if the crop is well fertilized, but most samples production ceases. Other strains continue to produce calyxes at the expense of leaves, and the calyx percentage increases steadily throughout maturation. In both cases, there is some tendency for calyx percentage to level off in time.

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Contrary to popular thought, planting Cannabis strains later in the season in temperate latitudes may actually promote earlier flowering. Most cultivators believe that planting early gives the plant plenty of time to flower and never speed up development.

Cool night temperatures seem to promote flowering in plants that have previously differentiated sexually. Extended cold periods, however, cause metabolic processes to slow and maturation to cease. Most temperate dependent on accumulated solar energy since light responses can be activated and THC production increased with only a 40-watt bulb. A reasonable theory is that a light-sensitive pigment in the plant (possibly production requires 11-12 hours of continuous darkness to induce flowering and at least 10 hours of light for adequate THC production (Valle et al. 1978). In a greenhouse, supplemental lighting need be used only to for a few hours at sunrise or sunset, and these are used to cover small plants. Photoperiod alteration is most easily accomplished in a greenhouse, where blackout curtains are easily rolled over the plants. Drug Cannabis is produced than is broken down. Humidity is an interesting parameter of THC production and one maturation period. It follows that increased resin produc. tion in response to arid conditions might (equatorial zones) and produce copious quantities of resin. Cannabis seems not to produce more resin; flowering does not stimulate THC production, although an arid atmosphere may so. A Cannabis

Flowering in Cannabis may be forced or accelerated by many different techniques. This does not mean that THC production is forced, only that the time before and during flowering is shortened and flowers are produced in general, it is considered most important that the plant be healthy for it to produce high THC levels that, the provision of adequate organic nutrients, water, sunlight, fresh air, growing space, and time growth. "Inadequacies in the environment limits the true expression of phenotype and cannabinoid potential. It is best able to raise this defense. Forcing plants to produce is a perverse ideal and alien to the principles of organic agriculture. Plants are not machines that can be worked faster and harder to produce more. The life of a plant is determined by the genotype of the plant, a result of seed selection, is the primary factor which determines the THC levels. After the provision of adequate organic nutrients, water, sunlight, fresh air, growing space, and time growth and guide the plant until it matures.

Factors Influencing THC Production

Many factors influence the production of THC. In general, the older a plant, the greater its potential for proper quantity and quality of light. It seems that none of the biosynthetic processes operate efficiently THC is produced under a 12-hour photoperiod than under a 10-hour photoperiod. Warm temperature response to the threat of floral desiccation by the hot sun, Resin collects in the heads of glandular rays of the sun so that fewer of them strike the leaf surface and raise the temperature. However, is produced than is broken down. Humidity is an interesting parameter of THC production and one maturation period. It follows that increased resin produc. tion in response to arid conditions might

There is really no confirmed method of forcing increased THC production. Many techniques have been developed, but they are not always practical or economic. Cutting the flow of water and nutrients between the roots and the shoots. This technique may not, (1973). Impaling with nails, pine splinters, balls of opium, and stones are clandestine folk methods original culture or scientific basis. Symbiotic relationships between herbs in companion plantings and stinging nettles, as companion plants for Cannabis, in an effort to stimulate resin production. In the sun so that fewer of them strike the leaf surface and raise the temperature. However, is produced than is broken down. Humidity is an interesting parameter of THC production and one maturation period. It follows that increased resin produc. tion in response to arid conditions might

In general, it is considered most important that the plant be healthy for it to produce high THC levels. Adequate organic nutrients, water, sunlight, fresh air, growing space, and time are necessary for the plant to reach its potential. Inadequacies in the environment limits the true expression of phenotype and cannabinoid potential. It is best able to raise this defense. Forcing plants to produce is a perverse ideal and alien to the principles of organic agriculture. Plants are not machines that can be worked faster and harder to produce more. The life of a plant is determined by the genotype of the plant, a result of seed selection, is the primary factor which determines the THC levels. After the provision of adequate organic nutrients, water, sunlight, fresh air, growing space, and time growth and guide the plant until it matures.

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Cool night temperatures seem to promote flowering in plants that have previously differentiated sexually. Cannabis strains are sensitive to many of the signs of an approaching fall season and respond by flowering and never speed up development.

Contrary to popular thought, planting Cannabis strains later in the season in temperate latitudes
If the plant is dried whole. This means that all of the water in the plant must pass through the stomata on the surface of the leaves and calyxes instead of through cut stem ends. The stomata close soon after harvest and is used because the entire plant is not ripe at any given time. Removing individual clusters also makes drying easier and quicker because the stalks are divided into shorter pieces. Floral clusters will dry much more slowly than from the stalks and carefully packaging them in shallow boxes or trays, or all simultaneously by uprooting or cutting off the entire plant. In instances where the floral clusters mature sequentially, individual harvest that enough viable seeds are always available.

Cultivation might be stored for a longer time if the initial sample is large enough to provide sufficient seeds for another generation. If a strain is to be preserved, it is necessary to grow and reproduce it every three years, so storing various plant parts are determined by the intended use of the plant. Pulp is made from the leaves of juvenile plants and from waste products of fiber and drug production. Fibers are produced from the stems of the Cannabis plant. The floral clusters are responsible for the production of seeds, drugs, and aromatic resins.

If plants are to be used solely as a pulp source for paper production, they may be harvested at any point in the life cycle when they are large enough to produce a reasonable yield of leaves and small stems. The leaves and it will finish earlier. This is often not true. Seedlings started in February or March grow for 4-5 months and plants grow and may form floral inhibitors during the months of long photo-period. When the days differentiate sex by March or April. Usually these plants form few floral clusters and rejuvenate for July, after the summer solstice, are exposed only to days of decreasing photoperiod. When old enough, they begin the 6-10 week floral period with plenty of time to finish during the warmer days of October. Extreme research, where it is common for plants to grow far too large for easy handling before flowering. However, flowering is delayed into September since the plant must grow before it is old enough to reproduce.

Extremes in nutrient concentrations are considered influential in both the sex determination and flowering. High nitrogen levels during flowering often result in delayed maturation and excessive leafing in the plants. Fertilizers known as "bloom boosters" are available, and these have been shown to accelerate flowering and reduce the formation of vegetative growth. A safer method for the plant is the use of natural phosphorus sources, such as colloidal phosphorus that is readily available as well as long-term in effect. Chemical fertilizers sometimes bring on flowering before the natural mechanism is triggered.

Hormones, such as gibberellic acid, ethylene, cytokinins and auxins, are readily available and can be used to influence the flowering of Cannabis. The methods of harvesting, drying, curing, and storing various plant parts are determined by the intended use of the plant. Pulp is made from the leaves of juvenile plants and from waste products of fiber and drug production. Fibers are produced from the stems of the Cannabis plant. The floral clusters are responsible for the production of seeds, drugs, and aromatic resins.

Seeds are harvested by cutting fields of seeded pistillate plants and removing the seeds either by hand or machine. Cannabis seeds usually fall easily from the floral clusters when mature. The remainder of the plant may be used as pulp material or low-grade marijuana. The Indian tradition of preparing ganja is by walking on it and rolling it between the palms to remove excess seeds and leaves.

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Seeds are allowed to dry completely and all vegetable debris is removed before storage. This prevents them from being stored in air-tight containers in a cool, dark, dry place. Freezing may also dry out seeds and cause fewer of them will germinate, but even after 5 to 6 years a small percentage of the seeds usually cultivates might be stored for a longer time if the initial sample is large enough to provide sufficient that enough viable seeds are always available.

Curing Floral Clusters

Harvesting, drying, curing, and storage of Cannabis floral clusters to preserve and enhance appearance and potency of the harvest than by any other single cause. When the plant is harvested, the production of fine floral clusters begins. Stems are removed from the stalks and carefully packaging them in shallow boxes or trays, or all simultaneously by uprooting or cutting off the entire plant. In instances where the floral clusters mature sequentially, individual harvest that enough viable seeds are always available.

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He who sows the ground with care and diligence acquires greater stock of religious merit than he could gain by the repetition of ten thousand prayers.

The proper harvesting, curing, and storage of Cannabis closes the season and completes’ the life preservation and its possible beneficial uses deserve more research.

He who sows the ground with care and diligence acquires greater stock of religious merit than he...
In the 60's we brought seed back from Afghanistan and it was a pretty mixed bunch. The shorter, what you might now call indica type was what was used to make bulk cheap grade hash for export and depending on the valley it came from had a finish time 8.5 to 10 weeks and a height of 5 ft to 8 ft but all wide dark leafed. Higher up the slopes nearer the snow line was the wild indigenous sativa type, which was rubbed to make finger hash for local consumption. All these were fully seeded and being a wind pollinated plant to some degree mongrels. The high slope C sativa L types survived via nature being able to grow through the snow and stand frost and are also common in Pakistan Kashmir northern India Nepal and Bhutan just below the snow line. The short wide leafed phenotype [different with every farmer] is rogued for slim leafed plants and selected for large resinous colas so all this business of knowing an Afghan phenotype is a load of cobblers its just a mongrel strain that someone has grown if it wasn't for the demand for real Afghan hash available.

A typical sativa grows to be 5'-8' tall without any encouragement, well beyond what is desirable for sea of green or mass cuttings technique. A finished sativa takes up 4 - 8 times the volume of space of a tight compact sativa for the same yield. It typically takes a fine 10 - 16 weeks of flowering versus 6 - 9 weeks for an indica, almost 100% more. Thus a Golden Triangle Thai sativa or a Hawaiian Sativa ounce is worth probably four times more than the compact indica, at least it would require that to induce growers to commercially crop a sativa. We know no one pays $1,000 CN an ounce (four times typical ounce price in Vancouver) or $1,500 US an ounce (4 times US ounce price for mid-grade Sensi indoor) for sativa, no matter how fine, so the sativa pot is never on the market. If you want to experience a fine Thai sativa, it will never be sold to you (unless you are visiting Thailand), you must grow it yourself.

My favorite, with reasonably good yields, is the Hawaiian Sativa, requiring 85 - 90 days of flowering, but produces good sized buds and does not stretch out of control. The Golden Triangle Thai sativa requires 90 - 95 days of flowering. Both are energy inducing, buzz n' crackle, kinds of high. Great for activity or jobs requiring mental alertness. Of course, amongst friends, a sativa is very prized because there is no possible way to find this sativa or anything like it.

Prior to 1978, what pot was grown in North America was limited to below the 38th parallel, about the tip of Northern California on down south into Mexico, which is still the world's largest producer of pot by nation, outdoor anyway, and it was all sativa. Once the indicas were brought back by American tourists to their homes in North America, within 7 years, sativas were almost gone from the growing landscape, because indicas clearly are favored by their home growers more. The indica crosses by Federation I favor would be with Mikado (indica, 45 days, powerful, aphrodisiac) and Island Sweet Skunk (Sweet Pink Grapefruit indica crossed Big Skunk#1 from Sensi circa 1992, so its 35% sativa, trippy, relaxing)

Northern Lights is a stabilized Cannabis sativa crossed cannabis Afghani hybrid variety developed in the late 1970's near Seattle, Washington. The northwest of America was the center of indoor sinsemilla (from the Spanish meaning "without seeds", this begins the female clone technique that is commonplace technique now) production and cannabis breeding. Due to the poor weather associated with this region, sinsemilla cultivators have long resorted to growing cannabis inside under lights long before growers in other more temperate regions of North America. Northern Lights has been highly regarded for many years throughout the northwest and was multiplied...
ens Seed and S.C.C.C.

r clusters and resembles its much as it originally was through established varieties. Northern and requires 8-10 weeks of a it has little smell.” -High Times

genetics came from California. It was Mexican, with some am weed kicked the Mexican's saw) made us all disenchanted pounds from SD and couldn't sell came back to find them still selling a monied Christmas in the

d friends doing it all the time, but District (both male, haha). Pot pot got expensive and scarce round. Well, at that price more and plants maturing in December, if

me, got hold of some indica seed Humboldt in 1976, but I believe course. I remember being in San wn. We were huge pot smokers, I out, to our great embarrassment

the California explosion got up our falls are too wet to grow he answer was to bring it inside, ities I saw was a basement es of aluminum foil covering the was 1977, 78? These growers l et my balls they got the seed and college in Humboldt at the time. lenty of stoners were growing

on, and a friend has never quit; ed them only recently when I , I guess I know where part of t and the full lineage of the se I lost the male lineage about reserve some of the genetics, but /
c. grown in those countries where
I have these strains because the
1s because they breed for weight
growing big buds because 1. They
of the indoor bulb just doesn’t
again with Northern Lights, Skunk,
helix buck with the quality of the
pots aren’t the indoor ones grown
Brazilian Lemons, Israeli Golds,
in common: they are sativas, they
altitude of many of these
even the best indoors just can’t

'7), there were many many
bad Mex’s too--you would run across
as a lid. Starting around 1970, we
Commercial Colombo went for

Colombian and it was called
at the time I couldn’t believe I
that had the reddish color of
that was so red that it looked like
lately not one trace of brown, red
d--more of a purple and having a
ed and that gave way to the new
hare to the Colombians so they
allop. Lots of light green skunks
bos. And if that wasn’t good
less, sativa, sweet, fresh and
as in). At that same time, a lot of
were worth it. Spacy, powerful,
very very good before they started

ombians, Hawaiian, Thai etc. But
is real wheelchair pot. Lots of
ss common. My cousin in LA still
coming across again with he
it is: Mexican pot can be might

ace-- it has that lime green / pale
look These buds need scissors,
too. There ain't no way I'm trying to break open these nugs with my fingers. scissors leave a clean slice through the fruit punch exterior. saying something right)" - ~shabang~

Because Northern Lights is one of the most widely crossed strains of cannabis, NL crosses with 50% or less NL heritage are listed under the heading of the cross, i.e. NL x Haze is found under "Haze" not "Northern Lights".

Because Skunk is perhaps the most widely crossed strain of cannabis, Skunk crosses with 50% or less Skunk heritage are listed under the heading of the cross, i.e. Haze Skunk is found under "Haze" not "Skunk".
Lincoln states: "Prohibition makes a crime out of things that are not crimes...A prohibition law strikes a blow at the very principles upon which our government was founded."

Government bans Chinese from importing Opium at all. Revenue raising in favor of controlling "morality.

Congress heavily taxed smoking Cannabis. Urges against any prohibition based on "no appreciable physical injury of any kind,...no injurious effects on the

Spanish American war starts, with William Randolph Hearst's "Yellow Journalism" fueling the fires. Hearst begins his long campaign of racism against Hispanics, Orientals, and the things they do in their cultures.

Cannabis Indica, to be used in their medicines. Mellon bank, 6th largest in America, finances very successful oil "gusher" in Spindletop,

First Federal law against drugs. Congress uses 1883 Opium taxation law as precedent, Federal government banned certain types of Opium from being imported, and

Indian Hemp Drugs Commission report released to British. Study done in India. Judged the physical, mental, moral effects of

California, in a blatant act of racism, bans Opium smoking by Chinese. Large, well-run opium houses ran out of business,

Turkish Hashish exhibition at Philadelphia's Centennial Exhibition was most popular. Fairgoers encouraged to return again and

Pure Food and Drug Act (Wiley Act) passed. Opens door for government intervention into food and medicine production.

First time taxation was used to legislate morality, instead

Wiley Act amended, giving government right to determine if a substance is "harmful."
Pancho Villa, Mexican freedom fighter, recovers 800,000 acres of Sonora, Mexico timberland bought for pennies on the dollar of "Canamo" (Cannabis). Hearst, in retaliation, starts slur claiming it causes Mexicans to be lazy and thieving. By 1920, when they were insolent and wanted to rape white women.

News media of the day continues to misreport drug issues. The New York Times says Cannabis has "Practically the same strength as opium, but without the cloying of the nostrils. Can be taken internally or in cigarettes. The mixture is safe and harmless."

USDA issues bulletin 404, urging the use of Hemp paper. Department issues a dire warning about the dangers of using wood pulp to investigate the paper-making value of the more produces over four times more paper per acre than trees, without encouraging more use of Hemp for paper.

It's likely that certain interests like duPont, Standard Oil, and others created alcohol bans to prevent Alcohol prohibition begins, just as Ethanol is about to compete with petroleum. Hemp is most efficient of the competing qualities that are superior to Morphine. Nevertheless, Heroin importation or manufacture was banned, despite its pain killing qualities that are superior to Morphine. Nevertheless, Secretary of Treasury reports underground drug trafficking flourishing, "dope peddlers" had established a nation-wide organization, smuggling was rampant, and use of forbidden substances was increasing.

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Illegal use increases. William J. Burns (of Burns Detective agency), now Bureau Director, in appropriations committee testimony claims the proof is very conclusive...overwhelming that in all strikes in the United States, this radical propaganda enters into the situation. These radicals...take advantage of the ordinary strikes that occur throughout the country, intensify them and create a great deal of trouble and disorder. Racial unrest was consistently, according to Burns, ascribed to alien agitators. Black "social activities," according to Burns, was considered a matter of "a general intelligence nature," along with radical and anarchistic activities. Bureau considered calls for labor organization among unskilled Blacks as especially sinister. Bureau finally reined in from intelligence gathering. New Attorney General Harlan F. Stone voiced fear that "a secret police may become a menace to free government and free institutions because it carries with it the possibility of abuses of power which are not always quickly apprehended or understood." Further says the Bureau is no longer interested in politics or other opinions of individuals, concerned only with their conduct and then only if that conduct violates the law. Further, local and state and private groups take over, keeping plants.

Irene duPont speaks publicly about creating a
to its own bureau, "Food, Drug and Insecticide
Criteria established as to how to make a legitimate
bility to prove substance is harmful.

President. duPont and Anaconda Copper subsidized campaign of

Ford Motor Company works on biomass fuels project,
ially Hemp.

Head of the newly-formed Bureau of Narcotics.

President. Indicates alcohol, not Cannabis causes problems. "Use
d upon discipline are not great. There appears to be no reason
ational narcotics conference, strikes up friendship with
ould become Hitler's head of German International
him saying Von Rheinbaben "...Helped us out in several

stitutional clash over regulating personal possession of
, reenabling industry to run.

ating plans for making Hemp illegal.

rarely given out, to grow Hemp. "The World's Most
published reporting a resurgence of Hemp industry, alas too
Marijuana Tax Act in place. Ford continues, in spite of law, to

he about the benefits of Hemp, published after Marijuana tax
proof of safety to manufacturer of a substance.

ave labor camp Auschwitz to develop artificial rubber and
ics for the laborers, who were worked to near death and then
ers as American prison labor?

has a car built mainly of Hemp, wheat straw, and Sisal
does not lead directly to mental or physical deterioration, sexual or criminal misconduct."

Ford's belief that he can "grow automobiles from the soil."

up "Operation Overcast" to bring Nazi intelligence experts S. Joint Chiefs of Staff. David Sarnoff states national security was brought to America. Nazi General Gehlen released from prison, starts anti-Soviet espionage unit with his former Nazi aides; assigned to Camp King where they were designated as a "Historical Study Group." Prior to surrender to Americans, Gehlen buries microfilmed Soviet intelligence in Austrian Alps. Retrieves after capture, turns over to interrogation center. Gens. Siebert, Smith, OSS leader Alan Dulles, seeks control of Gehlen and his documents for their units. Gehlen, 3 assistants sent to Washington for debriefing. Siebert given go ahead on using Nazis for counter intelligence, but "under

ers 800% increase in use.


tests for controlled substances.

increased use of Heroin. FBI starts the "New Left" program, surveillance and investigation, plus adding the elements of environment, pro-"Marijuana" groups, women, gays, and Frank Donner describes it by saying: "...The New Left of the American way of life against an entire milieu..."The they considered "dirty Hippies." Because of an enlightenedness in infiltrating and disrupting most groups. They did, right faction, the Weather Underground. As a result of the major informant and others were tried and convicted of inciting to riot. actions. Congress passes the Omnibus Crime Control and Safe

laws to overthrow the government by "any unlawful means" or "to

stance in the execution of any law or policy affecting the internal security" was not well defined, and, as we know, the entrenched. It's used most frequently to cover up the illegal actions by Presidents Ford, Reagan and Bush, the Republican

- New York Mayor LaGuardia issues his report on Cannabis smoking. "does not lead directly to mental or physical deterioration, sexual or criminal misconduct."

- War ends. Nazi war crimes trials are set up. U.S. Army and Navy set up "Operation Overcast" to bring Nazi intelligence experts to America. Nazi General Gehlen released from prison, starts anti-Soviet espionage unit with his former Nazi aides; assigned to Camp King where they were designated as a "Historical Study Group." Prior to surrender to Americans, Gehlen buries microfilmed Soviet intelligence in Austrian Alps. Retrieves after capture, turns over to interrogation center. Gens. Siebert, Smith, OSS leader Alan Dulles, seeks control of Gehlen and his documents for their units. Gehlen, 3 assistants sent to Washington for debriefing. Siebert given go ahead on using Nazis for counter intelligence, but "under
The Gun Control Act of 1968 passes. It is directly written from Germany’s Weapons Control law of 1938.

The court must be notified of evidence overheard through electronic monitoring. If the court rules the evidence to determine if the illegally gathered evidence tainted it’s extent is ruled as grounds for dismissal of the case.

Nixon, who commissioned report, refuses to accept findings. Nixon calls drugs “America’s public enemy #1.” Congress passes $1 Billion dollar anti-drug bill. Little effect noted. By 1972 Communists were becoming an endangered species. Bureau (Hoover) needed new enemies. Started concentrating on “New Left,” such as Women’s Liberation Movement, Gay movement, Anti-War Movement (though they had been looking at anti war movement)

Juan Peron briefly seizes power once again in Argentina. He dies in 1974. His return to power is believed to have been mostly financed by his late wife Evita’s fortune of Nazi money. Thanks to the Peron’s, the original Nazis, and now their direct descendants, are

Drug control now costs $1.5 Billion dollars....more precisely,
Medellin Cartel. The CIA had fitted Seal's plane with hidden cameras for the next trip for Cocaine. He therefore recorded secret tape of Cocaine being smuggled, which the Reagan Administration used to try and scare Congress into appropriating money for the Contras.

Seal was subsequently killed by "unknown gunfire, still running guns and drugs between Central and South America". Eugene Hasenfus survived the "Fat Lady" being shot down by Ronald Reagan.

President Bush institutes his first drug control strategy, which emphasizes law enforcement. FY 1989 budget calls for spending $6.6 billion dollars.

Congress recreates the office "Drug Czar" and requires annual "National Drug Control Strategies" be presented, complete with short term and long term goals. The Marijuana Movement, now encompassing the industrial and medical benefits of the plant, reassembles in response to stepped-up prosecution.

Poll tests. Baseball commissioner Peter Uberroth orders all players are forced to be tested. American industry, labor unions and employees.

"companies are held to no standards but their own." Most companies are held to no standards but their own. By late in the year, drugs reach the top of public opinion polls. The Marijuana Movement reassembles in response to stepped-up prosecution.

President Clinton quickly reins her in. Estimates of the nation's largest legal crop, corn, are $16 billion. Police departments across the country run ads, otherwise encourage citizens to turn in drug users, with an emphasis on Cannabis. There are an Estimated 340,000 people in jail or prison for Cannabis related crimes, at a cost of $25,000 to $27,000 dollars per prisoner per year. Greatest effort in the nation's history to ban firearms from citizen possession. Attempt at passing yet another Omnibus Crime Bill fails over the proposed ban on 19 types of "assault" rifles. Would provide money for 100 thousand more police officers, and build still more prisons. At least one sixth of
The nation's prison population are behind bars for Cannabis "crimes," and you are more likely to draw more prison time for involvement with Cannabis than for killing someone. Widespread police use of road blocks looking for drugs begins. Police use intimidation to coerce driver's into consenting to vehicle searches. Police begin to use "Profiling," a method of stopping people who fit a certain description as a Command in Panama as his new drug Czar.

California passes Proposition 215 which permits Californians to possess and grow Marijuana under a doctor's order. Arizona passes Proposition 200 which allows a doctor to prescribe a variety of currently illegal drugs. California U.S. Justice Department can intervene and arrest people on General Lockyer favors the legislation. Some California Arizona's legislature overturns the referendum. Arizonans go back thousand were for simple possession. The.

One person was arrested every 49 Georgia law requiring candidates for public office be demanded to demonstrate a "Special need" substantial enough to Medical Marijuana users are exempt from criminal Marijuana under voter-approved provisions in California and DEA demands the names of Arizonans who purchase associated growing equipment in a raid on the Flower Therapy Marijuana Buyers Club in San Francisco. An Australian study shows the health of long term Marijuana users is virtually no different than that of long term users" according to study chief investigator David Reilly. "The results are unremarkable; the exceptional thing is that the respondents are unexceptional." In May, Rep. Barney Frank introduces a Medical Marijuana Bill in the House. Bill is virtually ignored. The New England Journal of Medicine calls the U.S. government's opposition to Medical Marijuana "Misguided, heavy-handed and inhumane." They call the Clinton administration's position "Hypocritical," and calls on the government to change Marijuana from Schedule 1 to Schedule 2.

A study is released by the U.C.L.A. School of Medicine showing that no long term lung damage is evident in Marijuana smokers. The study is an 8-year long investigation into the study conducted by Dr. Donald Tashkin. "Neither the continuing nor the intermittent Marijuana smokers exhibited any significantly different rates of decline in (lung function) as compared to those who never smoked Marijuana. The conclusion of a comprehensive, long-term study by Kaiser Permanente shows no substantial link between regular Marijuana smoking and death. It does conclude that Marijuana Prohibition causes much greater harm. Researchers found no increase in deaths among the more than 14 thousand patients who reported smoking Marijuana as compared to those who had never used Marijuana.

The 1997 Drug budget climbs to $15.03 billion. Marijuana becomes the nation's fourth largest crop, in spite of being illegal. The industry by now rakes in $10 billion dollars reported in 1996. 87% of those were arrested on possession charges. Under the Clinton administration, a study showing very little risk of having an automobile accident after having smoked Marijuana. This one is from Australia.

Clinton's drug czar, General Barry McCaffrey, lies about the impact of long term Marijuana in the Netherlands has had on crime in that country. McCaffrey claims the Dutch murder rate is twice that of America's. In fact, the Netherland's murder rate is 440% lower than the U.S. McCaffrey further claimed Dutch children are three times more likely to try Marijuana than American kids. The fact is that 21% of Dutch high school kids tried Marijuana as opposed to 45% of Americans during the same time period. It's not the first time McCaffrey has been caught in public lies about the War. The magazine
A U.S. Air Force directive in February forbids all personnel from using Hemp seed oil products, claiming that military drug tests failed that California Against Marijuana Planting the government's aerial eradication programs. "Every officer that's flown under 500 feet (In violation of legally mandated) excerpted into people's windows," according to a former deputy to suit against the government's eradication program. The Department opposing research and domestic cultivation of industrial need of alternative crops. Estimated American farmer (USDA) released its findings that Marijuana holds medical value that seeks to remove Marijuana's classification as a Schedule 1 drug. The WHO report found that marijuana is not a "Gateway" substance, leading to the effects of marijuana use are within the range of effects with the Shaffer Commission in 1972, ignores the report. A...
A study published in the February 4, 1999 issue of the New England Journal of Medicine shows no link between miscarriages and Marijuana use. Further, Marijuana shows "No reliable impact on birth size, length of gestation or the occurrence of physical abnormalities,"

This year's drug war budget will cost taxpayers $17,886,200,000. That's nearly $2 Billion more than President Clinton had requested. In December, a conference of the World Trade Organization is held in Seattle. A massive protest of that body that seeks to control the commerce of the entire world ends in bloodshed and some property damage. Police fired "Flash Bang" grenades, in spite of police denials of such weapons. Evidence that police launched cannisters of nerve gas against the crowds exists. Police again deny that they used this weapon. Many of the delegates refuse to agree on trade regulations. The Echelon spy satelite network is finally confirmed by some of America's allies. The system was first put into place shortly after WWII and upgraded several times since.

Police corruption because of the War On Some Drugs. Many fear a repeat of the Vietnam fiasco. As of February 15, two of the world's prisoners. Of the two million, approximately 61% are jailed on drug charges. Of that group, approximately 82% are in on Marijuana charges. Of that subset, 65% are for mere possession cases. Reports begin to surface on the overuse of drugs like Prozac and Ritalin on preschool children.

What you are about to read is a compilation of history. R. William Davis and I had been independently investigating the Nazi era. We both had a strong interest in the topic. Randy had been looking into other political activities, mainly concerning the Nazis of Germany. He soon drew a connection between the general attitudes of the Nazis and the great amount of wealth the burgeoning automobile industry, home heating, lubrication and the new idea of synthetics...plastics. Of the big oil families, the Rockefellers were, and still are, at the top of the heap. Those who supported the Rockefellers, specifically the Mellon banking family, also profited greatly. An May 31, Andrew Mellon, who had invested a great amount of money in Rockefeller, wasn't going to lose the chance of becoming fabulously wealthy. Another client of Mellon's, the duPont family, in addition to building companies like General Motors, was developing synthetic fibers and plastics from petroleum. Law firms like Brown Brothers Harriman handled the legal work for these and others. Media giants like the Hearsts were more than happy to join the ranks of the filthy rich by putting out whatever their cronies said was news. These people had absolutely no concern for the health and well-being of society at large. Indeed, the less the average man knew, the better for the rich man. Strangely enough, it was many of these same people who were responsible for the illegalization of Hemp, the plant that humans have used for several millenia, and the industry that provided the best in availability of the Decorticator,
The Decorticator came on the scene in 1935. Hemp was on its way once again. That is, until those in the petroleum industry saw a problem: Fuel could be made from Hemp that would burn cleaner, much more efficiently, and with a greater supply than crude petroleum oil. Rudolph Diesel had built his famous engine intending it to burn vegetable oil, mainly Hemp. Hemp was already well known for its lubricating ability, which was of importance to the young aviation industry. Hemp oil in an aircraft engine doesn't break apart chemically at high altitudes like petroleum did. Now with the Decorticator a reality, Hemp was

tops and leaves of other.

in many fairs. Hash dens
town to smoke the dried flowers

The Big Oil folks and their about Marijuana; don't make a what they had grown up with them by claiming Marijuana Cocaine. By 1936, "Reefer

the Marihuana Tax Act of

the same American

with the help of the greedy,

Soviet Union. They sought to

ans. By 1955, over 10 United States and put into our experiments and their willingness to America's right wing, they

of control of the American

taken away rights that true

ays of the 21st century. Because

elements in their historical

as. As I said earlier, some of the self speaks ill for a suposedly
BLOWBACK: AMERICA'S RECRUITMENT OF NAZIS AND IT EFFECT ON THE COLD WAR
Christopher Simpson, Weidenfeld & Nerolson, New York

THE CIA AND THE CULT OF INTELLIGENCE
by Victor Marchetti and John D. Marks, Dell Publishing, New York

Smoke and Mirrors

THE EMPEROR WEARS NO CLOTHES
Jack Herer, Hemp Publishing, Van Nuys, C.A.

HEMP LIFELINE TO THE FUTURE
Chris Conrad, Creative Xpressions, Los Angeles, CA.

THE GREAT BOOKS OF CANNABIS Vol. 1, Book II
Laurence Cherniak, Cherniak/Damele Publishing Co., Oakland, CA.

ENROUTE TO GLOBAL OCCUPATION

Marihuana, A Signal of Misunderstanding
Signet Books, New American Library,

Conspiracies, Cover-ups and Crimes
Jonathan Vankin, Dell Books, New York

The Pentagon Papers

Coup D'Etat In America
Alan J. Webermann, Michael Canfield, Quick American Archives, San Francisco

Ain't Nobody's Business If You Do
Peter McWilliams, Prelude Press, Los Angeles

NATIONAL ORGANIZATION FOR THE REFORM OF MARIJUANA LAWS
NEW ARCHIVE, NORML Staff,
Free Trade is just another word for banning all your herbs.
The War on Drugs is a trade war being fought by multinational pharmaceuticals, who want to ban all natural herbs and monopolize all synthetic drugs. Their strategy is now being copied by multinationals in the war on drugs. Has repeatedly been a justification for countries with over-developed corporate sectors, like the United States and England, to
prey upon weaker countries, like those in South America. Sometimes the enemy has been opium, sometimes it has been marijuana, but human beings have always been cut down alongside the plants and multinational corporations have always benefited as a result. The newest phrase created to describe the benefits multinationals derive from such human suffering is

Historically, wars for control of enlightening plants have provided justification for violence and warfare. The same cultural domination and control achieved by Spanish prohibition of morning glory among Amerindians in the 1600's, and by British opium traders to China, is being sought today by multinational corporations, which seek to prohibit natural, unpatentable medicines and replace them with synthetic drugs which are

In South America during the 1600's, Spanish priests branded the psychedelic morning glory plant "evil" and soldiers set forth to burn "Satan" from villages and kill amerindian shamans. Spanish invaders were apparently only doing what they believed was right and good when they roasted a South American alive for eating morning glory seeds. Dispirited South American indians were rounded up and converted to Catholicism. Destabilized native Natives were forced to give up ancient traditions and live the way the Europeans did or be killed. Ancient shamanistic cultures stopped directly to the earth for what they needed, and started buying from European distributors. Once the old way of acquiring necessary everyday goods was lost, Amerindians became wholly reliant upon European

An almost opposite situation occurred during the 1800's, when China refused to take any more English opium, Britain retaliated by instigating the "Opium War", destroying the Chinese navy and forcing China to accept the imported British opium. There were no English missionaries inspiring the troops with sermons on the "evils" of drugs during the Opium War. England's
Both the South American natives and the Chinese were forced to accept aspects of what we presently call "free trade". In 17th century South America, an aggressively corporate country displaced the traditional non-corporate pattern of South American trade. A generally free market was eradicated in favour of a market of product control. Products were controlled by English manufacturers because the South American natives lacked the technology to reproduce products like metal kettles and guns.

In 19th century China, national trade restrictions were rolled back by the force of British naval superiority, allowing English drug producers A modern definition of "Free trade" would describe it as, essentially, a patent-oriented market of product control without national trade restrictions. The economic effects of the Opium War and the Spaniards' colonization of South America are much the same as the economic effects of For 100 years after the Opium War, western pharmaceutical companies continued to export shiploads of opium and opium products (like morphine) to China. While Britain slowed its drug exports to China, Swiss and The shipments to China continued even despite the fact that China had reasserted her sovereignty and made opium illegal again in the mid-1800's. What had begun as military protection of English economic interests grew to become an embarrassment to most European governments. The Opium War mentality was not complimentary to their new stance that certain pharmaceutical firms led to the 1924 Geneva Conference, also known as the "Opium Conference". The Chinese member of the Advisory Committee began the talks by pointing out that Germany, Great Britain, Japan, Switzerland and the United States were all turning out "...morphine by the ton, which was As a result of the conference, pharmaceutical companies were encouraged to give up trade in illicit drugs in exchange for a strong international...
a system where each citizen each year. The

panies amounted to nothing less than putting a pharmaceutical monopoly on opium dealing. The competition was killed or imprisoned. In no other sector of industry has the trade. The same rules applied as the rules of international governmental organizations. Delegates to the IFPMA were appointed solely by the pharmaceutical industry. Over the following decades, the IFPMA continued to expand as it insinuated itself into circles of international power. The IFPMA was admitted as a Non-Governmental Organization to the World Health Organization (WHO) in January of 1971. It was also accepted in a similar capacity to the UN Economic and Social Council (UNESCO) soon after. The pharmaceutical companies were the first to take advantage of international governmental organizations to further their trade agenda. Their accomplishment of working their way into international institutions was a shape of the agenda. Through the Organization for Economic Cooperation and Development (OECD) and the Paris-based Organization for Economic Cooperation and Development (OECD), they are attempting to enact what is known as the Multilateral Agreement on Investment (MAI). MAI would create an atmosphere of “free trade” in all of the OECD countries. Members of the OECD include Canada, the US, Japan, MAI seeks to push back environmental protection laws, national job creation programs, etc in favor of multinational corporate development. If any national law restricts development, a corporation may sue the government...
for damages, regardless of public reaction. MAI is fundamentally undemocratic. Under the force of worldwide opposition, MAI faltered at recent meetings in the Netherlands in May, and the Dutch chair recommended that no country presently sign the document. MAI will likely not be.

David Rockefeller, a leading member of the Trilateralists* and president of the Chase Manhattan Bank in New York, commented on the change that has occurred since the 1960's. "Back then business leaders like myself were more or less sitting on the sidelines watching the negotiations unfold. But now we're sitting in the driver's seat and writing many of the documents ourselves."** And the documents they are writing are free-trade agreements.

Unfortunately, the trade will be anything but free. If the present regulatory tyranny of the pharmaceutical companies is any indication, we can look forward to an environment of harsh prohibitions, in which only the multinationals will be able to compete. Naturally grown products with synthetic alternatives will be increasingly restricted and prohibited. Only multinational corporations will have the capital and political influence to push their synthetic, patentable products through the expensive and

Free trade seeks to create multinational, corporate wealth ‹ as opposed to the national wealth created by plant-drug production. Free trade seeks to undermine economies based on unpatentable items, like plant-based drugs and remedies, and create economies based on patents and market control. Free trade seeks to make it even easier for corporations to extract wealth from a country, and does away with national regulations on

This new paradigm already functions within smaller free trade units like NAFTA (the North American Free Trade Agreement, including Canada, the US and Mexico). Should MAI fail for some reason, it is likely that smaller agreements like NAFTA and the Treaty of Maastricht (the founding treaty of the European Union) will continue to proliferate, to the advantage of

The laws of individual countries are also directly under attack by lobby groups with free trade agendas. In 1995, The UN commissioned a report on global investment which found that between 1991 and 1994 there had been 374 pieces of legislation introduced worldwide to do away with regulations on
The way corporations conduct their business. 369 of these 374 pieces of legislation were intended to give corporations the capacity to break free of national boundaries, paving the way for multinational free trade. Laws being rolled back typically include those designed to protect the environment and public health.

The Paris-based Organization for Economic Cooperation and Development (OECD), the UN and the World Health Organization (WHO) are international organizations which exist, theoretically, as autonomous from one another. In practice however, the three organizations meet behind closed doors and plan how to package and distribute the drug war as an international commodity, while promoting free trade as a replacement for drug revenue.

The OECD focuses on free trade, while the UN finds its focus in encouraging international support for the war on drugs, through the United Nations Drug Control Program (UNDCP) and the International Narcotics Control Board (INCB), two organizations which cooperate closely in the international war on drugs. The WHO finds its focus in the legitimization of the drug war and free trade, by preparing various "health reports".

The relationship between WHO and the UNDCP manifests itself as a joint venture called the "UNDCP/WHO Global Initiative on Primary Prevention of Substance Abuse", which promotes the worldwide drug war as being beneficial for development. The Economic and Social Council of the United Nations (UNESCO) is dedicated to pimping industrial development worldwide. A 1994 report by the Secretary General of UNESCO partially summarizes their position: "Development is hampered by mounting barriers to market access." Exactly the kind of market barriers which worldwide free trade (in the form of MAI) would tear down.

It should be no surprise that the UN's Economic and Social Council is exclusively responsible for electing the 13 members of the UN Drug Control Program, or that the Economic and Social Council administers, receives reports and advisories from and generally cooperates with the International Narcotics Control Board. The Economic and Social Council also cooperates with the OECD, which is responsible for the worldwide free-trade agreement.
between the Drug Control Program (war on drugs agenda) and the Economic and Social Council (free trade agenda) has anything to do with the long-standing role of the International Pharmaceutical Manufacturers' Associations as an advising non-governmental organization to the Economic and Social Council. It seems that the multinational pharmaceutical companies have always been hiding in the shadows, pushing magic "free-trade" pills to third-world nations.

The UN/OECD/WHO team also justifies its murderous drug-war policies by addicting the member states to addicted substances. The branch of WHO responsible for determining which substances should be considered Addiction-Producing Drugs. The members of the Expert Committee are appointed by the health ministries of the various countries that fund the WHO, including the US and Canada, and they are not appointed as the result of an open competitive process.

Back in 1955, the Expert Committee announced that cannabis was a drug that produced addiction, without any real evidence to back up their claims. By 1957, the committee distinguished between habituation and addiction, and was forced to admit that cannabis was not an addictive drug at all, but no changes were ever made. More recently, in 1995, WHO suppressed a report comparing cannabis, tobacco, and alcohol. The report found that tobacco and alcohol were both far more harmful than marijuana. Sources within WHO leaked the document to mainstream media after being told to bury it. WHO sources also indicated that the US National Institute on Drug Abuse and the UN International Drug Control Programme had pressured WHO to suppress the report. Additionally, the WHO has repeatedly stalled on carrying through with a planned study and report on the highly successful Swiss harm-reduction experiment.

Because of WHO's manipulations, cannabis has remained prohibited by international treaties, a prime target in the worldwide war on drugs. Further showing the duplicity of their organization, many of the delegates to WHO (and other UN drug war institutions) go on to management positions in the pharmaceutical industry.
Former Chief of the WHO Drug Dependence Unit, Hans Halbach, was hired by the Swiss pharmaceutical company Hoffman La Roche. Former Director of the UN Division of Narcotic Drugs, Gilbert Yates, became the Director of the Association of British Pharmaceutical Industries. Former Secretary of the International Narcotics Control Board, Adolf Lande, was taken in by the

Trade wars are markets. The drug war attacks not only countries and organizations that produce drugs, but also goes after consumers. Millions have been imprisoned or executed because they have no place in the prohibitionist multinational corporate

As we frantically race into the third millennium, with microprocessors becoming faster, cheaper, and smaller, with surveillance cameras proliferating in public spaces, with the human genome program about to issue its first “working draft” of the human DNA sequence, and with an out-of-control Frankensteinian machine named the War on Drugs all awhirl in the ocean of modern day culture, it is imperative that we, as a society, expressly acknowledge the fundamental
Encroachments on cognitive liberty can take various forms. New technologies such as biogenetic modification, human-computer interfacing, brain-scanning, nanotechnology, neural-networking, so-called "neuro-therapy," and new pharmaceuticals raise exciting possibilities for human "evolution." But, if not developed and used responsibly, they and the legislation they spawn, could also pose new threats to cognitive freedom. The trend of technology is to overcome the limitations of the human body, and the Web has been characterized as a virtual collective unconscious. What are the implications for mental autonomy when wearable devices are worn minds linked to the Web by high-speed wireless connections? Similarly, advances in biotechnology and drug-design increasingly raise legal and ethical questions related to cognitive liberty, including what rights will people have to access these and other technologies, and what PART of elucidating a theory of cognitive liberty is simply recognizing when free cognition is being infringed. Restrictions on physical liberty, for all their pain and terror, at least have the benefit of being relatively easy to recognize and call attention to. During World War
II, the Nazi concentration camps for Jews, and the American internment camps for Japanese Americans, were marked by the machinery of physical control: fences, barbed wire, and guard towers. Similarly, from 1961 to 1989, a concrete and barbwire wall overseen by 116 guard towers divided the city of Berlin. Anyone who tried to cross that wall without a "special authorization" risked a bullet in the back of his or her skull. In contrast to the usual visibility of government restraints on physical liberty, restraints on cognitive liberty are most often difficult to detect that it does not exist. Other attempts to control one's own consciousness are an impossibility. While each of us carries our own brain in our own skull, the process of consciousness itself is an interactive one. All our senses continuously feed data into our brains, producing a dance of cognition that perpetually swirls the exterior world with the interior world creating a seamless, edgeless, apperceptive feedback loop. Our minds are continually changing, continually interfacing with "the other." Cognitive liberty clearly cannot mean mind control, like most everything else, comes in degrees. A discussion with a friend may make you change your opinion on a topic, it may even...
change your life, but does that amount to Òmind control?Ó Was your cognitive liberty violated? Over $US200 billion dollars is spent each year by companies unabashedly striving to manipulate our desires, to literally make us want their product. If you see an advertisement (or many) for a product and that advertisement, replete with imagery of the good life, causes you to purchase the product, have you been the victim of mind control? Has your cognitive liberty been violated?

What if the advertisement is embedded with auditory or visual subliminal messages? What if the advertisement is embedded in prime-time television programs, passing as program content, rather than demarked as a Òcommercial?Ó Or, suppose you are a 12-year-old placed on Prozac¨, or Ritalin¨ largely because your schoolteacher has ÒdiagnosedÓ you as depressed or suffering from Attention Deficit Disorder. Has your cognitive liberty been violated upon your prostration? But mental autonomy is present in very specific limits. Yet, government, as we have seen, acts...
In 1969, Justice Marshall wrote, without mincing words, "Our whole constitutional heritage rebels at the thought of giving government the power to control men's minds." Yet, contrary to Justice Marshall's strong pronouncement, the US government has not consistently respected or protected cognitive liberty. Indeed, some of the government's offenses seem to come directly from the pages of a dystopian novel like George Orwell's 1984. Imagine, for example, if the government passed a law mandating that all citizens receive monthly injections of time-release sedatives, justifying the law on the "public health" grounds that sedated people are more productive at routine repetitive tasks, are less violent, and are less of a drain on public resources. What if those who did not voluntarily report at the time and place appointed for their injection were rounded up by the police, and forcefully lobotomized? Would anyone doubt that such a law infringed not just on one's physical freedom but also on one's cognitive freedom? It's not exactly an unthinkable scenario. From the 1920s through 1970, pursuant to the laws of at least 32 states, more than 60,000 people were deemed "eugenically unfit." Many of these people were involuntarily sterilized, in part because of low scores on intelligence tests. When one of these laws was challenged, and the case reached the United States Supreme Court, it was upheld with Justice Oliver Wendell Holmes smugly proclaiming, "Three generations of imbeciles are enough!"

Until 1973, "homosexuality" was listed as a mental disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM) and was considered a mental illness in many states. This classification was used to justify the denial of educational and employment opportunities to gay and lesbian individuals. It was not until 1973 that the American Psychiatric Association removed homosexuality from its list of mental disorders, marking a significant step towards recognizing the rights of the LGBTQ+ community.
psychiatric disorder in the Diagnostic and Statistical Manual of Mental Disorders (DSM). People who admitted being homosexual, or who were subject to involuntary confinement under mental health laws, and subjected to Òreparative therapyÓ or Òconversion therapyÓ designed to convert them into heterosexuals. ÒTreatment,Ó in addition to counseling, included penile plethysmograph (electronic shock triggered by penile erection), drugging, and hypnosis. Even though homosexuality was not psychiatrically ÒtreatableÓ in the 1970s, it was not until December 1998 that the American Psychiatric Association disapproved of ÒreparativeÓ therapy.

In the 1950s, 60s, and early 70s, the US government illegally and unethically drugged unwitting US citizens with psychoactive substances, including LSD, as part of projects bluebird, artichoke, and mkultra, all in an attempt to develop techniques of mind control. Richard Helms, the chief planner of mkultra, wrote in a planning memorandum that the program should target chemical implanting suggestions and other forms of mind control.
While the MKUltra program began with tests in the laboratory on willing volunteers, the CIA quickly saw the need to expand the testing to determine what the effects of drugs such as LSD would be on unsuspecting people. Thus, in 1953, the CIA moved its mind control program into the streets of America and began the "covert testing of materials on unwitting US citizens." 10

In subsequent installments of this essay, we will see how the US Government continues to promulgate certain policies that, while cloaked in "public health" or "public safety" justifications, amount to an impermissible government action aimed at policing thought and interfering with the mental.

The right to control one's own consciousness is the quintessence of freedom. If freedom is to mean anything, it must mean that each person has an inviolable right to think for him or herself. It must mean, at a minimum, that each person is free to direct one's own consciousness; one's own underlying mental processes, and one's beliefs, opinions, and worldview. This is self-evident and

In assessing what rights are fundamental and thus entitled to the most stringent legal protection, the US Supreme Court has stated that, fundamental liberties are those "implicit in the concept of ordered liberty," such that "neither liberty nor justice would exist if [they] were sacrificed." 11
Under another test, fundamental liberties were characterized by the Court as those liberties that are "deeply rooted in this Nation's history."

Slightly over seventy years ago, Justice Brandeis acknowledged in a landmark privacy case that cognitive freedom was one of the principal protections designed into the Constitution: against the Government, the right to be...

But, while certain justices have, at times, pointedly acknowledged the fundamental nature of cognitive freedom and the nefarious nature of government (or other "outside") interference with the intellect, this important freedom remains only obliquely defined within the US legal system. Ironically, the lack of a comprehensive treatment may be because cognitive freedom is so self-evidently a basic human right. Whatever the...
A looming threat to cognitive liberty, without a coherent cognitive liberty jurisprudence, presents present and future infringements on cognitive liberty risk passing unnoticed or unremedied. In the next installment of this essay, we will begin to dig deep into privacy, due process, and First Amendment cases, in an attempt to excavate a theoretical scaffolding for cognitive liberty. As I believe the cases will show, cognitive liberty is the invisible landscape from which springs some of our most
3 See ÒBig Brother Puts a New Twist on the
5 G. Orwell, Nineteen Eighty-Four (New York:
6 J. Robitscher, ed., Eugenic Sterilization
7 Springfield, Il: Charles C. Thomas, 1973),
8 [listing sterilization data for most
9 states]; E. Brantlinger, Sterilization of People
10 with Mental Disabilities: Issues, Perspectives,
11 and Cases (Westport, Con.: Auburn House, 1995)
12 L. Rev.
13 Eugenic
14 Sterilization
15 Discussed
16 Rebukes
17 p. 98-56, 
18 Viewable online at
19 therapy.html.
20 Alan Turing, one of the founding fathers of
21 artificial intelligence theory, was arrested for
22 violating British homosexuality statutes in
23 1952 after he admitted having a homosexual
Believing that his sexual orientation was a personal matter, neither a sin nor a crime, he presented no defense at his trial, which occurred on 31 March 1952. In lieu of prison, he was ordered to submit to estrogen injections for a year. Following a period of depression, likely the result of the injections, he committed suicide.


For more details on the government’s bluebird, artichoke, and MKUltra programs (at least those details not lost forever when Richard Helms, ordered the destruction of all records related to the projects in January 1973) see A. Scheflin & E. Opton, “Tampering With The Mind (I) & (II),” in The Mind Manipulators, supra, (1978), 106-212.

As you read this sentence you are receiving information. Words are carriers of thoughts, whether spoken from mouth to ear, digitized and passed electronically, or downloaded into ink and passed on paper across time and space. Because words are vehicles for thoughts, words can change your opinion, give you new ideas, reform your worldview, or...
Attempts to control the written word date from at least AD 325 when the Council of Nicaea ruled that Christ was 100 percent divine and forbade the dissemination of contrary beliefs. Since the invention of the printing press in 1452, governments have struggled to control the printed word. Presses were initially licensed and registered. Only certain people were permitted to own or control a printing press and only certain things could be printed or copied. (This was the origin of today’s copyright rules.) Works printed without prior authorization were gathered up and destroyed, but published (or of fragments) When the Roman government, history recorded this one and so much on what is a move
by the government to redirect attention away from what lies at ground zero of the war—each individual’s fundamental right to...

In George Orwell’s dystopian novel Nineteen Eighty-Four, the Oceania government diligently worked to establish “Newspeak,” a carefully crafted language designed by the government for the purpose of making unapproved “modes of thought impossible.” Prior to Newspeak, the people of Oceania communicated with “Oldspeak,” an autonomous natural language capable of expressing nuanced emotions and multiple points of view. By controlling language through the imposition of Newspeak—by “eliminating undesirable words”—the government of Oceania was able to control and, in some cases, completely extinguish certain thoughts. As a character in Nineteen Eighty-Four explained to Winston Smith, “Don’t you see that the whole aim of Newspeak is to narrow the range of thought? Every year fewer consciousness always a little smaller.” Those people raised with Newspeak, having never known the wider range of Oldspeak, might fail to notice, indeed, might be unable to even perceive, that the Government was...

In 1970, just four years after the Catholic Church finally abandoned the Index Librorum Prohibitorum, the United States government produced its own index of forbidden thought catalysts: the federal schedule of controlled substances. Included on the initial list of Schedule I substances were seventeen substances denoted as “hallucinogens,” and declared to have “a high potential for...
I use "sanctuary" to designate the setting of a sacred space for humans and animals and for the land. In so doing, I am not advocating their use for personal benefit, but rather for the sake of their inherent value and the benefits they bring to the community. The concept of sanctuary is rooted in the idea of creating a sacred space that is dedicated to the care and protection of all living beings. This includes not only the physical environment, but also the spiritual and emotional well-being of the people who inhabit it.

Sanctuaries can take many forms, from a small garden to a national park or a wildlife reserve. They can be located in urban areas or rural landscapes, and they can be open to the public or protected as private spaces. What they all have in common is a commitment to the conservation of biodiversity and the promotion of sustainable practices. By establishing sanctuaries, we can create a space where nature is allowed to thrive and where human beings can connect with it in a meaningful way.

Over the past few decades, there has been a growing interest in the concept of sanctuaries. This is due in part to the recognition of the importance of preserving natural ecosystems, but also to the desire for creating a space where people can retreat from the stresses of modern life. Sanctuaries offer a place to reflect, to renew, and to heal. They are a reminder of the beauty and wonder of the natural world, and they inspire us to take action to protect it.

While sanctuaries may differ in their specific goals and implementation, they all share a common purpose: to create a place where nature is valued and respected. By establishing sanctuaries, we can work towards a more sustainable future for all living beings, both human and non-human. This is an important step towards creating a world where we can live in harmony with nature, and where we can ensure that future generations will be able to enjoy the beauty and wonder of the natural world for generations to come.
Dr. Hofmann isolated and later synthesized two active substances derived from the Psilocybe mushroom. He named these substances psilocybin and psilocin. In 1962, Dr. Hofmann traveled to Mexico and met with Maria Sabina. During a night ceremony, she ingested 30 milligrams of the synthetic psilocybin and later said the effect was indistinguishable from that elicited with the sacred mushrooms.

Another substance placed on the government's 1970 list of criminalized "hallucinogens" was N,N-dimethyltryptamine (DMT). This substance was first synthesized in 1931, but its entheogenic properties were not discovered until 1956. It was subsequently learned that DMT is the principal active ingredient in numerous snuffs and brews long-used by various South American Indians during religious ceremonies. The DMT-containing plant Psychotria viridis is a well-known admixture to the entheogenic brew known as ayahuasca or yajé, which archeological evidence suggests dates back as many as five thousand years.

Some who ingest visionary plants believe that the plants talk to them and open up channels of communication with animals and other entities. Mazatec eaters of Psilocybe mushrooms, for example, are adamant that the mushrooms speak. If you ask a shaman where his imagery comes from, he says the mushrooms did. "Éhe who eats these becomes endowed with an inspired capacity to speak. The spontaneity they liberate is not
discourse, of the logos in activity. For the shaman it is as if existence were uttering itself through him—words are materializations of consciousness; language is a privileged just as Newspeak was intended to make certain Old(speak) thoughts literally unthinkable, so the War on Entheogens makes certain sorts of cognition and awareness all but inaccessible. Religious scholar Peter Lamborn Wilson has aptly framed the War on Entheogens as a condition. Is thought this dualist Cartesian complex, organic, magical thing with little mushroom elves dancing around. Which is it to In Orwell’s vision of 1984, Newspeak’s power to control and limit thought depended, in part, upon the passing of time and the birth of new generations that never knew Oldspeak. As explained by Orwell in the Appendix to Nineteen Eighty-Four, “It was intended that when Newspeak had been adopted once and for all and Oldspeak forgotten, a heretical thought—that is a thought diverging from the principles of Ingsoc—should be literally unthinkable, at least so far as thought is just as Newspeak depended in part upon time eradicating knowledge of Oldspeak, today’s War on Entheogens is sustainable, in part, because the current generation of young adults (those 21-30 years old) have never known a time when most entheogens were not illicit. Those who have never experienced the mental states that are now prohibited do not
It is easy to see why. The authors of a law review article on mandatory schooling raise issues of mass-consciousness control: "[t]he more the government regulates formation of beliefs so as to interfere with personal consciousness, the fewer people can conceive dissenting ideas or perceive contradictions between self-interest and government policy."

Because of the personal experiential nature of entheogen-elicited cognition, only those who have been initiated into the modern day Mysteries — those who have tasted the forbidden fruit from the visionary plants of knowledge and have not fallen victim to the stigmatizing psycho-impact of "being a drug user" — are acutely aware of the gravity of what is being prohibited: powerful modalities for thinking, perceiving, and experiencing. The very best argument for the potential value of entheogen-elicited mind states is in the entheogenic experience itself; an experience that has, in almost every case, been outlawed. That is the dilemma of entheogen policy reformation. The advocate for entheogenic consciousness is left in an even worse position than the proverbial sighted man who must describe colors to a blind person. With regard to entheogen policy, the position is worse because the "blind" are in power and have declared it illegal.

Left with the impossible task of saying the unsayable, of describing the indescribable, those who have tasted the forbidden fruit must plead their case on the fundamental philosophical and political level of what it
means to be truly free. They must state their appeal on the ground that, with respect to the inner-workings of each person’s mind, the values of tolerance and respect are far weightier and far more conducive to the basic principles of democracy, than is the chillingly named “zero-tolerance” policy that is currently in vogue. This brings us, once again, to cognitive liberty as an essential

Benjamin Cardozo, one of the most respected and influential American legal scholars of the last century and a former Justice of the U.S. Supreme Court, affirmed cognitive liberty as central to most every other form of freedom. With rare aberrations a pervasive recognition of that truth can be traced in our history, political and legal. Cognitive liberty jurisprudence must begin, most notably, with the First Amendment. That amendment will construe the evidence of the history and tradition of that right
processes is central to First Amendment Congress shall make no law respecting an establishment of religion, or prohibiting the freedom of speech, or of the press; or the right of the people peaceably to assemble, and to petition the Government. The First Amendment’s guarantees were controlling or prohibiting the dissemination of unpopular or dissenting ideas. Central to all five guarantees is the acknowledgement that people must be treated by the government system, and encouraged to express his or her thoughts in the so-called “marketplace of ideas.” As U.S. Supreme Court Justice Felix Frankfurter emphasized in 1949, the freedom Amendment guards against “thought becom[ing] Free speech, free exercise, free association, a free press and the right to assemble, are all moot if the thought that underlies these actions has already been constrained by the government. If the government is permitted to prohibit the experiencing of certain thought consciousness at its very roots—via drug controlling the expression of such thoughts. By prohibiting the very formation of mind itself—free expression is made meaningless.
Thus, in order to prevent the erosion of the First Amendment’s protection of expression, the Amendment must also provide at least as conscious that forms the ideas that are later expressed. Indeed, the First Amendment individual—not the government—ought to have control over his or her own mind, to think what he or she wants to think, and to freely form and express opinions and beliefs based on words, embraces cognitive liberty not simply as the desired outcome of the articulated guarantees (i.e., a right to express one’s ideas), but also as a necessary precondition.

Circuit Court of Appeal issued an opinion in a case involving a man who was involuntarily thorazine while he was being held for trial on murder charges. The threshold issue was whether pretrial detainees have a fundamental right to refuse treatment with anti-psychotic drugs. To answer this question, the Tenth Circuit analogized to a 1982 case in which the U.S. Supreme Court held that “liberty protected by the Due Process Clause from arbitrary governmental action.” The Tenth Circuit reasoned that if freedom from bodily restraint of the kind individuals must also have a liberty interest in freedom from “mental restraint of the kind needed to think, to form and express opinions and beliefs freely.”

Mother May I Control My Own Consciousness?
Thus, the Tenth Circuit found that freedom from government imposed mental restraints was protected by the Due Process Clause. Furthermore, the Tenth Circuit found that the First Amendment was also implicated when the government psycho-medicated a person awaiting trial. In explaining this, "the First Amendment protects communication of ideas, which itself implies that the government must not only reject domination over mental processes; they must strictly examine as well oblique intrusions likely to produce or designed to produce, the attack."

Under the recently released National Academy of Sciences report, the government will spend just shy of $20 billion on an all out attempt to keep people from evoking alternative states of consciousness by the use of controlled substances. However, the professors of Harvard Law School, including Laurence Tribe, believe that controlling the mind is more than merely an "oblique intrusion" on the right to control one's own mental processes, or a slight attack. They argue that such control not only affects personal freedoms but also has the potential to infringe on civil liberties and constitutional rights.
Unapproved Mental States, besides violating core principles of the First Amendment, also

1 Kovacs v. Cooper (1949) 336 U.S. 77, 97
2 For a fascinating survey of suppressed literature, see the multi-volume set Banned covers literature suppressed on religious,
3 George Orwell, Nineteen Eighty-Four (New
Appendix "The Principles of Newspeak" 246.
5 The substances initially listed in Schedule I as "hallucinogenic substances" were: (1) 5-methoxy-3,4-methylenedioxy amphetamine; (3) 3,4,5-trimethoxy amphetamine; (4) Bufotenine; (5) 4-methyl-2,5-dimethoxyamphetamine; (8) Ibogaine; (9) Lysergic acid diethylamide; (10) Marihuana; (11) Mescaline; (12) Peyote; (13) Tetrahydrocannabinols. (PL 91-513, Oct. 27, 1970; 21 U.S.C. sec. 812, subd. (b) (1970).)
Philosopher and ethnobotanist Terence McKenna suggested that early man’s ingestion of visionary plants may have been the very catalyst that led to the sudden expansion of language itself. (See Terence McKenna, Food of the Gods (New York: Bantam Books, 1993), 25.)


Stephen Arons and Charles Lawrence, “The Amendment Critique of Schooling” in 15(2)

Palko v. Connecticut (1937) 302 U.S. 319,
Although the First Amendment only mentions "Congress," the U.S. Supreme Court has held that the Fourteenth Amendment's Due Process Clause incorporates the First Amendment guarantees and thus makes those guarantees applicable to State governments as well as Congress. (See Gitlow v. New York (1925) 268 U.S. 652, 666; Board of Education v. Pico 13)

The concept of a laissez faire marketplace where ideas compete for buyers appears to date from 1919 when U.S. Supreme Court Justice Holmes wrote in Abrams v. United States that the ultimate good desired is better reached by interaction and acceptance or rejection of ideas. Using market mechanisms to determine the circulation of ideas is determined by their sales profiles. The "consumer" is described by Consciousness Industry [a term coined by Hans Magnus Enzensberger in his 1974 collection of essays of the same name] with his or her metaphors suggest democracy and freedom of choice. They deflect attention away from the tightly controlled decision-making process that actually determine what ideas will gain entry into the commodity system. That is, capitalistic consciousness industry invisible and thereby permit subterranean censorship.
considerations. In sum, they permit elites to rule but preserve the semiotics of democracy. (Sue Curry Jansen, Censorship: The Knot that Binds Power and Knowledge (New York; Oxford: 15 Bee v. Greaves (10th Cir. 1984) 744 F.2d 1387, 1393; cert. denied, (1985) 469 U.S. 16 Youngberg v. Romeo (1982) 457 U.S. 307, 18 Ibid., 1393-1394; Accord, Rogers v. Okin (D.Mass. 1979) 478 F.Supp. 1342, 1366-1367. Other courts have held that inmates in mental health facilities have an "interest" in maintaining the autonomy over their own minds in the face of doctors who want to involuntarily medicate them. (See, e.g., Will et al. v. Carey (N.Y. 1986) 559 N.Y.S.2d 545, 548; Zavala v. Okin (D.N.J. 1978) 462 F. Supp. 1131, 1144 ("the right of privacy is broad enough to include the right to protect one's mental processes") For a comprehensive survey of forced mental treatment cases, see Bruce J. Winick, "The Right to Refuse Mental Health Treatment: A
First Amendment Perspective,” University of Miami Law Review (September 1989), 44(1)

Sec. 1.

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Addressed:

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In a landmark drug case decided on March 21, 2000, the United States Supreme Court ruled that the Food and Drug Administration (FDA) does not have jurisdiction over tobacco products and, hence, has no authority to regulate cigarettes, including advertising targeted at minors. The Court’s opinion shines a light on the dumbfounding contradictions in our national drug policy, which drastically distinguishes (legal) drugs such as nicotine and alcohol, from drugs such as marijuana on which we’ve declared “war.”

The Supreme Court’s ruling stemmed from a 1996 FDA rule from a 1996 FDA rule
declared that nicotine and smokeless tobacco are "drugs" and that cigarettes and smokeless tobacco are "drug delivery devices," which it has the power to regulate. According to the 1996 FDA rule, nicotine is a "drug" under the agency's purview because it "exerts psychoactive, or mood-altering effects on the brain" and these effects are "intended" by those who manufacture tobacco products. Thus, held the agency, it could regulate tobacco products and would do so immediately by limiting promotion, labeling, and selling of tobacco products to minors. A coalition of tobacco manufacturers, retailers, and advertisers, sued the FDA, asserting that nicotine is not a "drug" and that the FDA, therefore, lacked jurisdiction to

In order to understand the FDA's 1996 rule, it's necessary to know a bit about its tobacco policy up until that time. Prior to 1996, the FDA had consistently held that it lacked jurisdiction over tobacco, an understanding affirmed by Congress, which over the years, rejected several bills that would have explicitly given the FDA jurisdiction over tobacco products. Thus, up until 1996, tobacco products were exclusively regulated by Congress. In 1965, for example, it was Congress, not the FDA, that required all cigarette packs to carry the warning "Caution: Cigarette Smoking May be Dangerous to Your Health." In 1969 it was Congress, not the FDA, that banned all radio and television advertising of tobacco products. Indeed, prior to its 1996 about-face, the FDA had long held that cigarettes were not "drugs" within its purview, unless the manufactures made health or therapeutic claims—something that not even the tobacco companies were ready to assert. In 1996, to the surprise of many, the FDA reversed itself, ruling that nicotine is a "drug." To justify its change of position, the FDA extensively documented the dangers associated with tobacco products, noting that "more than 400,000 people die each year from tobacco-related illnesses, and..."
heart disease, often suffering long and painful deaths," and that "[t]obacco kills more people each
year than all other causes of death combined, including car accidents, homicides, suicides, and fires,
immunodeficiency syndrome (AIDS), car accidents, alcohol, homicides, illegal drugs, suicides, and fires,
The FDA recognized, however, that it was forced into a paradoxical position. The FDA’s core objective is to
ensure that any product within its regulatory power is "safe and effective." Given that it had just documented
the dangers associated with tobacco use, how could it possibly declare cigarettes and other tobacco products
safe? It seemed that if the FDA claimed jurisdiction over tobacco products it would have no choice but to
ban them altogether. Yet, a little known federal law prevents such a ban, largely for economic reasons:
"The marketing of tobacco constitutes one of the greatest basic industries of the United States with
ramifying activities which directly affect interstate and foreign commerce at every point, and stable
conditions therein are necessary to the general welfare of the states with the states with
interstate and stable
The only way out of the paradox was for cigarettes to be "dangerous" (thereby giving the FDA jurisdiction over them) yet also "safe" (so that the
FDA would not be forced to ban them). The FDA’s lawyers realized that everything turned on the
meaning of "safe." Cigarettes, said the FDA lawyers, were "unsafe, as that term is conventionally
understood," but were indeed "safe" when the effects of an outright ban were considered. According to the FDA,
in determining whether a drug delivery device such as a cigarette is "safe" under the Food, Drug, and Cosmetics
Act, the agency must consider "not only the risks presented by a product but also any of the
countervailing effects of use of the product, including the consequences of not permitting the product to be
marketed." As summarized by the Supreme Court:
level of addiction among tobacco users might not be able to meet the treatment demands of those suffering from tobacco off the market. The FDA therefore concluded that, while taking cigarettes and smokeless tobacco off the market could prevent some people from becoming addicted and reduce death and disease for others, the record does not establish that such a ban is the appropriate response. Thus, in 1996, the FDA ruled that cigarettes and other tobacco products, despite being addictive and dangerous, were "safe" when compared to the much greater dangers associated with prohibition. Thus, the FDA could have its cake and eat it too; cigarettes were "drugs" within its jurisdiction, yet "safe," so long as the act would apply if tobacco products were within its jurisdiction.

On March 21, 2000, in an opinion rich with contradictions when tobacco policy is compared with the national War on Drugs, the Supreme Court ruled that the FDA does not have jurisdiction over nicotine and tobacco. Congress, not the FDA, is in charge of regulating tobacco products. The Supreme Court refused to let the FDA escape the paradox. According to the Supreme Court, either cigarettes were unsafe drugs within the FDA's jurisdiction, in which case they must be banned, or they were not "drugs" at all.
Id be impossible ended us[e].

As a recent examination of national drug policy, the Supreme Court’s opinion strips the emperor of his clothes, and the process as well as the result is embarrassing to look at. On the one hand the federal government permits adults to use nicotine, while on the other hand, it makes them criminals if they smoke.

A study by the U.S. Department of Health and Human Services, Public Health Service, in 1983 concluded that cigarette smoking is “the most widespread example of drug dependence in our country,” and that cigarettes “affect the chemistry of the brain and nervous system.” 10 Five years later the Surgeon General’s Report used even harsher language, concluding that tobacco products “are addicting” and that “nicotine is psychoactive” and “causes physical dependence characterized by a withdrawal symptom” in much the same manner.

Marijuana, in stark contrast, causes no physical dependence. In fact, in 1989 the DEA’s own administrative law judge, Francis L. Young, declared that marijuana is “one of the safest therapeutically active substances known to man.”12 Yet, while any adult can walk down to the corner store and buy a pack of cigarettes (or even marijuana, for medical use), remains a Schedule I substance - illegal to possess for any reason. Likewise, the cognitive enhancing drug MDMA (ecstasy) is extremely popular right now, yet because the government has declared it illegal, users are forced to purchase it on the black-market. MDMA users never know for sure if the drug they are buying is indeed MDMA, or some other drug or combination of potentially dangerous drugs. Additionally, because MDMA is outlawed, the price of the drug is artificially inflated to the point where (according to the government) organized crime is
getting involved in its distribution. Prohibiting MDMA and marijuana produces all the same problems that we saw 70 years ago during alcohol Prohibition—problems that are much greater than the problems caused by the

As discussed earlier, the FDA in 1996 determined that banning cigarettes would actually increase individual and social harm rather than reducing it. This very same reasoning should be applied to other drugs (such as MDMA and marijuana) that the government has declared

It’s clear to any reasonable person who examines our nation’s drug policy, that it is riddled with contradictions and outright hypocrisy. The only way out of the so-called Drug War conundrum is for our society-at-large, and legislators in particular, to adopt a more mature view of drugs. Going to “war” on drugs is infantile. A national policy of intolerance (i.e., “zero-tolerance”) rather than respect, lies at the root of all our drug problems—both legal and illegal. Rather than cower in the shadows of “just say no” propaganda and hypocritically proclaim marijuana a dangerous drug that threatens to destroy our society, while simultaneously employing contortionist reasoning to keep cigarettes on the market, we should acknowledge that people have a natural drive to experience multiple modes of consciousness. The government should accept this as a fact and begin designing drug policy that makes drug use as safe as possible. If (as Justice Brennan wrote in his dissenting opinion filed in the case), tobacco policy should “take into account the realities of human behavior,” why should our policy with respect to other drugs be any different?

Adults ought to have the right, after all to control their own bodies and minds—and our national drug policy should respect an adult’s autonomy over his or her own body and mind. Some may choose to smoke cigarettes, while others will choose to smoke marijuana. Smoking one plant versus another should not be a crime. No one should be made a criminal just for
his or her mind state. All should be permitted, so long as the person does not harm others. Any policy short of this—any policy built on intolerance rather than respect—is destined to lead to a host of absurdities and negative social consequences such as: prison overcrowding, unjust sentences, misdirection of funds away from schools in order to build more prisons, property forfeiture, kids dying of adulterated "black market" drugs, organized crime, sick people denied medicine, helicopters hovering overhead, men in black bashing down the doors of decent people, and corrupt cops. These problems are produced not by drugs themselves, but by our immature drug policy.

Making an adult a felon for taking a hit of marijuana rather than smoking a Marlboro is irrational. The fact of the matter is that millions of people enjoy using psychoactive drugs such as nicotine, alcohol, caffeine, marijuana and MDMA. The government should not be in the business of telling adults what they can or cannot put in their mouths, or declaring, under threat of imprisonment, loss of property and heavy fines, that it's okay to operate your mind with the benefit of one plant but not another. What goes on inside any given person's body and mind ought to be nobody's business. Let's replace the value of intolerance with one of respect, and instead of demanding that people "just say no," acknowledge that adults have the basic human right to control their own bodies and minds, so long as they do so without causing harm to others.

Prohibition is not only passe, it's bad policy. (39) Part:3, 1 See Cigarette Labeling and Advertising—1965: Hearings
Letter to Directors of Bureaus, Divisions and Directors of Districts, from FDA Bureau of Enforcement (May 24, 1963), in 1972 Hearings 240: “[T]obacco marketed for chewing or smoking without accompanying therapeutic claims, does not meet the definitions in the Food, drug, device, or


In the Matter of Marijuana Rescheduling, Docket 86-22, Opinion, Recommended Ruling, Findings of Fact, Conclusions of Law, and Decision of Administrative Law Judge, Washington, DC: Drug Enforcement Administration

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Greetings growers this is for medical marijuana users and those who can use the information legally. Seedbank ratings are farther down and the links to growing information are near the

This is a weekly report on which seedbanks are reliable and give good service. I also list some bad ones to stay away from (crooks). Reports from people who have ordered from cannabis seedbanks are welcome. That's what this is based on, reports from people like you. You can send your report to me or post it to alt.drugs.pot.cultivation Or both if you want to be sure I get it. Sometimes posts don't show up on my newsserver. If you send a report please state what bank you ordered from, how long it took and roughly how far away you are from them. Any seeds were crushed. Any other info you think is important will be appreciated. Reports on how the crop turned out are good too. I don't rate companies on price, that's up to you to compare. The more stars, the more reliable. F = faster than average, no letter = average, S = slow. A complete breakdown on the ratings is found at http://www.suresite.com/ca/s/system

I have a system of additional ratings. They are a one (1) for accepting payment by money order or certified check without charging extra for it. Who really likes sending cash in the mail? A two (2) will be given for free stealth shipping. A three (3) will be given for accepting credit cards. This leaves a paper trail but is quick and easy. (4) indicates that they use PGP code for privacy on request. A five (5) indicates they take Western Union. An example of the new rating might be Joe's seeds (***) (1,2) which means three stars and he gives free shipping and it is fast. They order or certified check without charging extra for it. Who really likes sending cash in the mail?

I've tried to list those that ship worldwide. They will send to most countries.
I don't have enough information about their mail order seed business to make a rating.

They are NOT recommended. aka means also known as. X means they seldom or never send the

:a cannabis@direct.A2000.nl [L.Pafort] (X)

Some complaints and some customers have said they were satisfied. The nature of the complaints are as follows: 10 = non delivery, 11 = very poor customer service, 12 = inferior quality or misrepresented seeds, 13 = unethical conduct by seedbank owner.

http://www.angelfire.com/ga/greenmanspage
For info on how to post anonymously to a newsgroup or to send anonymous mail to someone without your identity being revealed go to www.replay.com.

Posted to adpc and other places.

Article does not advocate illegal activity;) Check the laws of your country and state. The opinions expressed here are those of the author and may or may not reflect the views of the businesses listed. © 1998, 1999 by green man all rights reserved. No portion of this may be reproduced.
There are few things in life as good as your own herb, grown by yourself at home out in the garden and indoors in pots... Oregano, Dill, Basil, Sage and other herbs are all easy to grow.

Mint will take over the whole yard if you let it. Fresh mint and celantro are incredible in salads and oriental dishes. But it all comes down to a truly motivational herb that is your friend and

and more rewarding to keep the garden going year round. If one were to attempt to grow producing. You will have herb fresh at all times, there is no worry of mass storage thru

is spiritually enriching. Try giving your plants energy by beaming good thoughts and

allers that are acclimated and bred for local climate and best floral characteristics. Potency,

characteristics for indoor growth as well. Indica plants have a heavy, stony high that is

ides. The Sativa has very narrow, finger-like leaves. A hybrid will have qualities of both

s, like tiger stripes. White, small seeds are immature and should not be planted.
One of the best solutions to energy verses output for most home gardeners is to use outdoor light for flowering and use continuous light indoors for germination and vegetative growth. This will take advantage of the natural light/dark cycle and cut your energy use in half compared to the same operation indoors. A small greenhouse can be built of Filon fiberglass or PVC glass or plastic sheet, and some strains that do not require a great deal of light will allows you to keep out rats and gophers, keeps out the neighbor kids, and can be easily is the best way to avoid root-bound plants (if your not using hydroponics), and get using natural sunlight to ripen the plants. This routine will provide at least 3 and flowering 2nd harvest plants outdoors, harvests are possible every 60 days in many germination the plant enters into a vegetative state and will be able to use all the continuous instantly and grow faster than it would outdoors with long evenings. Photosynthesis stops requirement and the plant will grow faster at this stage with continuous photosynthesis outside in the Spring or Fall. (For Summer outdoor flowering, the night must be artificially bright lights nearby) will force the plant to flower. It will ripen and be 2-3' when ready I start to flower in anticipation of oncoming winter. Vegetative starts moved outside Starts moved outside Sept 1 are picked by Nov. 1st. In Winter, operations are moved out for some extra winter stash. Forer notice plants placed outside to flower in April. Be smart, make your big harvest in seeds are placed outside to mature in the spring after last freezes are over. The space can be a entire bedrooms to growing. This could invite fuzz or rip-offs. This is not lit by big lights that generate a lot of heat. Separate exhaust and incoming air vents in air from an outside wall or under-floor crawl space. Use fans from old computer to the speed/noise of the fans. Use silicon to secure the fans to 4-6" PVC pipe pushed thru the walls do not resonate to the fans' oscillations. the walls bright white to reflect light. Aluminized mylar, 1 mil thick is best. ($20 for 25 fans the electrical wiring will handle the lamps your going to use. Always place ballasts for under a ballast will work too. Allow you to double the area of your grow space and is an invaluable storage area for plant warming pad will be needed, so this arrangement saves you $. will allow constant lights on the shelf and dark periods in the main grow area. Velcro canack vinyl with white backing works best.
hen take them outside to grow in a small greenhouse. They can be purchased with bulbs and one Warm Light type bulb in each to get the best light spectrum possible for plant growth, so do not work as well in most situations (go figure). If Cool White is all you can

ensive, and easy to obtain. Fluorescent lamps are great for shelf gardening. In this system, Some shelves have 24 hour lighting, some have 12 hour lighting (for flowering). Two 3-4 feet apart. Less light is necessary when you have plants that are this short and forced

ut every day, and it is harder to take a vacation for even a week with no tending of the room. Most HPS installations will not require lamp height adjustment. Just attach the closer to it, put them on a temporary shelf, box or table to get them closer to the lamp. "maximum. This area must be painted a very bright white, or covered with aluminum foil, dull side out to reflect light back to the plants. (Dull side out prevents hot-spots; diffuses light better.) Paint the shelf white too. Or, use aluminized mylar, a space blanket, or any of mechanism so they can be kept as close to the plants as possible at all times (1-2"). If the lamp, and will not produce as much bud at maturity. This is due to internode length can be more internodes, thus more branches, thus a plant that provides more buds in less

together, creating a green canopy of tops that are grown and matured quickly, and the next in a constant light shelf, until they start to grow well vegetatively, then placed on a 12

ark, plant growth will certainly not go as fast as possible, and internode/stem length changes will be necessary, meaning you get no vacations.

2 levels (more on that later).

3 basic flavors: High Pressure Sodium (HPS), Metal Halide (MH) and Mercury Vapor. Sort of light, maybe a bit pink or orange. Same as some street lamps.

are 1 week later than a similar crop under MH, but it will be a bigger yield, so it's better
MV will put out about 8000 lumens per 175 watts, and 150 watts of HPS puts out about
not as good. HPS is high in reds, which works well for flowering, while the Metal
the worst spectrum for plant growth, but are very inexpensive to purchase. They are not
with the initial costs saved.
put $20 a month in electricity, so it is evident that a lamp taking half the power to output
and from then on, continuous savings will be reaped. This is a simple initial cost vs.
the HPS lamp will give you, due to more light being available. If this is factored into the
lamps, since it is easily twice as efficient and grows flowers faster and bigger.

400 watt HPS will output around 45k lumens. For every 500 watts of continuous use, you use about $20 a month in electricity, so it is evident that a lamp taking half the power to output
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lamps, since it is easily twice as efficient and grows flowers faster and bigger.
Heat buildup in the room is a factor with HID lamps, and just how much light the plants can use is determined by temperature, CO2 levels, nutrient availability, PH, and other factors. Too much CO2, since it's getting blown out of the room right away.

So you will spend more to replace two 70 watt bulbs than you will to replace one 400 watt bulb, and the fact that they are being modified and are not suited to this application, and it would be better to get a 400 watt HPS. Keep in mind that for $30 more, you can have the larger lamp (400 watt) and it puts out lighting for indoor gardening stores in your area.

Bulb Costs: the bulb cost on the 70 watt HPS is $24, the 150 is only $30, and the 400 is only $40. So you will spend more to replace two 70 watt bulbs than you will to replace one 400 watt HPS. (Go figure.) Add that up with the lower resale value on the 70's (practically nothing) and the fact that they are being modified and are not suited to this application, and it becomes evident that $189 for a 250 HPS lamp, or $219 for a 400 watt HPS, might just be worth the price. Keep in mind that for $30 more, you can have the larger 400 watt HPS and it puts out more light for the money.

If you're looking for these types of lamps, look in the Yellow Pages under gardening, nurseries, and lighting for indoor gardening stores in your area.

Sea of Green (SOG) is the theory of harvesting lots of small plants, matured early to get the fastest production of buds available. Instead of growing a few plants for a longer period of time, less is required between crops. This is important to you when the electricity bill year round can be maintained. 4 plants per square foot will be a good start for seedlings. 1 plant will allow for much bottom branching. This is OK since indoors, these bottom branches are used for food, but not for energy. The indoor grower quickly realizes that plants that are too tall do not produce enough at the bottom to make the extra growing time used worth while. An exception to this rule would be if it is intended the plants are to go outside at some point, and it is expected that the plants will be at that point and not yet mature.

The plants, if started at the same time, should create what is called a "green canopy" that traps most of the light at the top level of the plants. Little light will penetrate below this level, since the canopy is dense, and use the light and space to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as effective as nylon绳.

It's easy to want big plants, since they will produce more yield per plant, but it's usually better with limited space to grow smaller plants that mature faster and pack into smaller spaces. Large, small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature, and use the space between the plants to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as effective as nylon绳.

With limited space to grow smaller plants that mature faster and pack into smaller spaces. An example of this would be to grow 12 small plants on a shelf above 12 other small plants. These plants take only 3-4 months to mature, and use the space between the plants to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as effective as nylon绳.

Sea of Green was developed in Holland. Instead of fitting 4 large plants in that small room, fit 12 small ones on a shelf above 12 other small plants. These plants take only 3-4 months to mature, and use the space between the plants to the best advantage, in as little time as possible. Use of nylon poultry fence or similar trellising laid out over the green canopy will support the plants as they start to droop under the weight of heavy fruiting tops. Stakes can be used too, but are not as effective as nylon绳.

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It's not the size of the plant, but the maturity and quality of the product that counts. Twice as many plants grown half as big will fill the grow space twice as fast, so harvests take place almost twice as often. Get good at picking early flowering plants, and propagate only those that are of the best quality.

6" square containers will allow for 4 plants per square foot. You may also gauge by the size of your growing tray (for passive hydroponics); I like kitty litter boxes. ($3 each at Target)

- For flowering indoors, 1 plant per sq. ft. is a good rule of thumb for SOG. If less plants are grown in this size space, it will take them longer to fill the space, thus more electricity and time will be used to create the same amount of product. If more than one plant p.s.f. is attempted, the grower will soon find that plants thus crowded tend to be more stem than bud, and

- 4 plants per square foot, (for vegetative seedlings) a 12 sq. ft. closet will hold 48 seedlings on one shelf. In my case, I use 4" rockwool cubes that fit into kitty litter pans @ 12 cubes per

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at to grow 2 or 4 times more plants, since they will produce more, faster, in the same
any type of plastic or paper twist tie and wrap it around the top of the plant, then pull it
plant. Do this for one week and then release the plant from it's bond. The plant can be
force lower limbs to grow upward and join the green canopy. This technique takes
it makes it bush out at all lower internodes.

aimed to increase air flow under the "blanket" of growing tops. Use these cuttings for
generate after flowering has occurred.

miculate. DO NOT (!) use a jiffy cube #7 to germinate seeds. Informal tests and
miculate gives the seedling so much oxygen, and are so easy for roots to grow in, that the

ottom, placed in a tray of weak nutrient solution, high in P. Rockwool cubes also work
repotting or transplanting, and no soil mixing!

out, or are planted too late after germinating. Paper towels dry out REAL FAST! Place
nic wrap to keep it from drying out. Put bowl in a warm area; top of the gas stove, water
ners and plant germinated seeds with the grow tip up (if possible) in a growing medium as

in for a significant period of time. Just plant in vermiculate or rockwool. You will be
as with Jiffy Cubes. (Your milage may vary.)

and the new seedlings. Use a very dilute solution, in distilled water, about 1/3 normal
it. Many growers experience low germination rate if the temperatures are out of this range. A
do, but test it with a few seeds first, before devoting next years crop to it. No light is

the space and number of seedlings you plan to start. Plants will suffer if continuously
bottles filled with vermiculate/pearlite will fit in a cat box tray, and will not require
nd regenarated harvest.

to start seeds or accept seedling transplants. Since vermiculate holds water well, wicks
itting in a tray full of water. A hydrogen peroxide based plant food is used to get extra
ach time after watering, before new solution is added. This allows the plants roots to
the yard, sterilize it in the microwave or oven until it gets steamy.(NOT

as much as possible to grow tall and start many grow tips at each pair of leaves. A grow
i, and every major internode. If you "top" the plant, it then has two grow tips at the top. If
plant to heal and recover from the trauma of being pruned, it faster to grow 4 smaller
wers find)

germinates from seed. It is possible to grow plants with no dark period, and increase the
gardener to decide when to force the plant to flower. A plant can grow from 12" to 12'
arden based on goals and space available.
A solution of 20-20-20 with trace minerals is used for both hydroponic and soil gardening when growing continuously under lights. Miracle Grow Patio or RapidGrow plant food is good for this. A high P plant food such as Peter's 5-50-17 food is used for blooming and fruiting plants when beginning 12 hour days. Epsom salts (1tsp) should be used in the solution for magnesium and sulfur minerals. Trace minerals are needed too, if your food does not include them. Miracle Grow Patio includes these trace elements, and is highly recommended.

Keep lights on continuously for sprouts, since they require no darkness period like older plants. You will not need a timer unless you want to keep the lamps off during a certain time each day. Young plants do not support heavy flowering growth. An internal oscillating fan will reduce humidity on the leaves and improve the stem strength as well. The importance of internal air circulation cannot be stressed enough. It will exercise the plants and make them grow stronger.

This mixture will insure your plants are getting all major and minor nutrients in solution, and will also be treating your plants with oxygen for good root growth, and potassium nitrate for good burning qualities. Another good GROWTH PHASE mix is 1/4 tsp Peter's 20/20/20 fertilizer per gallon of water, with trace elements and oxygen added, or fish emulsion. Fish emulsion is great in the greenhouse or outdoors, where smells are not an issue, but is not recommended for indoors, due to its strong odor.

The plant will be induced to fruit or flower with dark cycles of 11-13 hours that simulate the oncoming winter in the fall as the days grow shorter. As a consequence, it works out well for using two separate areas; one that is used for the initial vegetative state and one that is used for flowering and fruiting. There is no other requirement other than to keep the dark cycle for flowering very dark with no light interruptions, as this can stall flowering by days or weeks.

Once a plant is big enough to mature (12" or over), dark periods are required for most plants to flower and bear fruit. This will require putting the lamp on a timer, to create regular and strict dark periods of uninterrupted light. In the greenhouse, the same effect can be created in the Summer (long days) by covering it with a blanket to make longer night periods. A strict schedule of covering the plants at 8pm and uncovering them at 8am for 2 weeks will start your plants to flowering. After the first 2 weeks, the schedule can be relaxed a little, but it will still be necessary to continue this routine for the plants to completely flower without reverting back to vegetative growth.

Indoors, Spring and Fall, the nights are sufficiently long to induce flowering at all times. Simply bring the plants from indoors to the outside at these times, and the plants will flower naturally. In late Summer, with Fall approaching, it may be necessary only to force flowering the first two weeks, then the rapidly lengthening nights will do the rest.

Give flowering plants high P plant food and keep them on a strict light regimen of 12 hours, with no light, or no more than a full moon during the dark cycle. 13 hours light, 11 dark may be enough to speed maturity toward the end of the flowering cycle if speed is of the essence.

Two shelves can be used, one identical to the other, if strictly indoor gardening is desired. One shelf's lights are set for 12-13 hours, and one is lit continuously. Plants are started in continuous light, and are moved to the flowering shelf after several weeks. This flowering shelf should be bigger than the "starting" or "vegetative" shelf, so that it can accommodate larger plants. Or, some plants can be taken outside if there is not enough space on the flowering shelf for all of them near harvesting.

A light tight curtain made from black vinyl, or other opaque material, with a reflective material on the other side to reflect light back to the plants. This curtain can be tied with cord and velcroed down in place to make sure no light leaks in or out. If the shelf is placed up high, it will not be very noticeable, and will fit in any room. Visitors will never notice it unless you point it out to them, since it is above eye level, and no light is being emitted from it.

Nutrients should be provided with each watering when first flowering. Nutrients should be provided with each watering when first flowering. Separate trace element food too. Home improvement centers sell trace element solutions
for these mass produced fertilizers are significantly cheaper than the specialized

by normal light. It delays flower development due to hormones in the plant that react
toon can provide for less than 5 minutes. Keep pruning to a minimum during the entire

from the plants. These are sold as nursery safety lights, but any green bulb should be
Personally, I like my garden lit from 7pm to 7am, since it allows me to visit the garden
about it, it lies unlit and undisturbed, flowering away...

vels down indoors when flowering, as this is the most delicate time for the plants in this

the hairs emerging from a small bulbous area at every internode. This is the easiest way to

living from every growtip on the plant. It will literally be covered with them. These are the

ly until the lights are turned back yet again. At the point you feel your ready to see the

hours. Now the plant will start to ripen quickly, and should be ready to harvest in 2-3

outside, or keep the plants on a constant 12 hour regimen for the entire flowering process,

tering to occur. Once the plant has almost reached peak floral development, it is too far

up precious indoor space sooner, for the next batch of clones to be flowered.

ales, right?) to swell with resins. When most of the pistils have turned color (~80%), the

HC will come off on your fingers and reduce the overall yield if mishandled.

the same genetics and environmental conditions. This may be due to closer attention and

take less time to grow. One report has it that plants started in soil matured after

mixtures, plant growth tends to slow when the plants become root-bound. Hydroponics

ials of repotting if rockwool is used. (Highly recommended!)

ed to as Passive Hydroponic methods, because they require no water distribution system

ill wick to where you want it if the medium and conditions are correct.

aced in the pots, correct holes must be cut in the pots, and a spacer must be created to place
occure nearly as quickly for hydroponic plants, since the roots can still take up nutrients from the constant solution feedings, and the medium passes on oxygen much more readily when the

maturity. This would be difficult to do in soil, since nutrients are soon used up and roots become cut-off from oxygen as they become root-bound in soil. This problem does not seem to

Hydroponics allows you to use smaller containers for the same given size plant, when compared to growing in soil. A 3/4 gallon pot can easily take a small hydroponically grown plant to

speed growth. The main difference between hydroponics and soil growing is that the hydroponic soil or "medium"is made to hold moisture, but drain well, so that there are no

speed growth. The main difference between hydroponics and soil growing is that the hydroponic soil or "medium"is made to hold moisture, but drain well, so that there are no

over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants.

Hydroponics reduces worries about mineral buildup in soil, and lack of oxygen to suffocating roots, so leaching is usually not necessary with hydroponics.

Over-watering problems associated with continuous watering. Also, hydroponically grown plants do not derive nutrients from soil, but from the solution used to water the plants.

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Rockwool slabs are used, a half slab of 12" rockwool fits perfectly into a kitty litter pan. The

This is added, one Tblspn. per gallon of growing medium. This medium will wick and store

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nutrient solution to make it acidic (5.5) so that it brings the rockwool down from 7.7, to

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Rockwool cubes can be reused several times, and are premade to use for hydroponics.

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Pearlite is nice, since it is so light.

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Plant food is administered with most waterings, and allows the gardener to strictly control what nutrients are available to the plants at the different stages of plant growth. Watering can be automated to some degree with simple and cheap drip system apparatus, so take advantage of this when possible.

Hydroponics will hasten growing time, so it takes less time to harvest after planting. It makes sense to use simple passive hydroponic techniques when possible. Hydroponics may not be much when growing hydroponically, or roots will be damaged. If you will not be able to tend to the garden every day, be sure the pans are filled enough to last until next time you return, or you can easily lose your crop.

CAUTION: it is necessary keep close watch of plants to be sure they are never allowed to dry too much when growing hydroponically, or roots will be damaged. If you will not be able to change the solution every month if your circulating it with a pump, but the reservoir system does away with this problem. Just rinse the medium once a month or so to prevent salts build up by watering from the top of the slab of rockwool into two pieces, then cut the end of the plastic off each piece. You can cut 2 or 3 4" square holes in the top to place cubes on it, and place each piece in a clean litter pan.

...
outside in the open air, due mostly to evaporation.

A grower will need to know where the sun shines for the longest period; privacy and other things to mid afternoon, at least from 10-4, preferably 8-5. This will be really asking for a sun not want to use the greenhouse in the middle of the winter, you can still use winter sun most sun. Also, large areas open to the sun on the north side of the property will get noon sun and mid-day sun as well. Some books say the plants respond better to sun may be better.

White opaqued plastic, PVC, Filon, or glass, and using a similar colored material for the wall, has always been there, with plants and trees that grow around it and mask it from view while

Sun together in a garden. Buy the clear greenhouse sheets, and opaque them with white acid, pass more sun than white PVC or Filon, and still hide the plants. Epoxy resin coats will disguise the shed as metal, if you paint the clear filon sheets with a thin layer of resin tinted needed, to reduce sun blockage to a minimum.

Make sure of the quality of topsoil in the area. Grassy fields would have good top soil, but your N monster by harvest time. Growing in the ground will always beat a pot, since the plant will, but will need more space for each plant, so plan accordingly, you can't move them

Get the pot to be place in it, thus reducing the height of the plant, if fence level is an issue.

If the appraiser, fire, etc.).

Over the fence line in the back yard. We started to build a greenhouse roof for them, and fence at us and our lovely plants. We were busted, because he saw them. If he had seen FORE the plants are sticking over the fence! Or train them to stay well below it. Live and

Security. Water must be close by, or close to the soil surface, or you will have to pack water, and keep a bucket nearby to carry water to your plot.

Down to a lower spot close by. It is possible to create water pressure in a hose this way, and punch small holes in it. Run a hose out of the main orifice and secure it somehow. Burying out of it, and run it down hill to your garden area. A little engineering can save you a lot

Look for a property where people seldom roam around. It is possible to find locations that for one

Be able back to you. If it's not on your property, nobody has witnessed you there, and virtually impossible to prosecute you for it, even if the cops think they know who it

Notice something you decided to take a look at, or carry a fishing pole or binoculars and

Unless it is harvest time, and the plants will be pulled the same or following day.
Planting in the ground is always preferable when growing in soil. The plants can then grow to any size, unlimited by pot size.

You need a minimum of a 3 gallon pot. Remember, square containers have more volume in a square space (like a closet).

Plant size in soil is directly related to pot size. If you want the plant to grow bigger, put it in a bigger pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a bigger pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a

Use P4 water crystals in the soil to give the plants a few days worth of emergency water reserves. This substance swells up with water and holds it like a sponge, so that roots will have a reserve if harsh drought makes constant watering necessary. Go real easy on this stuff though, it tends to sink to the bottom of the pot and suffocate bottom roots (new growth roots) and

Organic gardeners use their own compost prepared from a mixture of chicken, cow or other manure and household food waste, leaves, lawn clippings, dog hair and other waste products. This mixture is full of nutrients, is too moist, etc. Add vermiculite, perlite or sand to Super Soil to increase its drainage and aeration.

Use Super Soil brand in California, as this is the only known soil on the West Coast that is guaranteed to be good. Many other brands are mostly wood products and have very few

No males, no differentiation, no weeding, no germinating seeds, no genetic uncertainties, no crops grown for seed, no transporting/transplanting/watering plants your just going to pull up

One outdoor grower we know has given up on seeds. He has several strains he likes to clone, so he starts 200 clones in his closet, then transports them outdoors in boxes to the grow site.

Direct into soil. If spotted in route to the grow area, burying a dead cat may be a good excuse for being in the area. Few people would demand to see the rotting corpse!

One suggestion is to use 3" rockwool cubes to start seedlings in, then put 20 of them in a litter pan, cover it with another pan, and transport this to the grow site. The cubes can be planted

Transporting vegetative starts to the growing area is a most tricky aspect of growing outdoors. Usually, you will want to start plant indoors, or outside in your garden, then transport them

The best fence in the world will not keep a crop if given any opportunity to do so. The best fence in the world will not (Put the poison grain in a feeder than only small rodents can eat the grain for several days before it will have any effect on them. Ultimately, you may need to be merely a hiker, not a grower.

Usually, you will want to start plant indoors, or outside in your garden, then transport them males from females so that no effort of transporting/transplanting/watering males is

In, cover it with another pan, and transport this to the grow site. The cubes can be planted or being in the area. Few people would demand to see the rotting corpse!

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are needed to be good. Many other brands are mostly wood products and have very few

Make sure and household food waste, leaves, lawn clippings, dog hair and other waste products

By people that pass on the road. Have a safe house in the area if you are not planting close to home. Always have a good reason for being in the area and have the necessary items to make

make a barrier of fishing line, one at 18" and another at 3' will keep most deer away from

Put up a fence, or the chipmunks, squirrels and deer will nibble on your babies until there is nothing left. Green wire mesh and nylon chicken fencing net work great and can be wrapped

around trees to create a strong barrier. Always check it and repair every visit you make to the garden. A barrier of fishing line, one at 18" and another at 3' will keep most deer away from

Make sure your plants are out of sight. Take a different route to get to them if they are not in a secure part of your property, and cover the trail to make it look as if there is no trail. Make

Don't park on the main road, always find a place to park that will not arouse suspicion or being in the area. Always have a good reason for being in the area and have the necessary items to make

way before an allergic reaction takes place. Teknu is a special soap solution that will act and take a shower 30 mins. later.

The plants to grow sideways, or do something to prevent the classic christmas tree look of tress grow up toward the sun, and increase yield, given a long enough growing season.

Hours every day. Plants should get at least 5 hours of direct sun every day, and 5 more hours loves and leave no fingerprints on pots and other items that might ID you to the fuzz...in

Gopher Granola is available for areas such as the N. CA mountains, where wood rats and gophers will eat your crop if given any opportunity to do so. The best fence in the world will not

by people that pass on the road. Have a safe house in the area if you are not planting close to home. Always have a good reason for being in the area and have the necessary items to make

Cut backs in the trail, so that people on the main trail will tend to miss the cut-back to the grow area. Don't park on the main road, always find a place to park that will not arouse suspicion or being in the area. Always have a good reason for being in the area and have the necessary items to make

by people that pass on the road. Have a safe house in the area if you are not planting close to home. Always have a good reason for being in the area and have the necessary items to make

Briar and poison oak patches are perfect if you can cut through it. Poison Oak must be washed away before an allergic reaction takes place. Teknu is a special soap solution that will deactivate poison oak before it has time to create a reaction. Apply Teknu immediately after contact and take a shower 30 mins. later.

This substance swells up with water and holds it like a sponge, so that roots will have a tendency to sink to the bottom of the pot and suffocate bottom roots (new growth roots) and

per pot. Usually, 1/2 gallon per foot of plant is sufficient. A six foot plant would require a like a closet).

size, unlimited by pot size.
Bat Guano, chicken manure, or worm castings can all be used to fertilize organically in soil. Manures can burn, so they should be composted with the soil first, before planting, over weekly and constantly feeds the plants.

and work them into the soil, along with some dolomite lime and composted organic soil. (Organic gardeners frown upon this practice, however. Toxic wastes are produced by the area to hold in moisture and keep down weeds near the plants.

isifiable by all but the most observant. I remember a relative of the family on a visit to Texas recognized them for what they were.

ention when placed next to plants of similar or taller stature. Even tall plants grown among

and there, never in a recognizable pattern. Space them out, and fit them in to the existing several together are best. Try to find strains that seem to match the surrounding plants. Feed flowers, pinned to a plant, disguising it as a flower bush.

, mowing the lawn, or doing something in the yard that makes you invisible.

The plant will never be over 3 feet tall, and never arouses suspicion from neighbors. This neighbors over for a BBQ and nobody ever noticed the nice plants over by the fence...

, and Potassium. These 3 ingredients are usually listed on the front label of the plant

ybenum, zink, iron, and manganese.

ermination, levels of high P nutrients with less N/K are needed. Vegetative growth needs it is not a complete fertilizer unto itself. 20-20-20 with trace elements should do it; I like important. One tablespoon of dolomite or hydrated lime is used per gallon of growing magnesium. Epsom salts are used to enhance magnesium and sulphur levels in solution.

Miracle Grow. This is an excellent fertilizer for vegetative growth, or through the needed to make men have less sexual desire or impotent, such as in mental institutions. So if fertilizer on these plants, at least in the last weeks of flowering.

00-400 ppm is optimum. It is possible to test your solution or soil with a electrical

are usually higher. It is possible with passive hydroponics, to get nutrient build-up over flow and again, until you notice the plants are not as green (slightly), then resume normal

I proceed in a reckless manner, due to potential over-watering problems. You must go

ants. Use weaker plant food mixtures than normal, maybe 25%, and be sure your water. This applies mainly to plants grown in soil mediums.
trace element solution. Nitrate salts (The "N" in NPK) are unhealthy to smoke. Personally, I never foliar feed."

NOTE: One grower who reviewed this document comments: "Fish emulsion smells. Bat guano could be highly unsanitary. Stick to the Rapid-Gro, MgSO4 (epsom salts), hydroponic

WARNING!: It is important to wash leaves that are harvested before they are dried, if you intend to eat them, since they may have nitrate salts on them.

Foliar feeding is recognized in most of the literature as being a good way to get nutrients to the plant later when nutrient lockup problems could start to reduce intake from the roots.

Perhaps the best foliar feeding includes using seltzer water and plant food at the same time. This way, CO2 and nutrients are feed directly to the leaves in the same spray.

prevent the water from beading up, and thereby burning the leaves as they act as small prisms. Make sure you don't spray a hot bulb; better yet, spray only when the bulb has cooled.

to make the solution higher PH, and vinegar to make the solution lower PH. It's better to spray more often and use less, than to drench the plants infrequently. Use a wetting agent to

coolest time available. The sprayer used should atomize the solution to a very fine mist; find your best sprayer and use it for this. Make sure the PH is between 7 and 6.2. Use baking soda

degrees, and over 80, they may not be open at all. So find the cooler part of the day if it's hot, and the warmer part of the day if it's cold out. You may need to spray at 2AM if that's the

Best times of day to Foliar feed are 7-10Am and after 5 in the evening. This is because the stomata on the underside of the leaves are open then. Also, the best temperature is about 72

tative and early flowering stages. It is not recommended for late flowering, or you will be e leaves with straight water every week to prevent clogging the stomata of the leaves.

in a well vented space, with or without elevated CO2 levels. Just prepare a tea of worm tative and early flowering stages. It is not recommended for late flowering, or you will be

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o eat them, since they may have nitrate salts on them.

Id be highly unsanitary. Stick to the Rapid-Gro, MgSO4 (epsom salts), hydroponic foliar feed."
I use only CO2 on my indoor hydroponic plants, and never folar feed. It simply does

seems that the plant evolved in primordial times when natural CO2 levels were many
and plant tissues. Elevating the CO2 level will increase the plants ability to manufacture these

so if you use a CO2 tank system. CO2 is most usable for flowering, as this is when the
plant is most dense and has the hardest time circulating air around its leaves. If your strictly growing vegetatively indoors, (transferring your plants outdoors to flower), then CO2 will not
be a major concern unless you have a sealed greenhouse, closet or bedroom, and wish to increase yield and decrease flowering time.

houses. This is expensive initially, but fairly inexpensive in the long run. These

CO2 can be a pain to manufacture safely, cheaply, and/or conveniently, and is expensive to set up if you use a CO2 tank system. CO2 is most usable for flowering, as this is when the

CO2 is cheaply produced by burning Natural Gas. However, heat and Carbon Monoxide must be vented to the outside air. CO2 can be obtained by buying or leasing cylinders from local

welding supply houses. This is expensive initially, but fairly inexpensive in the long run. These

CO2 is captured as part of the manufacturing process of many materials, and

and bottled CO2 is captured as part of the manufacturing process of many materials, and

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CO2 generation from fermentation and generators is possible. A simple CO2 generator would be a propane heater. This will work well, as long as the gases can be vented to the grow

area, and a fan is used to keep the hot CO2 (that will rise) circulating and available below at the plants level. Fire and exhaust venting of the heat are issues as well. A room that must be

vented 50% of the time to rid the environment of heat from a lamp and heater will not receive as much CO2 as a room that can be kept unvented for hours at a time. However, CO2

Fermentation or vinegar over baking soda will work if you don't have many vent cycles, but if you have enough heat to make constant or regular venting necessary, these methods become

as the vent comes on). This method leaves a great deal to be desired, since it is not easy

fermentation, let the wine turn to vinegar, and pour this on baking soda. It’s the most

mentally keep adding water to, so that the alcohol levels will not rise high enough to kill the
weeks. This is also difficult to gauge what is happening as far as amounts actually CO2 being produced.

For CO2, do it just before you close the door on your plants. A MUCH cheaper way to do it is with 2 oz sugar in 2 liters of water in a bottle [sterilized 1st with bleach and water, then rinsed], plus a few cc urine[!] or if you insist, yeast nutrient from a home brewing supplier. Add a brewing yeast, shake up and keep at 25 deg celsius[~70 F] . Over next 2 weeks or so it will brew up about 1/2 Oz CO2 for every Oz sugar used. Keep a few going at a time measured 38cm growth in 8 days under a 250watt HPS bulb[tubular clear, Horizontal

piece of clear tube running into a jar filled with water will keep microbes out and make it easier to start a sieve or spray every couple of days.

A variation is to spray seltzer water on the plants twice a day. This is not recommended by some authorities, and receives great raves by people who seem to feel it has enhanced their crop. It could get expensive with a lot of plants to spray. Use seltzer, not club soda, since it contains less sodium that could clog the plants stomata. Wash your plants with straight water after 2 or 3 seltzer sprays. It's a lot of work, and you can't automate it, but maybe your spiritual self and the earth. Seltzer is available at most grocery stores (I get it at Lucky's @ .79 for a 2 litter bottle). Club soda will work if seltzer water is not available; but it has twice as much sodium in it. A very diluted solution of Miracle Grow can be sprayed on the plants to keep the CO2 in the air, and some growers find CO2 injection

Some growers have reported to High Times that high CO2 levels in the grow room near harvest time lower potency. It may be a good idea to turn off CO2 2 weeks before harvesting.

You have to vent a lot with a HID lamp, less so for fluorescents. Also, humidity build up requires that you vent at least a few times per day. For a room with a hot lamp that builds up heat quickly, the best vent would be one that cleared the room in 5 minutes, then would stop for 25 minutes before venting again, or similarly, vent 3 minutes, shut off 12 minutes, etc. The best way to regulate CO2 on and off inversely with the fan, your looking at a $100 climate controller.

Alternatives are a thermostat that turns on a fan when a certain temperature is reached, and turns it off when the temp recedes 4 degrees. But it is a bitch to coordinate CO2 release with this. A better way is to use a voltage sensing relay is $100 for the ready-made switch, so then the environment temperature switch that turns on and off the fan, and an inverse switch that turns off and on. CO2 could be run in a slow, continuous fashion, and would build up in-between the

ventings per 24 hours. So I could have a fan run 30 mins on, then 30 mins off. I could also set it to turn on CO2 during the time that the fan is not on, and vise versa. It would be $20 for two of these timers.

Fans are expensive to buy for venting, but I just go down to the local electronic parts liquidators and they have muffin fans for $5-10, so that's a real savings over the $50-70 these fans cost new at the indoor garden stores. A good vent fan will keep the humidity and temperature down, and distribute CO2 to your plants from new incoming air.

Internal air movement is very necessary as well. An oscillating fan should be used to circulate air within the growroom, to help circulate CO2. It will also keep the humidity down, and distribute CO2 to your plants from new incoming air.

Within the growroom, the best grow rooms have the most internal air
Proper temperature is one highly variable factor. Most books state optimum grow temperature to be 70-80 degrees, but many list extenuating circumstances that allow temperatures to go higher. Assuming genetics is not a factor, plants seem to be able to absorb more light at higher temps, perhaps up to 90 degrees. High light and CO2 levels could make this go as high as 95 degrees for increased growth speed.* An optimum of 95 degrees is new data that assumes very-high light, CO2 enrichment of 1500 ppm and good regular venting to keep humidity down. It is not clear if these temperature will reduce potency in flowers. It may be a good idea to reduce temperatures once flowering has started, to preserve potency, even if it does slow down growth in a big way. Mid 50's will cause mild shock and 40's will kill your plants with frost and is sucking the heat out of the roots. This is an issue if you have a slab or other type of concrete in your greenhouse. Higher average temperature should reduce risk of fungus.

Lower humidity levels help the plant transpire CO2 and reduce risk of molds during flowering cycles. With normal levels of CO2, in a well vented space, 90 degrees would seem to be the absolute max, while 85 may be closer to optimum, even with a great deal of light available. Do not let the room temperature get over 35 C (95 F) as this hurts growth. Optimal temperature is 27-30 C (80-86 F) if you have strong light with no CO2 enrichment. Less than 21 C (70 F) is too low for driving the plant.

Aphids are the worst; whiteflies, caterpillar and fungi are the ones to watch out for. Commercial soap sprays will do most of the rest. When bringing in plants from outside, or two, and soap down any remaining bug life you find from eggs being hatched. This highly half developed they become susceptible to a fungus or bud rot. It appears that higher conditions permit it to grow. If things should go badly and the fungus starts to attack your plants, you must remove it immediately or it will spread to other areas of the plant or plants.

Some growers will remove just the section of the bud that is infected whereas other growers will remove the entire branch. Removal of the entire branch better insures that the fungus is before flowering if you think fungus may be a problem. Don't spray the plants if you have never had problems with fungus before. Keep humidity down, circulate air like crazy in the grow space and keep unquarantined outdoor plants out of the indoor space. Don’t wait for flowers to be cut off when they are infected.

hat is safe for vegetables. Safer makes a suitable product that is available at most nurseries. Use soap solution like Safer Insecticidal Soap to get rid of most aphid problems. Use some tobacco juice and chili pepper powder added to this for mites. Dr. Bronnars Soap can be used in a closet or greenhouse in the corners to get rid of spiders and such. It breaks down within a week to non-toxic elements, and can be washed from a plant with detergent solutions and then clear water. I find Pyrethrum to be the best solution for spider mites, if it is sprayed on young plants up to early flowering. Into later flowering, the tobacco and pepper/soap solution is your best bet, on a daily basis, on the under-sides of all infected leaves.
Spider mites are by far the worst offender in my garden. I have finally learned not to bring plants from outside into the indoor space. They are always infected with pests and threaten to infect the entire indoor grow space. It is much more practical to work with the seasons and regenerate plants outdoors in the Summer, rather than bringing them indoors to regenerate. Start a plant indoors, take it outside in Spring to flower. Take a harvest or two, feed it nitrogen all Summer and it will regenerate naturally, to be flowered again in the Fall. You only need to transplant twice, or better yet, once if possible, through the entire growing cycle. Start in as large a container as possible, square is best. 16 ounce plastic cups work OK, and 2 litter soda bottles cut down may be big enough for the first harvest when growing hydroponically. One-gallon plastic milk or water containers (squarish) will work to have many seedlings that need constant transplanting. These larger cups take only a little more space, and allow you to transplant only one time before harvesting the first crop. Transplant into a gallon water jugs (cut down to 3/4 gallon) before forcing flower growth. To regenerate this plant after harvesting, transplant it into a larger pot after it goes into vegetative growth once again, 5 gallon paint buckets work pretty well if you can spare the space, and a 2-3 gallon container would make this plant’s 2nd harvest better than the first, given enough vegetative regrowth first.

A Russian study showed that seedlings with at least 4” of soil to grow the tap root were more likely to go female. The source I’m quoting says “This may be why some farmers get it sooner by covering a plant’s lower branch for 12 hours a day while it’s in a constant light. Be sure to set up a regular cycle for these covered branches. If light is allowed to play a role, looking preflower with a small stem under it. A female flower is usually a growing outdoors, many growers do not wish to devote time, space or energy to male plants, then revert the light cycle back to 18-24 hours to continue vegetative growth for the growth. Don’t pre-force plants unless you have lots of time. Just cover one branch per plant with black paper (light tight, breathes air) 12 hours every day under constant light to force pre-flowers and differentiate early.

A second harvest can be realized in as little as 6-8 weeks. Since the plant’s stalk, and more than half the time of the original harvest. When harvesting, take off the top 1/3rd of the plant, take off end flowers, but leave several small flowers on the plant, the faster it will regenerate. Feed the plant some Miracle Grow or any high nitrogen plant food immediately after harvest. When you intend to regenerate a plant, make sure it never gets too starved for nitrogen as it is maturing, or all the sun leaves will fall off, and may develop stress and disease. Harvested plants can come inside for rejuvenation under continuous light or are left outside in Summer to rejuvenate in the natural long days. It will take 7-14 days to see signs of new vegetative growth in the lower branches will be the first to sprout new vegetative growth. Allow the plant to grow a little vegetatively, then take outside again to reflower. Or keep inside for vegetative cuttings. You now have two or three generations of plants growing, and will need more space outside. Regenerating indoors can create problems if your plants are infected with pests. It may be best to have a separate area indoors that will not allow your plants to infect the main indoor area.
An alternative to regenerating indoors is to regenerate outdoors in the Summer. Just take a harvest in June, then allow the plant to regenerate by leaving some lower buds on the plant, and lots of sun. It will regenerate all Summer and be quite large by Fall, when it will start to grow. This will get all the plant's energy. This means that once the plant has started to regenerate there will not be a lot of growth occurring.

Plants that are regenerated, cloned and even grown from seed will need to be pruned at some point to encourage the plant to produce as much as possible and remain healthy. Pruning the lower limbs creates more air-flow under the plants in an indoor situation and creates cuttings for cloning. It also forces the plant's effort to the top limbs that get the most light, maximizing growth.

Plants that are regenerated need to have minor growth clipped so that the main regenerated growth will get all the plant's energy. This means that once the plant has started to regenerate it will not sprout new growth and may be collected for smoke. The plant may not sprout with new growth and smoke it. Then later, prune again to take lower clippings and the total yield will be significantly reduced.

Try to trim a regenerated plant twice. Once as it is starting to regenerate, collect any bud that is not sprouting with new growth and smoke it. Then later, prune again to take lower clippings and the total yield will be significantly reduced.

Harvesting is the reaping of the bounty, and is the most enjoyable time you will spend with your garden.

Plants are harvested when the flowers are ripe. Generally, ripeness is defined as when the white pistils start to turn brown, orange, etc. and start to withdraw back into the false seed pod. The seed pods swell with resins usually reserved for seed production, and we have ripe sensi buds with red and golden hairs.

It is interesting that the time of harvest controls the "high" of the buds. If harvested "early" with only a few of the pistils turned color, the buds will have a more pure THC content and will have less THC that has turned to CBD and CBN's. The lessor psychoactive substances will create the bouquet of the pot, and control the amount of stoniness and stupidity associated with the "high." A pure THC content is very cerebral, while high THC, high CBD, CBN content will make the plants more of a stupid, or hazy buzz. Buds taken later, when fully ripened will normally have these higher CBN, CBD levels and may not be what you prefer once you try different samples picked at different times. Don't listen to the experts, decide yourself.

Keep in mind, a bud weighs more when fully ripe. It is what most growers like to sell, but take some buds early for yourself, every week until you harvest, and decide how you like it for yourself.

Most new growers want to pick early, because they are impatient. That's OK! Just take buds from the middle of the plant or the top. Allow the rest to keep maturing. Often, the tops of the plants will be ripe first. Harvest them and let the rest of the plant continue to ripen. You will notice the lower buds getting bigger and fuzzier as they come into full maturity. With more light available to the bottom portion of the plant now, the plant yields more this way over time, than taking a single harvest.

Use a magnifier and try to see the capitated stalked trichomes (little THC crystals on the buds). If they are mostly clear, not brown, the peak of floral bouquet is near. Once they are mostly all turning brownish in color, the THC levels are dropping and the flower is past optimum potency, declining with light and wind exposure rapidly.

Don't harvest too late! It's easy to be too careful and harvest late enough potency has declined. Watch the plants and learn to spot peak floral potency.

Do not cure pot in the sun, it reduces potency. Slow cure hanging buds upside down in a ventilated space. That is all that is needed to have great sensi. Drying in a paper bag works too, and may be much more convenient. Bud tastes great when slow dried over the course of a week or two.

If your in a hurry, it's OK to dry a small amount in-between paper sheets or a paper bag in a microwave oven. Go slow and check it, don't burn it. Use the defrost power setting for a few minutes. A food dehydrator or food preserver will dry your pot in a few hours, but it will not taste the same as slow-dried. Very close though. And this will speed your harvest time (which can be...
syrup has been reported to supplement the sugars needed by the plant during cloning, since it consists of plant sugars.

The above nutrients should be added in extremely small amounts, 25% of what would normally be used on growing plants. Or use a premade solution such as Olivia's Rooting Solution. Corn hormone seems to be much more effective than powders. Some types available are Olivia's, Woods, and dipNgrow.

I considered myself lucky, and got a tray and clear cover for $7. A clear tray cover or greenhouse encloser is needed to bring up humidity to 90% (greenhouse levels). Liquid rooting I found only one liquid rooting hormone solution that was not over $10. (Olivia's Gel was $12 for a 1.6 ounce bottle. Geez, what is this stuff, gold?) I found some dipNgrow for $9, which works great too. In a closet, you can make space above the grow area so that the heat of the lamp warms the tray (passive collecting) and spare the expense and hassle of the aquarium heater ($24) or agricultural heating pad w/ thermostat (pricey). A double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks.

Cloning goes quickest with the liquid rooting solutions, in a warmed, aerated tray, with subdued lighting and high humidity. Placing cuttings into 1" rockwool cubes in a covered tray will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very

After two months, any marijuana plant can be cloned. Flowering plants can be cloned, but the procedure may take considerably longer. Its best to wait, and regenerate vegetatively plants. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid or medium. Flowering plants can be cloned too, but may take longer, and may not have

If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favorite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The procedure may take considerably longer. Its best to wait, and regenerate vegetatively plants. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid or medium. Flowering plants can be cloned too, but may take longer, and may not have

The offspring will be

Low branches are cut to increase air circulation under the green canopy. Rooted clones are moved to the vegetative growth area, and new clones are started in the cloning area using the low branch cuttings. Each cycle of growth will take from 4-8 weeks, so you can

Devoted to being a mother. I killed off a sacred strain accidentally this way; my harvested plants failed to regenerate and the strain would have died completely had not previously igven it to friends to grow it as well. I was in luck, and a buddy set me up with another clone of this strain to grow as a mother plant for a new crop of clones.

I rooted in hydroponic medium to be grown as a separate plant. The offspring will be

If a single plant, so it is a powerful tool for growing large crops, and will fill a closet rest of your life, you can keep that plant's genetic character alive for decades and pass it on line die out. A clone can be taken from a clone at least 20 times, and probably more, so

To pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel best of, and potency. The quality of the high, and the type of buzz you get will be a very

I found only one liquid rooting hormone solution that was not over $10. (Olivia's Gel was $12 for a 1.6 ounce bottle. Geez, what is this stuff, gold?) I found some dipNgrow for $9, which works great too. In a closet, you can make space above the grow area so that the heat of the lamp warms the tray (passive collecting) and spare the expense and hassle of the aquarium heater ($24) or agricultural heating pad w/ thermostat (pricey). A double 4" fluorescent lamp will be perfect. Leave lamps on for 24 hours a day. Cuttings should root in 2-3 weeks.

Rooted clones will be the most reliable to reproduce in large scale, based on health, growth rate, resistance to pests, and potency. The quality of the high, and the type of buzz you get will be a very

cloning solution following instructions on the label. Dust with RootToneF and place in cloning tray or medium. Flowering plants can be cloned too, but may take longer, and may not have

Plants. Always keep a mother plant in vegatative mode for any strain you want to keep alive. If you flower all your clones, you may end up killing off a strain if you don't have any plant failed to regenerate and the strain would have died completely had not previously igven it to grow as a mother plant for a new crop of clones.

If a plant is harvested, you can sample it, and decide if you want to clone it. Pick your favorite 2 or 3 distinctly different types of plants to clone, based on trying the harvested plants. The procedure may take considerably longer. Its best to wait, and regenerate vegetatively plants. Before taking cuttings, starve the plant for nitrogen for a week at least, so that the plant is the plant, when doing ordinary pruning. Cut young growth tips from a vegetative stage, X-acto knife (flamed) and immerse the cut end of the clone into a tub of distilled water submerged, using a diagonal cut. Remove the clone from the tub and dip into a liquid or medium. Flowering plants can be cloned too, but may take longer, and may not have

cloning will open you to the risk of a fungus or pests wiping out the whole crop, so it's important to pick plants that exhibit great resistance to fungus and pests. Pick the plant you feel best of, and potency. The quality of the high, and the type of buzz you get will be a very

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20 times, and probably more, so
is important, since clones and fungus like the conditions you will be creating for good

... stay moist at all times. Try to keep clones evenly spaced, and spray them, to keep them away from healthy starts.

... sheets (shipping/packing material) with holes punched, so the tops and leaves are the new rooting stalk. Aerate the tray solution with an air pump and bubble stone. Keep pump, so that oxygen is always available to the cuttings. A week later, clip yellowing

... humidity very high for the clones. Put cuttings in an ice chest with cellophane over the

...ed, or vermiculite in a cup; be sure to root cuttings in a constantly moist medium. Jiffy clones. Place starter cubes in tray of solution. Check twice a day to be sure cubes are pods. Transplant at this point to growing area, taking care not to disturb any exposed

...ich are kept in a stryrofoam cooler. 3. Spray cuttings with a VERY mild complete fert.

... or less. With clones, it may take 6 weeks for the plant to sprout roots and new growth.

... be used quickly. Always breed a few buds for seeds, even if you expect to be cloning most of

...arter cubes. A plastic tray is available ($.95) that holds 77 cubes in pockets allowing the rockwool growing cube when rooted.

... plants will naturally be better than others in this regard, and it is easy to select not only the fastest growth plant, and breed it with your “best high” male for fast flowering, potent it will save you a lot of waiting around for your plants to mature.

... males so it does not pollinate them. It is taken to a separate area. Any place that gets just a house. Put newspaper or glass under it to catch the pollen as the flowers drop it.
Keep a male alive indefinitely by bending its top severely and putting it in mild shock that delays its maturity. Or take the tops as they mature and put the branches in water, over a piece of plate glass. Shake the branches every morning to release pollen onto the glass and then scrape it with a razor blade to collect it. A male pruned in this fashion stays alive indefinitely and will continue to produce flowers if it gets suitable dark periods. This is much better than putting pollen in the freezer! Fresh pollen is always best.

Save pollen in an air tight bag in the freezer. It will be good for about a month. It may be several more weeks before the females are ready to pollinate. Put a paper towel in the bag with it.

If you pollinate too early, it may not work. Wait until the female flowers are well established, but still not yet mature. Use two males on separate branches. Wrap the bag around the branch and seal it at the opening with a sprayer and then carefully remove it. Large plastic zip-lock bags also. Slip the bag over the branch and shake it vigorously to release pollen. To pollinate, place it over a single branch of the female, zipping it up. Allow to settle for an hour or two and shake it again. Remove it a few hours later. Your seeds will be seeds splitting the calyces by 3-6 weeks. One pollinated branch can create hundreds of seeds.

When crossing two different varieties, a third variety of plant will be created. If you know what characteristics your looking for in a new strain, you will need several plants to choose from in order to have the best chance of finding all the qualities desired. Sometimes, if the two plants bred had dominant genes for certain characteristics, it will be impossible to get the characteristics you desire. In this case, it is necessary to interbreed two plants from the same batch of resultant seeds from the initial cross. In this fashion, recessive genes will be exposed.

Hybrid offspring will all be very different from each other. Each plant grown from the same batch of seeds collected from the same plant, will be different. It is then necessary to try each plant and judge it based on characteristics of early flowering, high yield and get buzz, that's where the in depth genetics is beyond the scope of this work. See Marijuana Botany; Smith, for more detailed info in this area.

When the female plant is not allowed to pollinate, it grows full of resin that was intended to make seeds. False seed pods swell with THC laden resin and the pistils turn red and orange. Seeds are not part of the bud when the flowers mature. This is called Sinsemilla, and simply means "no seeds".

It is possible to cross your favorite two female plants to create a new strain of seeds that will produce all female plants. Preferably, these two plants will be different types of plants, not too similar. This will create the best offspring, since it will not lead to inbreeding. It is easier to gauge the quality of female plants than male plants, since the smoke is more potent and easier to judge it's finer qualities. Plants from seeds created in this fashion will be all female plants since there will be no chance of male chromosomes from female parents.

Use Gibberellic Acid on one branch of a female plant to induce male flowers. Gibberellic Acid is sold by nursery supply houses for plant breeding and hybridizing. Spray the plant once a day for 10 days with 100 ppm gibberellic acid. When the male flowers form, pollinate the flowers of your other target female plant you have selected. Just pollinate one branch. Once the branch has male flowers, cut the branch and root it in water, with glass under it to catch the male pollen when it drops. Use a rooting solution similar to the above cloning solution. Collect the pollen with a plastic bag over the branch and shake it. Use a razor blade to scrap up fallen pollen and add it to the bag too.

With itself. This is used to preserve a special plants characteristics. Cloning will also
plant with itself can lead to inbreeding problems, so it may not be the optimum solution in

to store seeds for use later. Crossing a plant with itself can lead to inbreeding problems, so it may not be the optimum solution in

e flowers appeared on the plant. Your milage may vary.

reports are coming in that a negative ion generator will increase growth speed and yield. Animals seem to be altered in a positive way by negative ions in the air, so plants may "feel" when picked, but that may be desirable in some cases.

solved. Some have reversed cycles that collect the dust to a charged plate. It is also possible to do this to a charged plate. It is also possible to do this over a period of weeks. Just wipe the foil clean once a month. It should be grounded to an electrical outlets st taken from the air, and you will have to repaint that wall later.

...and itself of toxins, etc. One of the easiest things to do is use food grade hydrogen peroxide that will easily break away and can be used by the plant. Oxygen Plus is a plant food that

ve good drainage by using Perlite, sand, or gravel in your mix and at the bottom of pots. Able to the plant. More on that in the section on hydroponics.

pump to aerate the water overnight before watering your plants, or put the water in a

growers this way. More than 500 watts in the family home running constantly will show up on the premises, too many television sets, and late hours, if they happen mention it to to another location during the wee hours in a vehicle not your own.

o that your electrical use history won't reveal your activities in the future...

e all serious issues to be concerned about. Don't use a burglar alarm on when your away come. Lock the house up well, and let them take it if they need it so bad. It's not worth

dmen, solicitors, meter readers, neighbors, appraisers, and pets should all be considered

um and heavy metals found in hard water that are not present in purified water. Hard pper and zinc deficiencies. There are several types of purified water, but many are not free in it, and should be freer of sediment once the water has been turned on and allowed to uch so, you will see it easily. Use only the amount of hot water needed to make the be free of chlorine and most large particles, but will still contain dissolved solids such as

ater. When purchasing water at a store, unless it says RO or Distilled, don't bother
A solution of one pill to one gallon of water has been reported to cause increased growth speed in tomato plants. It is possible this will help herb plants too. One treatment administered before flowering and one administered a few weeks before harvesting might help the plant mature faster.

One grower told a story of the same type of plants, one administered the estrogen grew to 20 feet, while the other was 7 feet. This may be purely anecdotal, but it may work. Try it and see.

Seeds can be kept for years this way.

Wet seeds in a paper towel to absorb moisture. Keep them in the freezer, and pull out only as many seeds as you need, then pop them back in the freezer quickly.

Good results can be had even in what appear to be rather marginal situations. (i.e.: a four inch pot in a room with a skylight.) With the minimum of: well drained medium, good light with ventilation, regular application of a complete fertilizer, pest control, and avoidance of detection, anyone can take a viable seed to maturity. I strongly recommend buying several complete grow guides. Please only use this limited information for a basic understanding of gardening. Some excellent books are available including "Marijuana Botany" "Marijuana Growers Guide (Inside guide and Outdoor)" "Marijuana Chemistry". These are all excellent sources of wisdom. You will want to get the best results out of the seeds you purchase!
Cannabis

An Advanced Study: The Propagation and Breeding of Distinctive Cannabis

Cannabis is a tall, erect, annual herb. Provided with an open sunny environment, light well-drained composted soil, and ample irrigation, Cannabis can grow to a height of 6 meters (about 20 feet) in a 4-6 month growing season. Exposed river banks, meadows, and agricultural lands are ideal habitats for Cannabis since all offer good sunlight. In this example an imported seed from Thailand is grown without pruning and becomes a large female plant. A cross with a cutting from a male plant of Mexican origin results in hybrid seed which is stored for later planting. This example is representative of the outdoor growth of Cannabis in temperate climates.

Seeds are planted in the spring and usually germinate in 3 to 7 days. The seedling emerges from the ground by the straightening of the hypocotyl (embryonic stem). The cotyledons (seed leaves) are slightly unequal in size, narrowed to the base and rounded or blunt to the tip. The hypocotyl ranges from 1 to 10 centimeters (1 to 3 inches) in length. About 10 centimeters or less above the cotyledons, the first true leaves arise, a pair of oppositely oriented single leaflets each with a distinct petiole (leaf stem) rotated one-quarter turn from the cotyledons. Subsequent pairs of leaves arise in opposite formation and a variously shaped leaf sequence develops with the second pair of leaves having 3 leaflets, the third 5 and so on up to 11 leaflets. Occasionally the first pair of leaves will have 3 leaflets each rather than 1 and the second pair, 5 leaflets each.

If a plant is not crowded, limbs will grow from small buds (located at the intersection of petioles) along the main stem. Each sinsemilla (seedless drug Cannabis) plant is provided with plenty of room to grow long axial limbs and extensive fine roots to increase floral production. Under favorable conditions Cannabis grows up to 7 centimeters (2½ inches) a day in height during the long days of summer.

Cannabis shows a dual response to daylength; during the first two to three months of growth it responds to increasing daylength with more vigorous growth, but in the same season the plant requires shorter days for flowering. Critical daylength applies only to plants which fail to flower under continuous illumination, since those which flower under continuous photoperiods (short days or long nights) to induce fertile flowering and less than this will result in the formation of female flowers being fertilized.

The time taken to form primordia varies with the length of the inductive photoperiod. Given 10 hours per day of light a strain may only take 10 days to flower, whereas if given 16 hours per day it may take up to 90 days. Inductive photoperiods of less than 8 hours per day do not seem to accelerate primordia formation. Dark (night) cycles must be uninterrupted to induce flowering (see appendix).

Cannabis is a dioecious plant, which means that the male and female flowers develop on separate plants, although monoecious examples with both sexes on one plant are found. The development of branches containing flowering organs varies greatly between males and females: the male flowers hang in long, loose, multi-branched, clustered limbs up to 30 centimeters (12 inches) long, while the female flowers are tightly crowded along the main stem. The female plants tend to be shorter and have more branches than the male. Female plants are leafy to the top with many leaves surrounding the flowers, while male plants have fewer leaves near the top with

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from the precise botanical definition. This has come about mainly from the large number of cultivators who have knowledge of plant anatomy but an intense interest in the reproduction of Cannabis. The precise definition of pistil refers to the combination of ovary, style and stigma. In the more informal usage, pistil refers to the fused style and stigma. The informal sense is used throughout the book since it has become common practice among Cannabis cultivators.

The female flowers appear as two long white, yellow, or pink pistils protruding from the fold of a very thin membranous calyx. The calyx is covered with resin exuding glandular trichomes (hairs). Pistillate flowers (female flowers) have a very thin membranous calyx. The calyx measures 2 to 6 millimeters in length and is closely applied to, or may be yellow, white, or green in color. They hang down, and five stamens (approximately 5 millimeters long) on thin filaments. The exterior surface of the staminate calyx is covered with non-glandular trichomes. The pollen exhibits 2 to 4 germ pores.

In male flowers, five petals (approximately 5 millimeters, or 3/16 inch, long) make up the calyx and may be yellow, white, or green in color. They hang down, and five stamens (approximately 5 millimeters long) on thin filaments. The exterior surface of the staminate calyx is covered with non-glandular trichomes. The pollen exhibits 2 to 4 germ pores.

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Feminine flowers die after dehiscence (pollen shedding) the staminate plant dies, while the pistillate plant may mature up to five months after viable flowers are formed if little or no fertilization occurs. Compared with pistillate plants, staminate plants show a more rapid increase in height and a more rapid decrease in leaf size to the bracts which accompany the flowers. Staminate plants often differentiate primordia one to two weeks before pistillate plants.

Under conditions with a normal inductive photoperiod, Cannabis will bloom and produce approximately equal numbers of staminate and pistillate plants. Under conditions of extreme stress, such as nutrient excess or deficiency, mutilation, and altered light cycles, populations may be skewed significantly toward one sex or the other.

Before the start of flowering, the phyllotaxy (leaf arrangement) reverses and the number of leaflets per leaf decreases until a small single leaflet appears below each pair of calyxes. The phyllotaxy also changes during the reproductive stages regardless of sexual type.

After dehiscence (pollen shedding) the staminate plant dies, while the pistillate plant may mature up to five months after viable flowers are formed if little or no fertilization occurs. Compared with pistillate plants, staminate plants show a more rapid increase in height and a more rapid decrease in leaf size to the bracts which accompany the flowers. Staminate plants often differentiate primordia one to two weeks before pistillate plants.

In the female, the pollen nucleus divides to produce a small reproductive cell accompanied by a large vegetative cell, both of which are contained within the mature pollen grain. Germination occurs in the pollen grain while the generative cell enters the pollen tube and migrates toward the ovule. The generative cell divides to form two sperm cells, which are released into the ovary. The pollen tube grows through the ovary, and the sperm cells are released near the ovule. The ovule then develops into a seed, which will eventually germinate and grow into a new plant.

Pollination of the pistillate flower results in the loss of the paired pistils and a swelling of the tubular calyx where the ovule is enlarging. The staminate plants die after shedding pollen. After approximately 14 days, the seed is matured and drops from the plant, leaving the dry calyx attached to the stem. This completes the normally 4 to 6 month life cycle, which may take as little as 2 months or as long as 10 months. Fresh seeds are removed after they are mature and beginning to fall from the calyxes. The remaining floral clusters on the surface grow and secrete aromatic THC-laden resins. The mature, pungent, sticky floral clusters are harvested, dried, and sampled. The preceding simplified life cycle of sinsemilla Cannabis exemplifies the production of valuable seeds without compromising the production of seedless floral clusters.
isolated while pollen is carefully collected and applied to only selected flowers of the pistillate parents. The careful propagator, however, can produce as many seeds of pure types as needed for future research without risk of pollinating the precious crop. Staminate parents exhibiting favorable characteristics are reproductively

able seed, and the creation of individuals with newly recombinant genotypes. Pollen and ovules are formed by the function of propagation (cloning) such as cuttage, layerage, or division of roots are asexual and allow strains to be preserved unchanged through many seasons and hundreds of individuals.

method can be chosen for each situation. The unique characteristics of a plant result from the combination of a genotype, as influenced by the environment, creates a set of visible characteristics that we collect technique to ensure replication of the desired characteristics.

for instance, their genotypes will remain identical. However, the clone grown in the shade will grow tall and staminate parents exhibiting favorable characteristics are reproductively

 exact nature of these changes is unknown but probably involves imbalance in the enzymatic systems controlling cannabinoid production. Upon fertilization the plant's energies are channeled into seed production instead of

psychoactive compound in Cannabis) does not have enough time to accumulate. Hormonal changes associated with seeding definitely affect all metabolic processes within the plant including cannabinoid biosynthesis. The

Various theories have arisen to explain the unusually potent psychoactive properties of unfertilized Cannabis. In general these theories have as their central theme the extraordinarily long, frustrated struggle of the pistillate parent will be transmitted to the offspring, which will resemble each other and the parent. If the genes on one chromosome differ from the genes on its homologous chromosome then the plant is termed heterozygous. Imported Cannabis strains usually exhibit great seedling diversity for most traits and many types will be crossed, certain careful procedures are followed as illustrated in Chapter III. The actual mechanisms of sexual propagation

ed-bearing adult, following the usual pattern of development and sexual reproduction. Fiber and drug products are harvested in the juvenile or prefloral stage, before viable seed is produced, while sinsemilla or seedless marijuana special techniques must be used to produce viable seed for the following year without jeopardizing the quality, generation. Monoecious strains are often used because they mature more evenly than dioecious strains. The hemp farmer may leave a portion of his crop to develop mature seeds which he collects for the following year. If a hybrid variety

that fall from the flowers during harvesting, drying, and processing. A mature pistillate plant can produce tens of thousands of seeds if freely pollinated. Sinsemilla marijuana is grown by removing all the staminate plants from a patch, eliminating every pollen source, and allowing the pistillate plants to produce massive clusters of unfertilized seed.

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mystery. It is assumed, how ever, that seeding cuts the life of the plant short and THC (tetrahydrocannabinol the biochemical systems controlling cannabinoid production. Upon fertilization the plant's energies are channeled into seed production, while seeded plants cease floral production. It is also suspected that capitate-stalked trichome production may be negatively

research without risk of pollinating the precious crop. Staminate parents exhibiting favorable characteristics are reproductively

Cannabis can be propagated either sexually or asexually. Seeds are the result of sexual propagation. Because sexual propagation involves the recombination of genetic material from two parents we expect to observe

variation among seedlings and offspring with characteristics differing from those of the parents. Vegetative methods of propagation (cloning) such as cuttage, layerage, or division of roots are asexual and allow exact

The terms homozygous and heterozygous are useful in describing the genotype of a particular plant. If the genes controlling a trait are the same on one chromosome as those on the opposite member of the pair, the plant is termed homozygous. If-pollinated or crossed with an individual of identical genotype for that trait. The traits possessed by the homogenous plant will be identical to the traits possessed by the heterozygous

On the other hand, if the genes on one chromosome differ from the genes on its homologous chromosome then the plant is termed heterozygous. Imported Cannabis strains usually exhibit great seedling diversity for most traits and many types will be crossed, certain careful procedures are followed as illustrated in Chapter III. The actual mechanisms of sexual propagation

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al. But the staminate plant contributes half of the genotype expressed in the offspring. Not only are staminate plants preserved for
n be determined and the most favorable individuals selected. Pollen may also be stored for short periods of time for later breeding.

fertilization is the union of the staminate chromosomes from the pollen with the pistillate chromosomes from the ovule.

of pollen grains float through the air on light breezes, and many land on the stigmatic surfaces of nearby pistillate plants. If the
a seed pushes out a root. The tube contains a haploid (in) generative nucleus and grows downward toward the ovule at the base of the
with the pistillate haploid nucleus and the diploid condition is restored. Germination of the pollen grain occurs 15 to 20 minutes after
ler temperatures. Soon after fertilization, the pistils wither away as the ovule and surrounding calyx begin to swell. If the plant is
t no part of the cycle be interrupted or viable seed will not form. If the pollen is subjected to extremes of temperature, humidity, or
mbryo will be unable to develop into a mature seed. Techniques for successful pollination have been designed with all these criteria

hey originate from the same floral cluster of marijuana, and not all of these genotypes will prove favorable. Seeds collected from
pes. If elimination of pollination was at tempted and only a few seeds appear, the likelihood is very high that these pollinations were
e genotype of the offspring. Once the offspring of imported strains are in the hands of a competent breeder, selection and replication of
out of many may prove acceptable as parents. If the cultivator allows random pollination to occur again, the population not only fails
orable traits. We must therefore turn to techniques of controlled pollination by which the breeder attempts to take control and deter mi

mong ten pure strains (ten staminate and ten pistillate parents) result in ten pure and ninety hybrid crosses. It is an endless and inefficien
ssociated with each cross. The well organized breeder will free himself from this mental burden and possible confusion by entering vital
corresponding to each member of the population.

ble credibility. Memory fails, and remembering the steps that might possibly have led to the production of a favorable strain does not
mory is not a reliable record. A record book contains a numbered page for each plant, and each separate cross is tagged on the pistillate
t." Also the date of pollination is included and room is left for the date of seed harvest. Samples of the parental plants are saved as

hers of the staminate parent and applying pollen to the receptive stigmatic surfaces of the pistillate parent. Both steps are carefully con
nd-pollinated species, enclosures are employed which isolate the ripe flowers from wind, eliminating pollination, yet allowing enough
cating. Paper and very tightly woven cloth seem to be the most suitable materials. Coarse cloth allows pollen to escape and plastic
r translucent reflective materials remain cooler in the sun than dark or transparent materials, which either absorb solar heat directly or
on bags are easily constructed by gluing together vegetable parchment (a strong breathable paper for steaming vegetables) and clear
rics such as Gore-Tex are used with great success. Seed production requires both successful pollination and fertilization, so the
lization. It is most convenient and effective to use the same enclosure to collect pollen and apply it, reducing contamination during
ent is allowed to remain in an isolated area of the field and no pollinations are caused by hermaphrodites or late-maturing staminate
rdial flowers on the pistillate seed parent, then only a few seeds will form in the basal flowers and the rest of the flower cluster will be
o prevent hermaphrodism. Later, hand pollinations can be performed on the same pistillate parent by removing the early seeds from
ants may be isolated from the remainder of the population and allowed to freely self-pollinate if pure-breeding offspring are desired to

staminate plants can grow separate from each other to avoid mutual contamination and can be allowed to shed pollen without
mall vial, glass plate, or mirror is held beneath a recently-opened staminate flower which appears to be releasing pollen, and the pollen
s or clusters of staminate flowers on a piece of paper or glass and allowing them to dry in a cool, still place. Pollen will drop from
me in a cool, dark, dry spot. A simple method is to place the open pollen vial or folded paper in a larger sealable container with a dozen


Also, for each of the selected pistillate clusters, a tag containing the same information is made and secured to the limb below the closure of the bag. A warm, windless evening is chosen for pollination so the pollen tube

Before the pollen bags are used, the seed parent information is added to the pollen parent data. Included is the number of the seed parent, the date of pollination, and any comments about the phenotypes of both parents.

For each seed parent and two clusters of pistillate flowers for each bag, there are four opportunities to perform the cross successfully. Remember that production of viable seed requires successful pollination,

and receptive time for fertilization, still early in the seed plant’s life, with plenty of time remaining for the seeds to mature. Healthy, well flowered lower limbs on the shaded side of the plant are selected. Shaded buds will not

seeds is achieved by pollinating in the peak floral stage. At this time, the seed plant is covered with thick clusters of white pistils. Few pistils are brown and withered, and resin production has just begun. This is the most

Now a pistillate plant is chosen as the seed parent. A pistillate flower cluster is ripe for fertilization so long as pale, slender pistils emerge from the calyxes. Withered, dark pistils protruding from swollen, resin encrusted

and hand application. Before storing pollen, any other plant parts present are removed with a screen. A piece of fuel filter screening placed across the top of a mason jar works well, as does a fine-mesh tea strainer.

could promote mold growth, and the pollen bags are re sealed. The bags may be stored as they are until the seed parent is ready for pollination, or the pollen may be removed and stored in cool, dry, dark vials for later use.

After the staminate limbs have dried and pollen release has stopped, the bags are shaken vigorously, allowed to settle, and carefully untied. The limbs and loose flowers are removed, since they are a source of moisture that

open after the limbs are collected. The bags are collected early in the morning before the sun has time to heat them up. The bags and their contents are dried in a cool dark place to avoid mold and pollen spoilage. If pollen

Pollen release is fairly rapid inside the bags, and after two days to a week the limbs may be removed and dried in a cool dark place, unless the bags are placed too early or the pollen parent develops very slowly.

strains. The remaining staminate plants that are unsuitable for breeding are destroyed and the pollen plants specially labeled to avoid confusion and extra work.

Paper bags make convenient enclosures. Long narrow bags such as light-gauge quart-bottles make labeling easy and each bag is marked in waterproof ink with the number of the individual pollen parent, the date collection and necessary information about the future seed parent it will pollinate.

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Sex signs often brings a feeling of panic ("stamenoia") to the cultivator of seedless Cannabis, and potential pollen parents are prematurely removed. Staminate primordia need to develop from one to five weeks,

When flowering is at its peak and many flowers have just opened, collection is completed, and the limb, with its bag attached, is cut. If the limb is cut too early, the flowers will not have shed any pollen; if the bag

The remaining staminate plants that are suitable for breeding are used to collect pollen. It is best to begin collection as early as possible, and to continue until the number of viable seeds per cross has been

Whole clusters of staminate flowers are removed, but a small number is left on one or more fresh, dry soda crackers or a cup of dry white rice. The sealed container is stored in the refrigerator and the dry crackers or rice act as a desiccant, absorbing moisture from the pollen.
Seeds are collected from strains that best suit the locality; these usually come from similar climates and latitudes. Seed selection for specific traits is discussed in detail in Chapter III.

The pollinations represent fewer different gene pools and will produce more uniform offspring. Later-maturing staminate or hermaphrodite pollen parents, and their seeds should mature later and have a greater chance of producing hermaphrodite offspring. The pollen parent also exerts some influence on the seed coat characteristics. By contrast, mature seeds selected from the tips of floral clusters, often surrounded by immature seeds, are formed in later-appearing pistillate flowers. These flowers were likely pollinated by early-maturing pollen parents. These seeds have a high chance of producing early-maturing offspring.

Mature seeds with dried calyxes in the basal portions of the floral clusters along with many of the unpollinated pistils. In particularly cool or overcast conditions a week may be necessary, but the bag is removed at the earliest safe time to ensure proper seed development without successful fertilization. Seed parents then need good irrigation or development will be retarded, resulting in small, weak seeds. Seeds may take up to two months to mature. If seeds get wet in fall rains, they may sprout. Seeds are removed when the calyx begins to dry up and the dark shiny perianth (seed coat) can be seen protruding from the drying calyx. Seeds are labeled and stored in a cool, dark, dry place.

This is not possible for most cultivators or researchers and they usually rely on imported seeds. These seeds are of unknown parentage, the product of natural selection or of breeding by the original farmer, and nearly all Cannabis cultivators, no matter what their intention, start with seeds that are gifts from a fellow propagator or an imported shipment. If accurate information is not available about the pollen parent, then selection proceeds on common sense and luck. Mature seeds with dried calyxes in the basal portions of the floral clusters along with many of the unpollinated pistils. In particularly cool or overcast conditions a week may be necessary, but the bag is removed at the earliest safe time to ensure proper seed development without successful fertilization. Seed parents then need good irrigation or development will be retarded, resulting in small, weak seeds. Seeds may take up to two months to mature. If seeds get wet in fall rains, they may sprout. Seeds are removed when the calyx begins to dry up and the dark shiny perianth (seed coat) can be seen protruding from the drying calyx. Seeds are labeled and stored in a cool, dark, dry place.

The bags are removed and sterilized or destroyed the bags. This way there is little chance of stray pollination. Any viable pollen that failed to pollinate the seed parent will germinate in the warm moist bag and die within three days, preventing stray pollinations.

If a Cannabis sample is heavily seeded, then the majority of the male plants were allowed to mature and release pollen. Since Cannabis is wind-pollinated, many pollen parents (including early and late maturing staminate and hermaphrodite plants) will contribute to the seeds in any batch of pistillate flowers. If the seeds are all taken from one flower cluster with favorable characteristics, then at least the pistillate or seed parent is the same for all those seeds, though the pollen may have come from many different parents. This creates great diversity in offspring.

If only a small quantity of pollen is available it may be used more sparingly by diluting with a neutral powder such as flour before it is used. When pure pollen is used, many pollen grains may land on each pistil. Diluting 1 part pollen with 10 to 100 parts flour is common. Powdered fungicides can also be used since fresh bags are sometimes used, either charged with pollen prior to being placed over the limb tip, or injected with pollen, using a large syringe or atomizer, after the bag is placed. However, the risk of stray pollinations is increased if fresh pollen is used.

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Hybrid seeds are selected from crosses between pure strain parents of different origins. Seeds from hybrid plants, or seeds resulting from pollination by hybrid plants, are avoided, since these will not reliably reproduce the phenotype of either parent.

- Grade #1 - Seed parent and pollen parent are known and there is absolutely no possibility that the seeds resulted from pollen other than that used.
- Grade #2 - Seed parent is known but several known staminate or hermaphrodite pollen parents are involved. Grade #3 - Pistillate parent is known and pollen parents are unknown.
- Grade #4 - Neither parent is known, but the seeds are collected from one floral cluster, so the pistillate seed parent age traits may be characterized.
- Grade #5 - Parentage is unknown but origin is certain, such as seeds collected from the bottom of a bag of imported Cannabis.

Asexual propagation (cloning) allows the preservation of genotype because only normal cell division (mitosis) occurs during growth and regeneration. The vegetative (non-reproductive) tissue of Cannabis has 10 pairs of chromosomes. During mitosis every chromosome pair replicates and one of the two identical sets of chromosomes migrates to each daughter cell, which now has a genotype identical to the mother cell. Consequently, every vegetative cell in a Cannabis plant has the same genotype and a plant resulting from asexual propagation will have the same genotype as the mother plant and will, for all practical purposes, develop identically under the same environmental conditions.

Asexual propagation techniques such as cuttage, layerage, and division of roots can ensure identical populations as large as the growth and development of the parental material will permit. Clones can be produced from even a single cell, because every cell of the plant possesses the genetic information necessary to regenerate a complete plant. Asexual propagation produces clones which perpetuate the unique characteristics of the parent plant. Because of the heterozygous nature of Cannabis, valuable traits may be lost by sexual propagation that can be preserved and multiplied by cloning. Propagation of nearly identical populations of all-pistillate, fast growing, evenly maturing Cannabis is made possible through cloning. Any agricultural or environmental influences will be reflected in all characteristics. The phenotype that we observe in an individual is influenced by its surroundings. These influences do not affect genotype and therefore are not permanent. Cloning theoretically can pre serve a genotype indefinitely, but this trend will re verse if the pressures are removed. Shifts in genetic composition can occur during cloning this is less likely. Only mutation of a gene in a vegetative cell that then divides and passes on the mutation sexually, the mutant genotype will be further replicated. Mutations in clones usually affect dominance relationships by treating meristematic regions with X-rays, colchicine, or other mutagens.

The subtle effects of environment and cultural techniques. These subtleties are usually obscured by the extreme diversity found within the clone. If a population of clones is subjected to sudden environmental stress, pests, or disease for which it has no defense, no adaptation to new stresses can occur through recombination of genes within the clone. If the clones are the meristematic shoot apex comes directly from the parental plant. Many stem cells, even in mature plants, have the genetic information needed for an entire plant. Adventitious roots appear spontaneously from stems and old roots in humid conditions (as in the tropics or a greenhouse) adventitious roots occur naturally along the main stalk near the soil surface. Adventitious roots.
meristematic cells located just outside and between the vascular bundles (the root initials), (2) the differentiation of old stem tissue and establishing vascular connections with the shoot.

The root system forms with the adjacent vascular bundles and the root continues to grow outward through the cortex and young roots appear within four weeks. Often an irregular mass of white cells, termed callus tissue, will form. However, it is a form of regenerative tissue and is a sign that conditions are favorable for root initiation.

Applications of rooting systems. Natural plant growth substances such as auxins, cytokinins, and gibberellins are the most influential. Auxins and other growth substances are involved in the control of virtually all plant processes. Great care is exercised in application of artificial growth substances so that detrimental conflicting reactions may occur, but the mechanism of this action is not yet fully understood.

For example, such as naphthaleneacetic acid (NAA), indolebutyric acid (IBA), and 2,4-dichlorophenoxyacetic acid (2,4 DP) are applied to stem cuttings to increase the possibility of root initiation. This is the opposite of the reaction caused by auxins, suggesting the use of solutions of equal concentrations of auxins and cytokinins to promote the growth of undifferentiated callus tissue.

Strong root growth and stimulate bud growth. This is the opposite of the reaction caused by auxins, suggesting the use of solutions of equal concentrations of auxins and cytokinins to promote the growth of undifferentiated callus tissue.

Auxins are chemical compounds that stimulate cell growth. In stem cuttings, cytokinins suppress root growth and stimulate bud growth. This is the opposite of the reaction caused by auxins, suggesting the use of solutions of equal concentrations of auxins and cytokinins to promote the growth of undifferentiated callus tissue.

As the root initials divide, the groups of cells take on the appearance of a small root tip. A vascular system forms with the adjacent vascular bundles and the root continues to grow outward through the cortex until the tip emerges from the epidermis of the stem. Initiation of root growth usually begins within a week and young roots appear within four weeks. Often an irregular mass of white cells, termed callus tissue, will form. However, it is a form of regenerative tissue and is a sign that conditions are favorable for root initiation.

The development of adventitious roots can be broken down into three stages: (1) the initiation of meristematic cells located just outside and between the vascular bundles (the root initials), (2) the differentiation of old stem tissue and establishing vascular connections with the shoot.

If cuttings are exposed to the air they are cut again before being inserted into the rooting medium. If cuttings are exposed to the air they are cut again before being inserted into the rooting medium. If cuttings are exposed to the air they are cut again before being inserted into the rooting medium.
of holes are made in the rooting medium with a tapered stick, slightly larger in diameter than the cutting, to be rooted, treated with growth regulators and fungicides (such as Rootone F or Hormex), and each cutting placed between 10 centimeters (4 inches) apart. The rooting medium is lightly tamped around the cutting, taking care not to scrape off the growth regulator. The cuttings are then watered with a mild nutrient solution once a day.

weeks. At this time the hardening-off process begins, preparing the delicate cuttings for a life in bright sunshine on their own. It is necessary to water them with a dilute nutrient solution or feed with finished compost as soon as the momentum. When vegetative cuttings are placed outside under the prevailing photoperiod they will react accordingly (e.g., if too cold for them to be put out, then they may be kept in a vegetative condition by supplementary light and nutrients).

ium. Since the discovery in 1984 that auxins such as IAA stimulate the production of adventitious roots, and rooting, many new techniques of treatment have appeared. It has been found that mixtures of growth regulators and phenoxy compounds and fungicides in commercial preparations. Many growth regulators deteriorate rapidly, and so, but no inductive effect has been noticed. As soon as roots emerge, nutrients are necessary; the shoot cannot certainly help root growth; nitrogen is especially beneficial. Cuttings are extremely susceptible to fungus attack, using fungicide that is sometimes applied in powdered form along with growth regulators. This is done by rolling the roots may fail to produce roots and rooting will certainly be inhibited. It is very important to select a light, well ventilated with oxygen (O2) gas; enriched rooting solutions have been shown to increase rooting in many plant species. Oxygen could displace carbon dioxide which is also vital for proper root initiation and growth. If oxygen levels are low, roots will form only near the surface of the medium, whereas with adequate oxygen levels, roots will tend to form along the entire length of the implanted shoot, especially at the cut end.

ated to ensure proper rooting, aeration of the rooting media may be facilitated by aerating the water used in irrigating the leaves, from where much of it runs off into the soil, aiding rooting. Oxygen enrichment of irrigation water is adsorbed by the water. An increase in dissolved oxygen of only 20 parts per million may have a great influence on the atmosphere. Air from a small pump or bottled oxygen may also be supplied directly to the rooting media through the nutrient solutions are made up as needed. Treatments with vitamin B1 (thiamine) seem to help roots grow, but no inductive effect has been noticed. As soon as roots emerge, nutrients are necessary; the shoot cannot maintain a high-quality soil with good drainage such as that used for seedling bacteria and fungus. A small amount of soil can easily be sterilized by spreading it out on a cookie sheet and heating it in an oven at 150°C for 1 hour. The soil may be treated by chemical fumigants. Chemical fumigation avoids the breakdown of organic material by heat and microorganisms, and in sects. One gallon of commercial formalin (40% strength) is mixed with 50 gallons of water and sealed in plastic bags; large flats and plots are covered with polyethylene sheets. After 24 hours the seal is removed and the soil is enriched with water prior to use. Fumigants such as formaldehyde, methyl bromide or other lethal gases are ve
Layering is a process in which roots develop on a stem while it remains attached to, and nutritionally supported by the parent plant. The stem is then detached and the meristematic tip becomes a new individual shoot while still attached to the parent. Rooting is initiated in layering by various stem treatments which interrupt the downward flow of phloem, auxins, carbohydrates and other growth factors. Rooting occurs in this treated area even though the lateral shoot buds rotting from constant contact with the moist soil surface. Tip layers and serpentine layers may be started in small containers placed near the parental plant. Rooting usually begins with these layers when they become well established, transplanting may be difficult without damaging the tender root system. Shoots on layers may be removed with a sharp razor or clippers after four to six weeks. If the roots have become well established, transplanting may be difficult without damaging the tender root system. Shoots on layers are remoistened periodically. Unwrapping each layer is impractical and would disturb the roots, so a hypodermic syringe is used to inject water, nutrients, fungicides, and growth regulators. If the layers become too wet the soil will be visible through the clear plastic within four weeks. When the roots appear adequately developed, the layer is carefully unwrapped, and transplanted with the moss and the splint intact. The layer is watered well and placed in a shady spot for a few days to allow the plant to harden-off and adjust to living on its own root system.

Layering involves depriving the rooting portion of the stem of light, promoting rooting. Root-promoting substances and plant hormones are used to encourage rooting. Rooting depends on constant moisture, good air circulation and moderate temperatures at the site of rooting. Where the layers are checked regularly by injecting water until it squirts out and then very lightly squeezing the medium to remove any excess water. Heavy layers on thin limbs are supported by tying them to a large stake, and buried with a small mound of soil. The buried section of stem may be girdled by cutting, crushed with a loop of wire, or twisted to disrupt the phloem tissue and cause the accumulation of substances which promote rooting. Air layers are most useful to the amateur propagator and breeder because they take up little space and allow the efficient cloning of parental stock. Air layering is an ancient form of propagation, possibly invented by the Chinese. The ancient technique of goo tee uses a ball of clay or soil plastered around a girdled stem and held with a wrap of fibers. Above this is suspended a small container of water (such as a bamboo section) with a small hole in the bottom. The water wicks up to the ball of clay and the roots grow out of it. Air layering involves similar procedures except a hypodermic syringe is used to inject water, nutrients, fungicides, and growth regulators. If the layers become too wet the soil will be visible through the clear plastic within four weeks. When the roots appear adequately developed, the layer is transplanted and placed in a shady spot for a few days to allow the plant to harden-off and adjust to living on its own roots, termed a layer. Layering differs from cutting because rooting occurs while the shoot is still attached to the parent. Rooting is initiated in layering by various stem treatments which interrupt the downward flow of photosynthates (products of photosynthesis) from the shoot tip. This causes the accumulation of auxins, carbohydrates and other growth factors. Rooting occurs in this treated area even though the layer remains attached to the parent. Old woody reproductive stems that, as cuttings, would not root may be grafted by air layering because the xylem tissues connecting the shoot to the parental roots remain intact while it roots, thus greatly increasing the chances of success. Old woody reproductive stems that, as cuttings, would not root may be grafted by air layering because the xylem tissues connecting the shoot to the parental roots remain intact while it roots, thus greatly increasing the chances of success. Old woody reproductive stems that, as cuttings, would not root may be grafted by air layering because the xylem tissues connecting the shoot to the parental roots remain intact while it roots, thus greatly increasing the chances of success.

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Some plants grow too tall, and in order to save small samples of them for pollen collection and to conserve space. By the time the pollen is needed, the tall plants may not be mature enough to flower. However, by removing the layer to prevent excessive transpiration and wilting, the plant can be forced to flower profusely, the layers will be rooted and may be cut and removed to an isolated area. Layers taken from pistillate late plants are used for breeding, or saved and cloned for the following season.

Trellising is a common form of modification and is achieved in several ways. A horizontal or slightly slanted flat sheet of 2 to 5 centimeters (1 to 2 inches) is laid on the soil surface perpendicular to the direction of incoming light or to the lowest path of the sun. The seedlings or pistillate clones are placed between the posts, and the limbs are trained to grow horizontally. They are spaced evenly along the wires by hooking the upwardly growing limbs over the wire as they reach for the light. This might prove to be a feasible commercial cultivation technique.

Another method of trellising is used when light exposure is especially crucial, as with artificial lighting systems. Plants are placed under a horizontal or slightly slanted flat sheet of 2 to 5 centimeters (1 to 2 inches) during the early part of the growth cycle will have little effect on flowering, but plants that are pruned late in life, supposedly to promote branching and floral growth, will often flower late or fail to flower at all. This is particularly applicable if a staminate plant from an early maturing strain is grafted to the stock higher up the stem. After two weeks, the unwanted portions of the grafts are cut away. Eight to twelve weeks are needed to complete the graft, and the tape falls off.

Grafting of Cannabis is very simple. Several seedlings can be grafted together into one to produce very interesting specimen plants. One procedure starts by planting one seedling each of several separate strains close to the stock stem and one of the scion (shoot) seedlings at the same level. The cut portions are slipped together such that the inner cut surfaces are touching. The joints are held with a fold of cellophane tape. After eight weeks, the unwanted portions of the grafts are cut away. Eight to twelve weeks are needed to complete the graft, and the tape falls off.

Pruning techniques are commonly used by Cannabis cultivators to limit the size of their plants and promote branching. Several techniques are available, and each has its advantages and drawbacks. The most effective technique is to remove the apical meristem at the top of the plant. This is done by pinching off the growing tip when it becomes 1 to 2 inches long, or by removing the apical meristem with a sharp tool. The plant will then produce two new limbs, which can be trained to grow horizontally. They are spaced evenly along the wires by hooking the upwardly growing limbs over the wire as they reach for the light. This might prove to be a feasible commercial cultivation technique.

Intergeneric grafts between Cannabis and Humulus have fascinated researchers and cultivators for decades. Warmke and Davidson (1943) claimed that Humulus tops grafted upon Cannabis roots produced a completely nontoxic "active ingredient". However, this theory is entirely disproved by later research. Grafts were made between high and low THC strains of Cannabis, and the results showed "... no evidence of transport of intergeneric material". Detailed chromatographic analysis was performed on both donors for each graft and their control populations. The results showed "... no evidence of transport of intergeneric material". Moreover, the THC content of the Humulus tops was not changed by the grafting process.

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Although it is possible to breed Cannabis with limited success without any knowledge of the laws of inheritance, the full potential of diligent breeding, and the line of action most likely to lead to success, is realized by timely maturation of those products sought by the cultivator, without sacrificing seed or clone production.

Cannabis grows largest when provided with plentiful nutrients, sunlight, and water and left alone to grow and mature naturally. It must be remembered that any alteration of the natural life cycle of Cannabis will affect productivity. Imaginative combinations and adaptations of propagation techniques exist, based on specific situations of cultivation. Logical choices are made to direct the natural growth cycle of Cannabis to favor the productivity. Imaginative combinations and adaptations of propagation techniques exist, based on specific situations of cultivation. Logical choices are made to direct the natural growth cycle of Cannabis to favor the

If leaves must be removed, the petiole is cut so that at least an inch remains attached to the stalk. Weaknesses in the limb axis at the node result if the leaves are pulled off at the abscission layer while they are still green.

Removing large amounts of leaves may interfere with the metabolic balance of the plant. If this metabolic change occurs too late in the season it could interfere with floral development and delay maturation.

Leafing is one of the most misunderstood techniques of drug Cannabis cultivation. In the mind of the cultivator, several reasons exist for removing leaves. Many feel that large shade leaves draw energy from the rest of the plant with the most sun exposure and the greatest chance of pollination. The question arises: Is it possible to defeat its original purpose. Large leaves have a definite function in the growth and development of vegetation, and by metabolic upset in the plant. Removal of shade leaves does facilitate more light reaching the center of the plant, such as the flowers. Most Cannabis plants begin to lose their larger leaves when they enter the flowering stage, and this trend continues until senescence. It is more efficient for the plant to reuse the energy and various molecular components of existing chlorophyll than to synthesize new chlorophyll at the expense of the plant.

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in the pollen of the staminate parent and the ovule of the pistillate parent. Fertilization unites these two sets of chromosomes, and the transmitted units determining the expression of a character are known as genes. Individual plants have only one set of genes (in). Upon fertilization one set from each parent combines to form a seed (2n).

Each chromosome contains hundreds of genes, influencing every phase of the growth and development of the offspring. Results in offspring that all exhibit the same trait, and if all subsequent (inbred) generations also exhibit it, the trait is said to be true-breeding. A strain may breed true for one or more traits while varying in other characteristics. For instance, in Cannabis, the compound-pinnate leaf shape is dominant over the recessive webbed leaf shape. The genotype of the compound-pinnate leaf is WW or Ww, and the phenotype is compound-pinnate leaves. The genotype of the webbed leaf is ww, and the phenotype is webbed leaves.

Observation of many populations in which offspring differed in appearance from their parents led Mendel to his theory of genetics. If like only sometimes produces like, then what are the rules which govern the outcome of the cross? Since we know that there were just as many w genes as W genes combined in the offspring, the W gene must be masked by the w gene in the webbed leaf parent. Since each gamete carries one-half (in) of the genetic complement of the offspring, it follows that upon fertilization both "leaf shape" genes of the (2n) offspring will be w. That is, the offspring have only w genes to pass on in their gametes.

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With compound-pinnate leaf shapes. We know that all the gametes produced by the webbed-leaf parents will contain the gene for webbed leaves as W for that trait. Since these two genes both influence leaf shape, we assume that they are related genes. The gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait.

If cross-pollination of two plants with a shared genetic trait (or self-pollination of a hermaphrodite) results in offspring that all exhibit the same trait and if all subsequent (inbred) generations also exhibit it, we say the parents have genes that segregate or are hybrid. Just as a strain can produce offspring true-breeding for a given trait, we can also design crosses to produce true-breeding offspring. Assume that we separate two true-breeding populations of Cannabis, one with webbed and one with compound-pinnate leaf shapes. We know that all the gametes produced by the webbed-leaf parents will contain the gene for webbed leaves as W for that trait. Since these two genes both influence leaf shape, we assume that they are related genes. The gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait, it seems logical that the gametes of a true-breeding strain must each have the same genes for the given trait.
type combinations will form 4 F2 phenotypes in a 9:3:3:1 ratio, the most frequent of which is the
result in 9 F2 phenotypes in a 1:2:1:2:4:2:1:2:1 ratio, directly reflecting the genotype ratio. A mixed dominance involving two independently assorting pairs of genes results in a 9:3:3:1 Mendelian phenotype ratio only if present in the original gene pairs. Also, two new phenotypes, tall/late and short/early, have been created in the genon, termed recombination and explains the frequent observation that like begets like, but not exactly like.

As in the mono-hybrid back-cross. It should be noted that despite dominance influence, an F1 back-cross with 6 of the time, and by the same logic, a back cross with the homozygous-dominant parent will yield the results invaluable in determining the F1 and P1 genotypes. Since all four phenotypes of the back-cross progeny the back-cross phenotype is a direct representation of the four possible gametes produced by the F1 hybrid.

Genes. Gene interaction is the control of a trait by two or more gene pairs. In this case genotype ratios will result in F1 hybrids of the expected 9:3:3:1 for independently assorting traits. If P and C must both be present for any anthocyanin pigment to appear.

Evenly, the simple laws of inheritance have become more complex, but the data may still be interpreted.

In generation to generation.

Gamete of the pistillate parent.

Homozygous hybrid or heterozygous.

They are termed true-breeding or homozygous.

Recently.

2, and subsequent generations.

Chromosomes in the vegetative diploid (2n) condition. Triploid (3n) and tetraploid (4n) individuals have three or four times as many chromosomes as the diploid. The triploid condition would result in 6 F2 phenotypes in a 6:3:3:2:1:1 ratio. Thus, we see that a cross involving two independently assorting pairs of genes results in a 9:3:3:1 Mendelian phenotype ratio only if complete dominance for both gene pairs would result in 9 F2 phenotypes in a 1:2:1:2:4:2:1:2:1 ratio, directly reflecting the genotype ratio. A mixed dominance ratio may be altered. Consider a hypothetical example where 2 dominant gene pairs Pp and Cc control late-season anthocyanin pigmentation (purple color) in Cannabis. If P is present alone, the plant will remain green through out its life cycle despite environmental conditions. If both are present, however, the calyxes of the plant will also exhibit accumulated anthocyanin and turn purple as the leaves do. Let techniques be used to produce this trait?

An F1 offspring is observed.

But of the expected 9:3:3:1 for independently assorting traits. If P and C must both be present for any anthocyanin pigment to appear.

Genes. Gene interaction is the control of a trait by two or more gene pairs. In this case genotype ratios will result in F1 hybrids of the expected 9:3:3:1 for independently assorting traits. If P and C must both be present for any anthocyanin pigment to appear.

Evenly, the simple laws of inheritance have become more complex, but the data may still be interpreted.

In generation to generation.

Gamete of the pistillate parent.

Homozygous hybrid or heterozygous.

They are termed true-breeding or homozygous.

Recently.

2, and subsequent generations.
The increasing popularity of Cannabis and the requirements of agricultural technology will call for uniform hybrid races that are likely to displace primitive populations worldwide. Poorly selected seeds are appearing in North America and elsewhere, the result of attempts by growers and smugglers to supply an ever-increasing market for marijuana. 

Original fiber strains have escaped and become acclimatized (adapted) in the wild habitats of Cannabis. There is little chance that a grower, even a skilled botanist, can determine the degree of genetic wildness or domestication of these seedlings. However, the loss of a few seeds from a polyploid plant to the surrounding wild vegetation is a means of protecting a species. There is hardly a plant more flexible than Cannabis. As climate, diseases, and pests change, the strain evolves and selects new defenses, programmed into the genetic orders contained in each chromosome.

All of the Cannabis grown in North America today originated in foreign lands. The diligence of our ancestors in their collection and sowing of seeds from superior plants, together with the forces of natural selection, have produced the genetic diversity we see today.

Mapping the chromosomes of Cannabis will enable us to picture the location of the genes influencing the phenotype. This will enable geneticists to determine and manipulate the important characteristics contained in the gene pool. Coichicine has received recent media attention as a dangerous poison and while these accounts are probably a bit too lurid, the real dangers of exposure to coichicine have not been fully researched. The use of colchicine is a delicate procedure that requires special care and expertise. The transformation of diploid plants to the tetraploid level inevitably results in the formation of a few plants with an unbalanced set of chromosomes (2n + 1, 2n - 1, etc.). These plants are called aneuploids. Tetraploids are characterized by extremely small seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

The work of Menzel (1964) presents us with a crude map of the chromosomes of Cannabis. Chromosomes 2-6 and 9 are distinguished by the length of each arm. Chromosome 1 is distinguished by a large knob on one end. The size of these chromosomes is not constant, and chromosome 8 is assumed to be the sex chromosome. In the future, chromosome mapping will enable us to picture the location of the genes influencing the phenotype of Cannabis. This will enable geneticists to determine and manipulate the important characteristics contained in the gene pool. Mapping will enable us to picture the location of the genes influencing the phenotype of Cannabis. This will enable geneticists to determine and manipulate the important characteristics contained in the gene pool.

In treated plants with deformed leaf lamina, 90% of the cells are tetraploid (4n 40) and 10% diploid (2n 20). In treated plants, the percentage of tetraploids varies with the concentration of coichicine. In treated plants with deformed leaf lamina, 90% of the cells are tetraploid (4n 40) and 10% diploid (2n 20). In treated plants, the percentage of tetraploids varies with the concentration of coichicine. Two groups of treated plants were observed: one group (0.25%) with untreated seeds and the other (0.50%) with diploid seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

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The height of tetraploid (4n) Cannabis in these experiments often exceeded the height of the original diploid plants by 25-30%. Tetraploids were intensely colored, with dark green leaves and stems and a well-developed root system. Tetraploid plants often revert back to the diploid condition, making it difficult to support tetraploid populations. Polyploids require more water and are more sensitive to changes in environment. Vegetative growth cycles are extended by up to 30-40% in polyploids. An extended vegetative period could delay the flowering of polyploid drug strains and interfere with the formation of the seed containing THC. In treated plants, the percentage of tetraploids varies with the concentration of coichicine. Two groups of treated plants were observed: one group (0.25%) with untreated seeds and the other (0.50%) with diploid seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

Anomalies in leaf growth occurred in 20% and 39%, respectively, of the surviving treated plants. In the first group (0.25%) cannabinoid levels were highest in the survivors, while in the second group (0.50%) cannabinoid levels were highest in the plants with anomalies. Overall, treated plants showed a 166-250% increase in THC with respect to controls and a decrease in the biosynthesis and degradation of THC. THC levels in the control plants were very low (less than 1%). Post-treatment of the survivors with deformed leaf lamina, 90% of the cells are tetraploid (4n 40) and 10% diploid (2n 20). In treated plants, the percentage of tetraploids varies with the concentration of coichicine. Two groups of treated plants were observed: one group (0.25%) with untreated seeds and the other (0.50%) with diploid seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

De Pasquale et al. (1979) conducted experiments with Cannabis which was treated with 0.25% and 0.50% solutions of colchicine at the primary meristem seven days after generation. Treated plants were slightly taller and more vigorous, respectively, of the surviving treated plants. In the first group (0.25%) cannabinoid levels were highest in the survivors, while in the second group (0.50%) cannabinoid levels were highest in the plants with anomalies. Overall, treated plants showed a 166-250% increase in THC with respect to controls and a decrease in the biosynthesis and degradation of THC. THC levels in the control plants were very low (less than 1%). Post-treatment of the survivors with deformed leaf lamina, 90% of the cells are tetraploid (4n 40) and 10% diploid (2n 20). In treated plants, the percentage of tetraploids varies with the concentration of coichicine. Two groups of treated plants were observed: one group (0.25%) with untreated seeds and the other (0.50%) with diploid seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

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Many of the traits such as fiber quality may be improved through polyploidy. Polyploids require more water and are more sensitive to changes in environment. Vegetative growth cycles are extended by up to 30-40% in polyploids. An extended vegetative period could delay the flowering of polyploid drug strains and interfere with the formation of the seed containing THC. In treated plants, the percentage of tetraploids varies with the concentration of coichicine. Two groups of treated plants were observed: one group (0.25%) with untreated seeds and the other (0.50%) with diploid seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions, diploids produce twice as many seeds as tetraploids.

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Inbred Cannabis be attacked by some previously unknown pest or disease, this genetic uniformity could prove genetic complement of resistance cannot be reclaimed from primitive parental material, resistance cannot be irretrievably dropped from the Cannabis gene pool. Human intervention can create new phenotypes by selecting through the slow process of random mutation.

Indeed these principles are often the key to crop improvement, but only when applied knowledgeably and cautiously adaptation relies. At this time, the future of Cannabis lies in government and clandestine collections. The collection used as the primary seed stock for worldwide governmental research is depleted and spoiled.

Several steps must be taken to preserve our vanishing genetic resources, and action must be immediate:

Government seizures and smuggled shipments are seldom reliable seed sources. The characteristics of both parents, even if the exact origin of the sample is certain. Direct contact should be made with the farmer-breeder. Records of every possible parameter of growth must be kept with carefully stored triplicate sets of seeds.

Seed samples should be replenished every third year. Collections should be planted in conditions as similar as possible. of genes and ensure the preservation of the entire gene pool. Half of the original seed collection should be compared and back-crossing. Phenotypic data about these subsequent generations should be carefully recorded and catalogued.

Legal but only for approved, patented strains. Special caution would be needed to preserve variety in the gene pool.

If Cannabis seed. In spite of this, the conscientious cultivator is making a contribution toward preserving and improving the strain. They do not degenerate and can be reproduced if lost. Left to the selective pressures of an introduced environment, most seeded accessions will degenerate and lose potency as they acclimatize to the new conditions. Let me cite an example of a typical grower with good intentions.

Seeds were selected from the best floral clusters of several strains available over the past few years, both imported and domestic. Nearly all of the staminate plants were removed as they matured, and a nearly seedless crop of beautiful plants resulted. After careful consideration, the few seeds from accidental pollination of the best flowers were saved. The second season resulted in plants inferior even to the first crop, and this trend continued year after year. What went wrong? The crop improved the first year. Why did the strain degenerate?

The grower began well by selecting the best seeds available and growing them properly. The seeds selected for the sex were from the best parents, and the collected hybrid seeds produced, on the average, larger and more desirable offspring than the first season. The greatest tendency is for the characteristics of many of the dominant characteristics from both parents to be transmitted to the F1 offspring. These acclimatized members of the third crop have a higher chance of maturing viabili ties, and thereby increase the chance that undesirable characteristics associated with acclimatization will be transmitted to a fully acclimatized weed strain of little drug value.

Seed collection is responsible for carrying on the breeding traditions that have produced the sample. Accurate records of every possible parameter of growth must be kept with carefully stored triplicate sets of seeds.

In the future, Cannabis cultivation for resale, or even personal use, may be legal but only for approved, patented strains. Special caution would be needed to preserve variety in the gene pool.

Seeds and pollen should be collected directly from reliable and knowledgeable sources. Government seizures and smuggled shipments are seldom reliable seed sources. The characteristics of both parents, even if the exact origin of the sample is certain. Direct contact should be made with the farmer-breeder. Records of every possible parameter of growth must be kept with carefully stored triplicate sets of seeds.

Favorable traits of each strain should be characterized and catalogued, and to provide parental material for comparison and back-crossing. Phenotypic data about these subsequent generations should be carefully recorded to aid in understanding the genotypes contained in the collection.

Limited access to the Cannabis gene pool and the possible F2 combinations are tremendous. By the third season the gene pool is tending toward early native environment. These acclimatized members of the third crop have a higher chance of maturing viability, and thereby increase the chance that undesirable characteristics associated with acclimatization will be transmitted to a fully acclimatized weed strain of little drug value.

Goals are vital to progress in breeding Cannabis. What qualities are desired in a strain that it does not already exhibit? These questions suggest goals for breeding. In addition to a basic knowledge of Cannabis botany, propagation, and genetics. A sensitive rapport is established between breeder and plants and at the same time strict guidelines are practiced.

Breeder and plant wizard Luther Burbank stands as a beacon to breeders of exotic strains. His success in improving hundreds of thou sands of seedlings and adults from the world over.
Back-crossing is another technique used to produce offspring with reinforced parental characteristics. In this case, a cross is made between one of the F₁ or subsequent offspring and either of the parents expressing the desired characteristics. After initial field tests, undesirable hybrid seeds are destroyed and desirable hybrid seeds stored for later use. If hybrids are to be reproduced, a clone is saved from each parental plant to ensure continuity. Additionally, as a result of gene recombination, F₁ hybrids are not true-breeding and must be reproduced from the original parental strains.

When breeders create hybrids, they try to produce enough seeds to last for several successive years of cultivation, ensuring a steady supply. (For example, P₁ high-THC X P₁ low-THC yields F₁ hybrids of intermediate THC content. Selfing the F₁ yields F₂ hybrids, of both P₁ [high and low THC] phenotypes, intermediate F₁ phenotypes, and parental traits. From the F₂ hybrid generation, selections can be made for parents which are used to start new true-breeding strains. Indeed, F₂ hybrids might appear with more extreme characteristics than either of the P₁ strains, indicating potential for hybrid vigor results, because dominant genes tend to carry valuable traits and the differing dominant genes inherited from each parent mask recessive traits inherited from the other. This gives rise to particularly large, vigorous, healthy plants, which are always used for hybrid crosses.

Large amounts of hybrid seed are most easily produced by planting two strains side by side, removing the staminate plants of the seed strain, and allowing nature to take its course. Pollen- or seed-sterile strains could be used to generate sterile seedlings, which also increases plant vigor. However, genes for sterility are rare. It is important to remember that parental weaknesses are transmitted to offspring as well as strengths. Because of this, the most vigorous, healthy plants are always used for hybrid crosses.

Hybridization is the process of mixing differing gene pools to produce offspring of great genetic variation from which distinctive individuals can be selected. The wind performs random hybridization in nature, as cross-pollination, cross-fertilization, or simply crossing. If seeds result, they will produce hybrid offspring exhibiting strengths. Because of this, the most vigorous, healthy plants are always used for hybrid crosses.

Growing the staminate plants of the seed strain, and allowing nature to take its course. Pollen- or seed-sterile strains could be used to generate sterile seedlings, which also increases plant vigor. However, genes for sterility are rare. It is important to remember that parental weaknesses are transmitted to offspring if they are used as pollen parents. If the parents represent diverse genetic pools, mutant genes inherited from each parent mask recessive traits inherited from the other. This gives rise to parental weaknesses which are selected since they will probably represent more diverse gene pools.

Geneticists contain recessive genes for a favorable characteristic seen in a parent if the parent was homozygous for that trait, and these desired parental traits. Many breeders stop with the first cross and never realize the genetic potential of the F₁ hybrids for many characteristics, great diversity and recessive recombination can result from back-crossing, and a year is saved by going directly to F₂ hybrids. These F₂ hybrids are more likely to express the desired parental traits and produce new true-breeding strains. Indeed, F₂ hybrids might appear with more extreme characteristics than expected. Selfing the F₁ yields F₂ hybrids, of both P₁ [high and low THC] phenotypes, intermediate F₁ phenotypes, and parental traits. In this case, a cross is made between one of the F₁ or subsequent offspring and either of the parents expressing the desired characteristics. In this case, a cross is made between one of the F₁ or subsequent offspring and either of the parents expressing the desired characteristics.
selected parental trait. Back-crossing is a valuable way of producing new strains, but it is often difficult because poor lighting or greenhouses can be used to protect breeding stock from winter weather. In tropical areas plants seeds from the original P1 group that produced the valuable characteristic so that other P1 plants also exhibit of the original cross (differentiation).

breeding strain breed true for all characteristics. When discussing crosses, we are talking about the inheritance crosses involve one trait, dihybrid crosses involve two traits, and so forth. Plants have certain limits of growth, gene pool. Nothing is actually created by breeding; it is merely the recombination of existing genes into new produced by crossing selected individuals from different high-potency strains of different origins, such as Thailand, every other respect. From this great exchange of genes many phenotypes may appear in the F2 generation. From example, consider some of the offspring from the P1 (parental) cross: Mexico X Thailand. In this case, genes either one. Genes for large stature and early maturation are selected from the Mexican seed-parent, and genes exhibit several of the desired characteristics. To further promote gene segregation, the plants most nearly approaching expression. In the F2 generation there are several individuals out of many that exhibit all five of the selected characters. one acceptable staminate plant is selected along with two pistillate plants (or vice versa). Crosses between each expressing the desired characteristics. Each generation will produce new, more acceptable combinations. This comes from limiting the diversity of the gene pools in the two strains to be hybridized through previous back-crossing. This will establish two strains which are true-breeding for all the originally selected traits. This means that all the recessive inbreeding may by this time have resulted in steady decline in the vigor of the strain.

selected strains can then be interbred to recombine nonselected genes and restore vigor. This will probably the two separate lines, and this is highly unlikely. Now the breeder has produced a hybrid strain that breeds true breeding, hybrids are adapted from a heterozygous gene pool to a homozygous gene pool, providing the geno hybrid crosses with a better chance of predicting the outcome. Hybrids can be created that are not reproducible each year, because the F1 hybrids of two pure-bred lines do not breed true. Thus, a seed breeder can protect the Irrug Cannabis. In the future, however, with the legalization of cultivation, it is a certainty that corporations will legal to grow only certain patented strains produced by large seed companies. Will this be how government

C strains of equatorial origin to the climate of their growing area while preserving potency. Late-maturing, slow America. Even in a green house, it may not be possible to mature plants to their full native potential. Nevertheless, if it is important to preserve unique imported genetics, hybridizing may be inadvisable the ideal in blooming early. At this point the breeder may ignore many other traits and aim at breeding an ear
particular location unless selective pressure is exerted. If further crosses are made with several individuals that
THC content. After these true-breeding lines have been established, a dihybrid pure cross can be made in an-
other words, an acclimatized drug strain.

rable characteristics. A successful breeder is careful not to overlook a characteristic that may prove useful. It
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ng the outcome of crosses,

Crosses made without a clear goal in mind lead to strains that acclimatize while losing many favorable characteristics. A successful breeder is careful not to overlook a characteristic that may prove useful. It
emiptial that original imported Cannabis genetics be preserved intact to protect the species from loss of genetic variety through excessive hybridization. A currently unrecognized gene may be responsible for controll
strains to original parental gene pools.

Once pure breeding lines have been established, plant breeders classify and statistically analyze the offspring to determine the patterns of inheritance for that trait. This is the system used by Gregor
n the outcome of crosses,

Fixing traits (producing homozygous offspring) in Cannabis strains is more difficult than it is in many other flowering plants. With monoecious strains or hermaphrodites it is possible to fix traits by self-pollina-
er, most strains of Cannabis are dioecious, and unless hermaphroditic reactions can be induced, another parent
h a plant not exhibiting the trait, inbred in the F1 generation, and selections of parents exhibiting the favorab
ous strain and then fixed through selfing and selecting homozygous offspring. Dioecious individuals can then be
ent generations.

Acid (IAA), ethrel, and kinetin promoted pistil production in prefloral dioecious Cannabis. Sex alteration has
it is difficult to perform a cross unless it happens to be a hermaphrodite plant. Hormones might be used to com-
complished by changing a pistillate cutting to a staminate (pollen) parent, using a spray of 100 ppm gibberellic
en can then be collected for selfing with the original pistillate parent. Offspring from the cross should also be mon-
e floral production make inferior seed-parents since few pistillate flowers and seeds are formed.

production and seedless drug Cannabis production would be greatly facilitated.

A well-rooted, flourishing cutting from the parent plant is pruned back to 25% of its original size and stripped
ual type often appear. Flowers of the unwanted sex are removed until the cutting is needed for fertilization. E-
er and is much more difficult to perform in the field.

ives rise to four possible recombinant genotypes, a dihybrid cross gives rise to 16 possible recombinant genot
is not effective to raise only 64 offspring and count on getting one homozygous recessive individual. To increa-
us recessive individuals as future parents. All laws of inheritance are based on chance and offspring may not

predicted ratios until many more have been phenotypically characterized and grouped than the theoretical minimums.

It is the sum total of these traits that determines the general phenotype of an individual. It is often difficult to determine if the characteristic being selected is one trait or the blending of several traits and whether these traits are controlled by one or several pairs of genes. It often makes little difference that a breeder does not have plants that are proven to breed true. Breeding goals can still be established. The selfing of F1 hybrids will often give rise to the variation needed in the F2 generation for selecting parents for subsequent generations, even if the percentages that fixed characteristics appear and the breeding of pure strains can begin. By selecting and crossing in improved even if the exact patterns of inheritance are never determined. Complementary traits are eventually expressed by the parent, it is much less likely to appear in the offspring. It is imperative that desirable characteristics cannot be made hereditary. Breeding for as few traits as possible at one time greatly increases the chance of other generally desirable traits such as vigor and size. Determinations of dominance and recessiveness can one of the keys to adaptive survival. However, all the possible combinations will appear in the F2 generation if i.

Complementary traits are eventually combined into one line whose seeds reproduce the favorable parental traits. Inbreeding strains also allows weak recessive traits to express themselves and these abnormalities must be diligently removed from the breeding with other lines or by backcrossing.

After five or six generations, strains become amazingly uniform. Vigor is occasionally restored by crossing with other lines or by backcrossing. Parental plants are selected which most nearly approach the ideal. If a desirable trait is not expressed by the parent, it is much less likely to appear in the offspring. It is imperative that desirable characteristics be hereditary and not primarily the result of environment and cultivation. Acquired traits are not hereditary and cannot be made hereditary. Breeding for as few traits as possible at one time greatly increases the chance of other generally desirable traits such as vigor and size. Determinations of dominance and recessiveness can one of the keys to adaptive survival. However, all the possible combinations will appear in the F2 generation if i.

In-breeding strains also allows weak recessive traits to express themselves and these abnormalities must be diligently removed from the breeding with other lines or by backcrossing.

Now, after further simplifying this wonderful system of inheritance, there are additional exceptions to the rules which must be explored. In some cases, a pair of genes may control a trait but a second or third pair of genes is needed to express this trait. This is known as gene interaction. No particular genetic attribute in which we may be interested is totally isolated from other genes and the effects of environment. Genes are transferred in groups instead of assorting independently. This is known as gene linkage. These genes are spaced along the same chromosome and may or may not control the same trait. The result of linkage is that two chromosomes and they may be limited to expression in only one sex (sex linkage). Crossing over also inter fered with the expected Mendelian outcome. Chance is a major factor in breeding Cannabis, or any introduced plant, and the more reproducing, A plant breeder begins by producing or collecting various prospectuive parents from which the most is evaluated for favorable characteristics. If evaluation indicates that the offspring are not improved, then the process in the field is necessary to check for uniformity and to choose parents for further intermating. This cyclic approach for the plant is more important than memorizing Mendelian ratios. The words of the great Luther Burbank say it.

The first set of traits concerns Cannabis plants as a whole while the remainder concern the qualities of seedlings, leaves, fibers, and flowers. Finally a list of various Cannabis strains is provided along with specific characteristics. Following this order, basic and then specific selections of favorable characteristics can be made.
The size of an individual Cannabis plant is determined by environmental factors such as room for root and shoot growth, adequate light and nutrients, and proper irrigation. These environmental factors influence the phenotypic image of genotype, but the genotype of the individual is responsible for overall variations in gross morphology.
individuals are easily spotted and selected. Many dwarf Cannabis plants have been reported and as dwarf corn and citrus. Cannabis parents selected for large size tend to produce offspring of a larger rains and short (Cannabis ruderalis-Russia) strains yield F1 offspring of intermediate height (Beutler bring more than any other genetic factor. The increased size of hybrid offspring is often amazing and It is not known whether there is a set of genes for "gigantism" in Cannabis or whether polyploid etraploids tend to be taller and their water requirements are often higher than diploids. Yield is ling can be used to increase the yield of any one of these products. However, several of these traits may gene linkage). Inbreeding of a pure strain increases yield only if high yield parents are selected. High fried and manicured. Because of this, many of the most vigorous plants are crossed and seeds selected begins to grow immediately will usually reach a larger size and produce a higher yield in a short t for rich green foliage and rapid, responsive growth. This will ensure that genes for certain hile genes for strength and vigor remain.

Cannabis to be adaptable to many different environmental conditions. Indeed, Cannabis is one of the it has adapted to environmental conditions ranging from equatorial to temperate climates. Domestic t a variety of conditions.

The parental stocks with the highest survival percentages can be selected as prospective parents for an varying growth conditions.

drought and overwatering, and so on. Plants with a particular resistance appear when adverse members of the population might carry inheritable resistance to the environmental factor that the offspring to continuing stress conditions, and selecting carefully for several generations should cessive heat.

may be bred for resistance to a certain disease, such as damping-off fungus. If flats of seedlings are ll have some resistance to damping-off fungus. If this resistance is inheritable, it can be passed on to i, tested by inoculating flats of seedling offspring with damping-off fungus, should yield a more

seeds of Cannabis where one or a few plants are infested with insects while adjacent plants are repelling insect attack, and levels of these vary from plant to plant. Cannabis has evolved defenses over the reproductive and associated vegetative structures of mature plants. Insects, finding the resin outer leaves of the same plant because these develop fewer glandular trichomes and protective nce within leaf and stem tissues which possibly inhibit insect attack, may account for the varying pularity of greenhouse Cannabis cultivation, a strain is needed with increased resistance to mold, eenhouse cultivators destroy any plants which are attacked. Molds usually reproduce by wind-borne ring of the least infected plants should result in strains with increased resistance.

or what the reason for growing it. If Cannabis is to be grown for fiber it is important that the is in the crop mature at the same time to facilitate commercial harvesting. Seed production requires muation of seeds. An uneven maturation of seeds would mean that some seeds would drop and be key to the production of high quality drug Cannabis. Changes in gross morphology are accompanied deter mining the ripeness of Cannabis flowers.

open either evenly or sequentially.

eed for fast or slow flowering and even or sequential ripening. In general, crosses between maturing plants give rise to late-maturing offspring, and crosses between late- and early-maturing at maturation of Cannabis is not controlled by the simple dominance and recessiveness of one gene separate aspects of maturation. For instance, Sorghum maturation is controlled by four separate though breeders do not know the action of each specific gene, they still can breed for the total of
grown for initial selection, as less space is required to raise small seedlings than mature plants. Whorled phyllotaxy and resistance to damping-off are two traits that may be selected just after seedling traits can be very useful in the efficient and purposeful selection of future parental stock. If accurate selection can be exercised on small seedlings, much larger populations can be produced by hormone sprays, mutilation, and altered light cycles. These should prove most useful for fixing traits and sexual type.

If pollen from these few staminate flowers forming on a pistillate plant is applied to a pure pistillate seed parent, the resulting F1 generation should be almost all pistillate with pollen-parent is one which has grown as a pure pistillate plant and at the end of the season, or under artificial environmental stress, begins to develop a very few staminate flowers. Since then it has generally been assumed by researchers and breeders that a cross between ANY unselected hermaphrodite plant and a pistillate seed-parent should result in a population of all pistillate offspring. This is not the case. In most cases, the offspring of hermaphrodite parents tend toward hermaphroditism, which is largely unfavorable for the production of Cannabis other than fiber hemp. This is not to say that there is no tendency for hermaphrodite crosses to alter sex ratios in the offspring. The accidental release of some pollen from predominantly pistillate hermaphrodites, along with the complete eradication of nearly every staminate and staminate hermaphrodite plant may have led to a shift in sexual ratio in domestic populations of sinsemilla drug Cannabis. It is commonly observed that these strains tend toward 60% to 80% pistillate plants and a few pistillate hermaphrodite crosses to alter sex ratios in the offspring. The accidental release of some pollen from predominantly pistillate hermaphrodites, along with the complete eradication of nearly every staminate and staminate hermaphrodite plant may have led to a shift in sexual ratio in domestic populations of sinsemilla drug Cannabis. It is commonly observed that these strains tend toward 60% to 80% pistillate plants and a few pistillate hermaphrodite plants are harvested. Because of this many crosses are made early and seeds selected later.

Understanding of these traits and achievement of results more nearly approaching the goal of timely maturation than the parental strains.

Although every embryo sends out a taproot from which lateral roots grow, the individual growth of a deep taproot, up to 1 meter (39 inches) long, which helps support the plant against winds and is more than 30 centimeters (1 foot). Lateral growth is responsible for most of the roots in Cannabis function is to absorb water and nutrients from the soil. A large root system will be able to feed and there is more water, more oxygen, and more available nutrients. Breeding for root size and shape is often impossible in Cannabis plants, even very large ones, have very small and sensitive root systems. Recently, some medical value. If this proves the case, Cannabis may be cultivated and bred for high alkaloid

Inbreeding of nodes along each branch and the extent of branching at each node. For examples, consider little branching (Oaxaca, Mexico strain). Compare this with a stout, densely branched plant with 5). Different branching patterns are preferred for the different agricultural applications of fiber, flower, pest adapted to fiber production; a short, broad plant with short internodes and well developed branches will tolerate heavy rains and high winds without breaking. This is quite advantageous to outdoor plants (Mexico) which bend in the wind; others select short, stiff plants (Hindu Kush) which resist

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h) Branching - The branching pattern of a Cannabis plant is determined by the frequency of nodes along each branch and the extent of branching at each node. For examples, consider little branching (Oaxaca, Mexico strain). Compare this with a stout, densely branched plant with 5). Different branching patterns are preferred for the different agricultural applications of fiber, flower, pest adapted to fiber production; a short, broad plant with short internodes and well developed branches will tolerate heavy rains and high winds without breaking. This is quite advantageous to outdoor plants (Mexico) which bend in the wind; others select short, stiff plants (Hindu Kush) which resist

As with many traits, it is difficult to make selections for root types until the parents are harvested. Because of this many crosses are made early and seeds selected later.

Although every embryo sends out a taproot from which lateral roots grow, the individual growth of a deep taproot, up to 1 meter (39 inches) long, which helps support the plant against winds and is more than 30 centimeters (1 foot). Lateral growth is responsible for most of the roots in Cannabis function is to absorb water and nutrients from the soil. A large root system will be able to feed and there is more water, more oxygen, and more available nutrients. Breeding for root size and shape is often impossible in Cannabis plants, even very large ones, have very small and sensitive root systems. Recently, some medical value. If this proves the case, Cannabis may be cultivated and bred for high alkaloid

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c) Calyx Size - Mature calyxes range in size from 2 to 12 millimeters (1/16 to 3/8 inch) in length. Calyx size is largely dependent upon age and maturity. Calyx size of a floral

following traits are described from fully mature floral clusters (peak floral stage) before any decline. Chapter IV, Maturation and Harvesting of Cannabis, delves into the secrets and theories of maturation. For now, we will assume that the

floral form it is often difficult to breed Cannabis for floral characteristics. A thorough knowledge of the way a strain matures is important in separating possible inherited traits of

change, and the degree of maturity reached is subject to climatic limits as well as breeder's preference. Because of this interplay between environment and genetics in the control of

leaflets). The ratios (by dry weight) of these various portions vary by strain, degree of pollination, and maturity of the floral clusters. Maturation is a reaction to environmental

advantageous in characterizing plants as future parents of drug strains. At this point it must be noted that pistillate floral clusters are made up of a number of distinct parts. They

stems along the petioles of many of the large primary leaves.

b) Form - The form of a floral cluster is determined by the numbers and relative proportions of calyxes and flowers. A leafy floral cluster might be 70% leaves and have a

winter, many strains begin to stretch and cease calyx production in preparation for rejuvenation and subsequent vegetative growth in the spring. Staminate plants also exhibit

creeper phenotype plant will curve upwards at the end, and floral clusters from the huge upright phenotype will have long, straight floral clusters of various shapes. Early in the

shape of a floral cluster is also determined by the general growth habit of the plant. Among domestic Cannabis phenotypes, for instance, it is obvious that floral clusters from a

proportions of calyxes and flowers. A leafy floral cluster might be 70% leaves and have a
do are more adapted to calyx production, and therefore, to resin production. This factor could be

point it must be noted that pistillate floral clusters are made up of a number of distinct parts. They

nall, resinous, 1-3 leaflets), and outer leaves subtending entire floral clusters (larger, little resin, 3-11

tree of pollination, and maturity of the floral clusters. Maturation is a reaction to environmental

proportion of the flowering clusters at harvest. Both compound and webbed leaf variations seem to be hereditary, be for an ornamental strain or increase leaf yield for pulp production.

as on the plant, at the time of flowering, developed floral clusters of 5-10 pistil late calyxes at the

of the leaf. One of these clusters developed a partial staminate flower but fertilization was unsuccessful. It is

variations in leaves, there are a number of mutations and possible traits in leaf shape. It may turn out that

clustered with a low calyx-to-leaf ratio and narrow leaflets might be associated with a high calyx-to-leaf ratio. If

character of the flowering clusters at harvest. Both compound and webbed leaf variations seem to be hereditary,

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before any decline.

inch) in length. Calyx size is largely dependent upon age and maturity. Calyx size of a floral
lyxes are still considered viable if both pistils appear fresh and have not begun to curl or change shape as it will when the pistils die. It is generally agreed that the production of resin is as the quantity of calyxes produced. Hindu Kush, Thai, and Mexican strains are some of the most prolific.

hybrid strains usually have many rather small calyxes, while imported strains with large calyxes are heavily influenced by the imagination of the cultivator or breeder. A gold strain does not appear to be genetically determined, as the coloration is influenced by accessory pigments, Chlorophyll tends to break down late in the season and anthocyanin pigments accumulate, much as the leaves of many deciduous trees change color in the fall. This does not mean, however, that purple color to develop upon maturation, a strain must have the genetically controlled ability to produce anthocyanin pigments unmasked and become visible. But the color might never be expressed if the environmental conditions did not trigger anthocyanin production. The development of purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis.

Brown colors of Cannabis. They also begin to show in the leaves and calyxes of certain strains as the season progresses. The brown colors are usually due to the accumulation of reddish brown dried pistils. It is possible that different genes may control the coloring of these various parts.

Green colors of Cannabis. The green color of Cannabis stems, calyxes, and pistils color differently in various strains. Since most of the outer leaves during the late flowering stages will be all that remains in the final product. This is why these colors when dried. Anthocyanin accumulation in the stems is sometimes considered a sign of phosphorus deficiency. It is a genetic trait. Also, cold temperatures might interfere with phosphorus uptake, resulting in a deficiency. Pistils in Hindu Kush strains are quite often magenta or pink in color when they first appear. They are viable at this time and turn reddish brown when they develop. The coloring is usually triggered by seasonal change, much as the leaves of many deciduous trees change color in the fall. This does not mean, however, that expression of color is controlled by environment alone and is not an inheritable trait. For purple color to develop upon maturation, a strain must have the genetically controlled ability to produce anthocyanin pigments coupled with a responsiveness to environmental change such that anthocyanin pigments are unmasked and become visible.

Purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis.

Red color in pressed, imported tops is often a result of masses of reddish brown dried pistils. Carotenoid pigments are largely responsible for the yellow, orange, red, and brown colors of Cannabis. They also begin to show in the leaves and calyxes of certain strains as the season progresses.

Gold strain colors. Colombian and Hindu Kush strains often develop purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis. This also means that a strain could have the genes for expression of purple color but the color might never be expressed if the environmental conditions did not trigger anthocyanin production. The development of purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis.

Red strains are usually strong strains. Colombian and Hindu Kush strains often develop purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis. This also means that a strain could have the genes for expression of purple color but the color might never be expressed if the environmental conditions did not trigger anthocyanin production. The development of purple coloration year after year when subjected to low night temperatures during flowering and harvesting of Cannabis.

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Packageability and shelf life are important considerations in the breeding of fresh fruit species and will prove equally important if trade in Cannabis develops after legalization.

Hardly noticeable. Since fresh Cannabis is only available once a year in temperate regions, an important breeding goal has been a strain that keeps well when packaged.

Persistence of Aromatic Principles and Cannabinoids - Cannabis resins deteriorate as they age, and the aromatic principles and cannabinoids break down slowly until they are

breeder will be better able to make field selections of prospective high-THC parents without complicated analysis.

suspected that changes in aromatic terpene levels parallel changes in cannabinoid levels during maturation. As connections between aroma and psycho activity are uncovered, the

Biosynthetic relationships between terpenes and cannabinoids have been firmly established. Indeed, cannabinoids are synthesized within the plant from terpene precursors. It is

generation of different aromatic and nonaromatic terpene polymers. This happens as

growing and while curing after harvest. Additional aromas may interfere with the primary terpenoid components, such as

sor spoilage of the tissue (non-resin) portion of the floral clusters.

Cannabis and other aromatic compounds control the aroma of each plant. The production of each

matters to breed Cannabis for aroma. Breeders of perfume roses often are amazed at the complexity of

omas, and these are occasionally transmitted to hybrid offspring such that they resemble one or both

ere are separated to avoid confusion. Each sample is placed in the corner of a twice-folded, labeled

will release the aromatic principles contained within the resin exuded by the ruptured glandular

sins will ad here to the fingers and bias further sampling. The folded paper conveniently holds the

ass does in wine tasting.

or inhaling to draw a taste across the tongue. Samples should be approximately the same size.

of the aromatic components carried by air that passes over the Cannabis when it is inhaled without

nabis when it is consumed orally. These three are separate entities.

sensed in the aroma, but perceived through the sense of taste instead of smell. Orally ingested Cannabis

acteristically spicy and hot, somewhat like cinnamon or pepper. The taste of Cannabis smoke is

ot be detected in the aroma and unlighted taste.

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regions, an important breeding goal has been a strain that keeps well when packaged. A fresh fruit species and will prove equally important if trade in Cannabis develops after legalization.
aces of Cannabis. Several of these trichomes are glandular and secretory in nature and are divided into
ed glandular trichomes are apparently responsible for the intense secretion of cannabinoid laden resins. The
ers of drug Cannabis. The number and type of trichomes is easily characterized by observation
cludes that a positive correlation exists between the number of glandular trichomes on leaves and
bs, many capitate stalked trichomes means higher THC levels.

e opaque as they mature, as suggested by several authors. Some strains, however, produce fresh
ften some of the most psychoactive strains. Transparent resins, regardless of color, are a sign that the
rs turn opaque as cannabinoid and aromatic levels decline. Resin color is certainly an indication of
riterion for breeding.

ish is formed from detached resin heads. In modern times it might be feasible to breed a strain with
moderate shaking, rather than the customary flailing that also breaks up the plant. This would
benefit from extremely tenacious resin heads that would not fall off during packaging and shipment.

rnally determined by the way it is dried, but, all conditions being the same, some strains dry much
reventing desiccation and high resin content might retard drying. However, it is a misconception that
creted by glandular trichomes, but they are trapped under a cuticle layer surrounding the head cells of
ould rarely if ever have a chance to seal the surface of the epidermal layer and prevent the transpiration
s in rate and extent of drying. Strains may be bred that dry and cure rapidly to save valuable time.

cial drug Cannabis production is the seemingly endless chore of manicuring, or removing the
ly as psychoactive as the inner leaves and calyxes, so they are usually removed before selling as
. Long petioles on the leaves facilitate removal by hand with a small pair of scissors. If there
es inner leaves it is easier to manicure quickly because it is easier to see which leaves to remove.
size, oil content, and protein content. Cannabis seed is a valuable source of drying oils, and
y be developed for food. Also, seeds are selected for rapid germination rate.

they respond to changing environment. Some strains, such as Mexican and Hindu Kush, are famous
aturing and nearly always finish late, if at all. Imported strains are usually characterized as either
ne individuals which mature early and others which mature late. Through selection, breeders have, on
perate conditions; and on the other hand, they have developed green house strains that mature in up to
ntageous to growers who live in areas of late spring and early fall freezes. Consequently, especially

floral production in a few weeks, or the floral clusters may continue to grow and develop for
which it matures, so a plant may wait until late in the season to flower and then grow extensive,

rocess Floral clusters will usually mature and ripen in rapid succession, but sometimes large floral
egin to produce resin and ripen. Once ripening starts it usually spreads over the entire plant, but
ers at a time over several months. Some fruit trees are similarly everbearing with a yearlong season
perennials that continue to flower and mature consistently all year long.

eeded with different strains of Cannabis result from varying levels of cannabinoids. THC is the
ounts of CBN, CBD, and other accessory cannabinoids. We know that cannabinoid levels may be
ed on from parent to offspring. Therefore, cannabinoid levels are in part determined by genes. To
eeding strains with particular cannabinoid contents, an accurate and easy method is necessary for

ve most often see are most likely dominant and any effort to alter genetics and improve Cannabis
for the most important traits. The best breeders set high goals of a limited scope and adhere to their
branching pattern, sex, maturation, and floral characteristics. Most imported varieties have characteristic gross phenotype in nearly every variety. This indicates the complexity of genetic control determining gross phenotype in nearly every domestic strain of Cannabis. In hybrid crosses, some dominant characteristics from each parental variety will be expressed in the F1 offspring. Nearly all of the offspring will resemble both parents and very few will resemble only one parent. This sounds like it is saying a lot, but this F1 hybrid generation is far from true-breeding and the subsequent F2 generation will exhibit great variation, tending to look more like one or the other of the original parental varieties. If the F1 offspring are desirable plants it will be difficult to continue the hybrid plant traits in subsequent generations. Enough of the original F1 hybrid seeds are produced so they may be used year after year to produce uniform crops of desirable plants.

Following is a list of gross phenotypes and characteristics for many imported strains of Cannabis. In general the F1 and F2 pure-bred offspring of these imported varieties are more similar to each other than they are to other varieties and they are termed pure strains. However, it should be remembered that these are average. Gross phenotypes and recessive variations within each trait will occur. In addition, these representations are based on unpruned plants growing in a greenhouse environment that tends to obscure the difference between different strains. This section presents information that is used in the sele
Cannabis indica. Early maturation and the belief by clandestine cultivators that this strain may be exempt from laws controlling Cannabis sativa and indeed may be legal, has resulted in its proliferation.

Screen and collecting the dusty resins that fall off the plants. Adulteration and pressing usually follow in the production of commercial hashish. Strains from this area are often used as type examples for hashish. In these areas hashish is usually made from the resins covering the pistillate calyxes and associated leaflets. These resins are removed by shaking and crushing the flowering tops over a silk screen.

This strain from the foothills (up to 3,200 meters [10,000 feet]) of the Hindu Kush range is grown in small rural gardens, as it has been for hundreds of years, and is used primarily for the production of fiber hemp. Most fiber strains contain CBD as the primary cannabinoid and little if any THC.

Colombian strains appear as relatively highly branched conical plants with a long upright central stem, horizontal limbs and relatively short internodes. The leaves are characterized by highly serrated slender leaflets (7-11) in a nearly complete to overlapping circular array of varying shades of medium green. Colombian strains usually flower late in temperate regions of the northern hemisphere and often seem insensitive to the rapidly decreasing daylength during autumn in temperate growing areas and offered commercially over the last fifty years in both Europe and America. Escaped fiber strains of the midwestern United States are usually tall, skinny, relatively poorly branched, resembling com post heaps, may form CBN as a degradation product of THC. Colombian strains tend to make excellent hybrids with more rapidly maturing strains such as those from Central and South America.

Fiber strains are characterized as tall, rapidly maturing, limbless plants which are often monoecious. This growth habit has been selected by generations of fiber-producing farmers mature more evenly than dioecious strains, and fiber crops are usually not grown long enough to set seed. Several strains have been selected from the primi-

tive climates of Europe, Japan, China and North America. Escaped fiber strains of the midwestern United States are usually tall, skinny, relatively poorly branched, resembling com post heaps, may form CBN as a degradation product of THC. Colombian strains tend to make excellent hybrids with more rapidly maturing strains such as those from Central and South America.

Control of Mexican Cannabis importation and cultivation through tightening border security and the use of Paraquat, Colombian farmers have geared up their operations. Most of the marijuana smoked in America is imported from Colombia. This also means that the largest number of seeds available for it all but a few small areas where labor-intensive cultivation of high quality drug Cannabis such as "la mona" can continue. The fine marijuana of Colombia was often seedless, but commercial grades are nearly always well seeded. As a rule today, the more remote highland areas are the centers of production and older farmers still grow fine Cannabis, and occasional connoisseur crops surface. The older seeds from these highland areas are often superior to modern selections. Lowland marijuana has become the commercial product and is characterized by leafy brown floral clusters and sedative narcotic highs. Now highland marijuana has become the commercial product and is characterized by leafy brown floral clusters and sedative narcotic highs. Now highland marijuana has become the commercial product and is characterized by leafy brown floral clusters and sedative narcotic highs. Now highland marijuana has become the commercial product and is characterized by leafy brown floral clusters and sedative narcotic highs. Now highland marijuana has become the commercial product and is characterized by leafy brown floral clusters and sedative narcotic highs.

Colombian Cannabis originally could be divided into two basic strains: one from the low-altitude humid coastal areas along the Atlantic near Panama, and the other from the more arid mountain areas of southern central Colombia and the highland valleys stretching southward from the Atlantic coast have become primary areas of commercial export Cannabis cultivation. Until recent years high quality Cannabis was available through the black market from both coastal and highland Colombia. Cannabis was also found in some small rural gardens remote from the coasts and even the Caribbean Sea. Where the substrates are fertile and conditions are favorable, even today it is possible to find Cannabis growing wild in the mountains.

Colombian Cannabis was available through the black market from both coastal and highland Colombia. Cannabis was also found in some small rural gardens remote from the coasts and even the Caribbean Sea. Where the substrates are fertile and conditions are favorable, even today it is possible to find Cannabis growing wild in the mountains.

Another strain of Cannabis indica is grown in small rural gardens, as it has been for hundreds of years, and is used primarily for the production of fiber hemp. Most fiber strains contain CBD as the primary cannabinoid and little if any THC.
incorporated into several domestic hybrid strains. They appear as a dark green, large plant of medium height and strong limb growth. The leaves are dark green with coarsely serrated, large, slender

Malawi is a small country in eastern central Africa bordering Lake Nyasa. Over the past few years Cannabis from Malawi has appeared wrapped in bark and rolled tightly, approximately four ounces at a

for hashish making. Lebanese strains resemble Hindu Kush varieties in many ways and it is likely that they are related. Brown in color. As with Hindu Kush strains, these plants are grown for the production of screened and pressed hashish, and the calyx-to-leaf ratio may be less important than the total resin production

Lebanese strains are rare in domestic Cannabis crops but do appear from time to time. They are relatively short and slender with thick stems, poorly developed limbs, and wide, medium-green leaves

Jamaican strains produce a psychoactive effect of a particularly clear and cerebral nature, unlike many Colombian strains. Some strains may also have come to Jamaica from the Caribbean coast of

Jamaica's close proximity to India make it likely that Colombian varieties now predominate in Jamaica even if these varieties were not in leaf shape, seed type and general morphology but they tend to be a little taller, thinner, and lighter green, unlike many Colombian strains. Some strains may also have come to Jamaica from the Caribbean coast of

They are relatively short and slender with thick stems, poorly developed limbs, and wide, medium-green leaves leafy, reflecting a low calyx-to-leaf ratio. The calyces are relatively large and the seeds flattened, ovoid and dark. Many spicy aromas and tastes occur in Indian ganja strains and

Ganja (or flowering Cannabis tops) has been grown in India for hundreds of years. These strains are usually grown in a seedless fashion and are cured, dried, and smoked as marijuana instead of being####kunk weed typify its acrid aroma reminiscent of "primo" hashish from the high valleys near Mazar-i-Sharif,####

converted to hashish as in many Central Asian areas. This makes them of considerable interest to domestic Cannabis cultivators wishing to reap the benefits of years of selective breeding for fine ganja strains are finding their way into domestic American Cannabis crops.

Short stature, early maturation, and high resin production make Hindu Kush strains very desirable for hybridizing and indeed they have met with great popularity. The gene pool of imported Hindu Kush has passed on to the F1 hybrid generation. A fine hybrid may result from crossing a Hindu Kush variety with a strain of short stature, high resin content, early maturation, and sweet taste that will mature high quality flowers
tightly cultivated in many areas of North America. Hindu Kush seeds are usually large, round, and dark grey or brown in color. These leaves have so few broad coarse leaflets that they are often compacted as very resinous leafy balls. Most plants produce flowering clusters with a low calyx-to-leaf ratio, but the maturation and extreme resin production is characteristic of these strains. This may be the result of the acrid smell associated with strains from the Hindu Kush appears very early in the seedling stage of both aromas do often develop but this strain usually loses the sweet fragrance early, along with the clear, cerebral####

strains are usually grown in a seedless fashion and are cured, dried, and smoked as marijuana instead of being

interest to domestic Cannabis cultivators wishing to reap the benefits of years of selective breeding for fine ganja strains are finding their way into domestic American Cannabis crops.

Highly-branched limbs. The leaves are medium green and made up of 7 to 11 leaflets of moderate size and extensive compound branching so that by the time floral clusters form they grow from tertiary or quaternary lin
er, and curved. Seeds are usually small and dark. Many spicy aromas and tastes occur in Indian ganja strains and early 1900s was usually Indian ganja.

Jamaican strains were not uncommon in the late 1960s and early 1970s but they are much rarer today. Both green and brown varieties are grown in Jamaica. The top-of-the-line seedless smoke is kr

as appears stringy and brown much like low land or commercial Colombian strains. Jamaica's close proximity to

re characterized by cerebral psychoactivity and sweet taste. Hermaphrodites are common.

few years Cannabis from Malawi has appeared wrapped in bark and rolled tightly, approximately four ounces at a

elastic American and European Cannabis cultivators immediately planted the new strain and it has been come####

short of medium height and strong limb growth. The leaves are dark green with coarsely serrated, large, slende
days on the distal (tip portion) 20% of each leaflet. The mature floral clusters are sometimes airy, resulting from calyxes are very sweet and resinous, as well as extremely psychoactive. Seeds are large, shortened, flattened, the seed at the base of the seed is uncommonly deep and usually is surrounded by a sharp mature under exposed conditions. Although they mature relatively late, they do seem to have met with pear in small batches of low-quality African marijuana easily available in Amsterdam and other European cities. Thailand.

Russian Cannabis ruderalis is nearly always high in CBD and low in THC. Short stature (10 to 50 centimeters [3 to 18 inches]) and brief life cycle (8 to 10 weeks), wide, reduced leaves and specialized seeds characterize weed Cannabis of Russia. Janischewsky (1924) discovered a ball" and "finger" hashish hand-rubbed from wild plants. Resin production is abundant and psychoactivity is high. Few Nepalese strains have appeared in domestic Cannabis crops but they do seem to .

Most Cannabis in Nepal occurs in wild stands high in the Himalayan foothills (up to 3,200 meters [10,000 feet]). Little Cannabis is cultivated, and it is from select wild plants that most Nepalese strains were grown for seedless flower production and areas of Morocco may still exist where this is the tradition. Moroccan strains resemble both Lebanese and Hindu Kush strains in their relatively broad leaves, short growth habit, and high resin production. Moroccan strains were grown for seedless flower production and areas of Morocco may still exist where this is the tradition.

Because of selection for hashish production, Moroccan strains resemble both Lebanese and Hindu Kush strains in their relatively broad leaves, short growth habit, and high resin production. Mexican strains are thought of as tall, upright plants of moderate to large size with light to dark green, large leaves. The leaves are made up of long, medium width, moderately serrated leaflets arranged in a circular array. The plants mature relatively early in comparison to strains from Colombia or Thailand and produce many long floral clusters with a high calyx-to-leaf ratio and highly cerebral smoking. The seeds have a light colored grey or brown, unmottled perianth. Smaller, darker, more mottled seeds have appeared in Mexican crops, possibly with introduced seed from the largest seed source in the world, Colombia. No commercial seeds are grown for seedless flower production and areas of Morocco may still exist where this is the tradition.

Mexican strains are highly productive and there is a great deal of diversity, ranging from the plants grown in the mountains of Mexico. Mexican strains are tall, upright plants of moderate to large size with light to dark green, large leaves. The leaves are made up of long, medium width, moderately serrated leaflets arranged in a narrow, drooping, hand-like array. The leaves usually lack serrations on the distal (tip portion) 20% of each leaflet. The mature floral clusters are sometimes airy, resulting from calyxes are very sweet and resinous, as well as extremely psychoactive. Seeds are large, shortened, flattened, narrow, reduced leaves and specialized seeds characterize weed Cannabis of Russia. Janischewsky (1924) discovered a ball" and "finger" hashish hand-rubbed from wild plants. Resin production is abundant and psychoactivity is high. Few Nepalese strains have appeared in domestic Cannabis crops but they do seem to have met with pear in small batches of low-quality African marijuana easily available in Amsterdam and other European cities. Thailand.

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Aiming at the dominant phenotypes for the most important traits. The best breeders set high goals of limited scope and adhere to their ideals. Various combinations of these traits are possible and inevitable. The traits we most often see are most likely dominant and the improvement of Cannabis strains through breeding is most easily accomplished by lean Cannabis populations and the socio-economic displacement of Cannabis cultures worldwide. Collectors and breeders are needed to preserve these rare and endangered gene pools before it is too late. American and European Cannabis enthusiasts. As a consequence of this extreme mobility, it is feared that many of the world’s finest strains of Cannabis have been or may be lost forever due to hybridization with foreign strains. The preceding has been a listing of gross phenotypes for several of the many strains of Cannabis occurring worldwide. Although many of them are rare, the seeds appear occasionally due to the extreme mobility of many cultivators and researchers, Thai strains mature late, flower slowly, and ripen unevenly. Retarded flowering has given rise to the story that Cannabis plants in Thailand live and bear flowers for years. Despite these shortcomings, many maturing strains, such as Mexican and Hindu Kush, in a successful attempt to create early-maturing hybrids. Since American troops first returned from the war in Vietnam, the Cambodian, Laotian, Thai, and Vietnamese strains have been regarded as some of the very finest in the world. Currently most Thai strains are very late-maturing and subject to hermaphroditism. It is not understood whether strains from Thailand turn hermaphroditic as a reaction to the extremes of northern temperate weather. Most Thai strains are very late-maturing and subject to hermaphroditism. It is not understood whether strains from Thailand turn hermaphroditic as a reaction to the extremes of northern temperate weather. It is suspected that other Cannabis strains, hybridized with original Thai strains and altered the resultant genetics. Also, wild stands of Cannabis may now be found whether strains from Thailand turn hermaphroditic as a reaction to the extremes of northern temperate weather. It is suspected that other Cannabis strains, hybridized with original Thai strains and altered the resultant genetics. Also, wild stands of Cannabis may now be found. Thai strains are very psychoactive and many hybrid crosses have been made with rapidly maturing strains, such as Mexican and Hindu Kush, in a successful attempt to create early-maturing hybrids. Thai strains are characterized by tall meandering growth of the main stalk and limbs and fairly extensive branching. The leaves are often very large with 9 to 11 long, slender, coarsely serrated leaflets arranged in a drooping hand-like array. The Thai refer to them as “alligator tails” and the name is certainly appropriate. Thai strains are characterized by tall meandering growth of the main stalk and limbs and fairly extensive branching. The leaves are often very large with 9 to 11 long, slender, coarsely serrated leaflets arranged in a drooping hand-like array. The Thai refer to them as “alligator tails” and the name is certainly appropriate.
and dry seasons, the effective growing season may be determined. If an area has too short an effective growing season for drug Cannabis, a greenhouse or other shelter from cold, rainy conditions is used. The timing of area, but at some locations along the equator it is possible to grow two crops of fully mature Cannabis in one year. By locating a particular latitude on the chart, and noting local dates for the last and first frosts and wet Equatorial areas gain and lose daylength twice during the year as the sun passes north and south of the equator, resulting in two identical photoperiodic seasons. Rainfall and altitude determine the growing season of each finishes later than at higher latitudes. However, because the photoperiod is never too long to induce flowering, Cannabis may also be grown in a short season from December through March or April (90 to 120 days). THC production, between 10 and 14 hours. The light cycle at 200 north latitude starts at the summer solstice when the photoperiod is just a little over 13 hours. This means that a long season exists that starts by the spread of escaped Cannabis strains in the midwestern United States. In these areas Can nabis abounds in thousands of pistillate flowers, resulting in thousands of viable seeds from each pistillate plant. As the pistillate plant eventually dies and decomposes.

As of the first flowers to be pollinated dry out, each releases a single seed which falls to the ground. Since seeds from freshly fertilized ovules to large, dark, mature seeds. In this way the plant is able to take advantage of flowered by the spread of escaped Cannabis strains in the midwestern United States. In these areas Cannabis abounds in thousands of pistillate flowers, resulting in thousands of viable seeds from each pistillate plant. As the pistillate plant eventually dies and decomposes. Photoperiod and seasonal cycles are determined by latitude. The most even photoperiods and mildest seasonal variations are found in polar and high altitude locations. Areas in intermediate latitudes show more pronounced changes based on latitude is helpful in exploring the maturation and cycles of Cannabis from various latitudes and t

Pistillate plants continue to develop up to three months longer as they mature seeds. As the calyxes of the first flowers to be pollinated dry out, each releases a single seed which falls to the ground. Since new flowers are continually produced and fertilized, there are nearly always seeds ranging in maturity from freshly fertilized ovules to large, dark, mature seeds. In this way the plant is able to take advantage of flowered by the spread of escaped Cannabis strains in the midwestern United States. In these areas Cannabis abounds in thousands of pistillate flowers, resulting in thousands of viable seeds from each pistillate plant. As the pistillate plant eventually dies and decomposes. Photoperiod and seasonal cycles are determined by latitude. The most even photoperiods and mildest seasonal variations are found in polar and high altitude locations. Areas in intermediate latitudes show more pronounced changes based on latitude is helpful in exploring the maturation and cycles of Cannabis from various latitudes and t

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season, or if they are used indiscriminately for both seasons. Sometimes the only information available is what season the seed plant was grown. It may not be practical to grow a long-season strain from Hawaii in a because of the length of the season and differences in response to photoperiod. For that reason, it is usually necessary to determine if Hawai and California strains have been bred specifically for either the short or long separate set of environmental factors (distinct from the long season) that influence genotype and favor selection of a separate short-season strain. The maturation characteristics can vary greatly between these two strains.

...but it is of relatively low quality for fiber or drug production. In the southern subtropical zone has little Cannabis. These areas usually have a long season from February-March in the southern hemisphere. A short season may also exist from December or January through March or April; one may take use of a third short season from June through September or September through December, but these short seasons are not usually long enough. Southeast Asia, Hawaii, Mexico, Jamaica, Pakistan, Nepal, and India are all major Cannabis-producing areas. Some Cannabis grows in all three of these areas, but none of the south temperate zone includes only the southern portions of Australia, South America, and Africa. Some Cannabis grows in all three of these areas, but none of them are particularly suitable for the growth of Cannabis. The areal season begins during the very long days of June or July, as soon as the seedlings appear, but the days rapidly get shorter and by September the plants begin to flower. Photoperiod is a major factor in the cultivation of drug Cannabis is not practical without a greenhouse. Parts of Russia, Alaska, Canada, and northern Europe in limited quantities but little is grown. Probably the best suited for growth in this area. Fiber strains also grow well in some arctic areas. Breeding programs with northern temperate zones of the world. It is striking that there are many unutilized areas suitable for the culture of Cannabis have the advantage of an extra full or partial season for the cultivation of Cannabis.

Domestic cultivation in much the same pattern as they would in their native conditions. For example, in northern temperate zones while strains from Colombia (equatorial zone) will usually not mature until December. By understanding this, the chances of growing drug Cannabis to maturity are maximized. The short season of Hawaii, Mexico, and other subtropical areas can favor selection of a separate short-season strain. The maturation characteristics can vary greatly between the different climates. It is usually necessary to determine if Hawaii and California strains have been bred specifically for either the short or long season. The variable is what season the seed plant was grown. It may not be practical to grow a long-season strain from...
The factors involved in the growth and maturation of Cannabis do affect final cannabinoid levels. These factors may be controlled to some extent by proper selection of mature floral clusters for harvesting, agricultural pathway at the same time, nor do all of them complete the cycle and turn into THC molecules simultaneously. There is no magical way to influence the cannabinoid biosynthesis to favor THC production, but certain along the cannabinoid biosynthetic pathway. These environmental factors can cause an atypical final cannabinoid profile (cannabinoid levels and ratios). Not all cannabinoid molecules begin their journey through the native environment. Imported examples from Thailand also have long internodes in the pistillate floral clusters. Thai strains may not develop tight floral clusters even in the most arid and exposed conditions; however, this be estimated from the graph of maturation patterns at various latitudes (p.124). In this way it is possible to reproduce exotic foreign environments to more accurately study Cannabis, Tight clusters of calyxes and leaves cause a stretched condition in the floral clusters in response to high humidity, high temperatures, lowered light intensity, and restricted air circulation.

At this time nearly all resin secretion has ceased at temperate latitudes (due to low temperatures), but may still continue in equatorial and subtropical areas that have a and the possibility of re-growth the following season. At this time nearly all resin secretion has ceased at temperate latitudes (due to low temperatures), but may still continue in equatorial and subtropical areas that have a and internode length within floral clusters. Calyx-to-leaf ratios are highest during the peak floral stage. Later stages are usually very short between pairs of calyxes in tight dense clusters. At the end of the maturation cycle, if there is no re-growth, this is most often a sign that the floral clusters are past their reproductive peak; if so, they are preparing for seed production at temperate latitudes (due to low temperatures), but may still continue in equatorial and subtropical areas and tropical environments and extend the period of resin production. It should be remembered that greenhouse cultivation this period involves lower light intensity, and restricted air circulation.

Correct lighting and supplemental lighting in a greenhouse or indoor environment. The localized light cycle particular but possible to reproduce exotic foreign environments to more accurately study Cannabis. Tight clusters of calyxes: internodes may be longer and appear airy and stretched. This seems to be a genetically controlled adaptation to light qualities. Floral clusters. Thai strains may not develop tight floral clusters even in the most arid and exposed conditions; a few weeks later after the pistils have begun to turn brown but before the calyx stops growing, it seems obvious that floral clusters reach within this period of maximum resin secretion, and these variations influence the nature of the resin's ps

It must be remembered that many environmental factors, such as light, temperature, and humidity, influence the path of a molecule along the cannabinoid biosynthetic pathway. There is no magical way to influence the cannabinoid biosynthesis to favor THC production, but The factors may be controlled to some extent by proper selection of mature floral clusters for harvesting, agricultural practices, and growing conditions such as light, temperature, and nutrient levels.
rther modified by the fact that each individual calyx goes through the cannabinoid cycle fairly independently. This means that at any given time the ratio of calyx-to-leaf, the average calyx condition, the condition of the resins for the amateur cultivator to determine the cannabinoid profile of a floral cluster without chromatographic analysis of calyx and resin and internal cannabinoid profile. A better understanding of these subtle changes in canna of the chart. Next, follow the chain of reactions until you find the four isomers of THC acid (tetrahydro-cannabinolic) and other cannabinoids. In the laboratory, Mechoulam has converted CBD acid to THC acids by exposing a solution of ric oxygen molecules (O2) and is irreversible; however, the yield of the conversion is only about 15% THC acid is the precursor to the THC acids, and, although CBD is only mildly psychoactive by itself, it may act with THC and interact synergistically with THC to alter the psychoactive effect (Turner et al. 1975). Indeed, CBD ma

activity in the entire pathway and the one about which we know the most. Personal communication with Raphael Mechoulam has centered around the role of ultraviolet light in the bio-synthesis of THC acids and minor cannabinoids. In the laboratory, Mechoulam has converted CBD acid to THC acids by exposing a solution of n-hexane to ultraviolet light of 235-285 nm. for up to 48 hours. This reaction uses atmospheric oxygen molecules (O2) and is irreversible; however, the yield of the conversion is only about 15% THC acid is the precursor to the THC acids, and, although CBD is only mildly psychoactive by itself, it may act with THC and interact synergistically with THC to alter the psychoactive effect (Turner et al. 1975). Indeed, CBD ma

with geranyl pyrophosphate. Both of these molecules are derived from terpenes, and it is readily apparent that the union of these two molecules forms CBG (cannabigerolic acid) which is the basic cannabinoid precursor to the cannabinoid pathways. CBD acid forms hydroxy-CBG acid. Through the formation of a transition state, C5D acid is the precursor to the THC acids, and, although CBD is only mildly psychoactive by itself, it may act with THC and interact synergistically with THC to alter the psychoactive effect (Turner et al. 1975). Indeed, CBD ma

Environmental conditions influence cannabinoid biosynthesis by modifying enzymatic systems and the resultant potency of Cannabis. High altitude environments are often more arid and exposed to more intense sunlight; can at 1,300 meters (4,350 feet) elevation show that significantly more propyl cannabinoids are formed than the short chain methylene-THCs, but it cannot be discounted that altitude might influence which path of cannabinoid biosynthesis is favored. Arid conditions promote THC production specifically. It is suspected that increased ultraviolet radiation might promote THC production, the conversion of CBC acids to CCY acids, and the conversion of CBD acids to CBS acids. However, certain pathways might potentiate the effects of THC acids in their own right.
Terpene production is also nearing a peak and the floral clusters are beautifully aromatic. Many cultivators prefer to pick some of their strains during this stage in order to produce marijuana with a clear, cerebral,

levels remain stable as the molecules are rapidly converted to THC acids, THC acid synthesis has not been active long enough for a high level of CBN acid to build up from the degradation of THC acid by light and heat.

interrupted. Pistillate plants remain unfertilized and begin to produce capitate-stalked trichomes and accumulate resins in a last effort to remain viable. Since capitate-stalked trichomes now predominate, resin and THC

precious unfertilized ovule. Under wild conditions the pistillate plant would be starting to form seeds and the cycle would be drawing to a close. When Cannabis is grown for sinsemilla floral production, the cycle is

white with many pairs of ripe pistils. Resin secretion is quite advanced in some of the older infertile calyxes, and the young pistillate calyxes are rapidly producing capitate-stalked glandular trichomes to protect the

leaves begin to wilt and turn yellow as the pistillate plant reaches its reproductive peak. In the primordial calyxes the pistils have turned brown; however, all but the oldest of the flowers are fertile and the floral clusters are

darken as they lose fertility, and some resin secretion is observed in trichomes along the veins of the calyx. The newly produced calyxes show few if any capitate-stalked trichomes. As a result of low resin production, only

of CBC and CBD. CBD production begins when the seedling is very small. THC production also begins when the seedling is very small, if the plant originates from a drug strain. However, THC levels rarely exceed 2%

production is low, and there is no economic value other than fiber and leaf. Terpene production starts as the glandular trichomes begin to secrete resin; premature floral clusters have no terpene aromas or tastes. Total

trichomes have begun to develop. Resin secretion is minimal, as indicated by small resin heads and few if any capitate-stalked, glandular trichomes. There is no drug yield from plants at the premature stage since THC

white filaments stretching to test the surroundings. During this stage the surface of the calyxes is lightly covered with fuzzy, hair-like, non-glandular trichomes, but only a few bulbous and capitate-sessile glandular

diameter within the floral clusters is very nearly maximum. The stems are easily visible between the nodes and form a strong framework to support future floral development. Larger vegetative leaves (5-7 leaflets)

now, tapered calyxes may be found nestled in the leaflets near the stem tips and the fresh pistils appear as tiny, white trichomes. As they develop, the pistils become fleshy, green, and elongate with the tiniest of petals.

pistillate flowers appear at the tips of limbs in addition to the primordial pairs along the main stems. By this stage the nodes and form a strong framework to support future floral development. Larger vegetative leaves (5-7 leaflets)

predominate and smaller tri-leaflet leaves are beginning to form in the new floral axis. A few narrow, tapered calyxes may be found nestled in the leaflets near the stem tips and the fresh pistils appear as tiny, white

grows. During this stage the surface of the calyxes is lightly covered with fuzzy, hair-like, non-glandular trichomes, but only a few bulbous and capitate-sessile glandular trichomes. There is no drug yield from plants at the premature stage since THC

reaction as more an "effect" than a "high." This most likely results from small amounts of THC as well as traces of resin when the seedling is very small, if the plant originates from a drug strain. However, THC levels rarely exceed

resin begins when the seedling is very small, if the plant originates from a drug strain. However, THC levels rarely exceed 2%. At this stage floral development is slightly beyond primordial and only a few clusters of immature pistillate flowers appear at the tips of limbs in addition to the primordial pairs along the main stems. By this stage the nodes and form a strong framework to support future floral development. Larger vegetative leaves (5-7 leaflets)

pistillate calyxes emerge from the nodes, subtending each pair of calyxes. These subtending leaves are correctly referred to as bracts. The newly produced calyxes show few if any capitate-stalked trichomes. As a result of low resin production, only

their size through the addition of more calyxes along the secondary stems until they cover the primary stem tips, emerging from secondary stems within the floral clusters. These subtending leaves are correctly referred to as

mordial calyxes the pistils have turned brown; however, all but the oldest of the flowers are fertile and the flower calyxes, and the young pistillate calyxes are rapidly producing capitate-stalked glandular trichomes to protect the

and cycle would be drawing to a close. When Cannabis is grown for sinsemilla floral production, the cytoplasm and accumulate resins in a last effort to remain viable. Since capitate-stalked trichomes now predominate, resin

production is at a peak and has not been active long enough for a high level of CBN acid to build up from the degradation of THC acid by light. Cultivators prefer to pick some of their strains during this stage in order to produce marijuana with a clear, cerebral...

through the progressive degradation of THC acids to CBN acid (cannabinolic acid) and other cannabinoid acids. This process may also be suspected of synergistic modification of the psychoactivity of the primary cannabinoids, THCs. The cannabinoid production is an ongoing process as long as the glandular trichome remains active. Variations in the level of THC in plants during the flowering stage being converted to THC acid. If the rate of THC biosynthesis exceeds the rate of THC breakdown, the THC level in the plant will continue to rise. A clear or slightly amber transparent resin is a sign that the glandular trichome is still active. As soon as resin synthesis in the glandular trichome tends to darken to a transparent amber color. If it begins to deteriorate, it first turns translucent and then darkens. As soon as active secretion, THC acids are constantly being formed from CBD acid and breaking down into CBN acid.

see, the logic behind harvesting at a specific time is easier to understand. The usual aim of timing the moment of harvest is to select the propyl homologs, to approximate the desired psychoactive effect. Since THC acids are being broken down to THC and CBD as the plants reach their reproductive peak, THC is converted to CBD. The THC level in the plant will continue to rise. A clear or slightly amber transparent resin is a sign that the glandular trichome is still active. As soon as resin synthesis in the glandular trichome tends to darken to a transparent amber color. If it begins to deteriorate, it first turns translucent and then darkens. As soon as active secretion, THC acids are constantly being formed from CBD acid and breaking down into CBN acid.

reaction as more an "effect" than a "high." This most likely results from small amounts of THC as well as traces of resin when the seedling is very small, if the plant originates from a drug strain. However, THC levels rarely exceed 2%.
Resins generally accumulate steadily while the plant matures, but strains may vary as to the stage of peak resin secretion. Seed percentage increases exponentially with time if the crop is well fertilized, but most samples out during the peak floral stage irrespective of whether leaf growth accelerates or calyx growth continues at a later stage. Production ceases. Other strains continue to produce calyxes at the expense of leaves, and the calyx percentage increases steadily throughout maturation. In both cases, there is some tendency for calyx percentage to level strains the percentage of inner leaves drops sharply during the peak floral stage and rises again as calyx production slows and leaf production increases in the late floral stage.

It is important to understand differences in the anatomy of floral clusters for each Cannabis strain. Trends in the relative quantity (dry weight) of various parts (such as leaves, calyxes and trichomes) at various harvest dates are characteristic of particular strains and may vary widely. Some generalizations can be made. In most cases, the percentage of stem weight steadily decreases as the floral cluster matures. Rejuvenation growth can account for a sudden increase in stem percentage. The percentage of inner leaves usually starts very low and climbs rapidly as the floral clusters mature. This often reflects increased leaf growth near the end of the season. In many cases the percentage of inner leaves is highest at this stage, but the period of maximum resin production has passed. If climatic conditions are harsh, resins and cannabinoids will begin to decompose. As a result, resin yield may activity of the resin has dropped. THC decomposes to CBN in the hot sun and will not remain intact or be repla on by sunlight, the higher psychoactivity of amber resins may be a secondary effect. It may be that the THC ions develop opaque, white resin heads as a result of terpene polymerization and THC decomposition. Opaque resin production completely stopped. Floral clusters left to ripen until the bitter end usually produce inferior marijuana of lowered THC level, especially outdoors in bad weather.

By this stage plants are well past the main reproductive phase and their health has begun to decline. Many of the larger leaves have dropped off, and some of the small inner leaves begin to change color. As the pistils turn brown and begin to fall off. Only the last terminal pistils are still fertile and swollen calyxes ditional capitulate-stalked glandular trichomes is rare, although some existing trichomes may still be elongating terpene molecules (which make up most of the resin) produces long chains and a more viscous and darker-col transparent amber color of mature resin is usually indicative of high THC content. Many cultivators agree that characteristic. Particularly potent Cannabis from California, Hawaii, Thailand, Mexico, and Colombia is often en from other equatorial, subtropical and temperate zones where the growing season is long enough to accom on to fully mature resins unless a greenhouse is used. Specially acclimatized strains are another possibility. Th

The weight yield of floral clusters is usually highest at this point, but strains may begin to grow an excess of leaves in late-stage clusters to catch additional energy from the rapidly diminishing autumn sun. Terpene secretion changes along with cannabinoid secretion and psychoactive effect. Various terpenes, terpene polymers, and other aromatic principles are produced and ripen at different times in the development of the fresh plant. Cannabinoid production favors high THC acid and rising CBN acid content at this stage, produced from CBD acid. CBD acid may accumulate because not enough energy is available to complete synthesis slows, because THC acid levels decrease as it decomposes, and at the same time CBD acid levels re characterized by more somatic and sedative effects. Some cultivators prefer this to the more cerebral and clear e plant continues senescence (decline towards death). In unusual situations, however, rejuvenation will begin highlighted by striking color changes in the floral clusters. Leaves, calyxes, and stems display auxiliary pigment is near. In warm areas, rejuvenation starts as vegetative shoots form within the floral clusters. These shoots plant were reaching for limited winter light. Leaf production is accelerated as plants reach the rejuvenation st erior marijuana of lowered THC level, especially outdoors in bad weather.

Autumn colors and tastes are often less resinous and tar like than at later stages. Many strains, if they are harvested in the peak floral stage, lack the completely developed aroma, taste and psychoactive level that appear

...
The floral cluster will snap when bent. In plant research, dry weight is done in ovens at higher temperatures, but leaves, calyxes, seeds, and stems are segregated and each group weighed individually. The percentage is determined on variety and harvest date. Inner leaf percentages fluctuate between 15 and 45% of dry weight; stems rank third in resin production. A strain where maximum calyx production occurs simultaneously with peak resin production is best able to raise this defense. Forcing plants to produce is a perverse ideal and alien to the principles of organic agriculture. Plants are not machines that can be worked faster and harder to produce more. The life inadequacies in the environment limits the true expression of phenotype and cannabinoid potential. Cannabis finds a normal adaptive defense in the production of THC laden resins, and it seems logical that a healthy plant may actually promote earlier flowering. Most cultivators believe that planting early gives the plant plenty of time to flower, but this is not necessarily true.

Cool night temperatures seem to promote flowering in plants that have previously differentiated sexually. Extended cold periods, however, cause metabolic processes to slow and maturation to cease. Most temperate phytochrome) acts as a switch, causing the plant to follow the flowering cycle. THC production is probably associated with the induction of flowering resulting from the photoperiod change. Extend daylength, while the sun supplies the energy needed for growth and THC biosynthesis. It is not known why at least 10 hours (and preferably 12 or 13 hours) of light are needed for high THC production. This is not production requires 11-12 hours of continuous darkness to induce flowering and at least 10 hours of light for adequate THC production (Valle et al. 1978). In a greenhouse, supplemental lighting need be used only to extend the day to bring on increased with only a 40-watt bulb. A reasonable theory is that a light-sensitive pigment in the plant (possibly a flavin) is produced by the induction of flowering resulting from the photoperiod change.

In general, it is considered most important that the plant be healthy for it to produce high THC levels. The genotype of the plant, a result of seed selection, is the primary factor which determines the THC level. Proper light for adequate THC production is the key to producing high-THC Cannabis in all circumstances. Stress resulting from inadequate light causes the final THC level, but it does cause rapid maturation and yellow gold coloration in the floral cluster (Peters 1973). Impaling with nails, pine splinters, balls of opium, and stones are clandestine folk methods of promoting flowering, taste and THC production. However none of these have any valid documentation from the original culture or scientific basis. Symbiotic relationships between herbs in companion plantings are known to influence the production of essential oils. Experiments might be carried out with different herbs, such as stinging nettles, as companion plants for Cannabis, in an effort to stimulate resin production. In the future, agricultural techniques may be discovered which specifically promote THC biosynthesis.

There is really no confirmed method of forcing increased THC production. Many techniques have developed through misinterpretations of ancient tradition. In Colombia, farmers girdle the stalk of the main stem to raise the final THC level, but it does cause rapid maturation and yellow gold coloration in the floral cluster (Peters 1973). Cannabis finds a normal adaptive defense in the production of THC laden resins, and it seems logical that stress resulting from the deprivation of light and heat also destroy THC. In a drug strain, a bio-synthetic rate must be maintained such that substantial amounts of THC can be produced in a season. The role of light is to increase THC biosynthesis. The genotype of the plant, a result of seed selection, is the primary factor which determines the THC level. Proper light for adequate THC production is the key to producing high-THC Cannabis in all circumstances. Stress resulting from inadequate light causes the final THC level, but it does cause rapid maturation and yellow gold coloration in the floral cluster (Peters 1973). Impaling with nails, pine splinters, balls of opium, and stones are clandestine folk methods of promoting flowering, taste and THC production. However none of these have any valid documentation from the original culture or scientific basis. Symbiotic relationships between herbs in companion plantings are known to influence the production of essential oils. Experiments might be carried out with different herbs, such as stinging nettles, as companion plants for Cannabis, in an effort to stimulate resin production. In the future, agricultural techniques may be discovered which specifically promote THC biosynthesis.
months of increasing photoperiod before the days begin to get shorter following the solstice in June. Huge vegetative plants begin to get shorter, these older plants may be reluctant to flower because of the floral inhibitors formed in the later harvest date into November or December. Cannabis started during the short days of December or January will flower the long season ahead. No increased potency has been noticed in old rejuvenated plants. Plants started in late June, though they begin flowering immediately, possibly because they haven't built up as many long-day floral inhibitors. These later plantings yield smaller plants because they have a shorter vegetative cycle. This may prove an advantage they begin to flower. Late plantings after the summer solstice receive short inductive photoperiods almost immediately after flowering. Although flowering is delayed, the small plants rapidly produce copious quantities of flowers in a fine

Floral development of Cannabis. High nitrogen levels in the soil during the seedling stage seem to favor pistil development of the floral clusters. Phosphorus and potassium are both vital to the floral maturation of Cannabis. High-phosphorus fertilizers such as super phosphate, rock phosphate, or bone meal; these tend to cause less shock in the maturing plant. They are a poor choice for producing floral clusters with a metallic, salty flavor. Extremes in nutrient levels usually affect the growth of the plant, produce some strange effects. They can stimulate flowering in some cases, but they also stimulate sex reversal.

Drugs, and resin are produced from various parts of the Cannabis plant. The methods of harvesting, drying, curing, and storing floral clusters are responsible for the production of seeds, drugs, and aromatic resins. Fibers are produced from the other parts of the plant. Cultivation might be stored for a longer time if the initial sample is large enough to provide sufficient seeds for another generation. If a strain is to be preserved, it is necessary to grow and reproduce it every three years, so fewer of them will germinate, but even after 5 to 6 years a small percentage of the seeds usually still germinate. Old batches of seeds also tend to germinate slowly (up to 5 weeks). This means that a batch of seeds for storage should be studied to determine whether it is sufficiently fertile.

Seeds are allowed to dry completely and all vegetable debris is removed before storage. This prevents spoilage caused by molds and other fungi. Seeds to be used for oil production may be stored in bags, boxes, or jars, but they should be thoroughly air dried. Seeds preserved for future germination are thoroughly air dried in paper envelopes or cloth sacks and thoroughly wrapped in bundles and stored in a cool, dry area. The yield of seed can be increased by hand or machine. Cannabis seeds usually fall easily from the floral clusters when mature. The remainder of the cluster can be harvested by applying pressure on it and rolling it between the palms to remove excess seeds and leaves.

Fiber or hemp Cannabis is usually grown in large, crowded fields. Crowding of seedlings results in tall, thin plants with few limbs and long, straight fibers. The total field is harvested when the fiber content reaches the correct level but before the fibers begin to lignify or harden. The cut stalks are stripped of leaves and bundled to dry. Fibers are extracted by natural or chemical retting, Retting is the breaking down of the outside skin layer of the stalk, organisms such as fungi and bacteria. Dew may also wet the stalks, and they are turned frequently to evenly wet them and avoid excessive decay. Continued soaking, attack by organisms, and pounding of the stalks results in the liberation of individual fibers from their vascular bundles. Natural retting takes from one week to a month. The fibers are thoroughly dried, wrapped in bundles and stored in a cool, dry area. The yield of fiber is

If plants are to be used solely as a pulp source for paper production, they may be harvested at any point in the life cycle when they are large enough to produce a reasonable yield of leaves and small stems. The leaves and small stems are stripped from the larger stalks, and after drying they are bailed and stored or made directly into paper pulp. Cannabis contains approximately 67% cellulose and 16% hemicellulose; this makes it a fine

If the plant is dried whole. This means that all of the water in the plant must pass through the stomata on the surface of the leaves and calyxes instead of through cut stem ends. The stomata close soon after harvest than by any other single cause. When the plant is harvested, the production of fine floral clusters for smoking begins. Cannabis floral clusters are harvested by two basic methods: either individually, usually by uprooting or cutting off the entire plant. In instances where the floral clusters mature sequentially, individual clusters can be removed, which makes drying easier and quicker because the stalks are divided into shorter pieces. Floral clusters will dry much faster if the stalk is removed and the stomata on the surface of the leaves and calyxes instead of through cut stem ends. The stomata close soon after
He who sows the ground with care and diligence acquires greater stock of religious merit than he could gain by the repetition of ten thousand prayers.

The proper harvesting, curing, and storage of Cannabis closes the season and completes' the life cycle. Cannabis is certainly a plant of great economic potential and scientific interest; its rich genetic diversity deserves

Vacuum-sealing machines are available for Mason jars and may be modified to vacuum-sealed bags.

Another opaque container is used to cover the clear glass or plastic wrapping. Clusters are not sealed permanently until they have finished curing. Curing involves the presence of oxygen, and sealing floral clusters will end

air-tight, but glass breaks. It is feared by some connoisseurs that plastic may also impart an unpleasant taste to the floral clusters. In either case, additional care is usually taken to protect the floral clusters from light so

breathe air and water vapor. This may cause the floral clusters to dry out excessively and lose potency. Heat-sealed boilable plastic pouches do not breathe and are frequently used for storage. Glass canning jars are also very

so they do not rub together. Glass jars and plastic freezer bags are the most common containers for the storage of floral clusters. Polyethylene plastic sandwich or trash bags are not suited to long-term storage since they

The leaves act as a wrapper to protect the delicate floral clusters. If manicured before drying, a significant increase in the rate of THC breakdown occurs.

If the container is airtight and not vented, then rot from anaerobic bacteria and mold is often seen. Paper boxes breathe air but also retain moisture and are often used for curing Cannabis. Dry floral clusters

gnificant increase in the rate of THC breakdown occurs.

wn of cannabinoids, but freezing has adverse effects. Freezing forces moisture to the surface from the inside of the plant's intact are well protected from abrasion and accidental removal of resins, but manicured floral clusters are better for the storage of floral clusters. Polyethylene plastic sandwich or trash bags are not suited to long-term stor

tency. Heat-sealed boilable plastic pouches do not breathe and are frequently used for storage. Glass canning jars and some other opaque containers are used to prevent spoilage; this requires extra handling. It is easy to bruise the

fragile and fall from the outside of the calyx if shaken. The less handling the floral clusters receive the better their taste and aroma also improve as chlorophylls and other pigments begin to break down. When floral clusters are dried, bags or jars or clusters is a procedure that keeps the humidity high within the container and allows the pe

le of gases given off during curing. It also exposes the clusters to fresh air needed for proper curing.

is suspected that cannabinoid biosynthesis may also continue for a short time after harvest. Taste and aroma also improve as chlorophylls and other pigments begin to break down. When floral clusters are dried slowly they

apple after it is picked. During this period, cannabinoid acids decarboxylate into the psychoactive cannabinoids and terpenes isomerize to create new polyterpenes with tastes and aromas different from fresh floral clusters. It

the tissues and may remain there indefinitely. A floral cluster is not dead after harvest any more than an apple is. Certain metabolic activities take place for some time, much like the ripening and eventual spoilage of apples. Cannabinoids and terpenes isomerize to create new polyterpenes with tastes and aromas different from fresh floral clusters. When floral clusters are dried slowly they

Paper boxes breathe air but also retain moisture and are often used for curing Cannabis. Dry floral clusters

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Cannabis is a tall, erect, annual herb. Provided with an open sunny environment, light well-drained composted soil, and ample irrigation, Cannabis can grow to a height of 6 meters (about 20 feet) in a 4-6 month growing season. Exposed river banks, meadows, and agricultural lands are ideal habitats for Cannabis since all offer good sunlight. In this example an imported seed from Thailand is grown without pruning and becomes a large female plant. A cross with a cutting from a male plant of Mexican origin results in hybrid seed which is stored for later planting. This example is representative of the outdoor growth of Cannabis in temperate climates.

Seeds are planted in the spring and usually germinate in 3 to 7 days. The seedling emerges from the ground by the straightening of the hypocotyl (embryonic stem). The cotyledons (seed leaves) are slightly unequal in size, narrowed to the base and rounded or blunt to the tip. The hypocotyl ranges from 1 to 10 centimeters (1 to 3 inches) in length. About 10 centimeters or less above the cotyledons, the first true leaves arise, a pair of oppositely oriented single leaflets each with a distinct petiole (leaf stem) rotated one-quarter turn from the cotyledons. Subsequent pairs of leaves arise in opposite formation and a variously shaped leaf sequence develops.

If a plant is not crowded, limbs will grow from small buds (located at the intersection of petioles) along the main stem. Each sinsemilla (seedless drug Cannabis) plant is provided with plenty of room to grow long axial Cannabis shows a dual response to daylength; during the first two to three months of growth it responds to increasing daylength with more vigorous growth, but in the same season the plant requires shorter days to flower.

Cannabis flowers when exposed to a critical daylength which varies with the strain. Critical daylength applies only to plants which fail to flower under continuous illumination, since those which flower under continuous illumination have no critical daylength. Most strains have an absolute requirement of inductive photoperiods (short days or long nights) to induce fertile flowering and less than this will result in the formation of The time taken to form primordia varies with the length of the inductive photoperiod. Given 10 hours per day of light a strain may only take 10 days to flower, whereas if given 16 hours per day it may take up to 90 days.

Cannabis is a dioecious plant, which means that the male and female flowers develop on separate plants, although monoecious examples with both sexes on one plant are found. The development of branches containing flowering organs varies greatly between males and females: the male flowers hang in long, loose, multi-branched, clustered limbs up to 30 centimeters (12 inches) long, while the female flowers are tightly crowded.

Note: Female Cannabis flowers and plants will be referred to as pistillate and male flowers and plants will be referred to as staminate in the remainder of this text. This convention is more accurate and makes examples of the sexes of Cannabis easy to understand.

The first sign of flowering in Cannabis is the appearance of undifferentiated flower primordia along the main stem at the nodes (intersections) of the petiole, behind the stipule (leaf spur). In the prefloral phase, the sexes of the flower primordia are not yet differentiated. When the primordia first appear they are undifferentiated sexually, but soon the males can be identified by their curved claw shape, soon followed by the differentiation of round pointed flower buds having five radial segments. The females are recognized by the enlargement of a symmetrical tubular calyx (floral sheath). They are easier to recognize at a young age than male primordia. The first female calyxes tend to lack paired pistils (pollen-catching appendages) though initial male flowers often mature and shed viable pollen. In some individuals, especially hybrids, small non-flowering limbs will form at the nodes and are often confused with male flowers.

The female plants tend to be shorter and have more branches than the male. Female plants are leafy to the top with many leaves surrounding the flowers, while male plants have fewer leaves near the top with few if any with few if any
The term pistil has developed a special meaning with respect to Cannabis which differs slightly from the precise botanical definition. This has come about mainly from the large number of cultivators who have casual knowledge of plant anatomy but an intense interest in the reproduction of Cannabis. The precise definition of pistil refers to the combination of ovary, style and stigma. In the more informal usage, pistil refers to the fused ovary and style, with the stigma being the protrusion of the stigma at the end of the style.

The female flowers appear as two long white, yellow, or pink pistils protruding from the fold of a very thin membranous calyx. The calyx is covered with resin exuding glandular trichomes (hairs). Pistillate flowers are borne in pairs at the nodes one on each side of the petiole behind the stipule of bracts (reduced leaves) which conceal the flowers. The calyx measures 2 to 6 millimeters in length and is closely applied to, and completely surrounds the female flowers.

In male flowers, five petals (approximately 5 millimeters, or 3/16 inch, long) make up the calyx and may be yellow, white, or green in color. They hang down, and five stamens (approximately 5 millimeters long) emerge, consisting of slender anthers (pollen sacs), splitting upwards from the tip and suspended on thin filaments. The exterior surface of the staminate calyx is covered with non-glandular trichomes. The pollen grains are released with the help of insects, the wind, or through self-pollination.

Before the start of flowering, the phyllotaxy (leaf arrangement) reverses and the number of leaflets per leaf decreases until a small single leaflet appears below each pair of calyxes. The phyllotaxy also changes from opposite to alternate. Once flowering begins, the male flowers take on a more prominent role as they begin to develop flowers at the nodes, and the female flowers begin to develop seeds. Male plants grow rapidly and can mature in as little as 2 months, while female plants can take up to 5 months to mature.

The differences in flowering patterns of male and female plants are expressed in many ways. Soon after dehiscence (pollen shedding) the staminate plant dies, while the pistillate plant may mature up to five months after flowering. Viable flowers are formed if little or no fertilization occurs. Compared with pistillate plants, staminate plants show a more rapid increase in height and a more rapid decrease in leaf size to the bracts which accompany the flowers.

Many factors contribute to determining the sexuality of a flowering Cannabis plant. Under average conditions with a normal inductive photoperiod, Cannabis will bloom and produce approximately equal numbers of pure staminate and pure pistillate plants with a few hermaphrodites (both sexes on the same plant). Under conditions of extreme stress, such as nutrient excess or deficiency, mutilation, and altered light cycles, populations have been observed to produce more staminate or more pistillate plants.

Just prior to dehiscence, the pollen nucleus divides to produce a small reproductive cell accompanied by a large vegetative cell, both of which are contained within the mature pollen grain. Germination occurs 15 to 20 minutes after contact with a pistil. As the pollen tube grows the vegetative cell remains in the pollen grain while the generative cell enters the pollen tube and migrates toward the ovule. The generative cell divides into two sperm cells, one of which fertilizes the ovule to produce a seed, while the other sperm cell is used for pollination.

Pollination of the pistillate flower results in the loss of the paired pistils and a swelling of the tubular calyx where the ovule is enlarging. The staminate plants die after shedding pollen. After approximately 14 to 35 days the seed is matured and drops from the plant, leaving the dry calyx attached to the stem. This completes the normally 4 to 6 month life cycle, which may take as little as 2 months or as long as 10 months. Fresh seeds are harvested, and care is taken to prevent mold and pest damage.

The hard mature seed is partially surrounded by the calyx and is variously patterned in grey, brown, or black. Elongated and slightly compressed, it measures 2 to 6 millimeters (1/16 to 3/16 inch) in length and 2 to 4 millimeters in width. Careful closed pollinations of a few selected limbs yield hundreds of seeds of known parentage, which are removed after they are mature and beginning to fall from the calyxes. The remaining floral clusters are sinsemilla or seedless and continue to mature on the plant. As the unfertilized calyxes swell, the glandular trichomes on the surface grow and secrete aromatic THC-laden resins. The mature, pungent, sticky floral clusters are harvested, and care is taken to prevent mold and pest damage.
The careful propagator, however, can produce as many seeds of pure types as needed for future research without risk of pollinating the precious crop. Staminate parents exhibiting favorable characteristics are reproductively potential.

If genes in the plant's genome influence the tendency to produce a pistillate or staminate condition, then the pigment production and cannabinoid metabolism could be affected. Increased resin production is important with respect to propagation. Sinsemilla plants continue to produce new floral clusters until late fall, while seeded plants cease floral production. It is also suspected that capitate-stalked trichome production might cease when the pistillate condition is reached.

The exact nature of these changes is unknown but probably involves imbalance in the enzymatic systems controlling cannabinoid production. Upon fertilization, the plant's energies are channeled into seed production instead of fruit production. The development of seeds if freely pollinated. Sinsemilla marijuana is grown by removing all the staminate plants from a patch, eliminating every pollen source, and allowing the pistillate plants to produce massive clusters of unfertilized seeds.

Growers of seeded marijuana for smoking or hashish production collect vast quantities of seeds that fall from the flowers during harvesting, drying, and processing. A mature pistillate plant can produce tens of thousands of seeds. Each seed contains a nucleus of the new individual plant and is capable of growing into a new plant if it is placed in suitable conditions. The earliest description of a seed is found in a papyrus document of 1500 B.C. which indicated that seeds were to be kept properly in water, because they are reproductively active when watered.

Various theories have arisen to explain the unusually potent psychoactive properties of unfertilized Cannabis. In general these theories have as their central theme the extraordinarily long, frustrated struggle of the pistillate plant to reproduce, and many theories are both twisted and romantic. What actually happens when a pistillate plant remains unfertilized for its entire life and how this ultimately affects the cannabinoid (class of molecules found only in Cannabis) and terpene (a class of aromatic organic compounds) levels remains a mystery. It is assumed, however, that seeding cuts the life of the plant short and THC (tetrahydrocannabinol the major psychoactive compound) levels increase.

Cannabis can be propagated either sexually or asexually. Seeds are the result of sexual propagation. Because sexual propagation involves the recombination of genetic material from two parents we expect to observe variation among seedlings and offspring with characteristics differing from those of the parents. Vegetative methods of propagation (cloning) such as cuttage, layerage, or division of roots are asexual and allow exact genetic reproduction. The actual mechanisms of sexual propagation and seed formation both involve meiosis where the chromosome number is halved. The parent will be transmitted to the offspring, which will resemble each other and the parent. If the genes on one chromosome differ from the genes on its homologous chromosome then the plant is termed heterozygous; the trait is one of the parental types and the offspring are of the parental type.

The terms homozygous and heterozygous are useful in describing the genotype of a particular plant. If the genes controlling a trait are the same on one chromosome as those on the opposite member of the chromosome pair (homologous chromosomes), the plant is homozygous and will "breed true" for that trait if self-pollinated or crossed with an individual of identical genotype for that trait. The traits possessed by the homozygous plant are the same as those possessed by the parent and are called dominant. The traits possessed by the heterozygous plant are different from those possessed by the parent and are called recessive. The trait that is not dominant is called recessive.
of the anthers as they dry, and this may be scraped up and stored for a short time in a cool, dark, dry spot. A simple method is to place the open pollen vial or folded paper in a larger sealable container with a dozen

direct collection may be used. A small vial, glass plate, or mirror is held beneath a recently-opened staminate flower which appears to be releasing pollen, and the pollen is

Pollen may be collected in several ways. If the propagator has an isolated area where staminate plants can grow separate from each other to avoid mutual contamination and can be allowed to shed pollen without

each limb to be re-pollinated, so avoiding confusion. Hermaphrodite or monoecious plants may be isolated from the remainder of the population and allowed to freely self-pollinate if pure-breeding offspring are desired to

plants. If the selected staminate parent drops pollen when there are only a few primordial flowers on the pistillate seed parent, then only a few seeds will form in the basal flowers and the rest of the flower cluster will be

nylon oven bags (for observation windows) with silicon glue. Breathable synthetic fabrics such as Gore-Tex are used with great success. Seed production requires both successful pollination and fertilization, so the

create a greenhouse effect, heating the flowers inside and killing the pollen. Pollination bags are easily constructed by gluing together vegetable parchment (a strong breathable paper for steaming vegetables) and clear

materials tend to collect transpired water and rot the flowers. Light-colored opaque or translucent reflective materials remain cooler in the sun than dark or transparent materials, which either absorb solar heat directly or

light penetration and air circulation for the pollen and seeds to develop without suffocating. Paper and very tightly woven cloth seem to be the most suitable materials. Coarse cloth allows pollen to escape and plastic

controlled so that no pollen escapes to cause random pollinations. Since Cannabis is a wind-pollinated species, enclosures are employed which isolate the ripe flowers from wind, eliminating pollination, yet allowing enough

Controlled hand pollination consists of two basic steps: collecting pollen from the anthers of the staminate parent and applying pollen to the receptive stigmatic surfaces of the pistillate parent. Both steps are carefully con

parent and recorded as follows: "seed of pistillate parent X pollen or staminate parent." Also the date of pollination is included and room is left for the date of seed harvest. Samples of the parental plants are saved as

The single most important task in the proper collection of data is to establish undeniable credibility. Memory fails, and remembering the steps that might possibly have led to the production of a favorable strain does not

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Also, for each of the selected pistillate clusters, a tag containing the same information is made and secured to the limb below the closure of the bag. A warm, windless evening is chosen for pollination so the pollen tube Before the pollen bags are used, the seed parent information is added to the pollen parent data. Included is the number of the seed parent, the date of pollination, and any comments about the phenotypes of both parents.

For each seed parent and two clusters of pistillate flowers for each bag, there are four opportunities to perform the cross successfully. Remember that production of viable seed requires successful pollination, receptive time for fertilization, still early in the seed plant’s life, with plenty of time remaining for the seeds to mature. Healthy, well flowered lower limbs on the shaded side of the plant are selected. Shaded buds will not

When flowering is at its peak and many flowers have just opened, collection is completed, and the limb, with its bag attached, is cut. If the limb is cut too early, the flowers will not have shed any pollen; if the bag remains on the plant too long, most of the pollen will be dropped inside the bag where heat and moisture will destroy it. When flowering is at its peak, millions of pollen grains are released and many more flowers will

The first step in collecting pollen is, of course, the selection of a staminate or pollen parent. Healthy individuals with well-developed clusters of flowers are chosen. The appearance of the first staminate primordia or male calyxes are a sign that the reproductive peak has long passed. Cannabis plants can be successfully pollinated as soon as the first primordia show pistils and until just before harvest, but the largest yield of uniform, healthy seeds is achieved by pollinating in the peak floral stage. At this time, the seed plant is covered with thick clusters of white pistils. Few pistils are brown and withered, and resin production has just begun. This is the most

The progress of pollen release, a flashlight is held behind the bag at night and the silhouettes of the opening flowers are easily seen. In some cases, clear nylon windows are installed with silicon glue for greater visibility. The first flowers begin to swell, they are removed prior to pollen release and destroyed. Tossing them on the ground is ineffective because they may release pollen as they dry. When the staminate plant enters its full

There fore, a method has been designed so that controlled pollen collection and application can be performed in the same area without the need to move staminate plants from their original location. Besides the advantages

Both of the previously described methods of pollen collection are susceptible to gusts of wind, which may cause contamination problems if the staminate pollen plants grow at all close to the remaining pistillate plants. Staminate flowers will often open several hours before the onset of pollen release. If flowers are collected at this time they can be placed in a covered bottle where they will open and release pollen within two days. A

To prevent mold growth, and the pollen bags are re sealed. The bags may be stored as they are until the seed parent is ready for pollination, or the pollen may be removed and stored in cool, dry, dark vials for later use. Any breeze may interfere with collection and cause contamination with pollen from neighboring plants. Early morning is the best time to collect pollen, as it has not been exposed to the heat of the day. All equipment

Enclosures for collecting and applying pollen and preventing stray pollination are simple in design and construction. Paper bags make convenient enclosures. Long narrow bags such as light-gauge quart-bottle bags, giant popcorn bags or bakery bags provide a convenient shape for covering the limb tip. The thinner the paper used the more air circulation is allowed, and the better the flowers will develop. Very thick paper or plastic bags are

To prevent stray pollinations. Large leaves are left on the remainder of the plant but are removed at the limb tips to minimize condensation of water vapor released inside the enclosure. The portions

While the flowers open and pollen is released. During this period the selected pollen plants are carefully watched, daily or hourly if necessary, for developmental rates vary greatly and pollen may be released quite early in some

As the first flowers begin to swell, they are removed prior to pollen release and destroyed. Tossing them on the ground is ineffective because they may release pollen as they dry. When the staminate plant enters its full

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has time to grow before sunrise. After removing most of the shade leaves from the tips of the limbs to be pollinated, the pollen is tapped away from the mouth of the bag. The bag is then carefully opened and slipped over two inverted limb tips, taking care not to release any pollen, and tied securely with an expandable band. The bag is shaken vigorously, so the pollen will be evenly dispersed throughout the bag, facilitating complete pollination. Fresh bags are sometimes used, either charged with pollen prior to being placed over the limb tip, or injected with pollen, using a large syringe or atomizer, after the bag is placed. However, the risk of...

If only a small quantity of pollen is available it may be used more sparingly by diluting with a neutral powder such as flour before it is used. When pure pollen is used, many pollen grains may land on each pistil when only one is needed for fertilization. Diluted pollen will go further and still produce high fertilization rates. Diluting 1 part pollen with 10 to 100 parts flour is common. Powdered fungicides can also be used since this...

The bags may remain on the seed parent for sometime; seeds usually begin to develop within a few days, but their development will be retarded by the bags. The propagator waits three full sunny days, then carefully removes and sterilizes or destroys the bags. This way there is little chance of stray pollination. Any viable pollen that failed to pollinate the seed parent will germinate in the warm moist bag and die within three days, along with many of the unpollinated pistils. In particularly cool or overcast conditions a week may be necessary, but the bag is removed at the earliest safe time to ensure proper seed development without stray pollinations. As soon as the bag is removed, the calyxes begin to swell with seed, indicating successful fertilization. Seed parents then need good irrigation or development will be retarded, resulting in small, immature, warm weather and take usually from two to four weeks to mature completely. In cold weather seeds may take up to two months to mature. If seeds get wet in fall rains, they may sprout. Seeds are removed when the calyx begins to dry up and the dark shiny perianth (seed coat) can be seen protruding from the drying calyx. Seeds are labeled and stored in a cool, dark, dry place, This is the method employed by breeders to create seeds of known...
Seed stocks are graded by the amount of control exerted by the collector in selecting the parents. Grade #1 - Seed parent and pollen parent are known and there is absolutely no possibility that the seeds resulted from pollen.

Asexual propagation (cloning) allows the preservation of genotype because only normal cell division (mitosis) occurs during growth and regeneration. The vegetative (non-reproductive) tissue of Cannabis has 10 pairs of chromosome pairs in the nucleus of each cell. This is known as the diploid (2n) condition where 2n = 20 chromosomes. During mitosis every chromosome pair replicates and one of the two identical sets of chromosome pairs migrates to each daughter cell, which now has a genotype identical to the mother cell. Consequently, every vegetative cell in a Cannabis plant has the same genotype and a plant resulting from asexual propagation will have the same genotype. Clones can be produced from meristematic areas of a plant, such as the shoot apex (meristem), root tip meristems, and the meristematic cambium layer of the stalk. A propagator makes use of these meristematic areas to produce clones that will grow and be multiplied. Asexual propagation techniques such as cuttage, layerage, and division of roots can ensure identical populations as large as the growth and development of the parental material will permit. Clones can be propagated from cuttings, layers, or by dividing roots. Clones are stable and can be propagated indefinitely, allowing for the perpetuation of unique genetic traits.

In Cannabis, mitosis takes place in the shoot apex (meristem), root tip meristems, and the meristematic cambium layer of the stalk. A propagator makes use of these meristematic areas to produce clones that will grow and be multiplied. Asexual propagation techniques such as cuttage, layerage, and division of roots can ensure identical populations as large as the growth and development of the parental material will permit. Clones can be propagated from cuttings, layers, or by dividing roots. Clones are stable and can be propagated indefinitely, allowing for the perpetuation of unique genetic traits.

The concept of clone does not mean that all members of the clone will necessarily appear identical in all characteristics. The phenotype that we observe in an individual is influenced by its surroundings. Therefore, members of the clone will develop differently under varying environmental conditions. These influences do not affect genotype and therefore are not permanent. Cloning theoretically can preserve a genotype forever. Vigor may slowly decline due to poor selection of clone material or the constant pressure of disease or environmental stress, but this trend will reverse if the pressures are removed. Shifts in genetic composition occasionally occur during selection for vigorous growth. However, if parental strains are maintained by infrequent cloning this is less likely. Only mutation of a gene in a vegetative cell that then divides and passes on the mutated gene will permanently affect the genotype of the clone. If this mutated portion is cloned or reproduced sexually, the mutant genotype will be further replicated. Mutations in clones usually affect dominance relations and are relatively rare.

The genetic uniformity provided by clones offers a control for experiments designed to quantify the subtle effects of environment and cultural techniques. These subtleties are usually obscured by the extreme diversity resulting from sexual propagation. However, clonal uniformity can also invite serious problems. If a population of clones is subjected to sudden environmental stress, pests, or disease for which it has no defense, every member of the clone is sure to be affected and the entire population may be lost. Since no genetic diversity is found within the clone, no adaptation to new stresses can occur through recombination of genes as in a sexual population.

In propagation by cuttage or layerage it is only necessary for a new root system to form, since the meristematic shoot apex comes directly from the parental plant. Many stem cells, even in mature plants, have the capability of producing adventitious roots. In fact, every vegetative cell in the plant contains the genetic information needed for an entire plant. Adventitious roots appear spontaneously from stems and old roots as opposed to systemic roots which appear along the developing root system originating in the embryo. In humid conditions (as in the tropics or a greenhouse) adventitious roots occur naturally along the main stalk near the ground.
is essential that the cuttings be placed in water as soon as they are removed or a bubble of air (embolism) may enter the cut end and block the transpiration stream in the cutting, causing it to wilt. Cuttings made under

Cuttings of relatively young vegetative limbs 10 to 45 centimeters (4 to 18 inches) are made with a sharp knife or razor blade and immediately placed in a container of clean, pure water so the cut ends are well covered. It

4 - Girdling a stem by cutting the phloem with a knife or crushing it with a twisted wire may block the downward mobility of carbohydrates and auxin and rooting cofactors, raising the concentration of

Cytokinins are chemical compounds that stimulate cell growth. In stem cuttings, cytokinins suppress root growth and stimulate bud growth. This is the opposite of the reaction caused by auxins, suggesting that a natural

... content cuttings seem to root more poorly than cuttings with medium to low nitrogen content. Therefore, young, rapidly-growing stems of high nitrogen and low carbohydrate content root less well than slightly older

firmness is a sign of high carbohydrate levels in stems but may be confused with older woody tissue. An accurate method of determining the carbohydrate content of cuttings is the iodine starch test. The freshly

... (1/8 to ? inch) in diameter, root most easily. Weak, unhealthy plants are avoided, along with large woody branches and reproductive tissues, since these are slower to root. Stems of high carbohydrate content root most

Although Cannabis cuttings and layers root easily, variations in rootability exist and old stems may resist rooting. Selection of rooting material is highly important. Young, firm, vegetative shoots, 3 to 7 millimeters

growth, root formation, lateral bud inhibition, floral maturation, fruit development, and determination of sex. Great care is exercised in application of artificial growth substances so that detrimental conflicting reactions in

... responsible for regulating normal plant growth. Skoog discusses the use of solutions of equal concentrations of auxins and cytokinins to promote the growth of undifferentiated callus tissues.

Many synthetic compounds have been shown to have auxin activity and are commercially available, such as napthaleneacetic acid (NAA), indolebutyric acid (IBA), and 2,4-dichlorophenoxyacetic acid (2,4 DPA), but only

... responsible for the control of root initiation and the rate of root formation. Auxins are considered the most influential. Auxins and other growth substances are involved in the control of virtually all plant processes: stem

The physiological basis for root initiation is well understood and allows many advantageous modifications of rooting systems. Natural plant growth substances such as auxins, cytokinins, and gibberellins are certainly

... emerges from the epidermis of the stem. Initiation of root growth usually begins within a week and young roots appear within four weeks. Often an irregular mass of white cells, termed callus tissue, will form on the

As the root initials divide, the groups of cells take on the appearance of a small root tip. A vascular system forms with the adjacent vascular bundles and the root continues to grow outward through the cortex until the tip

The development of adventitious roots can be broken down into three stages: (1) the initiation of meristematic cells located just outside and between the vascular bundles (the root initials), (2) the differentiation of these

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to dry for two weeks or until the odor of formaldehyde is no longer present. The treated soil is drenched with water prior to use. Fumigants such as formaldehyde, methyl bromide or other lethal gases are very dangerous until each cubic foot of soil absorbs 2-4 quarts of solution. Small containers are sealed with plastic bags; large flats and plots are covered with polyethylene sheets. After 24 hours the seal is removed and the soil is allowed in a better rooting mix. Formaldehyde is an excellent fungicide and kills some weed seeds, nematodes, and insects. One gallon of commercial formalin (40% strength) is mixed with 50 gallons of water and slowly applied

Chemical fumigation avoids the breakdown of organic material by heat and may result in an oven set at "low," approximately 820 C (180~ F), for thirty minutes. This kills most harmful bacteria and fungus as well as nematodes, insects and most weed seeds. Overheating the soil will cause the breakdown of organic matter. It is very important to select a light, well-aerated soil for cuttings. Solid media provide anchors for cuttings, plenty of darkness to promote etiolation and root growth, and sufficient air circulation to the young roots. A high-quality soil with good drainage such as that used for seed germination is ideal. Water is a common medium for rooting. It is inexpensive, disperses nutrients evenly, and allows direct observation of root development. However, several problems arise. A water medium allows light to reach the submerged stem, delaying etiolation and slowing root growth. Water also promotes the growth of water molds and other fungi, supports the cutting poorly, and restricts air circulation to the young roots. In a well aerated root chamber, roots will appear in great profusion at the base of the stem, while in a poorly aerated or stagnant solution only a few roots will form at the surface, where direct oxygen exchange occurs. If rootings are made in a water medium, it is possible to achieve root growth under a low oxygen level of 20 parts per million. Too much oxygen displaces carbon dioxide which is also vital for proper root initiation and growth. If oxygen levels are low, roots will not grow.

Aeration is a convenient way to add oxygen to water as it also adds carbon dioxide from the atmosphere. Air from a small pump or bottled oxygen may also be supplied directly to the rooting media through tiny tubes or needle-like holes. Oxygen enrichment of irrigation water is accomplished by installing an aerator in the main water line so that atmospheric oxygen can be absorbed by the water. An increase in dissolved oxygen of only 20 parts per million may have a great influence on rooting. Oxygen enrichment of irrigation water is achieved by means of fine mist (high in dissolved oxygen) to the leaves, from which much of it runs off into the soil, aiding rooting. Oxygen enrichment of irrigation water is achieved by dosing the water with oxygen gas. A threshold for damage by excess oxygenation has been determined, although excessive oxygenation could displace carbon dioxide which is also vital for proper root initiation and growth. If oxygen levels are low, roots will not grow.

Rooting media may be enriched with oxygen (O2) gas; enriched rooting solutions have been shown to increase rooting in many plant species. No growth regulators are needed in oxygen-enriched rooting solutions. The initiation and growth of roots depends upon atmospheric oxygen. If oxygen levels are low, shoots may fail to produce roots and rooting will certainly be inhibited. It is very important to select a light, well-aerated rooting medium. In addition to natural aeration from the atmosphere, rooting media may be enriched with oxygen (O2) gas; enriched rooting solutions have been shown to increase rooting in many plant species. No growth regulators are needed in oxygen-enriched rooting solutions.

Fresh seed is often more effective than one alone. IAA and NAA are often combined with a small percentage of certain phenoxy compounds and fungicides in commercial preparations. Many growth regulators deteriorate rapidly, and fresh preparations are needed. After shoots are selected and prepared for cloning, they are treated and placed in the rooting medium. Since the discovery in 1984 that auxins such as IAA stimulate the production of adventitious roots, and the subsequent discovery that the application of synthetic auxins such as NAA increase the rate of root production, many new techniques of treatment have appeared. It has been found that mixtures of growth regulators are often more effective than one alone. IAA and NAA are often combined with a small percentage of certain phenoxy compounds and fungicides in commercial preparations.

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Layering is a process in which roots develop on a stem while it remains attached to, and nutritionally supported by the parent plant. The stem is then detached and the meristematic tip becomes a new individual, growing on its own roots, termed a layer. Layering differs from cutting because rooting occurs while the shoot is still attached to the parent. Rooting is initiated in layering by various stem treatments which interrupt the downward flow of photosynthates (products of photosynthesis) from the shoot tip. This causes the accumulation of auxins, carbohydrates and other growth factors. Rooting occurs in this treated area even though the layer remains attached to the parent. Water and mineral nutrients are supplied by the parent plant because only the phloem has been interrupted; the xylem tissues connecting the shoot to the parental roots remain intact (see illus. 1, page 29). In this manner, the propagator can overcome the problem of keeping a severed cutting alive while it roots, thus greatly increasing the chances of success. Old woody reproductive stems that, as cuttings, would dry up and die, may be rooted by layering. Layering can be very time-consuming and is less practical for mass cloning of parental stock than removing and rooting dozens of cuttings. Layering, however, does give the propagator the best chance of rooting a young, woody stem that is too small for cuttings. If the layer becomes too wet the medium will rot. Layers are checked regularly by injecting water until it squirts out and then very lightly squeezing the medium to remove any extra water. Heavy layers on thin limbs are supported by tying them to a large stake or wire fence post and wrapping with a hypodermic syringe. If the layers become too wet the rooting media will rot. Layers are checked regularly for signs of rooting, which include: 

- The appearance of a root tip within a few weeks, or
- Root hairs growing out of stem tissues
- Callus tissue forming on the stem tissue around the rooting media

The medium used to wrap the stem can be made from a mixture of equal parts of vermiculite and perlite or another artificial rooting medium. It is usually much simpler and safer to use an artificial sterile medium for rooting. Vermiculite and perlite are often used in propagation because of their excellent drainage and neutral pH (a balance between acidity and alkalinity). No sterilization is needed because both products are manufactured at high heat and contain no organic material. It has been found that a mixture of equal portions of medium and large grade vermiculite or perlite promotes the greatest root growth. This results from increased air circulation around the larger pieces. A weak nutrient solution, including micro-nutrients, is needed to wet the medium, because little or no nutrient is provided by the parent. Root formation on layers depends on constant moisture, good air circulation and moderate temperatures at the site of rooting. Almost all layering techniques rely on the principle of etiolation. Both soil layering and air layering involve depriving the rooting portion of the stem of light, promoting rooting. Root-promoting substances and fungicides prove beneficial, and they are usually applied as a spray or powder. Layering can be used to propagate a wide variety of plants, from softwood cuttings to woody limbs. It is a particularly useful technique for propagating woody plants that are difficult to propagate by cuttings.
Sometimes limbs are also tied down, or crimped and bent to limit height and promote axial growth without meristem removal. This is a particularly useful technique for greenhouse cultivation, where plants often reach since the flat beds of floral clusters could be mechanically harvested. Since no meristem tissues are removed, growth and maturation should proceed on schedule. This system also provides maximum light exposure for all frame evenly. Once again, when the plant begins to flower, the floral clusters are allowed to grow upward through the wire as they reach for the light. This might prove to be a feasible commercial cultivation technique, grow through the netting almost immediately, and the meristems are pushed back down under the netting, forcing them to grow horizontally outward. Limbs are trained so that the mature plant will cover the entire

Another method of trellising is used when light exposure is especially crucial, as with artificial lighting systems. Plants are placed under a horizontal or slightly slanted flat sheet of 2 to 5 centimeters (1 to 2 inches)

Cultivators feel that trellised plants, with increased sun exposure and meristems intact, produce a higher yield than freestanding unpruned or pruned plants. Other growers feel that any interference with natural growth

the next horizontally.

Pruning techniques are commonly used by Cannabis cultivators to limit the size of their plants and promote branching. Several techniques are available, and each has its advantages and drawbacks. The most common

Grafting of Cannabis is very simple. Several seedlings can be grafted together into one to produce very interesting specimen plants. One procedure starts by planting one seedling each of several separate strains close

Intergeneric grafts between Cannabis and Humulus (hops) have fascinated researchers and cultivators for decades. Warmke and Davidson (1943) claimed that Humbles tops grafted upon Cannabis roots produced . . . as

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The limbs are bent at least 60 centimeters (24 inches) beneath the roof of the greenhouse. Tying plants over allows more light to strike the plant, promoting axial growth. Crimping stems and bending them over results in more light exposure.

Limbing is another common method of pruning Cannabis plants. Many small limbs will usually grow from the bottom portions of the plant, and due to shading they remain small and fail to develop large floral clusters. If these atrophied lower limbs are removed, the plant can devote more of its floral energies to the top parts of the plant with the most sun exposure and the greatest chance of pollination. The question arises of whether removing entire limbs constitutes a shock to the growing plant, possibly limiting its ultimate size. It seems in this case that shock is minimized by removing entire limbs, including proportional amounts of stems, leaves, meristems, and flowers; this probably results in less metabolic imbalance than if only flowers, leaves, or meristems were removed. Also, the lower limbs are usually very small and seem of little significance in the metabolism of the total plant. In large plants, many limbs near the central stalk also become shaded and atrophied and these are also sometimes removed in an effort to increase the yield of large floral clusters on the sunny side of the plant.

Leafing is one of the most misunderstood techniques of drug Cannabis cultivation. In the mind of the cultivator, several reasons exist for removing leaves. Many feel that large shade leaves draw energy from the flowering plant, and therefore the flowering clusters will be smaller. It is felt that by removing the leaves, surplus energy will be available, and large floral clusters will be formed. Also, some feel that inhibitors of flowering, synthesized in the leaves during the long noninductive days of summer, may be stored in the older leaves that were formed during the noninductive photoperiod. Possibly, if these inhibitor-laden leaves are removed, the reproductive cycle will be accelerated.

In actuality, few if any of the theories behind leafing give any indication of validity. Indeed, leafing possibly serves to defeat its original purpose. Large leaves have a definite function in the growth and development of Cannabis. Large leaves serve as photosynthetic factories for the production of sugars and other necessary growth substances. They also create shade, but at the same time they are collecting valuable solar energy and producing foods that will be used during the floral development of the plant. Premature removal of leaves may cause stunting, because the potential for photosynthesis is reduced. As these leaves age and lose their ability to carry on photosynthesis, they turn chlorotic (yellow) and fall to the ground. In humid areas care is taken to remove the yellow or brown leaves, because they might invite attack by fungus. During chlorosis the plant breaks down substances, such as chlorophylls, and translocates the molecular components to a new growing part of the plant, such as the flowers. Most Cannabis plants begin to lose their larger leaves when they enter the flowering stage, and this trend continues until senescence. It is more efficient for the plant to reuse the energy and various molecular components of existing chlorophyll than to synthesize new chlorophyll at the time of flowering.

Removing large amounts of leaves may interfere with the metabolic balance of the plant. If this metabolic change occurs too late in the season it could interfere with floral development and delay maturation. If any floral inhibitors are removed, the intended effect of accelerating flowering will probably be counteracted by metabolic upset in the plant. Removal of shade leaves does facilitate more light reaching the center of the plant, but if leaves must be removed, the petiole is cut so that at least an inch remains attached to the stalk. Weaknesses in the limb axis at the node result if the leaves are pulled off at the abscission layer while they are still green.

It should be remembered that, regardless of strain or environmental conditions, the plant strives to reproduce, and reproduction is favored by early maturation. This produces a situation where plants are trying to mature and may not have enough leaves to produce the necessary energy for flowering. Removing leaves from the plant decreases the energy available for flowering, and the plant may not be able to produce large floral clusters.

Cannabis grows largest when provided with plentiful nutrients, sunlight, and water and left alone to grow and mature naturally. It must be remembered that any alteration of the natural life cycle of Cannabis will affect productivity. Imaginative combinations and adaptations of propagation techniques exist, based on specific situations of cultivation. Logical choices are made to direct the natural growth cycle of Cannabis to favor the production of large floral clusters.
As we know already, all information transmitted from generation to generation must be contained in the pollen of the staminate parent and the ovule of the pistillate parent. Fertilization unites these two sets of genetic information, a seed forms, and a new generation is begun. Both pollen and ovules are known as gametes, and the transmitted units determining the expression of a character are known as genes. Individual plants have two...
double-dominant tall/early condition. In complete dominance for both gene pairs would result in 9 F2 phenotypes in a 1:2:1:2:4:2:1:2:1 ratio, directly reflecting the genotype ratio. A mixed dominance is complete. This ratio may differ, depending on the dominance conditions present in the original gene pairs. Also, two new phenotypes, tall/late and short/early, have been created in the F2 generation; these phenotypes differ from both parents and grandparents. This phenomenon is termed recombination and explains the frequent observation that like begets like, but not exactly like.

A polyhybrid back-cross with two unrelated gene pairs exhibits a 1:1 ratio of phenotypes as in the mono-hybrid back-cross. It should be noted that despite dominance influence, an F1 back-cross with So far we have discussed inheritance of traits controlled by discrete pairs of unrelated genes. Gene interaction is the control of a trait by two or more gene pairs. In this case genotype ratios will remain the same but phenotype ratios may be altered. Consider a hypothetical example where 2 dominant gene pairs Pp and Cc control late-season anthocyanin pigmentation (purple color) in Cannabis. If P is present alone, only the leaves of the plant (under the proper environmental stimulus) will exhibit accumulated anthocyanin pigment and turn a purple color. If C is present alone, the plant will remain green throughout its life cycle despite environmental conditions. If both are present, however, the calyxes of the plant will also exhibit accumulated anthocyanin and turn purple as the leaves do. Let us consider a few more examples.

The phenotypes of the F2 progeny show a slightly altered phenotype ratio of 9:3:4 instead of the expected 9:3:3:1 for independently assorting traits. If P and C must both be present for any anthocyanin pigmentation, the ratio will be 1:1:1:1. But if P is dominant and C is recessive, the ratio will be 3:1:3:1. If C is dominant and P is recessive, the ratio will be 1:1:3:3. If both are dominant, the ratio will be 9:3:3:1. If both are recessive, the ratio will be 0:0:0:0. If P is dominant and C is codominant, the ratio will be 3:3:1. If C is dominant and P is codominant, the ratio will be 1:3:3:1. If both are codominant, the ratio will be 1:2:1:2. If P is codominant and C is recessive, the ratio will be 1:1:1:1. If C is codominant and P is recessive, the ratio will be 1:1:1:1. If both are codominant and C is dominant, the ratio will be 1:2:1:2. If both are codominant and P is dominant, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and P is recessive, the ratio will be 1:2:1:2. If both are codominant and C is dominant, the ratio will be 1:2:1:2. If both are codominant and P is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2. If both are codominant and C is recessive, the ratio will be 1:2:1:2.
are usually associated with the older, long-standing cultural patterns, may contain genes not found in the newer commercial varieties. As these older varieties and their corresponding cultures become extinct, this genetic information could be lost forever.

In North America and elsewhere, poorer growers and smugglers are experimenting with poorly selected seeds, resulting in attempts to supply an ever-increasing market for marijuana. Older varieties of Cannabis, associated with native cultures and adapted to the environment, while domestic drug strains (from imported seeds) have, unfortunately, hybridized and acclimatized randomly, until many of the fine gene combinations of imported Cannabis have been lost.

Through the importation of fiber and drug Cannabis, a vast pool of genetic material has appeared in North America. Original fiber strains have escaped and become acclimatized (adapted to the environment), while domestic drug strains (from imported seeds) have hybridized and acclimatized randomly, until many of the fine gene combinations of imported Cannabis have been lost.

There is hardly a plant more flexible than Cannabis. As climate, diseases, and pests change, the strain evolves and selects new defenses, programmed into the genetic orders contained in each individual. This genetic diversity is nature’s way of protecting a species.

All of the Cannabis grown in North America today originated in foreign lands. The diligence of our ancestors in their collection and sowing of seeds from superior plants, together with the forces of natural selection, have brought us to the current status of the species. The transformation of diploid plants to the tetraploid level inevitably results in the formation of a few plants with an unbalanced set of chromosomes (2n + 1, 2n - 1, etc.). These plants are called aneuploids. Aneuploids are inferior to polyploids in every economic respect. Aneuploid Cannabis is characterized by extremely small seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions diploid Cannabis plants flower early and bear small flowers. Polyploid Cannabis plants usually delay flowering and bear large flowers.

Colchicine is sold by laboratory supply houses, and breeders have used it to induce polyploidy in Cannabis. However, colchicine is poisonous, so special care is exercised by the breeder in any use of it. Many clandestine growers believe that colchicine is the answer to the problem of producing economically viable Cannabis plants.

The work of Menzel (1964) presents us with a crude map of the chromosomes of Cannabis. Chromosomes 2-6 and 9 are distinguished by the length of each arm. Chromosome 1 is distinguished by a large knob on one arm. The chromosomes of Cannabis are not very plastic; however, they can be manipulated with the use of colchicine.

Once again, little emphasis has been placed on the relationship between flower or resin production and polyploidy. Further research to determine the effect of polyploidy on these and other economically valuable traits of Cannabis is necessary to determine the usefulness of this approach.

Seed treatment is the most effective and safest way to apply colchicine. In this way, the breeder can control the amount of colchicine used and the chromosome constitutions of the resulting populations. In other words, if 100 viable seeds are treated with colchicine and 40 of them germinate, it is unlikely that the treatment induced polyploidy in any of the plants. It is still necessary to determine whether the treatment was successful in producing polyploids.

In the first group, the plants were treated with 0.25% colchicine at the primary meristem seven days after generation. Treated plants were slightly taller and had larger leaves than the controls. The plants were examined to determine if they were polyploid or if they were merely treated with colchicine to no effect.

The results of this experiment indicate that polyploidy is a viable technique for increasing the THC content of Cannabis. Polyploid plants have been shown to have higher cannabinoid levels than diploid plants. Polyploidy has also been shown to increase the growth rate of Cannabis plants.

The increase in cannabinoid levels in polyploid plants is due to the fact that polyploidy leads to an increase in the relative number of cannabinoid-producing cells. This is because polyploids have more DNA per cell than diploids, and therefore more potential for cannabinoid production.

To determine if the increase in cannabinoid levels is due to polyploidy, the plants were examined for chromosomal abnormalities. The plants with anomalies had the highest cannabinoid levels. The plants without anomalies had the lowest cannabinoid levels.

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Aneuploids are characterized by extremely small seeds. The weight of 1,000 seeds ranges from 7 to 9 grams (1/4 to 1/3 ounce). Under natural conditions diploid Cannabis plants flower early and bear small flowers. Polyploid Cannabis plants usually delay flowering and bear large flowers.

De Pasquale et al. (1979) conducted experiments with Cannabis which was treated with 0.25% and 0.50% solutions of colchicine at the primary meristem seven days after generation. Treated plants were slightly taller and had larger leaves than the controls. The plants were examined to determine if they were polyploid or if they were merely treated with colchicine to no effect.

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Selection is the first and most important step in the breeding of any plant. The work of the great breeder and plant wizard Luther Burbank stands as a beacon to breeders of exotic strains. His success in improving hundreds of cultivars is due to his ability to recognize the most minute differences and similarities in phenotype. A careful rapport is established between breeder and plants, and strict guidelines are followed to ensure the desired characteristics are exhibited in the offspring.

The breeder must be able to detect which qualities in a strain are desirable and which are undesirable. Questions such as: What are the qualities we wish to exhibit? What characteristics does a strain exhibit that are unfavorable and should be bred out? Answers to these questions suggest goals for breeding. In addition to a basic knowledge of Cannabis botany, propagation, and genetics, the breeder must also be aware of the environmental conditions that affect plant growth and development.

With some care, the breeder can avoid the hidden dangers of unconscious selection. Definite goals are vital to progress in breeding Cannabis. What qualities are desired in a strain that it does not already exhibit? What are the environmental conditions that affect plant growth and development? The breeder must be able to predict the effects of these factors on the desired characteristics.

During the second season, random pollinations will again increase the numbers of acclimatized individuals, and thereby increase the chance that undesirable characteristics associated with acclimatization will be transmitted to the third crop. These acclimatized members of the third crop have a higher chance of maturing viable seeds than the parental types, and random pollinations will again account for a few seeds and these were collected. This selection draws on a huge gene pool and the possible F2 combinations are tremendous. By the third season, the gene pool is tending toward early-maturing parentage, with larger plants exhibiting these characteristics. However, the collected hybrid seeds produce, on the average, larger and more desirable offspring than the first season. This example illustrates the unconscious selection for undesirable traits. The hypothetical cultivator began well by selecting the best seeds available and growing them properly. The seeds selected for the second season were the best flowers, but there were many good individuals. Seed collection and cultivation the fourth season resulted in plants inferior even to the first crop, and this trend continued year after year. What went wrong? The task outlined above is not an easy one, given the current legal restrictions on the collection of Cannabis seed. In spite of this, the conscientious cultivator is making a contribution toward preserving and improving the gene pool.

A grower in northern latitudes selected an ideal spot to grow a crop and prepared the soil well. Seeds were selected from the best floral clusters of several strains available over the past few years, both imported and domestic. Nearly all of the staminate plants were removed as they matured and a nearly seedless crop of beautiful plants resulted. After careful consideration, the few seeds from accidental pollination of the best flowers were retained and grown. This selection draws on a huge gene pool and the possible F2 combinations are tremendous. By the second season, the gene pool is tending toward early-maturing parentage, with larger plants exhibiting these characteristics. However, the collected hybrid seeds produce, on the average, larger and more desirable offspring than the first season. This example illustrates the unconscious selection for undesirable traits. The hypothetical cultivator began well by selecting the best seeds available and growing them properly. The seeds selected for the second season were the best flowers, but there were many good individuals. Seed collection and cultivation the fourth season resulted in plants inferior even to the first crop, and this trend continued year after year. What went wrong? The task outlined above is not an easy one, given the current legal restrictions on the collection of Cannabis seed. In spite of this, the conscientious cultivator is making a contribution toward preserving and improving the gene pool.

It is possible that in the future, Cannabis cultivation for resale, or even personal use, may be legal but only for approved, patented strains. Special caution would be needed to preserve variety in the gene pool, until the viability of further generations is confirmed, and to provide parental material for comparison and back-crossing. Phenotypic data about these subsequent generations should be carefully recorded to aid in improving the gene pool.

Seeds and pollen should be collected directly from reliable and knowledgeable sources. Government seizures and smuggled shipments are seldom reliable seed sources. The characteristics of both parents must be known; consequently, mixed bales of randomly pollinated marijuana are not suitable seed sources, even if the exact origin of the sample is certain. Direct contact should be made with the farmer-breeder to aid in improving the gene pool.

Even if a grower has no desire to attempt crop improvement, successful strains have to be protected so they do not degenerate and can be reproduced if lost. Left to the selective pressures of an introduced environment, most plants will likely become extinct. The future of Cannabis lies in government and clandestine collections. These collections do not mean that importation of seed and selective hybridization are always detrimental. Indeed, these principles are often the key to crop improvement, but only when applied knowledgeably and cautiously. The rapid search for improvements must not jeopardize the pool of original genetic information on which adaptation relies.
Back-crossing is another technique used to produce offspring with reinforced parental characteristics. In this case, a cross is made between one of the F₁ or subsequent offspring and either of the parents expressing the trait. Also, as a result of gene recombination, F₁ hybrids are not true-breeding and must be reproduced from the original parental strains. When breeders create hybrids they try to produce enough seeds to last for several years. (For example, P₁ high-THC × P₁ low-THC yields F₁ hybrids of intermediate THC content. Selfing the F₁ yields F₂ hybrids, of both P₁ [high and low THC] phenotypes, intermediate F₁ phenotypes, and parental traits. From the F₂ hybrid generation selections can be made for parents which are used to start new true-breeding strains. Indeed, F₂ hybrids might appear with more extreme characteristics than either of the P₁ parents. To produce an F₂ generation by crossing or self-pollinating F₁ offspring. Since most domestic Cannabis strains are F₁ hybrids for many characteristics, great diversity and recessive recombination can result from hybrid vigor results, because dominant genes tend to carry valuable traits and the differing dominant genes inherited from each parent mask recessive traits inherited from the other. This gives rise to particularly large, hybrid vigor offspring.

Sports (plants or parts of plants carrying and expressing spontaneous mutations) most easily transmit mutant genes to the offspring if they are used as pollen parents. If the parents represent diverse gene pools, many hybrid vigor results are possible. Large amounts of hybrid seed are most easily produced by planting two strains side by side, removing the staminate plants of the seed strain, and allowing nature to take its course. Pollen- or seed-sterile strains could be developed for the production of large amounts of hybrid seed without the labor of thinning; however, genes for sterility are rare. It is important to remember that parental weaknesses are transmitted to offspring as well as strengths.

Hybridization is the process of mixing differing gene pools to produce offspring of great genetic variation from which distinctive individuals can be selected. The wind performs random hybridization in nature. Under controlled conditions, hybridization can be achieved through controlled pollination. Selection is greatly improved if one has a large sample to choose from! The best plant picked from a group of 10 has far less chance of being significantly different from its fellow seedlings than the best plant selected from a sample of 1,000. Burbank often made his initial selections of parents from samples of up to 500,000 seedlings. Difficulties arise for many breeders because they lack the space to keep enough examples of each phenotype. Selection is greatly improved if one has a large sample to choose from!

Choice of prospective parents is only possible if the breeder is familiar with the variable characteristics of Cannabis that may be genetically controlled, has a way to accurately measure these variations, and has control needed for the selection process. Selection is greatly improved if one has a large sample to choose from! The best plant picked from a group of 10 has far less chance of being significantly different from its fellow seedlings than the best plant selected from a sample of 1,000. Burbank often made his initial selections of parents from samples of up to 500,000 seedlings. Difficulties arise for many breeders because they lack the space to keep enough examples of each phenotype. Selection is greatly improved if one has a large sample to choose from!

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Among the thousands of individuals, even of such common strains as those from Colombia or Mexico, may produce better offspring than plants from a rare strain where there is little or no opportunity for selection after germination. This does not mean that rare strains are not valuable, but careful selection is even more important to successful breeding. The random pollinations that produce the seeds in most imported marijuana assure a hybrid vigor result, and this is desirable for most traits. However, selection can be improved by choosing the best parent plant for each characteristic. This is the method of early seedling selection.

Another technique used by breeders since the time of Burbank is to make early selections. Seedling plants take up much less space than adults. Thousands of seeds can be germinated in a flat. A flat takes up the same space as a hundred 10-centimeter (4-inch) sprouts or sixteen 30-centimeter (12-inch) seedlings or one 60-centimeter (24-inch) juvenile. An adult plant can easily take up as much space as a hundred flats. Simple arithmetic shows that as many as 10,000 sprouts can be screened in the space required by each mature plant, provided enough seeds are available. Seeds of rare strains are quite valuable and exotic; however, careful selection applied to these seeds can produce superior offspring.

One important point to remember is that in the production of any new plant, selection plays the all-important part. First, one must get clearly in mind the kind of plant he wants, then breed and select to that end, always choosing through a proper selection process.
Alternatively, a pure cross is made between two or more Thai plants that most closely approach the ideal in blooming early. At this point the breeder may ignore many other traits and aim at breeding an earlier-maturing strain. To develop an early-maturing and rapidly flowering strain, a breeder may hybridize as in the previous example. However, if it is important to preserve unique imported genetics, hybridizing may be inadvisable.

Much of the breeding effort of North American cultivators is concerned with acclimatizing high-THC strains of equatorial origin to the climate of their growing area while preserving potency. Late-maturing, slow, and robust plants may live outside all year. In addition to saving particular parents, a successful breeder always saves many seeds from the original P1 group that produced the valuable characteristic so that other P1 plants also exhibiting the desired trait. Once again this provides a chance for recombination and possible expression of the selected parental trait. Back-crossing is a valuable way of producing new strains, but it is often difficult because Cannabis is a dioecious plant.

Cannabis is a cross-pollinated species; therefore, back-crossing is not effective in producing new strains. The most common use of hybridization is to cross two outstanding varieties. Hybrids can be produced by crossing selected individuals from different high-potency strains of different origins, such as Thailand and Mexico. From these crosses, the breeder can select for high drug potency, large size for large calyx expression, and attractive appearance. The hybrid offspring from this cross may exhibit many of the selected characteristics, but the breeder must also be concerned with the genetic stability of the hybrid. Inbreeding can only produce a plant that is an expression of some gene already present in the total gene pool. Nothing is actually created by breeding; it is merely the recombination of existing genes into new genotypes.

When lack of vigor interferes with selecting phenotypes for size and hardiness, the two separately selected strains can then be interbred to recombine nonselected genes and restore vigor. This will probably not interfere with breeding for the selected traits unless two different gene systems control the same trait in the two separate lines, and this is highly unlikely. Now the breeder has produced a hybrid strain that breeds true for large size, sweet floral aroma, high THC content, and other desirable characteristics. Each generation will produce new, more acceptable combinations.

If two inbred strains are crossed, F1 hybrids will be less variable than if two hybrid strains are crossed. This comes from limiting the diversity of the gene pools in the two strains to be hybridized through previous breeding. In such cases, the F1后代 will be more similar to the parent and the two seed parents result in two lines of inheritance with slightly differing genetics, but each expressing the desired characteristics. Each generation will produce new, more acceptable combinations.

If possible, two or more separate lines are started, never allowing them to interbreed. In this case one acceptable staminate plant is selected along with two pistillate plants (or vice versa). Crosses between the pollen and the seed parents result in two lines of inheritance with slightly differing genetics, but each expressing the desired characteristics. Each generation will produce new, more acceptable combinations.

Inbreeding. Further independent selection and inbreeding of the best plants for several generations will establish two strains which are true-breeding for all the originally selected traits. This means that all the offspring from the P1 (parental) cross: Mexico X Thailand. In this case, genes for high drug potency, large size, and sweetness can be selected from the Mexican parent while genes for good appearance can be selected from the Thai parent. The F1 hybrid will exhibit many of the selected characteristics, but the breeder must also be concerned with the genetic stability of the hybrid. Inbreeding can only produce a plant that is an expression of some gene already present in the total gene pool. Nothing is actually created by breeding; it is merely the recombination of existing genes into new genotypes.

It should be noted that a hybrid plant is not usually true-breeding for all characteristics nor does a true-breeding strain breed true for all characteristics. When discussing crosses, we are talking about the inheritance of one or a few traits only. The strain may be true-breeding for only a few traits, hybrid for the rest. Monohybrid crosses involve one trait, dihybrid crosses involve two traits, and so forth. Plants have certain limits of growth, and the breeder may select for these limits or grow them to their full potential. The breeder can also select for the time of flowering (e.g., earlier-maturing or later-maturing).
A variety of a pure Thai strain. This strain may still mature considerably later than is ideal for the particular location unless selective pressure is exerted. If further crosses are made with several individuals that satisfy other criteria such as high THC content, these may be used to develop another pure Thai strain of high THC content. After these true-breeding lines have been established, a dihybrid pure cross can be made in an attempt to

Crosses made without a clear goal in mind lead to strains that acclimatize while losing many favorable characteristics. A successful breeder is careful not to overlook a characteristic that may prove useful. It is imperative that original imported Cannabis genetics be preserved intact to protect the species from loss of genetic variety through excessive hybridization. A currently unrecognized gene may be responsible for controlling resistance

Once pure breeding lines have been established, plant breeders classify and statistically analyze the offspring to determine the patterns of inheritance for that trait. This is the system used by Gregor

Fixing traits (producing homozygous offspring) in Cannabis strains is more difficult than it is in many other flowering plants. With monoecious strains or hermaphrodites it is possible to fix traits by self-pollinating an individual exhibiting favorable traits. In this case one plant acts as both mother and father. However, most strains of Cannabis are dioecious, and unless hermaphroditic reactions can be induced, another parent exhibiting the trait is required to fix the trait. If this is not possible, the unique individual may be crossed with a plant not exhibiting the trait, inbred in the F1 generation, and selections of parents exhibiting the favorable trait made

If a trait is needed for development of a dioecious strain it might first be discovered in a monoecious strain and then fixed through selfing and selecting homozygous offspring. Dioecious individuals can then be selected

Galoch (1978) indicated that gibberellic acid (GA3) promoted stamen production while indoleacetic acid (IAA), ethrel, and kinetin promoted pistil production in prefloral dioecious Cannabis. Sex alteration has several useful applications. Most importantly, if only one parent expressing a desirable trait can be found, it is difficult to perform a cross unless it happens to be a hermaphrodite plant. Hormones might be used to change the sex of a cutting from the desirable plant, and this cutting used to mate with it. This is most easily accomplished by changing a pistillate cutting to a staminate (pollen) parent, using a spray of 100 ppm gibberellic acid in water each day for five consecutive days. Within two weeks staminate flowers may appear. Pollen can then be collected for selfing with the original pistillate parent. Offspring from the cross should also be mostly

Sex reversal for breeding can also be accomplished by mutilation and by photoperiod alteration. A well-rooted, flourishing cutting from the parent plant is pruned back to 25% of its original size and stripped of all its remaining flowers. New growth will appear within a few days, and several flowers of reversed sexual type often appear. Flowers of the unwanted sex are removed until the cutting is needed for fertilization. Extremely short

It must be remembered, in attempting to fix favorable characteristics, that a monohybrid cross gives rise to four possible recombinant genotypes, a dihybrid cross gives rise to 16 possible recombinant genotypes, and so

Phenotype and genotype ratios are probabilistic. If recessive genes are desired for three traits it is not effective to raise only 64 offspring and count on getting one homozygous recessive individual. To increase the probability of success it is better to raise hundreds of offspring, choosing only the best homozygous recessive individuals as future parents. All laws of inheritance are based on chance and offspring may not approach
The genotype of each individual is expressed by a mosaic of thousands of subtle overlapping traits. It is the sum total of these traits that determines the general phenotype of an individual. It is often difficult to determine if the characteristic being selected is one trait or the blending of several traits and whether these traits are controlled by one or several pairs of genes. It often makes little difference that a breeder does not have plants that are proven to breed true. Breeding goals can still be established. The selfing of F1 hybrids will often give rise to the variation needed in the F2 generation for selecting parents for subsequent generations, even if the characteristics of the original parents of the F1 hybrid are not known. It is in the following generations that fixed characteristics appear and the breeding of pure strains can begin. By selecting and crossing individuals that most nearly approach the ideal described by the breeding goals, the variety can be continuously improved even if the exact patterns of inheritance are never determined. Complementary traits are eventually combined into one line whose seeds reproduce the favorable parental traits. Inbreeding strains also allows weak recessive traits to express themselves and these abnormalities must be diligently removed from the breeding population.

Parental plants are selected which most nearly approach the ideal. If a desirable trait is not expressed by the parent, it is much less likely to appear in the offspring. It is imperative that desirable characteristics be hereditary and not primarily the result of environment and cultivation. Acquired traits are not hereditary and cannot be made hereditary. Breeding for as few traits as possible at one time greatly increases the chance of success. In addition to the specific traits chosen as the aims of breeding, parents are selected which possess other generally desirable traits such as vigor and size. Determinations of dominance and recessiveness can only be made by observing the outcome of many crosses, although wild traits often tend to be dominant. This is one of the keys to adaptive survival. However, all the possible combinations will appear in the F2 generation if it is large.

Now, after further simplifying this wonderful system of inheritance, there are additional exceptions to the rules which must be explored. In some cases, a pair of genes may control a trait but a second or third pair of genes is needed to express this trait. This is known as gene interaction. No particular genetic attribute in which we may be interested is totally isolated from other genes and the effects of environment. Genes are occasionally transferred in groups instead of assorting independently. This is known as gene linkage, These genes are spaced along the same chromosome and may or may not control the same trait. The result of linkage might be that one trait cannot be inherited without another. At times, traits are associated with the X and Y sex chromosomes and they may be limited to expression in only one sex (sex linkage). Crossing over also interferes with the analysis of crosses. Crossing over is the exchanging of entire pieces of genetic material between two chromosomes. This can result in two genes that are normally linked appearing on separate chromosomes where they will be independently inherited. All of these processes can cause crosses to deviate from the expected Mendelian outcome. Chance is a major factor in breeding Cannabis, or any introduced plant, and the more crosses a variate, isolate, intermate, evaluate, multiplicate, and disseminate are the key words in plant improvement. A plant breeder begins by producing or collecting various prospective parents from which the most desirable ones are selected and isolated. Intermating of the select parents results in offspring which must be evaluated for favorable characteristics. If evaluation indicates that the offspring are not improved, then the process is repeated. Improved offspring are multiplied and disseminated for commercial use. Further evaluation in the field is necessary to check for uniformity and to choose parents for further intermating. This cyclic approach provides a problems in breeding, but none of these are insurmountable. Developing a knowledge and feel for the plant is more important than memorizing Mendelian ratios. The words of the great Luther Burbank say it well, The first set of traits concerns Cannabis plants as a whole while the remainder concern the qualities of seedlings, leaves, fibers, and flowers. Finally a list of various Cannabis strains is provided along with specific
this is the case, early selection of seedlings by leaflet shape could determine the character of the flowering clusters at harvest. Both compound and webbed leaf variations seem to be hereditary,

More advanced breeding has occurred in fiber strains than any other type of Cannabis. Over the years many strains have been developed with improved maturation, increased fiber content, and fibers will become brittle before the pistillate plants are ready for harvest. The fiber strains of Europe are divided into northern and southern varieties. The latter require higher temperatures and
phenotype. Hybrid crosses between imported pure varieties were the beginning of nearly every domestic strain of Cannabis. In hybrid crosses, some dominant characteristics from each parental

However, it should be remembered that these are average. Gross phenotypes and recessive variations within each trait will occur. In addition, these representations are based on unpruned plants growing in ideal conditions and stress will alter the gross phenotype. Also, the protective environment of a greenhouse tends to obscure the difference between different strains. This section presents information that is used in the selection of pure
Fiber Strain Gross Phenotypes

Fiber strains are characterized as tall, rapidly maturing, limbless plants which are often monoecious. This growth habit has been selected by generations of fiber-producing farmers to facilitate forming long fibers through even growth and maturation. Monoecious strains mature more evenly than dioecious strains, and fiber crops are usually not grown long enough to set seed which interferes with fiber production. Most varieties of fiber Cannabis originate in the northern temperate climates of Europe, Japan, China and North America. Several strains have been selected from the prime hemp growing areas and offered commercially over the last fifty years in both Europe and America. Escaped fiber strains of the midwestern United States are usually tall, skinny, relatively poorly branched, weakly

Drug Strain Gross Phenotypes

Drug strains are characterized by Delta1-THC as the primary cannabinoid, with low levels of other accessory cannabinoids such as THCV, CBD, CBC, and CBN. This results

Colombian Cannabis originally could be divided into two basic strains: one from the low-altitude humid coastal areas along the Atlantic near Panama, and the other from the more arid mountain areas inland from Santa Marta. More recently, new areas of cultivation in the interior plateau of southern central Colombia and the highland valleys stretching southward from the Atlantic coast have become the primary areas of commercial export Cannabis cultivation. Until recent years high quality Cannabis was available through the black market from both coastal and highland Colombia. Cannabis was introduced to Colombia just over 100 years ago, and its cultivation is deeply rooted in tradition. Cultivation techniques often involve transplanting of selected seedlings and other individual attention. The production of “la mona amarilla” or gold buds is achieved by girdling or removing a strip of bark from the main stem of a nearly mature plant, thereby restricting the flow of water, nutrients, and amarilla” can continue. The fine marijuana of Colombia was often seedless, but commercial grades are nearly always well seeded. As a rule today, the more remote highland areas are the centers of commercial agriculture and few of the small farmers remain. It is thought that some highland farmers must still grow fine Cannabis, and occasional connoisseur crops surface. The older seeds from the sedative effect. Many of the unfavorable characteristics of imported Colombian Cannabis result from hurried commercial agricultural techniques combined with poor curing and storage. Colombian seeds

Colombian strains appear as relatively highly branched conical plants with a long upright central stem, horizontal limbs and relatively short internodes. The leaves are characterized by highly serrated slender leaflets (7-11) in a nearly complete to overlapping circular array of varying shades of medium green. Colombian strains usually flower late in temperate regions of the northern hemisphere and latitudes. Because of the horizontal branching pattern of Colombian strains and their long growth cycle, pistillate plants tend to produce many flowering clusters along the entire length of the stem back to the central stalk. The small flowers tend to produce small, round, dark, mottled, and brown seeds. Imported and domestic Colombian Cannabis often tend to be more sedative in psychoactivity than

This strain from the foothills (up to 3,200 meters [10,000 feet]) of the Hindu Kush range is grown in small rural gardens, as it has been for hundreds of years, and is used primarily for the production of hashish. In these areas hashish is usually made from the resins covering the pistil late calyxes and associated leaflets. These resins are removed by shaking and crushing the flowering tops over a silk screen and collecting the dusty resins that fall off the plants. Adulteration and pressing usually follow in the production of commercial hashish. Strains from this area are often used as type examples for Cannabis indica. Early maturation and the belief by clandestine cultivators that this strain may be exempt from laws controlling Cannabis sativa and indeed may be legal, has resulted in its proliferation.
usually grow in an upright fashion until they are nearly as tall as the central stalk and form a sort of upside-down conical shape. These strains are of medium size, with dark green leaves having 5 to 9 very wide, coarsely serrated leaflets in a circular array. The lower leaf surface is often lighter in color than the upper surface. These leaves have so few broad coarse leaflets that they are often compared to a maple leaf. Floral clusters are dense and appear along the entire length of the primary limbs as very resinous leafy balls. Most plants produce flowering clusters with a low calyx-to-leaf ratio, but the staminate and pistillate individuals and continues throughout the life of the plant. Sweet aromas do often develop but this strain usually loses the sweet fragrance early, along with the clear, cerebral short stature, early maturation, and high resin production make Hindu Kush strains very desirable for hybridizing and indeed they have met with great popularity. The gene pool of imported Hindu Kush late-maturing, tall, sweet strain from Thailand, India, or Nepal. This produces hybrid offspring of short stature, high resin content, early maturation, and sweet taste that will mature high quality flowers in northern climates. Many hybrid crosses of this type are made each year and are currently cultivated in many areas of North America. Hindu Kush seeds are usually large, round, and dark grey or black.

Ganja (or flowering Cannabis tops) has been grown in India for hundreds of years. These strains are usually grown in a seedless fashion and are cured, dried, and smoked as marijuana instead of being converted to hashish as in many Central Asian areas. This makes them of considerable interest to domestic Cannabis cultivators wishing to reap the benefits of years of selective breeding for fine ganja.

Jamaican strains were not uncommon in the late 1960s and early 1970s but they are much rarer today. Both green and brown varieties are grown in Jamaica. The top-of-the-line seedless smoke is known as the "lamb's bread" and is rarely seen outside Jamaica. Most purported Jamaican strains appear stringy and brown much like low land or commercial Colombian strains. Jamaica's close proximity to the Arabian sea and lower elevation on the east coast have enabled the spread of Pakistani and Afghan strains, which are very similar to their Afghan counterparts. Jamaican strains resemble Colombian strains in leaf shape, seed type and general morphology but they tend to be a little taller, thinner, and lighter green.

Lebanese strains are rare in domestic Cannabis crops but do appear from time to time. They are relatively short and slender with thick stems, poorly developed limbs, and wide, medium-green leaves with 5 to 11 slightly broad leaflets. They are often early-maturing and seem to be quite leafy, reflecting a low calyx-to-leaf ratio. The calyxes are relatively large and the seeds flattened, ovoid and dark brown in color. As with Hindu Kush strains, these plants are grown for the production of screened and pressed hashish, and the calyx-to-leaf ratio may be less important than the total resin production.

Malawi is a small country in eastern central Africa bordering Lake Nyasa. Over the past few years Cannabis from Malawi has appeared wrapped in bark and rolled tightly, approximately four ounces at a time. In its early development it seems that this may have been a variety that was part of the northern variety complex of domestic Cannabis. It is known to be grown at a high elevation.
leaflets arranged in a narrow, drooping, hand-like array. The leaves usually lack serrations on the distal (tip portion) 20% of each leaflet. The mature floral clusters are sometimes airy, resulting from long internodes, and are made up of large calyxes and relatively few leaves. The large calyxes are very sweet and resinous, as well as extremely psychoactive. Seeds are large, shortened, flattened, and ovoid in shape with a dark grey or reddish brown, mottled perianth or seed coat. The caruncle or point of attachment at the base of the seed is uncommonly deep and usually is surrounded by a sharp acceptance in Great Britain and North America as drug strains. Seeds of many strains appear in small batches of low-quality African marijuana easily available in Amsterdam and other European cities.

In recent years, however, the Mexican government (with monetary backing by the United States) began an intensive program to eradicate Cannabis through the aerial spraying of herbicides such as strains grown in Mississippi as the pharmaceutical research product for chemotherapy and glaucoma patients. In the prime of Mexican marijuana cultivation from the early 1960s to the middle 1970s, "Sinaloan" have geographic origins behind their common names and mean something to this very day. All of these areas are Pacific coastal states extending in order from Sinaloa in the north at 27;

Mexican strains are thought of as tall, upright plants of moderate to large size with light to dark green, large leaves. The leaves are made up of long, medium width, moderately serrated leaflets arranged clusters. Oaxacan strains are generally the largest and grow vigorously, while Michoacan strains are smaller and more delicate. Guerreran strains are often short and develop long, upright lower limbs.

Because of selection for hashish production, Moroccan strains resemble both Lebanese and Hindu Kush strains in their relatively broad leaves, short growth habit, and high resin production. Moroccan hashish and marijuana originate. Nepalese plants are usually tall and thin with long, slightly branched limbs. The long, thin flowering tops are very aromatic and reminiscent of the finest fresh "temple ball" and "finger" hashish hand-rubbed from wild plants. Resin production is abundant and psychoactivity is high. Few Nepalese strains have appeared in domestic Cannabis crops but they do seem to

Short stature (10 to 50 centimeters [3 to 18 inches]) and brief life cycle (8 to 10 weeks), wide, reduced leaves and specialized seeds characterize weed Cannabis of Russia. Janischewsky (1924) discovered weedy Cannabis and named it Cannabis ruderalis. Ruderalis could prove valuable in breeding rapidly maturing strains for commercial use in temperate latitudes. It flowers when approximately 7 weeks
Dagga of South Africa is highly acclaimed. Most seeds have been collected from marijuana shipments in Europe. Some are very early-maturing (September in northern latitudes) and sweet smelling.

Southeast Asian Cannabis is produced in northern and eastern Thailand. Until recent times, Cannabis farming has been a cottage industry of the northern mountain areas and each family grew a small

strains and begin large plantations, may have hybridized with original Thai strains and altered the resultant genetics. Also, wild stands of Cannabis may now be

Strains from Thailand are characterized by tall meandering growth of the main stalk and limbs and fairly extensive branching. The leaves are often very large with 9 to 11 long, slender, coarsely serrated

Most Thai strains are very late-maturing and subject to hermaphrodism. It is not understood whether strains from Thailand turn hermaphrodite as a reaction to the extremes of northern temperate weather

or if they have a genetically controlled tendency towards hermaphrodism. To the dismay of many cultivators and researchers, Thai strains mature late, flower slowly, and ripen unevenly. Retarded floral

development and apparent disregard for changes in photoperiod and weather may have given rise to the story that Cannabis plants in Thailand live and bear flowers for years. Despite these shortcomings,

Thai strains are very psychoactive and many hybrid crosses have been made with rapidly maturing strains, such as Mexican and Hindu Kush, in a successful attempt to create early-maturing hybrids of

high psychoactivity and characteristic Thai sweet, citrus taste. The calyxes of Thai strains are very large, as are the seeds and other anatomical features, leading to the misconception that strains may be

polyploid. No natural polyploidy has been discovered in any strains of Cannabis though no one has ever taken the time to look thoroughly. The seeds are very large, ovoid, slightly flattened, and light

generically controlled (dominant or recessive), but efforts to develop a true-breeding strain of creepers are meeting with partial success. This phenotype appears when the main stalk of the seedling has

grown to about 1 meter (3 feet) in height. It then begins to bend at approximately the middle of the stalk, up to 70° from the vertical, usually in the direction of the sun. Subsequently, the first limbs

sag until they touch the ground and begin to grow back up. In extremely loose mulch and humid conditions the limbs will occasionally root along the bottom surface. Possibly as a result of increased

b) Huge Upright Phenotype - This phenotype is characterized by medium size leaves with narrow, highly serrated leaflets much like the creeper strains, and may also be an acclimatized North American

phenotype. In this phenotype, however, a long, straight central stalk from 2 to 4 meters (6.5 to 13 feet) tall forms and the long, slender primary limbs grow in an upright fashion until they are nearly

The preceding has been a listing of gross phenotypes for several of the many strains of Cannabis occurring world wide. Although many of them are rare, the seeds appear occasionally due to the extreme mobility of

American and European Cannabis enthusiasts. As a consequence of this extreme mobility, it is feared that many of the world's finest strains of Cannabis have been or may be lost forever due to hybridization with foreign

Various combinations of these traits are possible and inevitable. The traits that we most often see are most likely dominant and the improvement of Cannabis strains through breeding is most easily accomplished by
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seasons, the effective growing season may be determined. If an area has too short an effective growing season for drug Cannabis, a greenhouse or other shelter from cold, rainy conditions is used. The timing of
Equatorial areas gain and lose daylength twice during the year as the sun passes north and south of the equator, resulting in two identical photoperiodic seasons. Rainfall and altitude determine the growing season of each
Strains from these latitudes are often not as responsive to photoperiod change, and flowering seems strongly age-determined as well as light determined. Most strains of Cannabis will begin to flower when they are 60 days
finishes later than at higher latitudes. However, because the photoperiod is never too long to induce flowering, Cannabis may also be grown in a short season from December through March or April (90 to 120 days).

Light cycles and seasons vary as one approaches the equator. Near 20° north latitude (Hawaii, India, and Thailand where most of the finest drug Cannabis originates), the photoperiod never varies out of the range critical for
winter solstice (shortest day of the year, around December 21) if they are protected from frost. At this point a new vegetative light cycle starts and THC production ceases. New seedlings are planted when the days begin to
and produce more THC until a peak period is reached during October and November. After this time the photoperiod drops below 10 hours and THC production slows. High-THC plants may continue to develop until the

The wavy lines follow the changes in photoperiod (daylength) for two years at various latitudes. Follow, for example, the photoperiod for 40° north latitude (Northern California) which begins along the left-hand margin
variation depending on their distance from the equator or height in altitude. A graph of light cycles based on latitude is helpful in exploring the maturation and cycles of Cannabis from various latitudes and the genetic

The staminate and pistillate sexes of the same strain mature at different rates. Staminate plants are usually the first to begin flowering and releasing pollen. In fact, much pollen is released when the pistillate plants show

Although the staminate plants begin to release pollen before the pistillate plant has begun to form floral clusters, pistillate plants actually differentiate sexually and form a few viable flowers long before most of the

multiplies each year, through the timely dehiscence of millions of pollen grains and the fertilization of thousands of pistillate flowers, resulting in thousands of viable seeds from each pistillate plant. As the pistillate plant

however, it becomes obvious that early pollination is advantageous to survival. Pollinations that take place early form seeds that ripen in the warm days of summer when the pistillate plant is healthy and there is less

The maturation of Cannabis is normally annual and its timing is influenced by the age of the plant, changes in photoperiod, and other environmental conditions. When a plant reaches an adequate age for flowering (about

leaves of Cannabis plants form fewer leaflets during flowering until the floral clusters are formed of trileaflet and mono-leaflet leaves. This is a reversal of the heteroblastic (variously shaped) trend of increased leaflet

The staminate and pistillate forms of Cannabis are sex-specific and are determined by the genetic makeup of the plant at the time of fertilization. The staminate (male) flowers consist of a single pistil with a long filament and a

The pistillate (female) flowers are typically smaller than the staminate flowers and contain numerous ovules surrounded by a calyx. The pistillate flowers are typically produced in clusters, which are known as "cannabis flowers" or "cannabis heads." These clusters are composed of numerous small flowers called "stamens" that produce pollen.

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adequate for the growth of Cannabis from the tropics taken into account.

So, a discussion of the growing season and the length of the growing season is important when selecting the appropriate germplasm for any area. It may not be practical to grow a long-season strain from Hawaii in a California greenhouse because of the length of the season and differences in response to photoperiod. For that reason, it is necessary to determine if Hawaiian and California strains have been bred specifically for either the short or long seasons. The maturation characteristics can vary greatly between these two strains, and it may be necessary to select from latitudes similar to the area to be cultivated so that the chances of growing drug Cannabis to maturity are maximized.

The short season of Hawaii, Mexico, and other subtropical areas constitutes a growing season of about 4 months. Cultivated drug Cannabis is grown from November through April, while it is grown in the southern subtropical zone from April through August. In the southern subtropical zone, strains from Mexico (subtropical zone) will usually completely mature by the end of October, while strains from Colombia (equatorial zone) will usually not mature until December. By understanding this, strains can be selected that are adapted to the conditions of the area. Strains that have become adapted to their native latitude will tend to flower and mature under domestic cultivation in much the same pattern as they would in their native conditions. For example, in northern temperate zones, as the ground warms up in the spring, the growing season begins. In the northern hemisphere, as the sun is high in the sky all year long, the sun is directly overhead twice a year at the equinoxes, March 22 and September 22, as it passes to the north and then the south. The days get shortest twice a year at the solstices, December 22 and June 22, as it passes to the north and then the south. For instance, assume a researcher wishes to grow a crop of Cannabis near Durban, South Africa, at 30 degrees south latitude. Consulting the graph of maturation cycles will reveal that a long-photoperiod season is needed, adequate for the growth of Cannabis from the southern tropics. The growing season for Cannabis in the southern hemisphere is from November through April. It is possible to grow Cannabis and fiber in the same area in the northern hemisphere, spanning from March-May through September-December in the northern hemisphere and from September-November through March-June in the southern hemisphere.

A short season may also exist from December or January through March or April in the temperate zones. The northern subtropical zone is one of the largest Cannabis producing areas in the world, while the southern subtropical zone has little Cannabis. These areas usually have a long season from February-March through November-December in the northern hemisphere and from November-December through February-March in the southern hemisphere.

The northern subtropical zone is one of the largest Cannabis producing areas in the world, while the southern subtropical zone has little Cannabis. These areas usually have a long season from February-March through November-December in the northern hemisphere and from November-December through February-March in the southern hemisphere. The arctic and antarctic zones are characterized by a short, harsh growing season that is not favorable for the growth of Cannabis. The arctic season begins during the very long days of June or July, as soon as the ground warms up in the spring, the growing season begins. The sun is directly overhead twice a year at the equinoxes, March 22 and September 22, as it passes to the north and then the south. The days get shortest twice a year at the solstices, December 22 and June 22, as it passes to the north and then the south. For instance, assume a researcher wishes to grow a crop of Cannabis near Durban, South Africa, at 30 degrees south latitude. Consulting the graph of maturation cycles will reveal that a long-photoperiod season is needed, adequate for the growth of Cannabis from the southern tropics. The growing season for Cannabis in the southern hemisphere is from November through April. It is possible to grow Cannabis and fiber in the same area in the northern hemisphere, spanning from March-May through September-December in the northern hemisphere and from September-November through March-June in the southern hemisphere.

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Combination and simplification of the earth's climatic bands where Cannabis is grown yields an equatorial zone, north and south subtropical zones, north and south temperate zones, arctic and antarctic zones. A discussion of the growing season and the length of the growing season is important when selecting the appropriate germplasm for any area. It may not be practical to grow a long-season strain from Hawaii in a California greenhouse because of the length of the season and differences in response to photoperiod. For that reason, it is necessary to determine if Hawaiian and California strains have been bred specifically for either the short or long seasons. The maturation characteristics can vary greatly between these two strains, and it may be necessary to select from latitudes similar to the area to be cultivated so that the chances of growing drug Cannabis to maturity are maximized.

Under tests twice a year in the tropics, strains often get that few if any areas of large crops of them are on each equinox. As a result, the equatorial zone has two times during the year when floral induction can take place and two distinct seasons. These seasons may overlap but they are usually five to six months long and are separated by the equinoxes.
The factors involved in the growth and maturation of Cannabis do affect final cannabinoid levels. These factors may be controlled to some extent by proper selection of mature floral clusters for harvesting, agricultural pathway at the same time, nor do all of them complete the cycle and turn into THC molecules simultaneously. There is no magical way to influence the cannabinoid biosynthesis to favor THC production, but certain factors can be selected. The cannabinoid ratios characteristic of a strain are primarily determined by genes, but it must be remembered that many environmental factors, such as light, temperature, and humidity, influence the path of a molecule harvested during this time. More subtle variations in terpenoid and cannabinoid levels also take place within this period of maximum resin secretion, and these variations influence the nature of the resin's psychoactive effect.

Since resin secretion and associated terpenoid and cannabinoid biosynthesis are at their peak just after the pistils have begun to turn brown but before the calyx stops growing, it seems obvious that floral clusters should be harvested during this time. More subtle variations in terpenoid and cannabinoid levels also take place within this period of maximum resin secretion, and these variations influence the nature of the resin's psychoactive effect.

The biosynthesis of cannabinoids and terpenes parallels the developmental stages of the calyx and associated resin-producing glandular trichomes. Also, the average developmental stage of the accumulated individual calyxes can be estimated from the graph of maturation patterns at various latitudes (p.124). In this way it is possible to reproduce exotic foreign environments to more accurately study Cannabis, Tight clusters of calyxes and leaves are characteristic of ripe outdoor Cannabis. Some strains, however, such as those from Thailand, tend to have longer internodes and appear airy and stretched. This seems to be a genetically controlled adaptation to their native environment. Imported examples from Thailand also have long internodes in the pistillate floral clusters. Thai strains may not develop tight floral clusters even in the most arid and exposed conditions; however, this does not affect their ability to produce high-quality resin.
and that during analysis, this cannabinoid ratios are not psychoactive.

In growing the plant, they begin to convert the cannabinoids toward the right side of the reaction sequence. Any remaining cannabinoid acids are decarboxylated by heat within a few days after harvesting. Other THC acids with shorter side-chains also occur in certain chemotypes, but if a strain has the genetically determined ability to convert CBD acid to THC acid, it is considered a drug strain.

It is also interesting to note that Turner and Hadley (1973) discovered an African strain with a very high THC level and no CBD, although there are fair amounts of CBC acid present in the strain. Turner states that he has seen several strains totally devoid of CBD, but he has never seen a strain totally devoid of THC. In addition to genetic and seasonal influences, the picture is further modified by the fact that each individual calyx goes through the cannabinoid cycle fairly independently and that during the dry season, THC acid in n-hexane is converted to ultraviolet light of 235-285 nm. for up to 48 hours. This reaction uses atmospheric oxygen molecules (O2) and is irreversible; however, the yield of the conversion is only about 15% THC acid, and some of the products formed in the laboratory experiment do not occur in living specimens.

Four types of isomers or slight variations of THC acids (THCA) exist. Both Delta1-THCA and Delta6-THCA are naturally occurring isomers of THCA resulting from the positions of the double bond on carbon 1 or carbon 6 of the geraniol portion of the molecule. They have approximately the same psychoactive effect; however, Delta1-THC could be formed but not Delta6-THC.

Delta1-THC acid is about four times more prevalent than Delta6-THC acid in most strains. Also, Alpha and Beta forms of Delta1-THC acid and Delta6-THC acid exist as a result of the juxtaposition of the hydrogen (H) and the carboxyl (COOH) groups on the olivetolic acid portion of the molecule. It is suspected that the psychoactivity of the a and ~ forms of the THC acid molecules probably does not vary, but this has not been proven. Subtle variations occur in the positions of the hydrogen and the carboxyl groups.
Terpene production is also nearing a peak and the floral clusters are beautifully aromatic. Many cultivators prefer to pick some of their strains during this stage in order to produce marijuana with a clear, cerebral, levels remain stable as the molecules are rapidly converted to THC acids, THC acid synthesis has not been active long enough for a high level of CBN acid to build up from the degradation of THC acid by light and heat.

Production increase. The elevated resin heads appear clear, since fresh resin is still being secreted, often being produced in the cellular head of the trichome. At this time THC acid production is at a peak and CBD acid leaves begin to wilt and turn yellow as the pistillate plant reaches its reproductive peak. In the primordial calyxes the pistils have turned brown; however, all but the oldest of the flowers are fertile and the floral clusters are.

Elongation growth of the main floral stem ceases at this stage, and floral clusters gain most of their size through the addition of more calyxes along the secondary stems until they cover the primary stem tips in an.

darken as they lose fertility, and some resin secretion is observed in trichomes along the veins of the calyx. The newly produced calyxes show few if any capitate-stalked trichomes. As a result of low resin production, only pairs of calyxes appear along each secondary floral axis and each pair is subtended by a tri-leaflet leaf. Older pairs of calyxes visible along the primary floral axis during the premature stage now begin to swell, the pistils floral clusters begin to form as calyx production increases and internode length decreases. Tri-leaflet leaves are the predominant type and usually appear along the secondary floral stems within the individual clusters. Many drug strain. A fiber strain rarely produces more than 2% THC, even under perfect agricultural conditions. This indicates that a strain either produces some varying amount of THC (up to 13%) and little CBD and is termed cannabinoid production is low but simple cannabinoid phenotypes, based on relative amounts of THC and CBD, may be determined. By the pre-floral stage the plant has already established its basic chemotype as a fiber or.

production is low, and there is no economic value other than fiber and leaf. Terpene production starts as the glandular trichomes begin to secrete resin; premature floral clusters have no terpene aromas or tastes. Total resin products not metabolically produced by the living plant. These cannabinoid acids are formed through the progressive degradation of THC acids to CBN acid (cannabinolic acid) and other cannabinoid acids. The degradation is the same level in the secretion opaque brown or.

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To ensure high THC levels modified by just the proper amounts of CBC, CBD and CBN, along with their propyl homologs, to approximate the desired psychoactive effect. Since THC acids are being broken down into CBN acid at the same time they are being made from CBD acid, it is important to harvest at a time when the production of THC acids is higher than the degradation of THC acids. Every experienced cultivator inspects a

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With this dynamic picture of the biosynthesis and degradation of THC acids as a frame of reference, the logic behind harvesting at a specific time is easier to understand. The usual aim of timing the moment of harvest is
Resins generally accumulate steadily while the plant matures, but strains may vary as to the stage of peak resin secretion. Seed percentage increases exponentially with time if the crop is well fertilized, but most samples are characteristic of particular strains and may vary widely. Some generalizations can be made. In most cases, the percentage of stem weight steadily decreases as the floral cluster matures. Rejuvenation growth can account for these changes in aromatic principles if directly correlated with changes in cannabinoid production, then harvest selections for cannabinoid level may be possible based on the aroma of the ripening floral clusters.

Leaf production is accelerated as plants reach the rejuvenation stage, and resin color from yellow through red to deep purple. Eventually a brown shade predominates and death is near. In warm areas, rejuvenation starts as vegetative shoots form within the floral clusters. These shoots are usually intact since CBD does not decompose as rapidly as THC acid. This tends to produce marijuana characterized by more somatic and sedative effects. Some cultivators prefer this to the more cerebral and clear psychoactivity of THC. The THC-to-CBD ratio in the harvested floral clusters certainly begins to drop as biosynthesis slows, because THC acid levels decrease as it decomposes, and at the same time CBD acid levels remain or rise due to active biosynthesis. CBN acid may accumulate because not enough energy is available to complete its conversion to THC. Drying, as by the late floral stage, a high proportion of ripe resins are present on the mature calyxes of the fresh plant. Cannabinoid production favors high THC acid and rising CBN acid content at this stage, since most active biosynthesis has ceased and more THC acid is being broken down into CBN acid than is being produced from CBD acid. CBD acid may accumulate because not enough energy is available to complete its conversion to THC.

Late floral clusters exhibit the full potential of resin production, aromatic principles, and psychoactive effect. Complex mixtures of many monoterpenes and sesquiterpenes along with alcohols, ethers, esters, and the plant is protected from the sun by amber or opaque resins. Some late maturing strains develop opaque, white resin heads as a result of terpene polymerization and THC decomposition. Opaque resin heads are equally preserved after drying and the plant is better prepared for long term storage, and resin heads are more resistant to damage by insects and disease. The weight yield of floral clusters is usually highest at this point, but strains may begin to grow an excess of leaves in late-stage clusters to catch additional energy from the rapidly diminishing autumn sun. Total resin accumulation is highest at this stage, but the period of maximum resin production has passed. If climatic conditions are harsh, resins and cannabinoids will begin to decompose. As a result, resin yield may appear high although it may be lower than expected.

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Cannabinoid production favors high THC acid and rising CBN acid content at this stage, since most active biosynthesis has ceased and more THC acid is being broken down into CBN acid than is being produced from CBD acid. Xylenes and styrenes are usually reduced at this stage, but some exist in their aldehydes and ketones and a few remain as thujone, amines, and esters. The THC-to-CBD ratio in the harvested floral clusters certainly begins to drop as biosynthesis slows, because THC acid levels decrease as it decomposes, and at the same time CBD acid levels remain or rise due to active biosynthesis. CBN acid may accumulate because not enough energy is available to complete its conversion to THC. Drying, as by the late floral stage, a high proportion of ripe resins are present on the mature calyxes of the fresh plant. Cannabinoid production favors high THC acid and rising CBN acid content at this stage, since most active biosynthesis has ceased and more THC acid is being broken down into CBN acid than is being produced from CBD acid. CBD acid may accumulate because not enough energy is available to complete its conversion to THC.
Contrary to popular thought, planting Cannabis strains later in the season in temperate latitudes may actually promote earlier flowering. Most cultivators believe that planting early gives the plant plenty of time to flower. Cannabis strains are sensitive to many of the signs of an approaching fall season and respond by beginning to flower. In contrast, strains from tropical areas, such as Thailand, often seem unresponsive to any signs of fall.

Cool night temperatures seem to promote flowering in plants that have previously differentiated sexually. Extended cold periods, however, cause metabolic processes to slow and maturation to cease. Most temperate-dependent on accumulated solar energy since light responses can be activated and THC production increased with only a 40-watt bulb. A reasonable theory is that a light-sensitive pigment in the plant (possibly extend daylength, while the sun supplies the energy needed for growth and THC biosynthesis. It is not known why at least 10 hours (and preferably 12 or 13 hours) of light are needed for high THC production. This is not

Flowering in Cannabis may be forced or accelerated by many different techniques. This does not mean that THC production is forced, only that the time before and during flowering is shortened and flowers are produced. The rate of flowering follows a predictable curve, and the time required for flowering can be controlled by manipulating environmental conditions. The most effective techniques involve the deprivation of light during the long days of summer to promote early floral induction and sexual differentiation. This is sometimes done by moving the plants inside a completely dark room, which \_

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if the plant is dried whole. This means that all of the water in the plant must pass through the stomata on the surface of the leaves and calyxes instead of through cut stem ends. The stomata close soon after harvest and is used because the entire plant is not ripe at any given time. Removing individual clusters also makes drying easier and quicker because the stalks are divided into shorter pieces. Floral clusters will dry much more slowly harvest than by any other single cause. When the plant is harvested, the production of fine floral clusters for smoking begins. Cannabis floral clusters are harvested by two basic methods: either individually, by cutting

Harvesting, drying, curing, and storage of Cannabis floral clusters to preserve and enhance appearance, taste, and psychoactivity is often discussed among cultivators. More floral clusters are ruined by poor handling after

fewer of them will germinate, but even after 5 to 6 years a small percentage of the seeds usually still germinate. Old batches of seeds also tend to germinate slowly (up to 5 weeks). This means that a batch of seeds for

stored in air-tight containers in a cool, dark, dry place. Freezing may also dry out seeds and cause them to crack. If seeds are carefully stored, they remain viable for a number of years. As a batch of seeds ages, fewer and

not exposed to excess humidity (causing them to germinate) or excessive aridity (causing them to dry out and crack). Seeds preserved for future germination are thoroughly air dried in paper envelopes or cloth sacks and

Seeds are harvested by cutting fields of seeded pistillate plants and removing the seeds either by hand or machine. Cannabis seeds usually fall easily from the floral clusters when mature. The remainder of the plant may be

and tissues that join the fibers into bundles, so that the individual fibers are freed. Natural retting is accomplished by soaking the stalks in water and laying them out on the ground, where they are attacked by decay

Natural retting is the breaking down of the outside skin layer by decay of the stalks results of fiber is

the plant may be

oxes, or jars, and cloth sacks and

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harvest and
The proper harvesting, curing, and storage of Cannabis closes the season and completes the life cycle. Cannabis is certainly a plant of great economic potential and scientific interest; its rich genetic diversity deserves another opaque container is used to cover the clear glass or plastic wrapping. Clusters are not sealed permanently until they have finished curing. Curing involves the presence of oxygen, and sealing floral clusters will end air-tight, but glass breaks. It is feared by some connoisseurs that plastic may also impart an unpleasant taste to the floral clusters. In either case, additional care is usually taken to protect the floral clusters from light so they do not rub together. Glass jars and plastic freezer bags are the most common containers for the storage of floral clusters. Polyethylene plastic sandwich or trash bags are not suited to long-term storage since they do not breathe air and water vapor. This may cause the floral clusters to dry out excessively and lose potency. Heat-sealed boilable plastic pouches do not breathe and are frequently used for storage.

Cannabis floral clusters are best stored in a cool, dark place. Refrigeration will retard the breakdown of cannabinoids, but freezing has adverse effects. Freezing forces moisture to the surface from the inside of the floral tissues and this may harm the resins secreted on the surface. Floral clusters with the shade leaves intact are well protected from abrasion and accidental removal of resins, but manicured floral clusters are best tightly packed so they do not rub together. As floral clusters dry, and even after they are sealed and packaged, they continue to cure. Curing removes the unpleasant green taste and allows the resins and cannabinoids to finish ripening. Drying is merely the removal of the moisture from the floral clusters. If drying occurs too rapidly, the green taste will be sealed into the tissues and may remain there indefinitely. A floral cluster is not dead after harvest any more than an apple is. Certain metabolic activities take place for some time, much like the ripening and eventual spoiling of an apple after it is picked.

During this period, cannabinoid acids decarboxylate into the psychoactive cannabinoids and terpenes isomerize to create new polyterpenes with tastes and aromas different from fresh floral clusters. It is suspected that cannabinoid biosynthesis may also continue for a short time after harvest. Taste and aroma also improve as chlorophylls and other pigments begin to break down. When floral clusters are dried slowly they appear to be more tightly packed. As they dry, and even after they are sealed and packaged, they continue to cure. Curing removes the unpleasant green taste and allows the resins and cannabinoids to finish ripening. Drying is merely the removal of the moisture from the floral clusters. If drying occurs too rapidly, the green taste will be sealed into the tissues and may remain there indefinitely. A floral cluster is not dead after harvest any more than an apple is. Certain metabolic activities take place for some time, much like the ripening and eventual spoiling of an apple after it is picked.

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