

## ... on Growing European Cucumbers

from the Staff at HGI Worldwide, Inc.

Growing European cucumbers can be an easy addition to your tomato crop. The same customers usually purchase tomatoes and cucumbers. Therefore, adding cucumbers to your line of products may help you diversify, while not requiring that you establish a new list of customers.

### Benefits

Cucumbers are considered a quick crop because it only takes about 2 weeks to get a seedling ready for transplant. Once the cucumber plant is transplanted to its final spacing, production should begin in about 30 days. Fruit harvest can continue for 90 days or more.

Cucumber plants require 8 - 10 square feet of greenhouse space compared to tomato spacing of 4 - 5 square feet of greenhouse space per plant. This means that only half as many cucumber plants are required to properly fill the same area.

Cucumber plants like higher nitrogen levels and can be grown in USED media that has been previously used for growing media for other crops.

The plants like warm, humid conditions. Being a member of the melon family, they grow very well in the weather conditions that are characteristic of the southern part of the U.S.

The plants are heavy producers - yields of 30+ lbs per plant from a 4 month crop are possible during the longer days of late Spring and Summer.

The plants are all female and the flowers do not require pollination.

### Selecting seeds

European cucumber seeds are available for full sized fruit that is usually harvested when the fruit weighs about one pound. "Mini" varieties are harvested when the fruit is about the size of a large dill pickle. These varieties of cucumber seed are specifically produced for greenhouse production. These varieties are capable of producing fruit without pollination. The seeds grown within the fruit are sterile, and immature. They will not produce another generation of plants.

Many of the newer varieties of seeds have been bred with resistance and/or tolerance to various diseases that have been a problem to growers in the past.

The time of year you choose to grow the crop may determine the size of fruit that you desire. During the long days of Summer, all fruit tends to reach its maximum length. During the short days of Winter, the

fruit tends to mature at a shorter length. Some growers will select a shorter variety during the Summer months and a longer variety during the Winter months. Their customers receive fruit that is very similar in length throughout the year. Some markets request different sizes of fruit and you may need to make your seed selection based upon the fruit length requirements of your market.

### Planting the seed

Seeds are usually started in 2" or 3" Net pots and are ready for transplant in 10 days to 2 weeks. When planting the seed, it is best to lay the seed flat. The taproot will extend out from one end of the seed and the growing point of the plant will come from the other end. If you plant the seed with one end pointed down, there is a good possibility that you will have planted about half of your seeds upside down. Lightly cover the seed with about 1/4" of media. Planting the seeds too deep can delay germination and increase the possibility of losses caused by "damping off" fungus.

Once you have finished planting the seeds, thoroughly wet the media with plain, room temperature water. Cover the seed flats with a single sheet of newspaper. Mist the newspaper with plain water until the paper is completely wet. The newspaper will become a "blanket" over the seed flats. It will help to stabilize the temperature around the seeds. It will allow a slight amount of air circulation. As the paper dries out, it will serve as an indicator of when to water the seed flats again. If you are starting your seedlings in a greenhouse, the newspaper will also serve as a shade cloth to keep the temperature of the growing media within the proper range. Temperatures about 85° F. can "cook" the seeds. When sunlight shines on any dark growing media, it absorbs heat and the temperature of the media can rise much higher than the air temperature. The best germination temperature is 75° - 78° F.

Although these seeds are expensive, you can expect nearly 100% germination in 2 - 4 days. Water with plain water until the seeds have germinated. The newspaper should be removed once the seeds have germinated. Once the seedlings have emerged from the media, apply Mycostop and Guardian nematodes. Use 1/2 strength fertilizer solution adjusted to a pH of 6.5 - 6.8 for the remainder of the seedling stage.

One final note as you start these seedlings. I don't think a year has gone by that I don't get at least one call from a grower who has lost a portion of their seeds to MICE. If you are going to grow your seedlings on the floor - or if your benches are positioned where mice can

get on top of them - do something to keep the mice away from your seeds.

### **Growing Media**

The growing media used for cucumbers is the same as tomatoes - it can consist of a wide variety of medias, including: peatlite mixes; coarse, aged sawdust/pine bark; soil; perlite; or rockwool. One cucumber plant will require as much growing media as two tomato plants.

### **Transplanting**

Cucumbers need 8 - 9 square ft. of greenhouse space per plant. This is double the spacing required for tomato plants. As an example, if your greenhouse was 30' x 120' (or 3600 sq. ft) it would hold 400 - 450 cucumber plants. In this example, the plants would be set out in 5 rows of 80 - 90 plants per row.

Two support wires are positioned over each row, about 28" - 30" apart. Assuming the rows are running North to South, we will call the support wires over each row, the East wire and the West wire. Unlike tomato plants, cucumber plants are brittle and will not be "leaned and lowered" when they reach the support wires. As the seedlings begin to grow, a plant clip is used to attach a support string to each plant. Every other plant will be attached to the East support wire, with the alternate plant being attached to the West support wire.

The support strings are attached to the support wires on a slight diagonal. As an example, all strings attached to the East wire would be attached to the support wire 18" - 24" North of the vertical position of each plant. All strings attached to the West wire would be positioned 18" - 24" South of the vertical position of the plants. This diagonal angle will help the developing fruit hang away from the main stem of the plant.

The initial growing temperature for cucumbers is 68° F. nights and 80° - 85° F. days. They will tolerate higher temperatures if the relative humidity is 70% or more. The night temperature can be lowered to 65° F. when the plants reach the support wire.

### **Initial pruning & training**

As the plants begin to grow, it is important to allow them to develop a strong root system. A strong root system will enable the plant to support more fruit and grow quicker. During this phase of their growth, all laterals (suckers), fruit and tendrils should be removed. Continue this pruning until the plant has developed 10 true leaves. The plant will be about 3' high before you allow any fruit to develop. This will take about 20 days from the time of transplanting. Keeping the fruit removed during this stage of growth allows the plant to develop a

strong root system. The last few leaves in this stage of growth should develop to nearly 12" across.

As the plants grow, the support string should be twisted around the stem, approximately one revolution every 6" - 9". Always twist in the same direction. The string should be carefully positioned to not damage any developing fruit. If you start twisting in a "clock-wise" direction, continue twisting in a "clock-wise" direction all the way to the support wire. You don't want to change the twisting direction to "counter clock-wise" half way up the plant. This could cause a serious problem when you begin removing the lower leaves from the stem. With proper twisting, you will probably not need to use any more plant clips until the plant gets close to the support wire.

Once the cucumber seedlings have been transplanted, you can begin feeding them a full strength, high nitrogen, fertilizer solution. Maintain the night temperatures at 65° - 68° F. at the flower level. The relative humidity should be kept at 70% - 85%. A misting system is beneficial for keeping the relative humidity in this range and as an added benefit; a misting system will help to keep spidermites under control. As the plants begin to grow, you will notice that they require 25% - 50% more water than tomato plants. Generating additional carbon dioxide within the building is also helpful during the daylight hours - when the exhaust fans are not running.

Hang yellow sticky ribbons and begin a monitoring program for insect pests. The primary insect pests of cucumbers are whiteflies, spidermites and thrips. These can be controlled using biologicals if releases are made before the pests get out of control.

### **After 10 leaves**

After 10 true leaves have developed on the plants, you can begin developing fruit. If all conditions have been maintained properly, this should be about 20 days after transplanting. The plants will be about 3' high at this time. If the plants are setting multiple flowers at a leaf node, you should prune down to only one flower at each leaf. Behind each flower will be a small embryo fruit. Select the straightest embryo fruit to mature. If a fruit is curled or crooked, it should be removed. These curled fruit will never straighten out and should not be allowed to waste the energy of the plant. If you allow multiple fruit to develop on the main stem leaves, later developing flowers will probably abort and you may find that you weekly production swings from peaks to valleys.

No pollination is required for these fruit to develop. The plant is all female and will produce fruit that contains sterile seeds. These seeds will not mature. It is believed that mature cucumber seeds cause some

people to “burp”. Because of the immature seeds, these fruit are considered “burpless”.

As the plant continues to grow up the support string, remove the lateral growth (suckers) and the tendrils. If the tendrils are not removed, you will notice that they can grab hold of a developing fruit and damage the appearance of the fruit. The flowers should be thinned to only one straight fruit for each leaf. Continue twisting the growing point around the support string. At this stage of growth, the plants will be growing nearly 6" per day. The fruit will mature to a harvesting size in about 10 days. During this stage of growth, bottom leaves should only be removed if they are interfering with your watering system or if they are beginning to discolor.

It is important that you maintain adequate water and fertilizer levels for the plants as they begin to set fruit. You should always watch the growing point of the plants and make sure that it remains strong. The stem of the plant should be about 1/2" in diameter. The flowers should be a good color, a good size, and it is good to have at least 2 flowers trying to develop at each leaf node. However, if you are developing more than 2 flowers per leaf node, you may be feeding them slightly more fertilizer than they need.

If you have a conductivity meter, you should compare the conductivity of the incoming solution to the plants with the solution that is leaching out of the bottom of the growing media on a weekly basis. Approximately 10% - 20% of the solution going in the top of the media should be running out the bottom each day. The conductivity of your “leachate” solution should be 10% - 20% higher than what is going in the top.

If the conductivity of the leachate solution is:

- a) Less than the conductivity going in the top - you should increase your fertilizer level.
- b) Equal to the conductivity going in the top - you should reduce the amount you are watering.
- c) 10% - 20% higher than what is going in the top - your feed & water is OK.
- d) Greater than 20% higher than what is going in the top - you should increase the number of waterings per day (and possibly leach the media with plain water to reduce the fertilizer levels in the media).

### **As the plant approaches the support wire**

As the growing point of the plant approaches the support wire, you should begin removing bottom leaves - 2 or 3 leaves at a time - at a weekly rate that is equivalent to the number of new leaves being set at the top of the plant. At this point, you have reached a good balance of leaves for photosynthesis and proper production. However, pruning is necessary to maintain proper ventilation within the plant canopy for fungus and insect control. Excessive pruning at any given time can cause

too much moisture loss in the plant and may result in aborted flowers. It is better to remove 2 or 3 leaves - wait 2 or 3 days - then prune again. A bottom leaf that is supporting a fruit should not be removed until the fruit has been harvested. The leaves on the main stem will gradually be removed as the fruit is harvested.

It is important to maintain sufficient foliage on the plant for proper photosynthesis. Excessive pruning of leaves can cause the plant to quit producing flowers. However, it is also important to maintain adequate air movement through the plant to reduce the risk of fungus and insect problems.

Watch the growing point of the plant. It may be necessary to increase water and fertilizer by 20% - 25% during times of heavy fruit load. The growing point should be producing a stem diameter of 1/2" and 1 - 2 flowers at each leaf node. If the growing point of the plant is weak as it approaches the support wire, you may choose to remove flowers from the last 2 - 3 leaves before the wire. This will allow the growing point to regain strength and improve the stem diameter for growth along the support wire.

### **Lateral Growing Techniques**

About 30 days after transplant, the plant should be approaching the support wire. Unlike tomato plants, cucumber plants are very brittle and you will break the stem if you attempt to “lean & lower” the plants. There are several methods of training the plants once they reach the support wires.

The “**Trellis**” method would have you run additional support wires over the top of the aisle way. The plants are then allowed to grow across the top of the aisle way towards to plants on the other side of the aisle. This forms an arch with the fruit hanging down above the aisle.

The “**Umbrella**” method would have you terminate the growing point of the plant about 2 leaves above the support wire. Two laterals are allowed to grow from the plant (one in each direction along the support wire). These laterals grow along the support wire for about 8", then are allowed to grow back down 3' - 4'. This forms an umbrella shape.

The “**Number 7**” method will perhaps keep your plants the most organized. Each plant is trained in the shape of the number 7. The growing point of each plant is trained to grow along the support wire in the same direction. The growing point is allowed to grow along the support wire until it is 8" - 12" from the main stem of the plant next to it. As the stem grows along the support wire, 2 laterals (suckers) are allowed to begin growing. The main growing point and the 2 laterals are then

allowed to grow downward for about 3'. The plant has now been trained in the shape of the number "7" with 2 additional laterals hanging from the support wire.

Once the original growing point or the laterals have grown down about 3' from the support wire, their growing points are pinched out. Removing the growing points will stimulate the plant to produce more laterals. As the fruit matures on each of the hanging vines, it is harvested. Once all the fruit has been harvested from one of the 3 hanging vines, a new developing lateral is located near the support wire. The old hanging vine is then removed just below the new developing lateral. This opens a space for the new lateral to grow. It is allowed to grow down about 3' before its growing point is pinched out. The cycle is repeated on each of the hanging vines until the crop is terminated.

The "Number 7" method keeps the plants growing in an organized fashion throughout their life cycle. It utilizes the vertical space within the greenhouse without blocking excessive amounts of light to the developing foliage. It provides a way to renew the foliage growth, while keeping proper ventilation within the plant canopy. Since each of the 3 growing points are developing at different times, fruit production is maintained in a predictable fashion.

### **Main problems**

Growers can experience problems growing cucumbers that are very similar to tomatoes. The plants are subject to attack from fungus, such as *botrytis* and Powdery Mildew. Maintaining proper ventilation and relative humidity levels between 60% - 85% can help reduce the incidence of fungus. Several cucumber varieties are resistant to Powdery Mildew.

Like most plants, cucumbers can also be attacked by a variety of root diseases; such as *fusarium*, *damping off*, *rhyzoctonia* and *pythium*. The regular use of Mycostop, which is a beneficial *streptomyces* bacteria that will grow around the roots of plants and help shield the roots from attack from these diseases, may help to reduce the problems from these problems.

Insect pests of cucumbers include; whiteflies, spidermites, thrips, aphids and fungus gnats. As is true with most plants, these insects can be controlled with the use of beneficial insects. However, it is important that the pests be detected early and control measures be implemented before the insects get out of control. The use of insect barriers and yellow sticky traps for early detection and control is important. Installing an inexpensive misting system can help with humidity and temperature control and will also provide an added benefit of slowing the rapid outbreak of spidermites and other insects.

Sanitation is very important. Keeping the greenhouse free of debris and old plant material will help prevent the spread of fungus and insect problems. Keeping the outside of your building free from weeds and other insect attracting material, especially around your intake vents, will aid in preventing a rapid invasion of insect pests coming in from the outside.

### **Harvesting**

The harvest of cucumber fruit usually begins about 30 days after transplant. The fruit grows very rapidly. A flower will yield a 1-pound fruit in about 10 days. The weigh gain of the fruit can be very rapid during the high light times of the year. A 3/4-pound fruit today will be a 1-pound fruit tomorrow. Fruit is usually harvested when it weighs about 1 pound. Harvesting may be required every day during high light periods. Fruit allowed to remain on the plant can grow to an unmarketable size of 3 - 4 pounds and will sap the energy of the plant.

When harvesting the fruit, it is important to remove the fruit stem back to the main stem of the plant. Any "stub" that is left can be attacked by the fungus *botrytis*. Harvesting early in the morning, while the fruit is still cool, will help maintain crisp fruit. The fruit is very thin skinned and should be quickly wrapped in stretch wrap or shrink-wrap film to prevent moisture loss. Once the cucumbers have been wrapped, they can be stored at 50° - 55° degrees F. for 2 - 3 weeks. You should avoid storing them with ethrel producing fruits and vegetables, because this will accelerate their ripening process and result in a shorter shelf life.

### **Wrapping Machines**

There are 3 different types of machines commonly used for wrapping cucumber fruit. The size machine used by a grower is dependent on the volume of production. The smallest is a stretch wrap machine. These machines are used in the meat and "deli" departments of most grocery stores. A grower can usually wrap 3 - 4 fruit per minute with one of these machines.

A mid-sized wrapping machine utilizes an L-sealer and a heat tunnel to shrink the film around the cucumbers. These machines are widely used in industry to "shrink wrap" a variety of products. With an L-sealer and heat tunnel, a grower can expect to wrap 15 - 20 fruit per minute.

A large cucumber grower may choose to use a special machine that is designed especially for wrapping cucumbers. These machines utilize 2 rolls of shrink film (one layer below the fruit & one layer above the fruit). These machines are capable of wrapping 100 - 160 fruit per minute.

## **Target Production estimates**

Cucumber plants are capable of producing yields of 3+ pounds of fruit per plant per week during the high light times of the year. This is about 12 pounds per plant per month and across the normal 90-day harvest period, yields of 30 - 35 pounds per plant should be the target production goal of a grower. During the low light times of the year, production will decline. Your target production goals may drop to 1 - 1.5 pounds per plant per week.

However, a grower who raises cucumbers on a year around basis (usually 3 crops), should target his annualized production at 60 - 90 pounds per plant space per year. This could also be stated as an annualized production of 7 - 10 pounds of fruit per square foot of greenhouse per year.

## **Marketing**

European cucumbers are eaten - skin and all - there is no peeling required because the skin is not bitter. Unlike field cucumbers, the fruit has not been waxed, therefore there is no waste to throw away. The fruit is very low in calories. The seeds do not mature, therefore they are considered "burpless". Once most customers have tried these cucumbers, they never want to return to using "field grown" varieties.

In the U.S., cucumbers are marketed in different ways. Along the East coast, cucumbers are sold in 12-pound boxes. In the Central and Western part of the country, cucumbers are sold in 16-pound boxes. These boxes are further defined by the size of fruit within the box. The most popular size is 1-pound fruit, therefore a 16-pound box with a 16 count of fruit. However, some boxes may be graded as 12 count (very large fruit), 14 count, and some boxes containing smaller fruit may be graded as 18 count.

All fruit is expected to be a dark green color and free of blemishes. They are expected to be relatively straight and evenly filled from end to end. If a slightly curved fruit is placed on a flat surface, the arch should not leave a clearance of more than 1" at the highest point. Fruit with a curvature greater than 1" would be graded as a #2 quality.

Some large producers ship nationwide. There are large growers in Florida, California, Mexico, British Columbia and Ontario in Canada. The majority of these growers begin their heavy production during March & April and there is a secondary peak in production during October & November of each year. This is usually when the selling price of cucumbers goes down. Many of these growers are out of production during the Winter months and again during the Summer months. With less available supply, the market price is high during the Winter months

with a secondary peak during the Summer months. The selling price usually ranges from \$1.99 - \$2.99 per pound during the Winter months to a low of about \$.99 per pound during the Spring and Fall. Wholesale prices are typically 33% - 40% less than the retail prices.

## **The Local Grower**

A local grower always has the advantage of providing "fresh picked" quality. However, European cucumbers are a relatively unknown commodity. Many people will confuse these cucumbers with zucchini or some other strange exotic fruit. It is the grower's responsibility (and opportunity) to develop their own markets.

One method of developing a market that has been very successful for several growers has been to set up a "demo table" in the produce section of local supermarkets. Most produce managers are very receptive to this because their section of the supermarket rarely gets the opportunity to give "demo's". If the grower can arrange to spend just 2 hours per week doing "demo's" at the local supermarkets, they will probably develop more demand for their product than they can produce.

A "demo table" usually consists of a card table, a cutting board, cucumbers and toothpicks. The grower provides "free sample" slices for very everyone to taste. Many growers will also put together a poster board of pictures and descriptions of how and where the cucumbers are grown. Most growers will also label their fruit and ask the customers to look for their label when making purchases in the future.

## **In Conclusion**

European cucumbers are a fast growing crop that can be either grown as a "catch crop" or as a primary crop. They are distinctive in their appearance and flavor. They can ONLY be grown in greenhouses. Many of the same customers that purchase your other produce items may be interested in your cucumbers. Cucumbers could help you diversify your production and allow you to deliver more produce to the same customers.