

## Phyto-Chemicals

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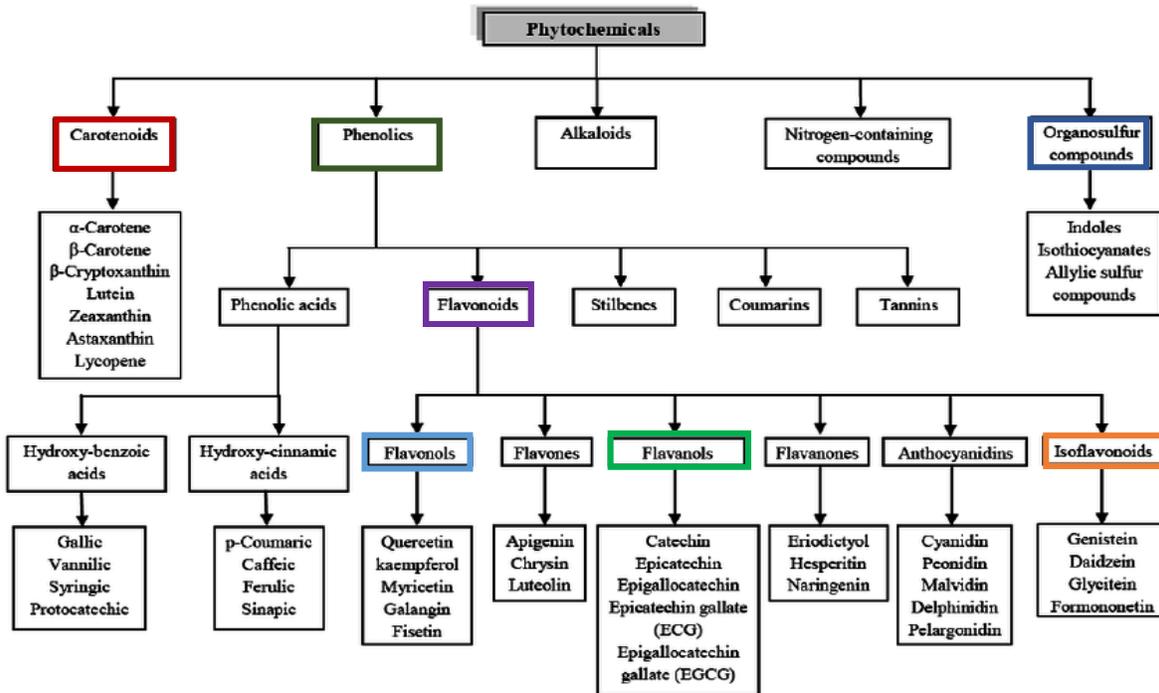
- What are phytochemicals?
- What are some examples of phytochemicals?
- How do they benefit our health?
- Are there foods that have a lot of phytochemicals?
- Should I take a supplement to get more phytochemicals?
- Do you have recipes to suggest that incorporate foods high in phytochemicals?

### What are **Phyto-Chemicals**?

- The word “phyto” comes from Greek, meaning “plant”. Therefore, phytochemicals are literally plant chemicals that occur naturally in plant foods.
- They are responsible for giving color, flavor, and odor to plant foods. These compounds provide the plant with protection against predators and infection.
- Research suggests that eating foods high in phytochemicals provide a variety of health benefits. When we eat food with phytochemicals, we reap the same protection against diseases such as cancer. Another way to think of “phyto” chemicals, are “fighter” chemicals.
- You might be surprised to learn that they are not essential nutrients in our diet. However, they are intriguing components to plants that hold promise to promote our health.

### What are examples of **Phyto-Chemicals**?

- There are tens of thousands of phytochemicals, but researchers speculate that there are likely many more that remain to be discovered. They are classified by their chemical structures and functional properties. Some scientists like to use a “Phytochemical Family Tree” to depict the major groups of phytochemicals found in food.



- **Polyphenols, or phenolics**, are a large group of phytochemicals. They include flavonoids, phenolic acids, stilbenes, lignans, among others.
  - **Flavonoids** are the largest known group of phytochemicals. More than 6000 types of flavonoids have been described.
  - Flavonols are a group of phytochemicals belonging to the flavonoid family. Quercetin is an example of a **flavonol**, and is found in red apples.
  - Anthocyanidins are another group of flavonoids, with anthocyanin as example. Anthocyanins are found in red-violet fruit like blackberries.
  - Another type of flavonoid is **isoflavonoids**; which is a group that contains daidzein, genistein, and glycitein. We find these phytochemicals in soy, and whole soy products.
  - Another example of flavonoids are catechins in the **flavanol** family. Tea, specifically green tea, contains catechins especially EGCG.
- **Carotenoids** are another group of phytochemicals that include beta carotene and lycopene. Less familiar carotenoids are lutein and zeaxanthin, and alpha carotene. Orange fleshed vegetables, as well as red, green, and orange colored fruit and vegetables contain these phytochemicals. For example, winter squash, spinach/leafy greens, broccoli, carrots, and cooked tomatoes contain carotenoids.
- **Indoles** and **Isothiocyanates** are another group of phytochemicals. Some examples are allyl isothiocyanate, sulforaphane, phenylethyl isothiocyanate, and 3-phenylpropylisothiocyanate. We find these phytochemicals in cruciferous vegetables.

This is a big group of vegetables, such as broccoli, cabbage, Brussels sprouts, cauliflower, collard greens, horseradish, kale, mustard greens, radishes, rutabaga, turnips, and watercress.

### How do **Phyto-Chemicals** benefit our health?

- Overall, the phytochemicals present in plant foods are associated with reduced risk for:
  - cardiovascular disease by lowering BP, reducing inflammation, increasing HDL while decreasing LDL, dilating blood vessels, and decreasing chance of blood clots to form;
  - decreased risk for Type 2 DM by reducing inflammation, improving insulin sensitivity, and indirectly reducing risk for weight gain;
  - reduced risk for neurodegenerative disease such as Alzheimer's disease and Parkinson's disease by increasing the number of connections among neurons, improving blood flow to the brain.

### How do **Phyto-Chemicals** protect us against cancer?

- ⇒ Stimulate our immune system
- ⇒ Inhibit toxins from becoming carcinogens
- ⇒ Reduce the kind of inflammation that makes cancer growth more likely
- ⇒ Prevent DNA damage, also repair damaged DNA
- ⇒ Trigger apoptosis
- ⇒ Slow the growth rate of cancer cells
- ⇒ Reduce oxidative damage to cells
- ⇒ Regulate gene expression
- ⇒ Regulate signaling of hormones
- ⇒ Activate insulin receptors

*In addition to the above, there are likely other effects of phytochemicals that have yet to be discovered.*

### Are there foods that have a lot of **Phyto-Chemicals** in them?

- Good news! The healthiest foods we can eat also possess the highest number of phytochemicals. Experts recommend a plant-based diet as important to reduce risk for many chronic diseases, including most cancers.
- Plant foods are whole grains, beans & lentils, vegetables, fruit, nuts & seeds. If we include a variety of plant foods for most of meals and snacks, we will consume significant amounts of phytochemicals.
- Experts recommend that we eat the rainbow! Vibrantly colored fruit and vegetables, like **tomatoes** and **raspberries**, **sweet potatoes** and **oranges**, **spinach** and **kiwi**, **blueberries**, and **purple cabbage** and **blackberries** are all high in phytochemicals. Some

foods that are not vibrantly colored contain high amounts of phytochemicals. Whole grains, beans, nuts and seeds are plant foods that contain phytochemicals. Tan or white vegetables and fruit, such as cauliflower and pears, are abundant in phytochemicals.

### Should I take a supplement to get more **Phyto-Chemicals**?

- A supplement would naturally seem to be a simple strategy to boost the phytochemicals levels in our body. However, the research currently only supports that we consume food and beverages rich in phytochemicals rather than using a dietary supplement.

There could be several reasons why food forms of phytochemicals are preferred to dietary supplement forms:

1. A plant food has a package of both nutrients and phytochemicals, and each of these has a synergy providing the maximum benefit. If you think about the sound that an orchestra makes compared to the sound of one single instrument. The effect is more potent because of the combination of sounds from all the instruments in the orchestra.
2. All those lines, components like fiber, vitamins, and minerals might exert an influence on the phytochemicals within a food. The inclusion of fiber, vitamins, and minerals might change the mechanism of action of the phytochemicals. If we took a dietary supplement that is an isolated phytochemical, it is not expected to have the same effect.
3. We have research that people who eat a plant-based diet consume greater amounts of phytochemicals, which imparts benefits to our health. On the other hand, we do not have any research that people who take dietary supplements of phytochemicals benefit from any improvements.



**Phyto-Chemicals**



## Do you have recipes to suggest that incorporate foods high in **Phyto-Chemicals**?

Yes! Each of the following recipes have varying types and amounts of phytochemicals. See each of the examples below.

<i>Recipe</i>	<i>Phyto Foods</i>	<i>Cancer Protective Properties</i>
<i>Breakfast Tofu Scramble</i>	<b>Tofu</b>	<b>Tofu contains isoflavonoids, including genistein, daidzein, and glycerin. They communicate with our genes to dial down oncogenes, and dial up tumor suppressor genes.</b>
	Spinach	Spinach contains high amounts of lutein and zeaxanthin. They help to promote cell communication, which mobilize carcinogen metabolizing enzymes, and promote apoptosis.
	<b>Broccoli</b>	<b>Broccoli has sulforaphane which dials down oncogenes and dials up tumor suppressor genes.</b>
	Onion, garlic	Allium vegetables slow the growth rate of cancer cells, and also lower the ability of carcinogens to initiate cancer.
<i>Blueberry Pistachio Parfait</i>	<b>Turmeric</b>	<b>The Anti-Cancer spice, turmeric contains curcumin. It is a potent antioxidant, and also induces cell cycle arrest.</b>
	<b>Blueberries</b>	<b>Blueberries have anthocyanins, that protect our cells from damage and tell cancer cells to self-destruct.</b>
<i>Apple Slaw</i>	Pistachios	Pistachios have EGCG, lutein, and anthocyanins. This slows cancer cell growth stimulates enzymes to detoxify carcinogens, tells cancer cells to self-destruct, and acts like sunscreen for our skin and eyes. Pistachios also have melatonin which has been shown to slow the growth rate of both ER+/- breast cancer. Also repairs DNA damage.
	Apples	The peels of red apples have quercetin, which influence gene expression. This signals to cells to detoxify carcinogens.
	<b>Cabbage</b>	<b>Cabbage contains indoles that take the body's estrogen and turns it into a weaker form.</b>
	Beet	Beets possess betalain, which acts as a potent antioxidant and has anti-inflammatory properties.
	<b>Carrots</b>	<b>Carrots have falcarinol, which acts to slow cell growth and induces apoptosis.</b>
<i>Winter Squash with Farro and Wild Blueberries</i>	Rosemary	Rosemary has carnosol which possess anti-proliferative effects. It also induces apoptosis and acts as a chemosensitizer.
	Winter squash	Winter squash has carotenoids that act as strong anti-oxidants. The phytochemicals also control cancer cell growth, limiting metastatic growth. They also stimulate apoptosis.

<b>Phyto-infused marinara</b>	<b>Blueberries</b>	<b>Blueberries have anthocyanins, that protect our cells from damage and tell cancer cells to self-destruct.</b>
	Rosemary	Rosemary has carnosol which possess anti-proliferative effects. It also induces apoptosis and acts as a chemosensitizer.
	<b>Walnuts</b>	<b>Walnuts have urolithins that suppress the aromatase enzyme, which is responsible to produce estrogen.</b>
	Farro	Farro has phenolic acids that improve glucose metabolism and decrease insulin resistance. They alter the gut microbiota in a favorable way to minimize the potential for carcinogenesis.
<b>Matcha Cocoa Date Bites</b>	<b>Tomatoes</b>	<b>Lycopene decreases cell growth and reproduction, increases self-destruction of abnormal cells and influences androgen hormones that can drive the development of prostate cancer. Most potent when heated.</b>
	Eggplant	Eggplant has several types of flavonoids that have shown to inhibit angiogenesis and also tells cancer cells to self-destruct.
	<b>Carrots</b>	<b>Carrots have falcarinol, which acts to slow cell growth and induces apoptosis.</b>
<b>Matcha Cocoa Date Bites</b>	<b>Matcha green tea</b>	<b>EGCG can act throughout the cancer process: stimulating enzymes that deactivate carcinogens, decreasing tumor growth, increasing self-destruction of cancer cells, and restraining the spread of cancer cells.</b>
	Cocoa powder	Flavanols in cocoa powder have antioxidant properties. May inhibit inflammation and tumor growth; may aid immunity and boost production of detoxifying enzymes in the body.
	<b>Walnuts</b>	<b>Walnuts have urolithins that inhibit the aromatase enzyme which produces estrogen.</b>

### Are there any resources that you suggest?

This guide can help you explore different fruits and vegetables throughout the year. Seasonal produce in your area will vary by growing conditions and weather.

<https://snaped.fns.usda.gov/seasonal-produce-guide>

Have a Plant provides information about nutrition, storage, and handling information on a variety of fruits and vegetables. One look and you will see that eating a colorful variety of fruits and veggies provides a wide range of valuable nutrients.

<https://fruitsandveggies.org/>