



PHYTONUTRIENT SPECTRUM

Comprehensive Guide





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Why Phytonutrients?

Natural compounds called phytonutrients or phytochemicals, are components of plants that are powerful defenders of health. Studies show that people who eat more plant foods have reduced risk of chronic diseases such as diabetes, heart disease, and cancer. Phytonutrients provide many functions in the plant itself, such as providing protection from pests and environmental stressors, along with imparting color and distinctive tastes and smells. In the human body, phytonutrients stimulate enzymes that help the body get rid of toxins, boost the immune system, improve cardiovascular health, promote healthy estrogen metabolism, and stimulate the death of cancer cells.

Fruits and vegetables are rich sources of phytonutrients, along with whole grains, legumes, herbs, spices, nuts, seeds, and teas. Phytonutrients in food come in all different colors—green, yellow-orange, red, blue-purple, and white. To promote good health, it is important to eat fruits and vegetables of varied color each day. Aiming for one to two of each color per day is a healthy goal to strive for! While darker-colored plants are generally higher in phytonutrients, fruits and veggies from the white family do have beneficial contributions for promoting health.

Starting with color is the first basic step to make when developing a healthy way of eating for everyone. It is foundational to all food plans within Functional Medicine, as plants are good medicine for chronic disease prevention and treatment.



RED

Red foods contain phytonutrients that may help reduce the risk for certain cancers, along with helping to protect the brain, heart, liver, and immune system.

The Food List: Red Foods

There is a vast selection of red foods for you to choose from on the food list. The red fruits on the list include apples, blood oranges, cranberries, cherries, goji berries, grapes, plums, pomegranate, raspberries, strawberries, watermelon, and rhubarb. Pomegranate is extra special for its ellagic acid, an important component for your liver to get rid of toxins. Strawberries, grapes, and apples contain the compound, fisetin, which has anti-cancer, anti-aging, and anti-inflammatory properties. If you buy dried cranberries, cherries, plums (prunes) or grapes (red raisins), make sure there is minimal or no added sugar. As mentioned above, watermelon and pink grapefruit are two excellent sources of lycopene (but cooked tomatoes seem to be the best!). When it comes to red vegetables, there are red bell peppers, beets, red onions, red potatoes, radicchio, radishes, sweet red peppers, and tomatoes. This category of foods also presents you with options for red-colored legumes to choose from such as adzuki beans and kidney beans.

Try something you are not as familiar with such as pomegranate, in the form of the seeds from the fruit, or even goji berries, which are perfect for a trail mix. Keeping the skin on red-skinned foods, like apples, onions, and potatoes will provide you with those essential phytonutrients.

Red Food Compounds

- Anthocyanins
- Astaxanthin
- Carotenoids
- Ellagic Acid
- Ellagitannins
- Fisetin
- Flavones
- Flavonols
- Flavan-3-ols
- Flavanones
- Luteolin
- Lycopene
- Proanthocyanidins
- Quercetin

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- DNA health
- Immune health
- Prostate health
- Vascular health

Foods

- Apples
- Beans (*Adzuki, Kidney, Red*)
- Beets
- Bell pepper
- Blood oranges
- Cranberries
- Cherries
- Grapefruit (*pink*)
- Goji berries
- Grapes
- Onions
- Plums
- Pomegranate
- Potatoes
- Radicchio
- Radishes
- Raspberries
- Strawberries
- Sweet red peppers
- Rhubarb
- Rooibos tea
- Tomato
- Watermelon



FEATURED RED PHYTONUTRIENTS

Lycopene

Lycopene is a red-colored phytonutrient that may protect against cancers of the prostate, breast, and skin, and reduce the risk of heart attacks. It is typically found in tomatoes and tomato-based products such as tomato juice, spaghetti sauce, tomato soup, and tomato paste, in addition to being in watermelon, pink grapefruit, and guava. The one thing about this red phytonutrient to remember is that cooked tomato products result in the lycopene being more “available” to the body to be absorbed. Here is one instance where cooking vegetables could be beneficial. Also, since it is fat-soluble like many of the other carotenoids, it requires fat together with cooking to optimize absorption into the body. Therefore, an ideal combination might be making a cooked tomato sauce into which you add olive oil.

Anthocyanins

Anthocyanins are phytonutrients you can find in red berries such as raspberries, sweet cherries, strawberries, cranberries, and in other red foods like apples (with skin), beets, cabbage, onion, kidney beans, and red beans. They help with reducing the risk of cancer and protecting the heart and brain.

Ways to get more red foods:

- Add fresh tomatoes, goji berries, raspberries, pomegranate seeds, or pink grapefruit sections to your green salads.
- If you eat pasta, use marinara (red) sauce instead of an Alfredo (white) sauce to increase your lycopene and reduce your fat intake.
- Use marinara sauce on vegetables.
- Make a Mediterranean salad with tomatoes, olives, garlic, herbs, and feta cheese.
- Prepare salsa using chopped tomatoes, chopped red onions, and chili peppers.
- If you drink juice, try blood orange, grapefruit, and/or guava juice.
- Great snack ideas include watermelon slices, raspberries, cherries, strawberries, and apple slices.



ORANGE

Orange foods help protect the immune system, eyes, and skin, and reduce the risk for cancer and heart disease.

The Food List: Orange Foods

When you look at the food list, you will find many orange-colored foods to include into your daily diet. The orange fruits include apricots, cantaloupe, mango, nectarine, oranges, papaya, persimmon, and tangerines. You can have these fruits as fresh or dried; however, note that dried fruits that you buy from the store will most likely have sugar and/or sulfites added. You will have to read the label carefully to be sure there is no added sugar. If you are sensitive to sulfites as some people are, it is best to avoid sulfites in these fruits. Orange vegetables on this list are acorn squash, orange bell pepper, butternut squash, carrots, pumpkin, and sweet potatoes. Keep in mind that several of these vegetables are relatively higher in sugar (like carrots) and even quite starchy (like squashes). Therefore, you will want to eat these foods in a mixed meal with other foods that will blunt the spike in blood sugar you may tend to see eating these foods. Adding some organic butter or oil to these foods will bring down the glycemic response as well as adding protein to the meal.

Some of the richest sources of carotenoids from orange foods include carrots, mango, papaya, and pumpkin. Finally, you will notice that turmeric root is on this list – an important food as well as a spice when it has been dried into a powder. Turmeric powder contains curcuminoids, which are potent anti-inflammatory compounds. You may want to sprinkle turmeric or grate turmeric root into stir-fries, onto meats, or even into a smoothie!

Orange Food Compounds

- Alpha-carotene
- Beta-carotene
- Beta-cryptoxanthin
- Bioflavonoids
- Carotenoids
- Curcuminoids
- Naringenin

Benefits

- Anti-bacterial
- Anti-cancer
- Cell protection
- Immune health
- Reduced mortality
- Reproductive health
- Skin health
- Source of vitamin A

Foods

- Apricots
- Bell pepper
- Cantaloupe
- Carrots
- Mango
- Nectarine
- Orange
- Papaya
- Persimmons
- Pumpkin
- Squash (*acorn, buttercup, butternut, winter*)
- Sweet potato
- Tangerines
- Turmeric root
- Yams



FEATURED ORANGE PHYTONUTRIENTS

Beta-Carotene

When most people think of orange phytonutrients, they think of beta-carotene, and when they think of beta-carotene, they think of carrots. Beta-carotene is important because it can turn into vitamin A in the body. Vitamin A has many functions such as promoting healthy vision, immune and inflammatory systems, cell growth, reproduction, and bone health. There are actually several plant compounds that convert to vitamin A in the body (called “carotenoids”) under the right conditions, and beta-carotene is just one.

Most food sources of vitamin A are of animal origin such as seafood, eggs, fish, and dairy products like yogurt, milk, and cheese. Therefore, if you are a vegan or do not eat select animal products, it will be essential for you to eat plenty of carotenoid-containing foods which tend to be colorful and of the red, orange, yellow, and green varieties. Additionally, it may not be enough to have carotenoids be your sole source of vitamin A as there are a number of factors that can limit the conversion of carotenoids into beta-carotene such as genes, digestive issues, excessive alcohol use, toxicity, and certain prescription or over-the-counter medications.

To get the most amount of carotenoids like beta-carotene from your food, here is another example where cooking foods like carrots will be important. Cooking carotenoid-containing vegetables that are higher in fiber will require the heat from cooking to free the carotenoids from the food matrix (including the fiber). Now once you’ve liberated the carotenoids from the food, you need fat to shuttle them into the body. Carotenoids are “fat-soluble” or they require the presence of fat to become more available to the body. Therefore, having a bit of cooked carrots drizzled with olive oil would be the ideal combination to maximize getting the beta-carotene in those carrots absorbed in the gut.

Bioflavonoids

The other popular group of phytonutrients associated with orange-colored foods is the bioflavonoids. Bioflavonoids are found in oranges, grapefruit, tangerines, clementines, peaches, nectarines, and even yellow-colored foods like lemons and pineapple. In contrast to beta carotene, bioflavonoids are water-soluble, so they don’t require cooking. In fact, cooking could be detrimental and lead to breakdown of these important compounds. The reason why bioflavonoids are important is because they work together with vitamin C to reduce the risk of heart attacks and cancer, and help maintain strong bones/teeth, healthy skin, and good vision. It is often the case in nutrition that you see vitamins, phytonutrients, and minerals working together to create the best effect!

Ways to get more orange foods:

- Have a baked sweet potato instead of a baked white potato.
- Sprinkle turmeric powder onto tofu and vegetable stirfry.
- Put orange slices into your water pitcher.
- Drink carrot and/or orange juice instead of soft drinks.
- Have a clementine, tangerine, nectarine, or peach as a mid-morning or afternoon snack.
- Puree carrots, butternut squash, and/or pumpkin and use as a soup base.
- Make a tropical fruit smoothie containing fresh, cubed mango, papaya, or orange in a base of nut milk with your choice of protein powder.
- Make a trail mix containing dried orange fruits like apricots, mango, and papaya.



YELLOW

Yellow foods are beneficial because they contain compounds that are anti-cancer, anti-inflammatory, and may protect the brain, heart, blood vessels, eyes, and skin.

The Food List: Yellow Foods

Like the other categories, it is recommended that you get a variety of yellow foods. Note that some of the yellow foods like banana, corn, and Yukon potatoes are starchy and should be eaten in a mixed meal to blunt any blood sugar responses. There are yellow fruits to choose from such as Golden Delicious apples, Asian pears, lemons, pineapple, and starfruit. Pineapple is particularly high in the enzyme, bromelain, which can be helpful in breaking down foods. Lemons are wonderful as an addition to water to give you more bioflavonoids. The yellow vegetables include yellow bell peppers, corn, and potatoes. You'll also find ginger root on this list. Ginger contains many anti-inflammatory compounds. You can grate fresh ginger into tea or into a stirfry. You can also use the powdered ginger spice in baked products like a (gluten-free) spice bread.

Yellow Food Compounds

Lutein
Rutin
Zeaxanthin

Benefits

Anti-cancer
Anti-inflammatory
Cell protection
Cognition
Eye health
Heart health
Skin health
Vascular health

Foods

Apple
Asian pears
Banana
Bell peppers
Corn
Corn-on-the-cob
Ginger root
Lemon
Millet
Pineapple
Potatoes
Starfruit
Succotash
Summer squash



FEATURED YELLOW PHYTONUTRIENTS

Lutein & Zeaxanthin

Similar to lycopene and beta-carotene, lutein and zeaxanthin are both carotenoids. These two carotenoids are not just found in yellow foods. Green foods like kale and spinach contain these important carotenoids, although they are not visible to the eye. A good yellow food source of lutein is corn. Since corn is in many foods as a processed ingredient, it is preferable to get your corn as corn-on-the-cob or the whole kernel form of corn. Keep in mind that corn tends to be starchy and can increase your blood sugar, so you will want to have it in a larger meal containing other foods that are higher in fiber, protein, and even fat. Like the other carotenoids, lutein and zeaxanthin are fat-soluble so they need fat to make their way into your body. Cooking corn-on-the-cob and eating it with a little organic butter would be a better option than not having any fat!

Ways to get more yellow foods:

- Slice a banana into your warm oatmeal cereal.
- Keep frozen corn kernels on hand and add them to stir-fries, rice and bean dishes, and, when warmed up slightly, even sprinkled on a Southwestern-style chicken salad.
- Have slices of a Golden Delicious apple or an Asian pear as a mid-morning or afternoon snack together with a thin layer of nut butter (e.g., almond butter or cashew nut butter).
- Add diced yellow bell pepper to a vegetable stir-fry.
- Have Yukon Gold and French fingerling potatoes rather than a starchy, white Russet potato.
- Grate ginger into a stirfry of Asian vegetables like snap peas, cabbage, and carrots.
- Make a ginger tea into which you squeeze fresh lemon.
- Have pineapple slices as a dessert.



GREEN

Green foods are healthy because they contain compounds that are anti-cancer, anti-inflammatory, and may protect the brain, heart, blood vessels, liver, and skin. One of the unique attributes of some green foods is that because they help the liver to work better, they can also assist with keeping hormones in balance.

The Food List: Green Foods

There is definitely no shortage of green foods! And surprisingly, most people eat too few of them. There are many options available to you to maximize your phytonutrient intake. There is a long list of phytonutrients that can be found inside these green foods. Remember that even though yellow foods contain lutein, the carotenoid that is helpful for eye health, it is also present in the green vegetables (especially kale, parsley, and spinach!). Other phytonutrients include the indoles and phytoestrogens (both which help with liver health and hormone balance), chlorophyll (what gives green vegetables their “green” color), folate (an important B vitamin), and phytosterols (can help with balancing cholesterol). For the most part, the more deep the green color of the plant, the more nutritious it will be (however, there may be some exceptions). Iceberg lettuce is probably the least nutritious of the green leafy vegetables. Dandelion greens are most likely among the highest. Look for greens that are loose leaves rather than tightly bound within a head to maximize your phytonutrients.

The green fruits listed here are apples (Granny Smith), avocado, limes, olives, and pears. Avocado and olives are considered fruits here since they contain a pit. These two foods are the “super foods” of the Mediterranean diet, so definitely a good addition to daily meals. Avocados are truly remarkable foods – one whole avocado has a substantial amount of fiber (about 9 grams) and even more potassium than a banana (about 700 mg). One study showed that eating a hamburger by itself led to an increase in inflammation in the body within hours after it was eaten. However, when just half of an avocado was eaten together with the hamburger, there were no increases in inflammation.

Olives and olive oil are just as good with respect to their strong anti-inflammatory and antioxidant effects. There is quite a list of compounds that are found within olives that you may have started to hear about in the media, including hydroxytyrosol, oleuropein, and oleocanthal. Because these compounds are so helpful in keeping the heart and blood vessels healthy, and protecting against heart disease, there are even dietary supplements containing these extracts of olives. You can get them without taking a supplement by eating more olives and by incorporating more extra virgin olive oil (especially the less refined versions that have more of these actives) into your everyday cooking.

The green vegetables on this list are numerous: artichoke, bamboo sprouts, bean sprouts, bitter melon, bok choy, broccoli, broccolini, Brussels sprouts, cabbage, celery, cucumber, edamame/soy beans, green beans, green peas, greens of all types (beet, chard, collards, dandelion, kale, lettuce, spinach, and turnip), okra, snow peas, and watercress. The cruciferous vegetables like Brussels sprouts, broccoli, and watercress, are considered to be excellent anti-cancer foods because of compounds they contain called glucosinolates (see below for more information). Some green vegetables and green foods like bitter melon and even green tea have a bit of a bitter taste. Research shows that these bitter foods could be important for promoting a healthy metabolism.

Green Food Compounds

Catechins
 Chlorogenic acid
 Chlorophyll
 Epigallocatechin gallate
 Flavolignans
 Foliates
 Glucosinolates
 Hydroxytyrosol
 Indole-3-carbinol
 Isoflavones
 Isothiocyanate
 Oleocanthal
 Oleuropein
 Phenolic diterpenes
 Phytosterols
 Phenols
 Phenylethylisothiocyanate
 Silymarin
 Sulforaphane
 Tannins
 Theaflavins
 Thearubigins
 Tyrosol

Benefits

Anti-cancer
 Anti-inflammatory
 Brain health
 Cell protection
 Skin health
 Hormone balance
 Heart health
 Liver health

Foods

Apples
 Artichoke
 Asparagus
 Avocado
 Bamboo sprouts
 Bean sprouts
 Bell peppers
 Bitter melon
 Bok choy
 Broccoli
 Broccolini
 Brussels sprouts
 Cabbage
 Celery
 Cucumbers
 Edamame/Soybeans
 Green beans
 Green peas
 Green tea
 Greens (*arugula, beet, chard, collard, dandelion, kale, lettuce, mustard, spinach, turnip*)

Limes
 Okra
 Olives
 Pears
 Snow peas
 Watercress
 Zucchini



FEATURED GREEN PHYTONUTRIENTS

Glucosinolates

The class of phytonutrients which make the cruciferous vegetables (also known as the Brassica vegetables) anti-cancer in their action is called glucosinolates. The glucosinolates are what give some these vegetables their stinky sulfur aroma. But that sulfur comes in handy as it provides the liver what it needs to get rid of toxins. When the cruciferous vegetables are chopped or chewed, the glucosinolates turn into active compounds called isothiocyanates (indole-3-carbinol, sulforaphane, and many others). These phytonutrients change the way estrogen

is metabolized or broken down in the body. As a result, eating these vegetables is associated with the decreased risk of hormone or estrogen related cancers such as breast and uterine cancer. Eating these vegetables either raw, lightly sautéed, or steamed (minimal, or about 90 seconds) is best to retain the full array of nutrients. Cruciferous vegetables are also known as important sources of fiber, vitamins, and minerals. Eating a serving of these vegetables daily (particularly broccoli, kale and Brussels sprouts) can help lower disease risk.

The following green vegetables are included in the cruciferous family: arugula, bok choy, broccoli, broccolini, Brussels sprouts, cabbage, Chinese cabbage (napa), collard greens, kale, kohlrabi, mustard greens, and watercress.

Phytosterols

Phytosterols, or plant sterols, are compounds that look like cholesterol, but they are not cholesterol. They actually block the absorption of cholesterol from food in the gut. There are many different types of phytosterols, and because of their known benefits in helping to reduce LDL-cholesterol (the bad kind), they have been added to foods and put into dietary supplements. There may also be some immune system benefits of these compounds. Since people have been eating more processed foods and less plant foods, it would seem that the average person is getting too few of these valuable compounds to help us with blood fats. Good sources of phytosterols from green foods include avocado, lettuce, and olive oil. Other non-green sources include dried sunflower seeds (probably one of the richest sources at 374 milligrams per ½ cup serving) and rice bran oil (162 milligrams in 1 tablespoon).

Catechins

Catechins are one of the bitter compounds found in green tea. The most famous catechin from green tea is called epigallocatechin gallate (or EGCG). Having just one cup of green tea a day has been shown to reduce the risk of breast cancer by 50%. Caffeinated and non-caffeinated versions of green tea are available.

Ways to get more green foods:

- Have an avocado in your salad or on top of a hamburger or grilled chicken breast.
- Make a stir-fry with bok choy, broccolini, carrots, and edamame. Serve on top of brown rice.
- Have a cup of green tea instead of coffee.
- Use extra virgin olive oil instead of refined vegetable oils like corn and soybean oils.
- To meat and vegetable dishes, add more green-colored herbs and spices like rosemary, oregano, dill, and thyme.
- Toss some greens into your morning smoothie.
- Make grilled Brussels sprouts and drizzle with olive oil.
- Add green olives, green peas, cucumber, and celery into a salad.
- Have diced asparagus and spinach in your morning omelet.
- Squeeze fresh lime into your water.
- Make soup with bitter melon, celery, and beet greens.



BLUE/PURPLE/BLACK

Blue/purple/black foods from nature are healthy because they contain compounds that are anti-cancer, anti-inflammatory, and may protect the brain, heart, and blood vessels. It is interesting to note that out of all the colors, this is the category that many people eat the least from on a daily basis. Unfortunately, too little blue/purple is not healthy since these compounds are especially used for the brain, protecting it from damage and promoting healthy cognition and memory.

The Food List: Blue/Purple/Black Foods

One of the reasons why people eat too few of these precious colored foods is because there are not as many options as the green and orange food categories. Therefore, it requires a conscious effort to get these foods into everyday eating.

The blue/purple/black fruits include a wide variety of berries: blueberries, blackberries, boysenberries, huckleberries, and marionberries. These foods are probably most commonly thought of when it comes to this category of colored foods. Indeed, they are very important for brain health and for protecting cells from too much stress. The smaller berries tend to be higher in nutrients. For example, a plump blueberry is less nutritious than a smaller blueberry that was grown wild without pesticides. The essential phytonutrients are in the skin. Frozen or fresh blueberries are rather equivalent in phytonutrient content, so it is possible to have blueberries year round if they are bought frozen. Other blue/purple fruits in addition to the large family of berries are figs, grapes (like blueberries, smaller is better), prunes, and raisins. When buying prunes, dried figs, and raisins at the grocery store, read the label to be sure that no added preservatives (e.g., sulfites, BHT, BHA) or added sugar is in the food.

The blue/purple/black vegetables listed are purple bell pepper, purple cabbage, purple carrots, purple cauliflower, eggplant, purple kale, black olives, purple potatoes, black rice, and purple rice. Not everyone realizes that there are purple varieties of certain vegetables like bell pepper, carrots, potatoes, and cauliflower. However, these selections are more phytonutrient-dense compared with their original, typical form. The downside is that they may be more expensive and not always at the grocery store, but it's worth looking for them and asking the grocer to carry them. What they can provide in the way of phytonutrients is worth the additional cost – almost like “built-in health insurance”!

Blue/Purple/Black Food Compounds

- Anthocyanidins
- Hydroxystilbenes
- Procyanidins
- Pterostilbene
- Resveratrol

Benefits

- Anti-cancer
- Anti-inflammatory
- Cell protection
- Cognitive health
- Heart health

Foods

- Bell pepper
- Berries (*blue, black, boysenberries, huckleberries, marionberries*)
- Cabbage
- Carrots
- Cauliflower
- Eggplant
- Figs
- Grapes
- Kale
- Olives
- Plums
- Potatoes
- Prunes
- Raisins
- Rice (*black, purple*)



FEATURED BLUE/PURPLE/BLACK PHYTONUTRIENTS

Resveratrol

Resveratrol is a popular purple phytonutrient that has made its way into the news for its effects on helping to promote healthy aging processes by reducing inflammation and blood sugar, along with being beneficial for the cardiovascular system. Food sources of resveratrol include grapes (in the skin), and grape-derived products like red wine. Less rich sources include peanuts (especially the skin) and peanut butter, dark chocolate, and blueberries.

Pterostilbene

Pterostilbene is a phytonutrient that resembles resveratrol and is found in blueberries and grapes. There is some animal research that suggests it wards off cancer, keeps blood fats (cholesterol and triglycerides) low, and may help with preserving cognition. There may even be some positive effects on blood sugar.

Ways to get more blue/purple/black foods:

- Have berries in a smoothie.
- Add blueberries and raspberries to yogurt, breakfast cereal (hot or cold), and pancakes/waffles.
- Try purple kale instead of the usual green kale.
- Make a stir-fry with purple vegetables like eggplant, purple potatoes, and complement with purple rice.
- Substitute purple or black rice for white rice.
- Try shredding some purple cabbage into salads for additional color and purple phytonutrients.
- Make purple carrot puree and use as a base for soups or sauces.
- Snack on figs, plums, raisins, and berries.
- Add raisins to baked recipes and to cereals.



WHITE/TAN/BROWN

When thinking of white/tan/brown foods, processed foods may come to mind – foods like bagels, cereals, breads, pastas, cakes, cookies, and crackers. Those foods are not the kind to focus on in the white/tan/brown category of plant foods. Instead, this category includes nuts, fruits, vegetables, legumes, spices, seeds, and whole grains that are beneficial to health. In fact, healthy white/tan/brown foods have anti-cancer and anti-inflammatory activity. Additionally, what makes this class of compounds special is that like the green foods, there are certain compounds that can assist with liver and hormone health.

The Food List: White/Tan/Brown Foods

What is different about this category compared with the other colored food categories is that this one contains more options that go beyond fruits and vegetables. There is the wide array of legumes, nuts, seeds, and grains to sample within daily eating.

White/tan/brown fruits are fairly sparse on this list, but include apples and applesauce (the non-skin part of the apple), coconut, dates, lychees, and pears. There are several types of coconut products which could be included into one's diet such as shredded, unsweetened coconut, coconut milk, coconut butter, and coconut oil. Dates can be used as a form of sweetener in a smoothie rather than adding sugar (although note that they will increase blood sugar). Lychees and pears are refreshing choices that are moist and complement a salad or make for a nice snack.

White/tan/brown vegetables include cauliflower, garlic, mushrooms, onion, sauerkraut, and shallots. While cauliflower and sauerkraut (cabbage) would belong to the Brassica/cruciferous family of plants mentioned in the green foods section. Garlic, onion, and shallots are part of another family of plants called Allium. This group is similarly rich in sulfur compounds (hence their pungent odors!) and have many health-promoting effects such as protecting against cardiovascular, cancer, and inflammatory diseases. Mushrooms encompass more than just the standard white mushroom as there are several types that are considered to have significant medicinal benefit because of their ability to help the immune system. Examples of mushrooms to try include: Shiitake, button, portabello, crimini, and chanterelle.



Looking to the other categories of foods within this section, there are whole grains, legumes, seeds, and nuts. Here are some choices to consider: legumes of all types (hummus, bean dips, dried beans or peas, lentils, chickpeas, peanuts, low-fat refried beans), nuts (Brazil, cashew, almond, hazelnut, pine nut, walnut) and nut butters, seeds (sesame and tahini paste, pumpkin, sunflower, flaxseed, and flaxseed meal) and seed butters (tahini, sunflower seed, and others), whole grains (wheat, rye, oats, spelt, barley, triticale).

Legumes can be prepared from scratch by cooking dried beans or peas over about an hour, or they can be bought pre-prepared in cans or as dips. Metal cans are lined with a chemical called bisphenol, so this form is less preferred, but rinsing them well should be helpful. Making extra servings of legumes can be useful for meal preparation since they can be somewhat labor intensive. Watch for the addition of lard or high amounts of fat to refried beans. Choose pinto or black beans varieties that are low in fat.

Nuts are very healthy for the heart. Choose unsalted nuts so that overeating is a less attractive option. If you have poor digestion, you may want to buy roasted rather than raw nuts. Nut butters are wonderful complements to fruits – a layer of almond butter on an apple slice or cashew nut butter on a sliver of pear. Similarly, seeds have many phytonutrients. They are found as seed oils (e.g., sesame seed oil, flaxseed oil), whole seeds, and seed butters (e.g., tahini is the paste made from sesame seeds). Nuts and seeds have not just beneficial phytonutrients, but also a good mixture of healthy fats and oils, fiber, minerals, and vitamins.

There are several whole grains on this list for those who can eat them. Some people may not be able to eat gluten-containing grains (the common ones are barley, rye, wheat, and spelt), in which case, alternate grains like brown rice, wild rice, millet, and quinoa may be good substitutes. There is a wide selection of gluten-free grain products now on the market. However, please note that “gluten-free” on a label does not necessarily mean “healthy” as they can contain low amounts of phytonutrients and greater amounts of sugar and fat.



There are brown-colored liquids like coffee and tea that have been acknowledged on this list. Caffeinated drinks may not be for everyone, in which case, decaf varieties are available. It may also not be your preference to drink these beverages. There are mixed reviews about drinking coffee – for heart disease and blood pressure, as some claim that caffeine can make arteries more stiff. However, there is also research to suggest that up to three cups per day could be good for maintaining healthy blood sugar and help ward off cognitive and neurological diseases like Parkinson’s disease. Talk with your practitioner about your use of coffee. On the other hand, teas are very medicinal and there are several herbal types (e.g., chamomile, mint, and rooibos) that do not contain caffeine. You may want to sample a variety to find out which ones you like.

Last but not least, you will find dark chocolate on this list. Cocoa phytonutrients are helpful for making blood vessels expand, which can be beneficial for the brain and heart. It is important that the chocolate products you are eating are not high in sugar or contain milk and other unnecessary preservatives. It may be best to use baker’s chocolate (100% cocoa), melt it down, and add your own healthy sweetener if you cannot find a dark chocolate source that fits these parameters.

White/Tan/Brown Food Compounds

- Allicin
- Allyl sulfides
- Cellulose (fiber)
- Lignans
- Lignins
- Sesamin
- Sesamol
- Tannins
- Terpenoids
- Theobromine

Benefits

- Anti-cancer
- Anti-microbial
- Cell protection
- Gastrointestinal health
- Heart health
- Hormone balance
- Liver health

Foods

- Apples
- Applesauce
- Bean dips
- Cauliflower
- Cocoa
- Coconut
- Coffee
- Dates
- Garlic
- Ginger
- Jicama
- Legumes (*chickpeas, dried beans or peas, hummus, lentils, peanuts, refried beans / low-fat*)
- Mushrooms
- Nuts (*almonds, cashews, pecans, walnuts*)
- Onions
- Pears
- Sauerkraut
- Seeds (*flax, hemp, pumpkin, sesame, sunflower*)
- Shallots
- Soy
- Tahini
- Tea (*black, white*)
- Whole grains (*barley, brown rice, oat, quinoa, rye, spelt, wheat*)



FEATURED WHITE/TAN/BROWN PHYTONUTRIENTS

Allicin

Allicin is one of garlic's medicinal components that may contribute to its anti-cancer, blood pressure-lowering effects. To maximize the production of allicin, it is recommended that you let the crushed or chopped garlic sit for 5-10 minutes before cooking it or adding anything to it. It has been suggested this compound is what makes garlic anti-bacterial and anti-viral in its activity.

Lignans

Several plant foods contain the phytonutrient, lignans. Lignans are not to be confused with another phytonutrient class called lignins, which are related to fiber. Lignans are fiber-related phytonutrients that act as antioxidants and phytoestrogens, or plant compounds with weak estrogen activity. The food that gets the credit for having high amounts of lignans is flaxseeds, which contain about 7 times as much lignan as the next runner-up food, sesame seeds. Other good food sources of lignans are sunflower seeds, cashew nuts, and peanuts. The benefits of lignans is that they are anti-inflammatory, promote healthy blood vessels, and act as anti-cancer agents, especially hormone-related cancers like breast and prostate cancers. One of the ways that lignans may be helpful in reducing cancer is by activating certain enzymes in the liver responsible for deactivating toxins in the body.

Ways to get more white/tan/brown foods:

- Add some cocoa powder to your smoothie.
- Add brown spices (cinnamon, clove, allspice) to your cooking and baking.
- Use dates instead of refined sweeteners to sweeten dishes.
- Add diced onion to a stir-fry.
- Drizzle warm tahini over vegetables (e.g., broccoli, cauliflower, carrots).
- Dip vegetables into hummus (ground chickpea dip) or bean dip.
- Have applesauce instead of pudding for dessert – dress up the applesauce with a dash of cinnamon.
- Add mushrooms to broths and soups for more flavor and medicinal impact.
- Sprinkle sesame seeds on a vegetable stir-fry.



Phytonutrients: What Are They and Why Should You Eat Them?

Phytonutrients (phyto = plant) refers to thousands of different, healthful, non-nutritive compounds in plants. These compounds are referred to as “non-nutritive” because they do not supply calories like proteins, carbohydrates, and fats. Phytonutrients have other benefits like changing the structure and function of cells. Certain phytonutrients can radically change how the liver metabolizes toxins, whereas other phytonutrients, like those found in blueberries, play a role in specific areas of the brain responsible for learning and memory. People who eat more plant foods tend to have lower rates of cancer, cardiovascular disease, diabetes, dementia, and other chronic health conditions.

How Can I Get More Phytonutrients in My Diet?

Start by observing your meals and colors eaten each day. Gradually shift to eating a broader spectrum and more color variety whenever possible. It is common to get stuck in a rut of eating the same foods over and over again. Many people eat the standard processed food colors of brown, yellow, and white, which may include fried, baked, and/or grilled foods which are inflammatory. It has been estimated that 80% of people are missing one or more phytonutrient colors. Eating the full seven colors every day with a variety of foods is a good goal to start.

Here are some simple ways to jump start getting more phytonutrients in your everyday eating:

- Make it your goal to try one new plant food (fruit, vegetable, nut, seed, legume, whole grain) per week. Explore ethnic stores for greater variety.
- Stock up on frozen vegetables for easy cooking. Berries tend to retain their phytonutrients. Cruciferous vegetables like broccoli are least desirable for freezing.



Frequently Asked Questions

- Use fruits and vegetables that go bad easily first. Save hardier varieties for later in the week.
- Keep fruits and vegetables where you can see them so you'll remember to eat them.
- Keep a bowl or container of fresh cut vegetables on the top shelf of refrigerator, within easy reach.
- Keep fruit bowl on kitchen counter, table, and desk at work.
- Pack fruit and vegetables in purse/briefcase to eat as a snack. Bring moist towelettes to clean them off before eating if you do not have time to wash.
- Choose fruit for dessert (fruit kabobs, berry compotes, fruit salads, etc.).
- Have dishes with lots of vegetable variety (e.g., soup, stir-fry).
- Use vegetable- and mushroom-based sauces.
- Choose darker vegetables over lighter to maximize nutrient content.
- Make the switch from mashed white potatoes to mashed cauliflower.
- Make a switch from corn to squash.
- Toss in red pepper, tomato sauce, garlic, onions or broccoli to omelets.
- Add rinds of oranges or lemons to water, chicken, and fish.
- Try a little bit of every color at a salad bar.
- Be generous with your use of spices!





Where can I find phytonutrients? Can I just take a supplement?

Sources of phytonutrients include any and all plant foods, including fruits, vegetables, whole grains, legumes, nuts, seeds, and spices. Although you can purchase supplements that contain phytonutrients, it is better to get the majority of these beneficial health compounds from a wide variety of whole, or minimally processed foods. Eating fruits, vegetables, legumes and other phytonutrient rich foods in their whole food form provides many other health promoting compounds including fiber, vitamins, minerals, and amino acids.

Are some foods higher in phytonutrients than others?

The short answer is: yes.

Some plant foods clearly provide more phytonutrients than others. For example, mashed purple potatoes or sweet potatoes contain more phytonutrients than mashed white potatoes. Substituting white rice with purple, brown, or black rice provides a wider array of phytonutrients than just eating white rice on a daily basis. One way to get more plant foods would be to think of foods that are commonly eaten that may not be as nutrient dense, and replace those with more nutrient-dense options.

How many servings of phytonutrient-rich foods should I be eating every day?

Most people eat too few servings of plant foods every day. It has been estimated that the average American gets somewhere between 2-4 servings of fruits and vegetables per day. However, much more – about 9-13 servings are recommended to prevent chronic disease.

A typical serving is a half a cup of cooked vegetables, one cup of raw leafy vegetables, or a medium-sized piece of fruit. Fresh, cooked, and processed fruits and vegetables including frozen and canned, 100% fruit juices, 100% vegetable juices, and dried fruits are all considered servings of fruits and vegetables. It would be best to aim for 3-4 servings at every meal of the day (not including snacks), to achieve the recommended amount of servings on a daily basis.

Foods Highest in Antioxidant Phytonutrients

Food	Antioxidant Content in mmol (per 100 grams = 3.5 ounces)
Blackberries	5.75
Walnuts	3.72
Strawberries	3.58
Artichokes, cooked	3.56
Cranberries	3.13
Coffee	2.96
Blueberries	2.68
Clove spice, ground	2.64
Grape juice	2.56
Dark chocolate	1.67
Cabbage, red, cooked	1.61
Pineapple	1.28
Oranges	1.26
Cabbage, red, cooked	1.61
Pinto beans	1.14
Spinach, frozen	1.05



U.S. Department of Agriculture, Agricultural Research Service. Nutrient Data Laboratory. USDA Database for the Oxygen Radical Absorbance Capacity (ORAC) of Selected Foods, Release 2. <https://naldc.nal.usda.gov/download/43336/PDF> Accessed March 17, 2020.



Is Variety that Important?

There are thousands of phytonutrients in nature. If we eat the same foods over and over again, even if they are colorful, we may be missing the plethora of other phytonutrients across the spectrum. Rather than getting all of your blue-purple phytonutrients from blueberries, you may want to try other blue-purple foods like purple potatoes, purple rice, and even purple cabbage – all of which will give you very different phytonutrients within the blue-purple color. One helpful tip is to try a new food every week to ensure getting as many phytonutrients as possible.

Is There a Benefit to Eating Certain Foods in Combination?

When certain foods are combined, there may be an enhanced effect in comparison to eating the food alone. In some instances, there can be a “synergistic” result from combining specific foods. For example, preparing turmeric with black pepper and olive oil may enhance the absorption and anti-inflammatory effect. Adding lemon juice to spinach helps the absorption of iron in the body.

When Do I Eat Plant Foods Raw and When Do I Cook Them?

For the most part, a combination of raw and cooked foods is recommended. Raw foods are typically eaten in the summer months and cooked foods are best in the winter when it is cold outside. People with compromised digestion (bloating, constipation, IBD/IBS, gas, and pain) will often do better with more cooked plant foods. Aside from seasonal and symptomatic concerns, preparation of plant foods to enhance absorption depends on the phytonutrient.

Here are some general guidelines:

- Carotenoids, found in red, orange, yellow, and green foods, typically do better with heat preparation and when eaten with some fat/oil.
- Steaming or waterless cooking of vegetables preserves nutrients far better than ordinary heating or boiling vegetables using water. Use as little water as possible and cook to the point at which the color of the vegetable becomes more bright and vivid.
- Cook to the point of making the vegetables tender and not mushy.



Frequently Asked Questions

- Using heat, mechanical processing, soaking, fermentation, and germination/malting when it comes to foods like seeds, nuts, and legumes can increase the availability of phytonutrients and decrease the content of plant nutrients that are not beneficial, like phytate, goitrogens, and thiaminases.
- Eating cruciferous vegetables raw, or very lightly cooked is best to preserve enzyme that produces anti-cancer compounds.
- The antioxidant content increases in the following foods when they are cooked: carrots, spinach, mushrooms, asparagus, broccoli, cabbage, red cabbage, green and red peppers, potatoes, and tomatoes.
- Overall, steaming is the preferred method of cooking since it results in the biggest increase in antioxidant content.
- Peeling skins of apples and cucumbers reduces their antioxidant content significantly.
- It is not advisable to pre-soak vegetables before cooking as nutrients are lost in the water.

Should I Be Using More Spices and Herbs?

The answer is definitely YES! One of the many reasons the Mediterranean diet is so healthy is because of the liberal use of spices and herbs. As a point of distinction, a spice is edible, aromatic, and dried. It comes from a plant's root, stem, bark, bud, leaves, flower, fruit, or seed. In comparison, herbs are usually leaves. When leaves are dried, they become a spice. Spices provide high levels of phytonutrients that combat oxidative stress, reduce inflammation, and provide many other health benefits. When it comes to purchasing spices, avoid fillers (e.g., sugar, maltodextrin, gluten, artificial colors, preservatives, synthetic anti-caking agents).



Frequently Asked Questions

Here are some other tips on buying herbs and spices:

- If you buy spices in bulk, store them in air-tight glass or tin containers. Don't buy large quantities – only what you will use within 6-12 months.
- You can buy herbs and spices in their fresh, dried, whole, cracked, coarsely ground, and finely ground forms.
- Store in a cool, dark place. Heat, light, and moisture will accelerate loss of flavor. High temperatures can cause spices to cake or harden and change or lose color.
- Don't let them sit around the stove. Close container well after using.
- Under ideal conditions, ground spices will keep for about a year and whole spices for 2-3 years.
- To test, rub between fingers to detect presence of aroma.
- Roast slowly before grinding for maximum impact.

Ways to get more herbs and spices in your eating:

- Add to smoothies.
- Make tea and add to smoothies.
- Combine finely chopped garlic and basil to extra virgin olive oil and lemon juice as a salad dressing.
- Add fresh herbs such as cilantro, chives, basil or mint to salads or sandwiches.
- Sprinkle cumin or fennel seeds in soups or salads.
- Marinate lean meats in curry powder or curry pastes.
- Sprinkle cinnamon and nutmeg over oatmeal or wholegrain toast for breakfast, steamed soymilk, and even on vegetables.
- Add fresh parsley or chives to scrambled eggs.
- Stew fruits with cinnamon stick and a vanilla pod.
- Steep lemongrass, ginger or mint in hot water.
- Add freshly grated garlic to mayonnaise.
- Add fresh or dried herbs to your favorite pasta dish.
- Add spices to ghee, honey, oil, salt and sprinkles.



What About Frozen Fruits and Vegetables?

It is more important to eat fruits and vegetables in any form (e.g., frozen, dried, canned) than to not eat them at all. Freezing foods can reduce flavor, and the final nutrient content will depend on the initial quality of the food before it was frozen. If the food was initially considered to be of high-quality (e.g., organic and fairly fresh at the time of freezing), then the final nutrient content may be retained to a large degree. For instance, studies have shown that frozen blueberries retain their phytonutrient content during freezing. That said, frozen foods are not 100% comparable to fresh foods. There are some concerns with freezing as the blanching process that occurs before freezing can result in a loss of vitamin C and B vitamins. In general, freezing foods properly for no longer than six months will help to maintain the nutrient content of frozen foods. For guidance on freezing foods at home, visit the website for the National Center for Home Food Preservation: <http://www.uga.edu/nchfp/how/freeze.html>

References:

Lohachoompol V, Szrednicki G, Craske J. The change of total anthocyanins in blueberries and their antioxidant effect after drying and freezing. *Biomed Biotechnol.* 2004;2004(5):248-252.

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Severi S, Bedogni G, Manzieri AM, et al. Effects of cooking and storage methods on the micronutrient content of foods. *Eur J Cancer Prev.* 1997;6 (Suppl 1):S21-4.

Should I Be Eating Dried Fruits Rather than Fresh Fruits?

In general, fresh fruits are going to be higher in phytonutrients in comparison to dried fruits. Dried fruits lose both water and nutrients in the drying process. Flavonoids in berries are susceptible to damage from heat, light, oxygen, and time-since-harvest. Another point to consider is that losing water in the drying process concentrates calories and sugar content. Eating dried fruit will result in consuming more calories than if you ate the same amount of fruit fresh.

For example, 1 cup of fresh apricots contains 74 calories, whereas, 1 cup of dried apricots contains 313 calories. Eating dried fruit is both a healthy and convenient option as long as the overall portion is reasonable.



Frequently Asked Questions

Another thing to keep in mind is that sweeteners are often added to dried fruit, especially cranberries which are extremely tart. While it may make sense to add some sweetness to cranberries, try to purchase dried berries and other fruits (papaya, mango, pineapple, etc.) without added sugar. In the case of cranberries, it would be better to have a natural sweetener like apple juice concentrate rather than corn syrup or high fructose corn syrup.

Using a dehydrator at home is not the same as dried fruit, per se. A home dehydrator can be temperature controlled so the intensity of dehydration can be adjusted. Indeed, it still produces dried fruit, but not in the same way the drying process is done commercially. The fact remains however, that eating dried fruit made at home or purchased at the store still contains more calories and sugar than the equivalent serving of fresh fruit.

Why Should I Eat Organically-Grown Food?

Adopting an organic lifestyle helps to enhance the health of people and the planet. It is generally agreed upon by its supporters that growing and eating organic food is better for the environment. Growing foods organically excludes, when possible, the use of synthetic fertilizers, pesticides, growth regulators, and additives to livestock feed. Organic farmers usually rely on crop rotation and animal manures to maintain soil productivity, to supply plant nutrients, and to control weeds, insects, and other pests.

As a result, in addition to reducing your exposure to harmful pesticides, eating organically may also reduce your exposure to hormones, antibiotics, and potentially harmful irradiated food. Less antibiotic use may help to avoid the development of antibiotic resistance. According to the Environmental Working Group, (a non-profit organization that focuses on protecting public health and the environment regarding public policy), scientists have begun to agree that even small doses of pesticides and other chemicals can have long-term health consequences that begin during fetal development and early childhood.

The Organic Seal of Approval guarantees the consumer that there has been no usage of genetically modified crops or sewage sludge as fertilizer, helping to reduce toxic runoff into rivers and lakes and the subsequent contamination of watersheds and drinking water.

When you eat organically grown food, you may also be supporting small, local farmers, who are able to use less energy in transporting food from the field to the table.

Organic beef, chicken, and poultry are raised on 100% organic feed and never given antibiotics or hormones; in addition, their meat is never irradiated. Organic milk and eggs come from animals not given antibiotics or hormones and fed 100% organic feed for the previous 12 months. (Free-range eggs come from hens that are allowed to roam, but they are not guaranteed to be organic.)



Frequently Asked Questions

Easy Ways to Reduce Your Pesticide Intake:

1. Do not over-consume foods that concentrate pesticides (animal fat, meat, eggs, cheese, milk).
2. Buy organically-grown produce.
3. Try to buy local produce, in season.
4. Peel off the skin or remove outer layer of leaves of some produce like lettuce or onions.
5. Remove surface pesticide residues, waxes, fungicides, and fertilizers by washing fruits and vegetables in a mild solution of additive-free soap (pure castile soap, biodegradable cleanser). Use a scrub brush.
6. Wash your hands for 20 seconds with warm water and soap before and after preparing fresh produce.
7. Cut away any damaged or bruised areas before preparing or eating.
8. Wash produce BEFORE you peel it, so dirt and bacteria aren't transferred from the knife onto the fruit or vegetable.
9. Dry produce with a clean cloth or paper towel to further reduce bacteria that may be present.

What foods are most important to eat organically? Organic meats and dairy appear to be the least contaminated with hormones, pesticides, and herbicides. Produce can be quite variable. If you are unable to purchase organic produce, it is wise to be aware of foods that are the most contaminated with pesticides.

The Environmental Working Group publishes the Dirty Dozen™ and Clean 15™ lists, which are updated annually. Foods are listed in order of importance. Their lists may be downloaded on ewg.org.



6 Steps to Getting More Phytonutrients

Food is more than calories. It is essential for optimal health to eat plenty of phytonutrients and to be nourished through the enjoyment of eating and cooking in a way that fosters creativity, community, and connection.

1 Aim for 9-13 Servings of Plant Foods Everyday

We need about 9-13 servings of whole plant foods for the prevention of chronic disease. A typical serving is a half a cup of cooked vegetables, one cup of raw leafy vegetable, or a medium-sized piece of fruit. It would be best to have 3-4 servings of plant foods at three general meals per day (not including snacks) in order to achieve the recommended number of servings on a regular basis.

2 Know Your Phytonutrient Sources

The options for phytonutrient-rich eats are limitless. It can be fun to experiment with new varieties and colors even within one category of food. Here are some sources of phytonutrients to get you started: any and all plant foods, including fruits, vegetables, whole grains, legumes, nuts, seeds, and even herbs and spices.

3 Eat the Rainbow of Colors

Instead of eating the full rainbow of color, many people eat a limited array of food colors of brown, yellow, and white. For example, think of the typical breakfast menu – waffles, pancakes, ready-to-eat cereal, sausage, and eggs – which typically does not provide much color early in the day. However, if you had a fruit smoothie with blueberries, peaches, and raspberries, you'd have three of the seven colors of the rainbow first thing in the morning! Make it your goal to get the full seven colors every day with a variety of foods.

4 Vary Your Choices

There are thousands of phytonutrients in nature. If we eat the same foods over and over again, even if they are colorful, we may be missing the plethora of important phytonutrients in foods. One helpful hint is to try a new food every week to ensure that you are getting different foods to try.

5 Maximize Combinations

When we combine certain foods, we may achieve a better effect than eating each food separately. Sometimes, there can be a “synergistic” result from combining specific foods. For example, putting turmeric, black pepper, and olive oil together in a meal may enhance the phytonutrient effects of all three foods on your health. Adding lemon juice to spinach helps iron become more absorbed by your body. Experiment with combining plant foods together and observe how you feel.

6 Be Creative with Substitutions

One way to get more phytonutrients is to replace less nutrient dense foods with more nutrient-dense options. Some foods clearly give us more phytonutrients than others! For example, you could substitute mashed potatoes with mashed purple potatoes or sweet potatoes. You could substitute white rice with purple, brown, or black rice. Lastly, you can use spiralized vegetable noodles made from zucchini or squash in place of pasta.

