

## What do we mean by phyto-power?

Much has been written about the benefits of including fresh fruit and vegetables in the daily diet. The World Health Organisation, in its 2007 report, repeated that advice. For many years the focus was placed on vitamins and minerals being the source of the health benefits, but more recently scientists have been looking at the actions of other plant chemicals and how they may affect human health. Phyto-power is a simple reference to those 'other plant chemicals' and their effects. The derivation of the term comes from phyto, meaning having to do with plants, and power, which has its normal meaning.

### Primary and secondary metabolites

Primary metabolites are plant chemicals that are essential to the very existence of the plant. They are directly involved in the normal growth, development, and reproduction of the plant. Secondary metabolites are not directly involved in those processes, but usually have important ecological functions. Examples include antibiotics and pigments. They often appear as a consequence of events that occur during the life cycle of the plant, for example attack by predators or pathogens. Why do plants do this? It may be a matter of self-defence. A plant cannot run away from threats, so it uses its own form of chemical warfare to ward off danger. In the same way that a human produces anti-bodies to combat disease, so a plant produces secondary metabolites, also known as phytoalexins. It may also be in order to attract insects for pollination, and to act as a protectant against UV-B irradiation.

Common examples that have been used in medicine are atropine, produced by the deadly nightshade plant, morphine produced by the poppy, and digitalis produced by the foxglove. Atropine has been used for the dilation of the pupils of the eye, and as a nerve gas antidote. Morphine is a powerful pain reliever and digitalis a heart stimulant. The plants do not produce these chemicals for our benefit, but as repellents against herbivores. Nevertheless, mankind can benefit from the proper use of these phytoalexins.

Other examples can be found in fruits which produce anti-microbial repellents to ward off fungi and bacteria. Some of the fungi that attack plants are also capable of producing fungal infections in humans. For example athlete's foot, thrush and candidiasis. If the fungi are repelled by the chemicals in the skin of the plant, there is every reason to believe, and scientific evidence to support that the consumption of produce containing those phytoalexins may confer health benefits to the sufferer.

### Quantity versus quality

Whilst there is general agreement that the regular consumption of fruit and vegetables is an essential part of a balanced diet, the recommended daily quantity varies from expert to expert.

The latest dietary guidelines call for five to thirteen servings per day, but research suggests that not all fruits and vegetables offer equal health benefits. The quality matters too, and will be discussed elsewhere on these pages.

### Fruits, Vegetables, and Cardiovascular Disease

There is compelling evidence that a diet rich in fruits and vegetables can lower the risk of heart disease and stroke. The higher the average daily intake of fruits and vegetables, the lower the chances of developing cardiovascular disease. Compared with those in the lowest category of fruit and vegetable intake (less than 1.5 servings a day), those who average 8 or more servings a day were 30% less likely to have had a heart attack or stroke.

Although all fruits and vegetables are likely contribute to this benefit, green leafy vegetables such as lettuce, spinach, cruciferous vegetables such as broccoli, cauliflower, cabbage, Brussels sprouts, and kale; and citrus fruits such as oranges, lemons, limes, and grapefruit make important contributions.

### Fruits, Vegetables, Blood Pressure, and Cholesterol

High blood pressure is a primary risk factor for heart disease and stroke. Consequently it is a condition that is very important to control. Diet can be a very effective tool for lowering blood pressure. One of the most convincing associations between diet and blood pressure was found in the Dietary Approaches to Stop Hypertension (DASH) study. This trial examined the effect on blood pressure of a diet that was rich in fruits, vegetables, and low-fat dairy products and that restricted the amount of saturated and total fat. The researchers found that people with high blood pressure who followed this diet reduced their systolic blood pressure (the upper number of a blood pressure reading) by about 11 mm Hg and their diastolic blood pressure (the lower number) by almost 6 mm Hg - as much as medications can achieve.

Eating more fruits and vegetables can also help lower cholesterol. In a study carried out in the US, men and women with the highest daily consumption (more than 4 servings a day) had significantly lower levels of LDL (bad) cholesterol than those with lower consumption. How fruits and vegetables lower cholesterol is still something of a mystery. It is possible that eating more fruits and vegetables means eating less meat and dairy products, and thus less cholesterol-boosting saturated fat. Soluble fibre in fruits and vegetables may also block the absorption of cholesterol from food.

### Fruits, Vegetables, and Cancer

Numerous early studies revealed what appeared to be a strong link between eating fruits and vegetables and protection against cancer. A more likely possibility is that fruits and vegetables may protect against certain cancers. The World Health Organization concluded in its 2007 report that there was probable evidence that the consumption of fruit and vegetables decreased the risk of certain cancers. Keep in mind that this is for total fruit and total vegetable consumption and that, as pointed out by the International Agency for Research on Cancer, specific fruits and vegetables may protect against specific types of cancer. For example, a line of research stemming from a finding from another study suggests that tomatoes may help protect men against prostate cancer, especially aggressive forms of it. One of the pigments that gives tomatoes their red hue - lycopene (a phytoalexin) - could be involved in this protective effect.

### Fruits, Vegetables, and Gastrointestinal Health

One of the wonderful components of fruits and vegetables is their indigestible fibre. As fibre passes through the digestive system, it sops up water like a sponge and expands. This can calm the irritable bowel and, by triggering regular bowel movements, can relieve or prevent constipation. The bulking and softening action of insoluble fibre also decreases pressure inside the intestinal tract and so may help prevent diverticulosis (the development of tiny, easily irritated pouches inside the colon) and diverticulitis (the often painful inflammation of these pouches).

### Fruits, Vegetables, and Vision

Eating plenty of fruits and vegetables also keeps your eyes in good shape. You may have learned that the vitamin A in carrots aids night vision. Other fruits and vegetables help prevent two common aging-related eye diseases - cataract and macular degeneration - which afflict millions of Americans over age sixty-five. Cataract is the gradual clouding of the eye's lens, a disk of protein that focuses light on the light-sensitive retina. Macular degeneration is caused by cumulative damage to the macula, the centre of the retina. It starts as a blurred spot in the centre of what you see. As the degeneration spreads, vision shrinks.

Free radicals generated by sunlight, cigarette smoke, air pollution, infection, and metabolism cause much of this damage. Dark green leafy vegetables contain two pigments, lutein and zeaxanthin, that accumulate in the eye. These two appear to be able to snuff out free radicals before they can harm the eye's sensitive tissues.

In general, a diet rich in fruits, vegetables, and whole grains appears to reduce the chances of developing cataract or macular degeneration.

### The Bottom Line: Recommendations for Fruit and Vegetable Intake

Fruits and vegetables are clearly an important part of a good diet. Almost everyone can benefit from eating more of them, but variety is as important as quantity. No single fruit or vegetable provides all of the nutrients you need to be healthy. The key lies in the variety and quality of different fruits and vegetables that you eat.

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[www.hsph.harvard.edu/nutritionsource/fruits.html](http://www.hsph.harvard.edu/nutritionsource/fruits.html)

