

by Irene Sabin, '94

Plants contain thousands of different chemicals called phytonutrients when the plants are used for food. "Phyto" comes from the Greek word for plant. Phytochemicals help protect the growing plants from assault by insects, fungi, germs, UV radiation and other natural threats. They also provide the sensory characteristics of plants such as color, flavor and smell. Fruits, vegetables and other plant-based foods like grains, nuts, beans, herbs, spices and teas, are often called "superfoods" or "functional foods" when they are found to contain large quantities of phytonutrients which help to maintain the health and vigor of the human body.

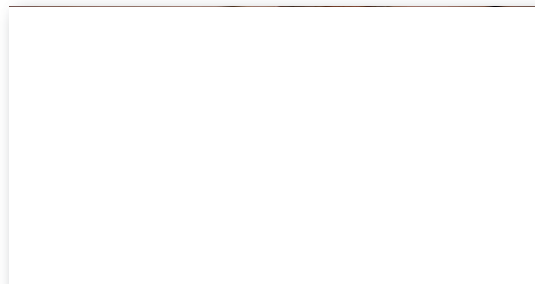
The large numbers of phytonutrients that have been identified by scientists are divided into subgroups, families and subclasses according to their chemical composition.

**Polyphenols** are a large sub-group of phytonutrients that are very abundant in nature and are considered to be excellent sources of antioxidants in the diet. Antioxidants protect cells from damage by unstable oxygen molecules called free radicals.

**Flavonoids** are the largest family in the polyphenol group of phytonutrients. Flavonoids protect plants against injury from parasites, harsh climate conditions and oxidative stress.

**Anthocyanins** are the subclass of flavonoids which give plants their purple, blue, and dark red colors. Blueberries, blackberries, grapes, red cabbage and other fruits and vegetables in that color range are rich in flavonoids and act as antioxidants. Blueberries are known to be one of the best "superfoods" because of their high polyphenol content. However, Rutgers University plant biologists have developed a deep burgundy red lettuce named "Rutgers Scarlet Lettuce" (RSL), which has two to three times the levels of polyphenols as blueberries. RSL could be called the first lettuce "superfood."

Lettuce was chosen as the research plant because it does not have the high sugar content of blueberries, is affordable, is readily consumed by many people, and is available all year as opposed to seasonal produce. RSL is not a genetically-modified plant. Samples of red leaf lettuce with the highest content of polyphenols were chosen. Tissue culture technology was used in which the plant was reduced to an individual cell then millions of cells were grown in a petri dish. The ones with the highest levels of beneficial compounds were selected for development. RSL contains only 10 calories per cup, and is a good source of vitamins A and C, magnesium, iron and potassium. Rutgers is conducting laboratory tests on diet-induced obese mice to see if RSL improves glucose metabolism



Rutgers professor Illya Raskin with a head of RSL that his research team developed. Photo: Nick Romanenko

in a high fat diet. Also, an artificial gut model (TMO Intestinal Model) is being used to investigate the bioavailability of nutrients from RSL in the digestive process.

**Carotenoids** are another large group of antioxidants. They are important for plants and algae during photosynthesis and can absorb harmful light rays. They provide pigment for plants in the yellow, orange and pink or red color range and are also present in green leafy vegetables. Of the 600 carotenoids currently identified by scientists, the best known are beta-carotene, lycopene, lutein and zeaxanthin.

Since many phytonutrients work in synergy with each other, it is best to choose a varied and colorful diet.

**More information is available as PDFs:**

Phytochemicals, Villanova  
[njaes.rutgers.edu/pubs/publication.asp?pid=FS942](http://njaes.rutgers.edu/pubs/publication.asp?pid=FS942)



## Twig Bits

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### Rutgers Scarlet Lettuce

Rutgers Scarlet Lettuce (RSL) has been patented and licensed to a Rutgers spinoff company called Nutrasorb LLC. Shamrock Seeds was granted a license by Nutrasorb to be the exclusive seed dealer for RSL. Coastline Family Farms of Salinas, CA, is the first grower to offer RSL trademarked as Nutraleaf in two varieties, a leaf and a romaine. Growers are not required to use the RSL name, but Nutrasorb's trademark, "Food4Good," will be on the label. The lettuce is available in large grocery stores in the area. <http://coastlinefamilyfarms.com/nutraleaf/>

**Holy Basil** (*Occimum sanctum*, *O. tenuiflorum*) grows in India, SE Asia and parts of Africa. There are three varieties of holy basil: green leaf (clove-like aroma and mellow taste); purple leaf (clove-like scent and peppery taste); and wild, light green, leaf (lemony aroma and taste). Holy basil has strong phytonutrient and antioxidant properties. It has been used in Ayurvedic, Greek and Roman medicine for centuries. It is considered an adaptogenic herb that reduces emotional and physical stress and increases energy. It does not alter mood but scientific studies show that various extracts of holy basil can reduce stress hormone levels and help the body and mind function better under stressful conditions.