

# Growers can boost benefits of broccoli and tomatoes

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A University of Illinois study has demonstrated that agronomic practices can greatly increase the cancer-preventive phytochemicals in broccoli and tomatoes.

"We enriched preharvest [broccoli](#) with different bioactive components, then assessed the levels of cancer-fighting enzymes in rats that ate powders made from these [crops](#)," said Elizabeth Jeffery, a U of I professor of food science and human nutrition.

The highest levels of detoxifying enzymes were found in rats that ate selenium-treated broccoli. The amount of one of the cancer-fighting compounds in broccoli was six times higher in selenium-enriched broccoli than in standard broccoli powder, she said.

Selenium-treated broccoli was also most active in the liver, reaching a level of [bioactivity](#) that exceeded the other foods used in the experiment.

"We were intrigued to find that selenium initiated this amount of bioactivity," she said.

Along with garlic and other plants of the allium family, broccoli and other plants of the brassica family are unique in having a methylating [enzyme](#) that enables plants to store high concentrations of selenium, she said.

"Our bodies need a certain amount of selenium, but many areas of the

world, including parts of the United States and vast areas of China, have very little selenium in the soil," she said.

"Not only could selenium in broccoli deliver this necessary mineral, it also appears to rev up the vegetable's cancer-fighting power," she added.

Jeffery is now working to determine whether selenium compounds are directly responsible for the increase in bioactivity or if selenium acts indirectly by directing new synthesis of the broccoli bioactives called glucosinolates.

In a previous study, Jeffery and U of I colleague John W. Erdman Jr. showed that tomato and broccoli powders eaten together are more effective in slowing prostate cancer in laboratory rats than either tomato or broccoli alone.

In their current research, they are experimenting with ways to increase the bioactive components in these foods in order to test the efficacy of enriched broccoli and tomatoes in a new [prostate cancer](#) study.

Rats were fed diets with food powders containing 10 percent of either standard broccoli; standard tomato; lycopene-enriched tomato; tomato enriched with lycopene and other carotenoids; broccoli sprouts, which contain very high levels of cancer-fighting compounds; or broccoli grown on soil treated with [selenium](#).

The scientists found that greater amounts of bioactive components in the food powders translated into increased levels of the compounds in body tissue and increased bioactivity in the animals.

Carotenoid-enriched tomatoes produced more bioactivity in the liver than lycopene-enriched or standard tomatoes, yielding the most cancer-preventive benefits.

"Carotenoids, which are phytochemical pigments found in fruits and vegetables, are thought to be excellent antioxidants and effective in cancer prevention," said Ann G. Liu, a U of I graduate student who worked on the study.

"A good rule is: the brighter the color, the higher the carotenoid content. If you're growing or buying tomatoes, select plants or produce that are a very bright red. High-lycopene tomatoes are now available through garden catalogs," she added.

"This research shows that you can greatly increase a food's bioactive benefits through normal farming practices, without resorting to genetic engineering. Farmers have traditionally been more concerned about yield than nutritional composition. Now we're asking, can we grow more nutritional broccoli and [tomatoes](#)? And the answer is a definite yes," said Jeffery.

**More information:** The study was published in the Journal of Agricultural and Food Chemistry.

Provided by University of Illinois College of Agricultural, Consumer and Environmental Sciences

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