

## Are GMOs to blame for the loss of nutrients in our fruits and vegetables?

We have been losing nutrient content in our food, particularly raw produce. Today's conventionally grown produce isn't as healthful as it was decades ago. The decline in the quality of fruits and vegetables was first reported more than 15 years ago by English researcher Anne-Marie Mayer, who looked at the dwindling mineral concentrations of 20 UK-based crops from the 1930s to the 1980s. Other countries, including the United States, face similar disheartening trends.

The usual coalition of anti-GMO and pro-organic activists claim that these losses result from genetically engineered foods. However, the science tells us that this trend predates the introduction of genetic modification, and may even predate the use of fertilizers, pesticides and other methods that ushered in the Green Revolution.

There's been a lot of data generated pointing to declines in vitamin and mineral content in produce, and there's also been a lot of blame. For example:

- A post on [Mercola.com claimed](#) that "Cultivation of GE crops may be a major contributor by adversely altering soil's ecological balance and fertility, possibly irreversibly; DNA from GE organisms is not readily broken down by soil microbes, and this foreign DNA can mix with the DNA of these microbes to create bizarre strains, toxins, and otherwise interfere with the biological system that controls soil's fertility."
- Many anti-GMO activists, like the Lotus Clinic, accused GMOs and glyphosate use for depleting soils, and therefore crops, of nutrients. Other anti-GMO sites similarly juxtaposed soil depletion with "studies" showing (falsely) that organic produce has higher nutritional content than genetically modified foods.
- The Organic Consumers Association has accused the USDA of doing nothing while nutrients have dropped since the 1970s. These included an "enormous 50 percent drop in the amount of calcium in broccoli, for example. Watercress down 88 percent in iron content; cauliflower down 40 percent in vitamin C content-all since 1975." The culprit? A commercial emphasis on how food looked, which overlooked nutritional content.
- A [blog post](#) in *Scientific American* cited a University of Texas study in 2004 as evidence that nutrient depletion between 1950 and 1999 was the result of soil depletion caused by so-called Big Ag: "The main culprit in this disturbing nutritional trend is soil depletion: Modern intensive agricultural methods have stripped increasing amounts of nutrients from the soil in which the food we eat grows."

**It's not the soil and not GM**

But that wasn't quite what the Texas paper said. A look at [the actual study](#), a statistical analysis of historical USDA nutrient data conducted by UT scientist Donald Davis, shows the researchers reached a different conclusion. It did show nutrient depletion in some vegetables and fruits between 1950 and 1999, but it also showed increases in nutrients in other produce. In addition, while Davis and his group did hypothesize about the role of soil types in depletion, they also focused on genetic variations in plants and the tradeoffs in creating hybrids and cultivars:

Cultivars commonly are selected for yield, growth rate, pest resistance and other attributes, but seldom have they been selected for nutrient content. It is well accepted in agricultural research that selection for one resource-using function may take resources away from other resource-using functions.

So, if you selected for nutrient increases, you'd eventually get them. If you didn't select for nutrient increases, you likely traded nutrients away in favor of something else.

### **What is the reason behind nutrient decreases?**

Nutrient depletion has clearly been a problem since well before the advent of genetic engineering of crops. But it also may have been a problem as we entered the era of what we consider modern agriculture (at least what the Green Revolution produced starting in the 1960s).

Carbon dioxide gas increases may be one factor in declining nutritional content. In a [paper published](#) in *Nature* in 2014, an international team led by the Harvard School of Public Health found that certain cereals and grasses contained less zinc and iron when grown under increased levels of carbon dioxide. The carbon dioxide levels tested were those predicted to exist by the middle of this century, assuming current trends in global warming/climate change continue. The researchers also found significant variation in nutrient levels among cultivars in the face of greenhouse gases, and concluded that breeding for resistance to carbon dioxide levels could restore zinc and iron levels.

Nutrient decreases may have started at the beginning of the industrial revolution, in the mid-19th century. A British experiment called the [Broadbalk Wheat Experiment](#) has been measuring nutrient (nitrogen, potassium, phosphorus, and calcium) content in wheat and straw since 1843. Studies [using these data](#) found steady levels of these minerals from 1845 until the 1960s, when nutrient content in plants began decreasing, possibly due to cultivar selection. In contrast, soil content of these same nutrients has remained stable over the past 160 years. Moreover, the soil and plant nutrient content was the same regardless of whether the plants were raised using inorganic fertilizers, no fertilizers, or under organic production rules.

There are a [lot of reasons](#) behind changes in nutrient content. Farming practices like spacing of rows, seeding, type of amount of fertilizer, irrigation, and other factors like geographic location and weather all play a significant role in how much of a specific nutrient is in a plant. And there has been a lot of variation depending on the breed of plant farmed. Davis' 2004 study, in fact, found 4-fold variations in beta-carotene, 9-fold variations in one type of Vitamin E, 10-fold variations in  $\gamma$ -tocopherol (another Vitamin E

subtype) and 2.8 fold in ascorbate, all in 50 broccoli varieties growth together.

In the 2004 study, Davis left us with perhaps a more significant warning. He noted that while refined sugars, processed fats and oils, and white flour and rice have all seen significant reductions in nutrients, they currently constitute half the calories consumed by Americans. Moving away from those foods toward any type of fresh produce, therefore, would be an improvement in nutrition that far eclipses any mineral and nutrient declines seen over the decades.

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