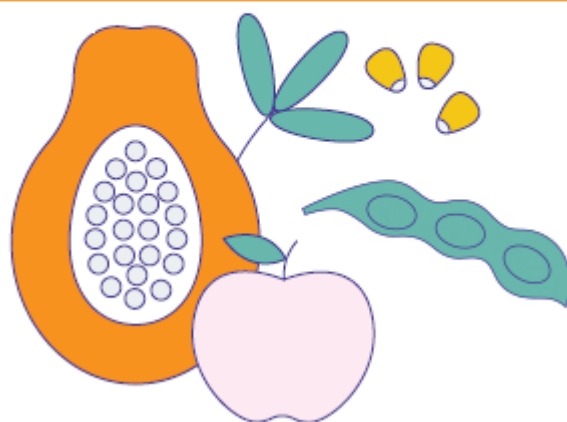


Understanding New Plant Varieties

FEED YOUR MIND



[\(/food/consumers/agricultural-biotechnology\).](#)

Better understand genetically engineered foods ([/food/consumers/agricultural-biotechnology](#)). (GMOs)

Foods derived from new plant varieties developed using genetic engineering are often referred to as “GMOs” (Genetically Modified Organisms). In the U.S., some GMOs are referred to as “bioengineered.” Although genetic engineering of plants began in the 1980s, there is a fair amount of confusion about how foods derived from these techniques — as well as from the more recent technique of genome editing — compare to foods from traditionally bred plants.

For general information on the science, safety and regulation of genetically engineered and genome edited foods, please see below.

Science Q & A

Why do plant breeders use genetic engineering and genome editing over traditional breeding methods?

Plant breeders produce new plant varieties using genetic engineering and genome editing for many of the same reasons traditional breeding methods are used. For example, new varieties may be produced to resist insect pests, provide easier weed control for farmers, improve the nutritional profile of food and provide for flexibility in how foods are used (e.g., non-browning potatoes and apples).

Genetic engineering and genome editing are plant breeding processes that allow plant breeders to introduce desirable characteristics to an organism through genetic modification techniques that utilize modern biotechnology. Compared to traditional plant breeding practices, genetic engineering and genome editing tools provide plant breeders with greater specificity when modifying the characteristics of plants. Genome editing allows scientists to make changes at precise locations in the DNA of a plant, animal or other living organism. In addition, results that could take decades to achieve with traditional breeding methods, could take just a few years with genetic engineering and genome editing.

How are plants genetically engineered?

Genetic engineering copies a gene or genes from an organism with a desired trait and adds the gene or genes to a single plant cell in a laboratory. A new plant is generated from the plant cell containing the added DNA. By narrowing the introduction to only the desired genes from the donor organism, scientists can eliminate unwanted characteristics from the donor's other genes that may be transferred to the new variety if traditional breeding techniques had been used. For instance, traditional breeding techniques include repeatedly cross-pollinating plants until the breeder identifies offspring with the desired combination of traits. During this breeding process a number of genes are introduced into the plant. These genes may include the gene responsible for the desired trait, as well as genes responsible for unwanted characteristics. The precision of genetic engineering allows developers to add only the gene of interest.

What is the difference between genetic engineering and genome editing?

"Genome editing" is a relatively new set of technologies that enable one to make precise changes in the DNA of a plant, animal or other living organism. The changes possible with genome editing may be as precise as a targeted single base-pair change in the plant's DNA. The genetic engineering techniques currently in use do not enable genetic changes to be targeted to specific locations in the plant genome like genome editing techniques do.

What foods are made from genetically engineered plants?

Foods from GE plants were first introduced into our food supply in the 1990s. The majority of genetically engineered plants - corn, canola, soybean, and cotton - are typically used to make ingredients that are then used in other food products. Such ingredients include cornstarch in soups and sauces, corn syrup as a general-purpose sweetener, and cottonseed oil, canola oil, and soybean oil in mayonnaise, salad dressings, cereals, breads, and snack foods. There are also genetically engineered varieties of potatoes, summer squash, apples, papaya, alfalfa and sugar beets.

How long have foods from genetically engineered plants been on the market?

Foods from genetically engineered plants have been on the market for more than twenty-five years. The first food from a genetically engineered plant was marketed in 1994. The food was a tomato called the FLAVR-SAVR tomato. Since then genetically engineered varieties of corn, cotton,

canola, soybeans, sugar beets, apples, potatoes, summer squash, alfalfa and papaya have been marketed.

Safety Q & A


Are foods from genetically engineered plants safe to eat?

Yes. Foods marketed from genetically engineered plants must meet the same requirements, including safety requirements, as foods from traditionally bred plants. Foods from genetically engineered plants intended to be sold in the United States that have been evaluated by the FDA through a voluntary consultation process have not gone on the market until the FDA's questions about the safety of such products have been resolved.

Are foods from genetically engineered plants more likely to (1) cause an allergic reaction or (2) be toxic?

No. The foods we have evaluated through the consultation process have not been more likely to cause an allergic or toxic reaction than foods from traditionally bred plants. When new genetic traits are introduced into plants, the developer evaluates whether any new material could be (1) allergenic or (2) toxic if consumed in foods made from the plant.

Are there long-term health effects of foods from genetically engineered plants?

No. Any long-term health effects of consuming food from genetically engineered plants would be no different than those associated with consuming foods from similar traditionally-bred plants. A 2016 report from the National Academies of Sciences, Engineering and Medicine analyzed health and safety data on food from genetically engineered plants. The report concluded that the health and safety data do not indicate a higher risk to human health from genetically engineered foods compared to their non-genetically engineered counterparts. For a summary of the report, please visit the [National Academies of Sciences website \(https://www.nap.edu/resource/23395/GE-crops-report-brief.pdf\)](https://www.nap.edu/resource/23395/GE-crops-report-brief.pdf)  [_ \(http://www.fda.gov/about-fda/website-policies/website-disclaimer\)](http://www.fda.gov/about-fda/website-policies/website-disclaimer).

Are foods from genetically engineered plants less nutritious than comparable foods?

No. Nutritional assessments for foods from genetically engineered plants that have been evaluated through the FDA's plant biotechnology consultation process have shown that foods from genetically engineered plants are as nutritious as foods from comparable traditionally bred plants.

How is the safety of genetically engineered plants evaluated by FDA?

Evaluating the safety of food from a genetically engineered plant is a comprehensive process that includes several steps. Generally, the developer identifies the distinguishing attributes of new genetic traits and assesses whether any new material that a person consumes in food made from the genetically engineered plants could be toxic or allergenic. The developer also compares the

levels of nutrients in the food from the new genetically engineered plant to those in comparable traditionally bred plants. This analysis typically includes such components as fiber, protein, fat, vitamins, and minerals.

Developers of genetically engineered plants have routinely voluntarily consulted with the FDA about the safety of foods from their new varieties prior to them entering the marketplace. The consultation process helps to ensure that all safety and regulatory questions are resolved prior to marketing. The FDA has been using this process for more than 25 years to help ensure the safety of foods from genetically engineered plants. As of 2020, the FDA has completed consultations on more than 180 genetically engineered plant varieties.

Regulatory Q & A

How are genetically engineered foods regulated by the FDA?

The FDA regulates the safety of foods and food products from plants. Foods from new plant varieties derived from traditional breeding practices, genetic engineering, or genome editing, must meet the same legal requirements that apply to all foods. To help ensure that firms are meeting their obligation to market only safe and lawful foods, the FDA encourages developers of new plant varieties to voluntarily consult with the agency before marketing their products. This process helps developers determine the necessary steps to ensure their food products are safe and lawful and to ensure that any safety or other regulatory issues related to a food product are resolved before commercial distribution. For more information, please visit: [Consultation Programs on Food from New Plant Varieties \(/food/food-new-plant-varieties/programs-food-new-plant-varieties\)](https://www.fda.gov/food/food-new-plant-varieties/programs-food-new-plant-varieties).

How are genetically engineered foods regulated by the U.S. Government overall?

The FDA regulates the safety of foods and food products from new plant varieties in conjunction with the U.S. Department of Agriculture (USDA) and the Environmental Protection Agency (EPA). The FDA enforces the U.S. food safety laws that prohibit unsafe food. Foods from new plant varieties must meet the same safety and legal requirements that apply to all food. The USDA's Animal and Plant Health Inspection Service (APHIS) regulates the introduction of certain genetically engineered organisms that may pose a risk to plant health. The EPA regulates pesticides, including those genetically engineered into food crops, to make sure that pesticides are safe for human and animal consumption and won't harm the environment.

For more information, please visit:

- [Unified Website for Biotechnology Regulation \(https://usbiotechnologyregulation.mrp.usda.gov/\)](https://usbiotechnologyregulation.mrp.usda.gov/)
- [EPA's Biopesticides \(https://www.epa.gov/pesticides/biopesticides\)](https://www.epa.gov/pesticides/biopesticides)
- [USDA's Biotechnology Regulatory Services \(https://www.aphis.usda.gov/aphis/ourfocus/biotechnology\)](https://www.aphis.usda.gov/aphis/ourfocus/biotechnology)

Are foods from genetically engineered plants required to have certain labels?

In 2016, Congress passed the National Bioengineered Food Disclosure Law. This law directs the USDA to establish a national mandatory standard for disclosing foods that are bioengineered. To learn more, please visit the [BE Disclosure \(https://www.ams.usda.gov/rules-regulations/be\)](https://www.ams.usda.gov/rules-regulations/be) page on USDA's website.