

Genetically Engineered Foods

Canola

#5 in a series

A Series from Cornell Cooperative Extension's Genetically Engineered Organisms Public Issues Education (GEO-PIE) Project

GENETICALLY ENGINEERED (GE) VARIETIES OF RAPESEED, THE PLANT FROM WHICH CANOLA OIL IS EXTRACTED, ACCOUNT FOR MORE THAN 60 PERCENT OF THE CANADIAN RAPESEED CROP — THE SOURCE OF MOST OF THE U.S. CANOLA OIL SUPPLY.

Frequently Asked Questions

Am I eating genetically engineered canola?

Definitely. Canola oil is extracted from the seeds of a mustard-like plant variously called "rape," "rapeseed," or "oilseed rape." GE herbicide-resistant varieties of rapeseed are popular in Canada, which exports more than 70 percent of its canola oil to the United States. Canola oil is used in a wide array of products, including vegetable cooking oils, salad dressings, margarines, processed cheese, "non-dairy" products, chips, fried foods, cookies, pastries, soaps and detergents.

One form of canola oil sold in the United States is made from rapeseed genetically engineered to have higher quantities of the oil laurate. Because it is nutritionally different from conventional canola oil it must be labeled as either "high laurate canola" or "laurate canola" Although relatively rare in food products, high laurate canola could be found in chocolates, candy coatings, confections, non-dairy creamers, low-fat margarines, soaps, detergents, and cosmetics.

What new traits have been genetically engineered into rapeseed plants?

Several rapeseed varieties have been engineered to be resistant to broad-spectrum herbicides. At least one variety has been developed to produce higher quantities of the oil laurate.

Herbicide tolerance

For the past several decades, with the increased adoption of no-till farming practices to reduce soil erosion, farmers have controlled weeds by spraying "post-emergent" herbicides directly onto the crop plants. Because these herbicides generally have a narrower spectrum of plants they can kill (if they didn't, they would kill the crop plants, too), many farmers apply mixtures of multiple herbicides to control weeds. Weeds growing in the same field with crop plants can significantly reduce crop yields because the weeds compete for soil nutrients, water, and sunlight.

Researchers realized that if a crop plant is genetically engineered to be resistant to a broad-spectrum herbicide, weed management could be simplified to an application of a single herbicide without concern of damaging the crop plant itself,

which could also reduce the number of herbicide applications. Herbicides kill plants by poisoning specific targets in the plant's physiology. When this target is known, genetic engineering can replace the target with a version that is not susceptible to the herbicide, giving the plant the ability to tolerate the herbicide. Rapeseed varieties have been engineered to tolerate the chemical herbicides glyphosate (trade name: Roundup) and glufosinate (trade names: Basta, Liberty, and others).

High-laurate canola

In addition to their direct nutritional benefits in the human diet, plant-based oils are important as food additives (cooking and salad oils, margarine, and in many processed foods) and for industrial applications (in soaps, detergents, cosmetics, paints, and lubricants). Plant oils are usually extracted from the seeds of the plant, which are very high in oil content. The physical properties of plant oils are determined by the kinds of fatty acids the plant makes. This explains why some plant oils are better for some applications than others-- for example, peanut oil is suitable for cooking, whereas jojoba is better suited for cosmetics and industrial lubricants. By using GE to alter the composition of the fatty acids in a plant, scientists can tailor a vegetable oil to be more suitable for a specific use.

At least one variety of rapeseed has been genetically engineered to modify its oil content. Scientists at Calgene (now Monsanto) added a gene from the California bay plant (*Umbellularia californica*) that increases the level of medium length fatty acids-- in particular, laurate. The main source of laurate, an important fatty acid in soaps and detergents, has been imported coconut and palm oil. High-laurate canola provides a new domestic, temperate zone source of the economically important oil. Because the nutritional content of the oil is altered significantly, the FDA requires products from this GE variety to be labeled as "high laurate canola," although it was developed mainly for industrial and not food uses.

History and prevalence of GE rapeseed plants

Calgene's high-laurate variety was the first GE rapeseed. This variety was first grown commercially in Georgia as a winter crop in the 1995-1996 growing season. Because its oil is

considered a "value added" product, the modified variety is grown under contracts from Calgene, which purchases the seed and markets its oil under the brand name Laurical.

Calgene had hoped that Laurical would prove to be a good domestic substitute for imported oils like coconut and palm (used in chocolates, confections, non-dairy creamers, and a host of other products). High price and other undesirable compositional qualities, however, have limited its use in food products and it has found a small market as a substitute for cocoa butter.

Far more prevalent are the herbicide-resistant varieties of rapeseed. Except for a small area in the upper Midwest, most canola oil used in the U.S. comes from rapeseed plants grown in western Canada. Canadian regulatory agencies have approved several GE herbicide-resistant rapeseed varieties since the mid-1990s, and these GE varieties now account for more than 60% of Canadian rapeseed acres (these varieties have also been approved for planting and food use in the US).

Are there environmental risks or benefits associated with genetically engineered rapeseed?

The main issue associated with herbicide-tolerant crops is whether they increase or decrease agricultural herbicide use. Herbicide-tolerant rapeseed varieties are grown with a smaller number of herbicide applications— due largely to the replacement of multiple herbicide treatments with a single herbicide. It is less clear, however, if the varieties require a smaller quantity of herbicides— in pounds applied— because different herbicides are applied at different rates. Some sources have argued that the herbicides applied to genetically engineered rapeseed are less harmful than the herbicides they are replacing.

For more information on this topic, see GEO-PIE fact sheet 11, *Environmental Safety and Genetically Engineered Crops*.

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