

Editorial note for transgenic crops.

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Genetically modified crops or transgenic crops are the plants whose DNA has been altered using genetic engineering techniques for commercial purposes. Plant genomes can be engineered by using different physical methods or by the use of Agrobacterium. The main purpose of alteration in the genome is to introduce a new trait to the plant that does not occur naturally in the species. Examples of the traits commonly introduced in food crops includes resistance to pests, diseases, heat, drought, moisture, reduction of spoilage, resistance to chemical treatments (e.g. resistance to herbicides, pesticides), or improvement in the nutrient content of the crop. Traits introduced in non-food crops include greater production of pharmaceuticals, biofuels, and other industrially useful goods.

Modern advances and discoveries in the genetics led the humans to alter the plant genome for practical use. The technique of genetic engineering was discovered simultaneously after the discovery of restriction enzymes by Hamilton Smith's in 1970 and DNA ligases in 1967, that allowed the DNA to be cut at specific sites and join broken DNA together respectively. The combination use of these two technologies led to the discovery of technique called genetic engineering. The plasmids discovered in 1952, served as information transferring vehicles or vectors between the cells and DNA sequences. The discovery of Ti plasmid of agrobacterium tumefaciens enlarged the scope of genetic engineering in wide variety of plants. By removal of tumor causing genes and addition of novel genes researchers were able to infect plants with A. tumefaciens and allowed the bacteria to insert their novel DNA sequence in the genomes of the plants.

In 1983 the first crop plant that was genetically engineered was tobacco. It was developed creating a recombinant DNA that joined an antibiotic resistant gene to the T1 plasmid from Agrobacterium. The tobacco was infected with Agrobacterium transformed with recombinant plasmid resulting in the chimeric gene being inserted into the plant. A single genetically modified tobacco cell was selected that contained the gene and a new whole plant was developed using tissue culture technique. The field trials of genetically engineered plants were first carried out in France and the US in 1986; the plants used were genetically engineered tobacco plants possessing a novel trait of resistance to herbicides.

Crops are genetically modified for a variety of purposes; the following are some of the uses of genetically modified crops. Some of the genetically modified are used for ornamental purpose. They are modified to obtain lower color, fragrance, flower shape and plant architecture. Majority of the crops are modified to be resistant against herbicides like glyphosate or glufosinate based ones. Insect resistant GM crops are produced using the insect resistance gene of Bacillus thuringiensis bacterium. Most of them are in the form of delta endotoxin genes known as cry proteins, while a few of them encode for vegetative insecticidal proteins. The only insecticidal gene that does not originate from B. thuringiensis is the Cowpea trypsin inhibitor (CpTI).

One of the best examples of GM crops for nutrient enrichment is golden rice. It has been engineered for the synthesis of beta-carotene, a precursor of vitamin A, in the edible parts of rice. It leads to production of rice high vitamin A content that is most commonly used in the areas with the shortage of dietary vitamin A. plants are also modified to produce biopharmaceuticals in large amounts in the bioreactors. Edible vaccines produced from GM crops, when ingested stimulate immune system to protect against certain diseases.

