GMP

GENETICALLY MODIFIED PLANTS

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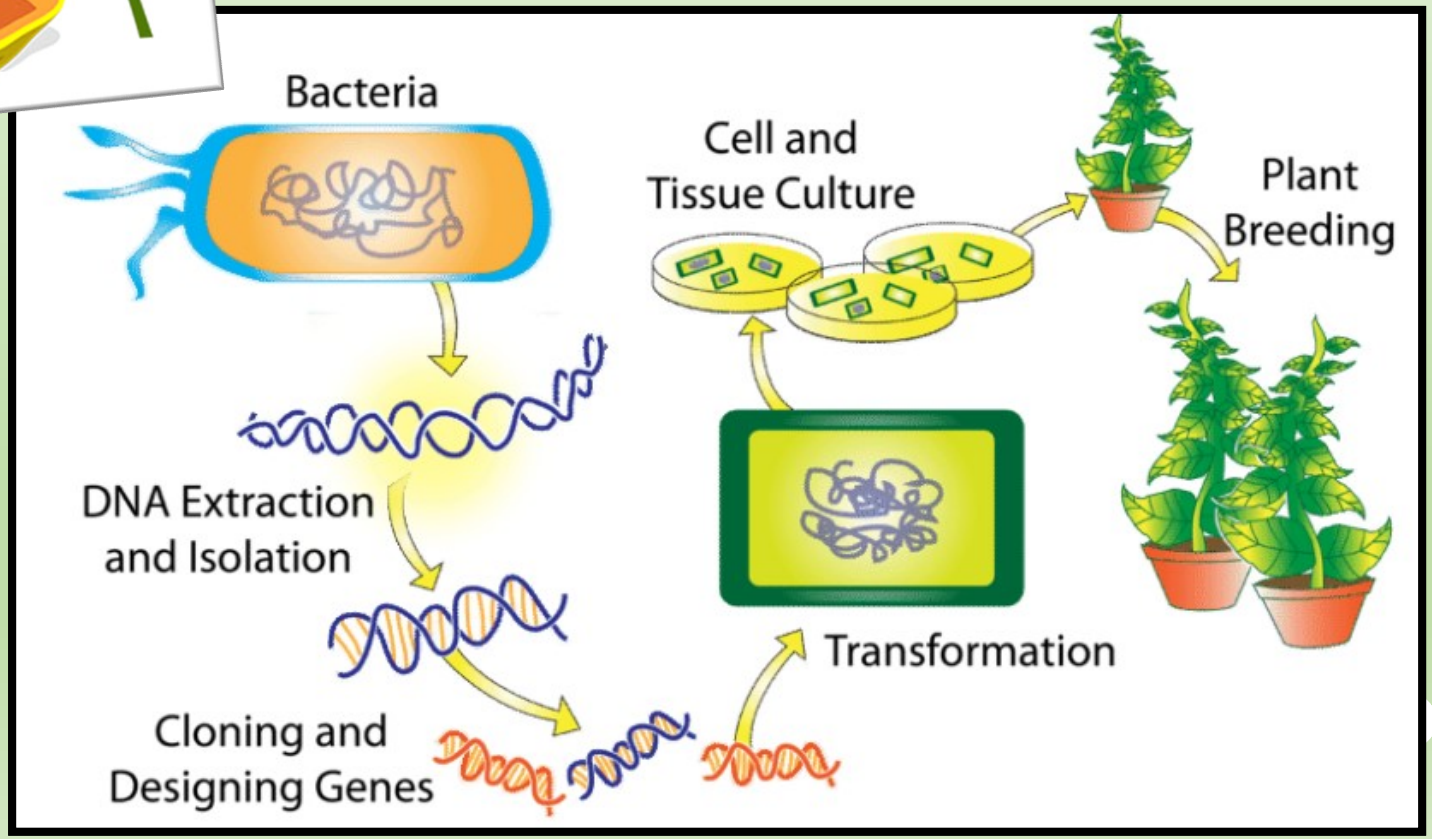
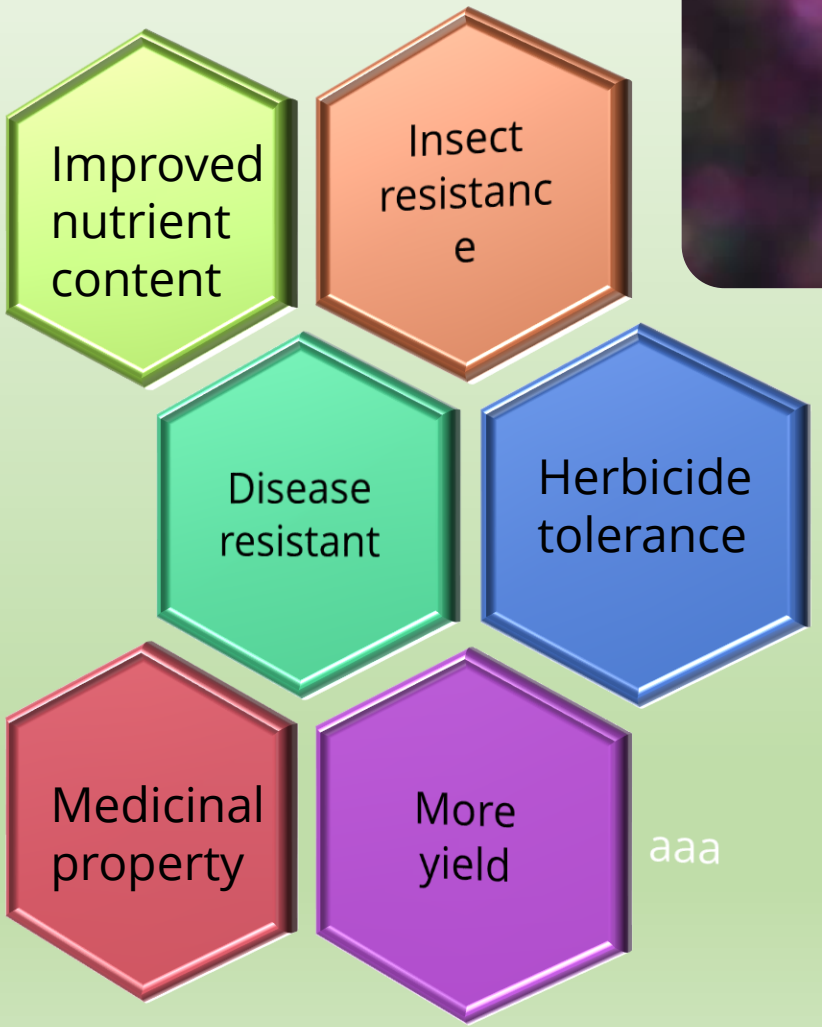
Overview

- Introduction
- Traits introduced by GM
- Case studies
- Ethical issues
- Controversies
- Conclusion

Introduction



Traits introduced by GM



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Genetically Conferred Trait	Example Organism	Genetic Change
APPROVED COMMERCIAL PRODUCTS		
Herbicide tolerance	Soybean	Glyphosate herbicide (Roundup) tolerance conferred by expression of a glyphosate-tolerant form of the plant enzyme 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) isolated from the soil bacterium *Agrobacterium tumefaciens*, strain CP4
Insect resistance	Corn	Resistance to insect pests, specifically the European corn borer, through expression of the insecticidal protein Cry1Ab from *Bacillus thuringiensis*
Altered fatty acid composition	Canola	High laurate levels achieved by inserting the gene for ACP thioesterase from the California bay tree *Umbellularia californica*
Virus resistance	Plum	Resistance to plum pox virus conferred by insertion of a coat protein (CP) gene from the virus

Case studies

Golden rice

- ✓ Attractive yellow colour
- ✓ More nutritious
- ✓ Vitamin A content

Golden rice was created by modifying the rice genome to include a gene from the daffodil *Narcissus pseudonarcissus* that produces an enzyme known as phyotene synthase and a gene from the bacterium *Erwinia uredovora* that produces an enzyme called phyotene desaturase. The introduction of these genes enabled beta-carotene, which is converted to vitamin A in the human liver, to accumulate in the rice endosperm—the edible part of the rice plant—thereby increasing the amount of beta-carotene available for vitamin A synthesis in the body.

Bt cotton

- ✓ Increases yield of cotton
- ✓ Reduction in insecticide use.
- ✓ Potential reduction in the cost of cultivation
- ✓ Reduction in predators.
- ✓ No health hazards due to rare use of insecticides

Bt cotton was created through the addition of genes encoding toxin crystals in the Cry group of endotoxin. When insects attack and eat the cotton plant the Cry toxins or crystal protein are dissolved due to the high pH level of the insect's stomach. The dissolved and activated Cry molecules bond to cadherin-like proteins on cells comprising the brush border molecules. The epithelium of the brush border membranes separates the body cavity from the gut while allowing access for nutrients. The Cry toxin molecules attach themselves to specific locations on the cadherin-like proteins present on the epithelial cells of the midge and ion channels are formed which allow the flow of potassium. Regulation of potassium concentration is essential and, if left unchecked, causes death of cells. Due to the formation of Cry ion channels sufficient regulation of potassium ions is lost and results in the death of epithelial cells. The death of such cells creates gaps in the brush border membrane.

Ethical issues

Gamborg, C. & Sandøe, P. 2010. Ethical considerations of genetically modified trees. In: *Forests and genetically modified trees*. Rome: FAO, pp. 163-176.

8. Ethical considerations regarding genetically modified trees

C. Gamborg and P. Sandøe

NON-TECHNICAL LIMITS TO BIOTECHNOLOGY

Until recently, the main limits to modern biotechnology were of a technical type: "What is it possible to do?" However, as the technical difficulties began to be resolved, and as practical applications came within reach, the question increasingly became one of "What is it acceptable to do?" Today, scientists and the biotechnology industry face a growing number of ethical issues and questions relating to the social context in which biotechnology is used. This may mean a growing discrepancy between expert and public views. Public apprehension about gene technology is triggered [illegible] of concerns: about environmental risks; the [illegible] organisms; labelling of products; and the [illegible]ol on the development and application of [illegible] Thompson, 2001).

[illegible]gineered trees, systematic silvicultural [illegible]breeding are, compared with agricultural [illegible]cy (Campbell *et al.*, 2003). The science [illegible]est trees, i.e. tree and plant genomics, is [illegible] first large-scale commercial applications [illegible] to appear (Sedjo, 2004). It is clear that [illegible]sed by the genetic engineering of forest

[illegible]eered trees will depend not only on the [illegible]t also on how these trees are perceived [illegible] 'genetically modified', 'transgenic' or [illegible]geably for those trees that have been [illegible]xual gene transfer methods, regardless [illegible]r *et al.*, 2007). Potential use of gene [illegible]rns around the world. These concerns [illegible]ave also emerged in North America [illegible] silvicultural genetic engineering have [illegible]ngly dubbed 'Frankenstein forests' (Warwick, 1999), 'Designer trees' (Rautner, 2001) and 'Frankentrees' (Native Forest Network, 2000) – with clear reference to the term 'frankenfoods' used in the genetic modification food debate. A number of protests, sometimes involving the destruction or vandalism of field trials, have occurred – for example in the United Kingdom in 1999, where

Controversies

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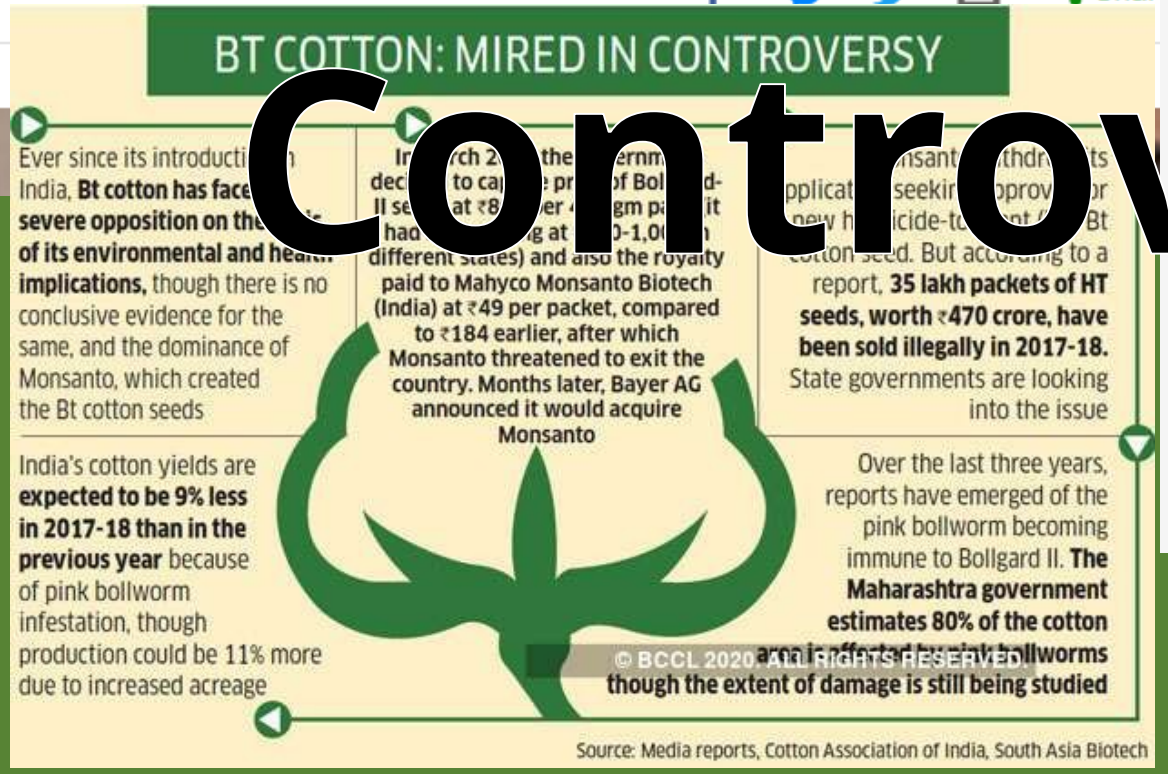
Is opposition to genetically modified food irrational?

3 June 2015



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All you need to know about the GM food controversy

Vidya Venkat

JULY 08, 2016 21:22 IST
UPDATED: NOVEMBER 01, 2016 19:36 IST

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Controversial trial of genetically modified wheat ends in disappointment

By Erik Stokstad | Jun. 25, 2015 , 1:00 PM

A genetically engineered wheat designed to scare away aphids has, in the end, just not proved scary enough. Researchers had hoped that the wheat modified to emit a warning pheromone would ward off aphids while also attracting their natural enemies, thereby allowing farmers to spray less insecticide. Despite promising signs in the laboratory, the field trial—which made headlines in 2012 after opponents of genetic modification (GM) threatened to obstruct it—failed to show any effect. "It was disappointing news," says Paul Temple, a wheat farmer with the U.K. Agriculture and Horticulture Development Board, which was not involved in the research.

Conclusion

- Need of the day
- Can overcome starvation and meet increasing demands due to population explosion
- Proper protocol need to be maintained
- No side effect for environment
- Avoid irrelevant exploitation


Thank
you