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Third Generation of Genetically Modified Crops

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Introduction:

GMO are the ones whose genetic material has been changed the usage of laboratory – primarily based totally switch of genetic switch. There is a dearth of arable land and a sturdy call for for meals on this increasing planet. More than 9 billion human beings to feed is a sizeable hassle for farmers. Our specialists are conversant in editing genomes through including, deleting, and converting them the usage of laboratory procedures. with the intention to introduce new or unique personalities. The "Flavr Savr" tomato turned into the primary GM crop legal for developing within side the USA in 1994. Bt Cotton turned into the primary GM crop kind to be licensed for industrial use in India.

Global area and distribution of GM Crops:

In 2015, GM Crops followed through 28 nations on 179 million hectares. It approach GM vegetation simplest contributes 10% of overall land used for international number one vegetation in remaining decades.

Country	Area in million hectares
United States	71.5
Brazil	52.8
Argentina	24
Canada	12.5
India	11.9

Crop wise distribution as per 2016-17 analysis :

Soybean - 50%
Maize - 33%
Cotton - 12%
Canola - 05%

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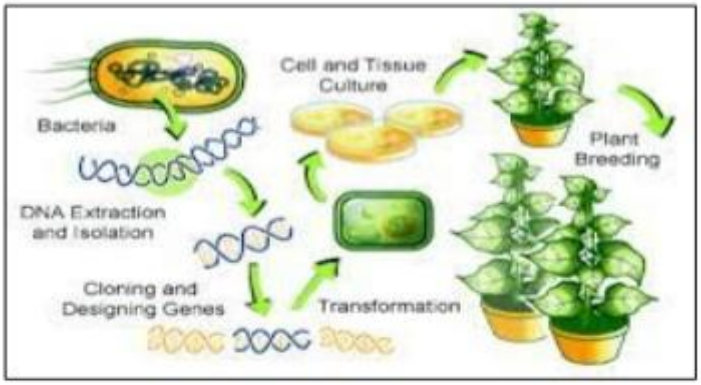
- Genetic Modification is a technology that involves inserting DNA into the genome of an organism.
- To create a GM plant, a new DNA is inserted into plant cells. These cells are then expanded in tissue culture, where they develop into plants.
- These plants will generate seeds with new DNA. The use of gene guns is the most used technique of insertion.
- Other genetic engineering methods include agrobacterium, microinjection, and electroporation.



There are Three main types of genetic modifications which are listed below :

Transgenic seeds : These seeds are developed using recombinant DNA technology where the desired gene for a character/trait is isolated from host and involved in the targeted cell to express the specific character.

1. **Transgenic plants :**
   - One or more alien genes or transgenes from unrelated organisms are present in these plants. This results in the introduction of a new characteristic into the plant that does not already exist or be discovered in the plant naturally.
   - There is no assurance that any gene combinations will be obtained by traditional breeding.
   - The purpose of this transgenic technology is to make the plant prolific and beneficial without causing any negative side effects.
   - In order to enhance certain traits in plants, such as resistance to herbicides, viruses, bacteria, and fungus, certain genes are put into the plants.
2. **Cisgenic :**

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One or more genes and their promoters can only be introduced into a plant using genes from the plant itself or from a close relative; these genes can also be passed from parent plant to offspring through traditional breeding techniques. Several breeders and researchers assert that cisgenic modification is advantageous for plants that are difficult to crossbreed using conventional techniques (such as potatoes). and that cisgenic plants shouldn't be scrutinised by the government as closely as transgenic ones.

3. Subgenic :

Gene knockdown can also be employed to make genetically modified flowers in order to change a plant's genetic makeup without adding genes from other flowers. In 2014, a Chinese scientist named Gao Caixia worked on patent applications for a strain of wheat that is resistant to powdery mould. The strain lacks genes that would normally produce proteins that would dampen the body's defences against the mould. The researchers removed all 3 copies of the genes from the hexaploid wheat genome.

Gao employed CRISPR and TALENs to change genes without adding or changing any other genes. No local trials have been scheduled without delay. White button mushrooms have also been modified using the CRISPR technique. It is (*Agaricus bisporus*).

Generations of Gm Crops :

The First Generation:

- They comprise input experiments such as pest and disease resistance as well as herbicide tolerance.
- Canola, soybean, cotton, maize, and other crops have all demonstrated success with them.

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- Since 1996, a number of traits, such as soybean herbicide tolerance and cotton insect resistance, have been offered.
- Once these crops were introduced, farmers have seen an increase in their financial returns.
- The first generation of crops is intended to enhance a few agronomical traits, including insect resistance and herbicide tolerance.

The Second Generation:

- Input features for some crops, such soybean, maize, and cotton, include different stacking of insect resistance and herbicide tolerance, which lower production costs.
- The crops have new qualities that increase the benefits to consumers, such as increased levels of protein, improved or healthier fats, improved carbohydrates, and higher levels of micronutrients.
- A few examples are foods like rice, which has more beta-carotene levels, tomatoes, which have higher levels of carotenoids, maize, which has higher levels of vitamin C, soybeans, which have a superior amino acid profile, and potatoes, which have higher calcium levels.

The Third Generation:

- This is the research pipeline. The traits in plants may be advantageous to human health because they increase their ability to endure abiotic stress like drought, high temperatures, or salty soils. Another goal is to construct "pharma factories" to produce drugs from active ingredients.
- This generation is concentrated on improving nutritional quality and developing output traits for improved product quality and composition. Examples of these traits include modified oils (omega-3 fatty acids and high oleic acid in soybean), modified

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starches/sugar (potato), low-lignin (alfalfa), non-browning fruits (apples), and increased beta-carotene, ferritin, and Vitamin E in major staple crops, which are in the advanced stages of development.

- With a high oleic acid content that reduces trans fats, a low phytate content that improves mineral absorption by the body and lowers phosphorus levels in animal manure, a high omega-3 content that benefits human health, and a high stearic acid content that speeds up food processing and reduces unhealthy fats, soybean has the most output traits to offer consumers. The highly amylose-containing GM Amflora potato was authorised to be planted.

Conclusion

- The second-most populous nation in the world, India, must be fed in order to end poverty and malnutrition; this is the largest challenge to farmers.
- It is a fantastic option for making money since it produces nutrient-rich grain with a high yield while using less pesticides and herbicides and posing no damage to agriculture or the environment.
- Several countries have imposed limitations on GM foods due to misunderstandings and fears that GMOs ruin ecosystems, risk the health of people and animals, and diminish plant variety.
- Introductions of GM crops are still in their infancy. Because to local awareness, farmers are encouraged to apply the most recent technologies in their fields.

References

Dutta, A. (2019). *A Textbook on principles of seed technology*. Kalyani Publishers.

https://byjus.com/free-ias-prep/genetically-modified-crops-upsc-notes/