

Biotechnology In Agriculture And Horticulture

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Abstract:

Use of Biotechnology in Agriculture is said to be a future strategy to solve the problem of poverty, malnutrition and hunger. A considerable progress has also been made in this regard. In spite of making considerable progress in the development of improved varieties, conventional plant breeding techniques have not been able to keep pace with the increasing demand for vegetables and fruits in the developing countries. Traditional breeding programs can improve some of these crops but the process can be slow. Also in floriculture and ornamental crops, the success of variety depends on the choice of individual which keep on changing very fast as the conventional methods cannot complete the demand. Therefore an immediate need is felt to integrate Biotechnology to speed up the crop improvement programmes. Biotechnology tools have revolutionized the entire crop improvement programmes by providing new strains of plants, supply of planting material more efficient and selective pesticides and improve fertilizers. Many genetically modified fruits and vegetables are already in the market in developed countries. But still there are many issues such as R&D extension and Bio-safety. Addressing these will go long way in promotion of Agriculture sector in the country and to enhance India's capability to compete globally.

Keywords: Biotechnology, Agriculture, New Methods, Integration, Crop improvement.

Biotechnology is an innovative science in which, the living systems and organisms are used to develop new and useful products.

Importance of Biotechnology in Agriculture:-

Technology in Agriculture can be used in different aspects of agriculture such as the application of herbicide, pesticides, fertilizer and improved seed. Over the years, technology has proved to be extremely useful in agricultural sector. Presently farmers are able to grow crops where they were thought could not grow, but this is only possible through agricultural biotechnology.

Adoption of modern Technology in Agriculture:-

Genetic Engineering has made it possible to introduce certain strains into other genes of crops. Such engineering boosts the resistance of the crops to pests (Bt. Cotton) and droughts.

Through technology, farmers are in a position to electrify every process for efficiency and improved production.

Benefits:-

- Increases agriculture productivity
- Prevents soil degradation
- Reduces chemical application
- Efficient use of water Resources
- Disseminate modern farms practices to improve quality and quantity and reduced cost of production.
- Changes the Socio-economic status of the farmers.

Major Benefits:-

1. Improve yield from crops help crops to combat problems like dryness and excess salts in soil.
2. Increased nutritional qualities of food improved taste.
3. Reduced dependence on fertilizers help in reduction of herbicides and pesticides weed killing and insect killing chemicals

Challenges:-

Education and Training Related

- Lack of knowledge
- Inadequate skills
- Lack of improved skills

- Technology and Infrastructure
- Poor infrastructure
- Lack of storage
- Lack of transport
- Economic and policy issues.
- Lack of money
- Access to credit
- Lack of access to Bank Loans
- Climate and environment issues
- Poor soil
- Soil fertility
- Unreliable rainfall
- Natural disasters such as floods, frosts, hail storms,
- PsychoSocial Issues, workers have no interest in agriculture, Farm jobs are time consuming.

The horticulture crops comprise a major segment of agriculture production of our country. It covers the production of fruits, vegetables, medicinal and aromatic plants, flower and ornamental plants and their management and marketing. The importance of horticultural crops can be justified with many advantages these crops have over other cereal crops, waste land utilisation, high export value, providing of raw material for food industry and optimal use of undulations on lands. In addition it provides employment opportunities for women and youth through processing floriculture nursery preparation, mushroom cultivation etc., apart from the economic growth, fruits and vegetables are valuable in providing vital nutrients with increasing population, the requirement of fruits and vegetables is increasing proportionally in the country. Hence there is an urgent need to integrate biotechnological methods which can be adopted for improvement of horticulture crops. The major areas of biotechnology methods to be implemented are

1. Tissue culture

2. Embryo Rescue method
3. Genetic Engineering
4. Molecular Diagnostics and Markers
5. GM Crops

Tissue Culture:-

Tissue culture has been one of the main technological tools that has contributed to the Green Revolution and Gene Revolution. In tissue culture, whole plants can be developed from single cells under the proper stimuli of growth regulators, nutrient medium and light. This technique is economical in time and space, provides greater output, disease free and elite off springs. The Indian scenario of tissue culture industry with about 125 tissue culture units with a total production capacity of 300 million plants per annum at present. The Government of India has identified Micro propagation Industry as a priority area for further research, development and commercialization.

Embryo Rescue Method:- Embryo Culture means excision of embryos and giving them under artificial environmental conditions. There are 2 types of Embryo Culture Mature and immature or Embryo rescue culture. Culture of Immature embryos to rescue the embryos of wild crosses is used to avoid embryoabortion and produce viable plants

Procedure:-

1. Selection of plant material
2. Sterilization of ex-plant
3. Excision of embryo
4. Embryo nurse endosperm transplant
5. Development stages of embryo.

Advantages:-

- Recovery of distant hybrids.
- Propagation of orchids

- Shortening of breeding cycle
- Overcoming dormancy

Genetic Engineering:-

It is a process of recombinant DNA technology alters the genetic makeup of an organism. Corp genetic engineering includes

1. DNA Isolation
2. Genetic cloning
3. Gene design and transformation
4. Ligation of foreign DNA
5. Gene expression

It helps to speed up process creating new foods with desirable traits. Crops developed through Generic Engineering are called transgenic crops or genetically modified crops. They can enhance yield and nutritional quality. They are tolerant to various biotic and abiotic stresses. Commercial crops like cotton and maize developed through this method. These are herbicides resistant some crops take insect resistant soya been and potato are developed scientists can use Genetic Engineering to increase crop yields, lower food costs, improve food quality food security and pharmaceutical production.

Molecular Diagnostics and Markers:-

In biological sense a marker distinguishes individuals, population, varieties or species. There are 3 kinds of markers Phenotypic Biochemical and Genetic. Genetic markets also known as DNA markers evaluates variation in individual based on variation in the DNA sequels examples of these markers are, RFLP, AFLP, RAPD, SSR, SNP etc., the following methods are seen to develop a marker. There are

- 1) Deletion
- 2) Insertion
- 3) Duplication
- 4) Inversion
- 5) Mutation

With the advent of marker assisted selection (MAS) a new breeding tool is available to make more accurate and useful selections in plant breeding.

Advantages of MAS in crop improvement:-

1. Simple methods
2. Selection of seedling stage
3. Increased Reliability

GM Crops:-

Conventional plant breeding involves crossing species of the same species to provide the offspring with desired traits of both parents. Genetic Engineering aims to introduce or transfer the alien gene into the seeds to get the desired effects. It could come from a plant, animal or even soil bacterium.

These crops are also called transgenic crops. Genetic material DNA is altered or artificially introduced using Genetic Engineering techniques. More than 10% of the world's croplands are planted with GM crops. The aim is to introduce new traits to the plant which does not occur naturally in species like resistance to pests, disease, environmental conditions, herbicides etc. Genetic modification is also done to increase nutritional value, production of biofuels etc.,

GM Crops in India:-

1. **Bt Cotton** :- It has an alien gene from *Bacillus thuringiensis* (Bt) that allows the crop to develop a protein toxic to the common pest pink bollworm.
2. **Ht Bt Cotton** :- resistant to herbicide glyphosate
3. **Bt Brinjal** :- Gene allows the plant to resist attack of fruit and shoot borer.
4. **DMH-H Mustard** :- Allows cross-pollination
5. **Golden Rice** :- enriched with B-Carotene and Vitamin A

Conclusion:-

Use of advanced technology and Biotechnology in Agriculture is said to be a future strategy to solve the problem of poverty, malnutrition and hunger. But still there are many issues in

promoting R&D and Bio-safety. Addressing there will go a long way in promotion of Agriculture and Horticulture in the country.

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