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Role of Biotechnology in Horticultural Crops

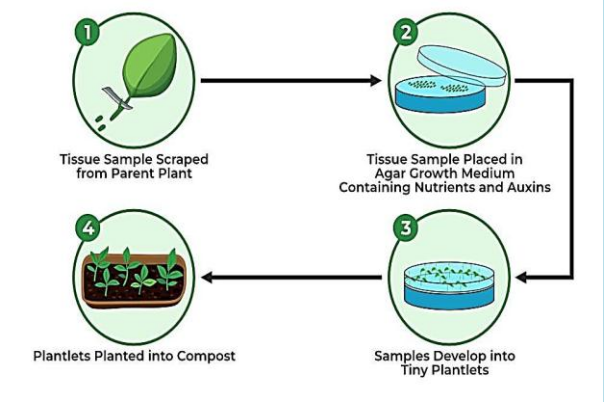
Ram Preet Singh and Sarvan Kumar

Introduction:

Plant regeneration and modification have enormous possibilities for biotechnology. Biotechnological instruments are anticipated to have a greater impact in agriculture, where tiny changes in colour, smell quality, and postharvest behaviour might have a significant commercial impact. Hereditary change, micropropagation, in vitro germplasm preservation, genetic innovation, virus-cleaning, biofertilizers, biopesticides, and postharvest biotechnology are critical areas in horticultural agricultural biotechnology. The following are the key areas of biotechnology that can be used to improve horticultural crops:

1. Plant Tissue Culture

This is a major approach associated with biotechnology. Tissue culture and micropropagation represent among biotechnology's most widely used applications. It is one of the most popular methods for quick asexual in vitro replication. This technology saves time and space, allows for more output, and produces disease-free and elite propagules. PTC also facilitates the safe and secure movement of germplasm across borders. When standard techniques of propagation are insufficient to meet the demand for propagation material, this technology can generate millions of evenly flowering and producing plants. Almost all fruit and vegetable crops can now be micro propagated. In many horticultural crops, virus-free planting material may now be produced utilising meristem culture.



Tissue culture processes

2. Genetic Engineering of Plants

Many desirable qualities have been introduced into plants via the application of genetic engineering techniques, and numerous transgenic plants have been generated in which the remote DNA has been progressively coordinated and resulted in the union of

Ram Preet Singh and Sarvan Kumar
Ph. D. Scholar, Department of Fruit Science, College of Horticulture & Forestry, Central Agriculture University, Pasighat, Arunachal Pradesh, India

suitable quality item. Up until 2001, transgenic plants have gained approximately 52.6 million hectares in the Mechanical and developing countries. The edit plants have been given qualities for the following traits. To feed such a vast population, the world has now declared GMO foods on a wide scale.

3. Herbicide Tolerance

Weeds are a major problem in horticulture. Herbicides were introduced to deal with such situations, but regrettably, plants were also damaged along with the weeds. As a result, transgenic plants that are resistant to herbicides are produced, allowing farmers to spray crops to kill only weeds but not their crops. Herbicide-tolerant plants have been created in a variety of crops, including tomato, tobacco, potato, soybean, cotton, corn, oilseed rape, petunia, and others.

4. Pathogen/Disease Resistance

Crop plant pests that cause significant yield losses are viruses and biotic stress. Many ways for controlling virus infection have been developed, including the use of coat protein and satellite RNA. The best example in this regard is virus-free potato seed.

5. Abiotic Stress Resistance

A wide range of genes have been found that are responsible for giving resistance to stressors such as water stress, heat, cold, salt, heavy metals, and phytohormones. Chilling resistance was developed into tobacco plants by inserting the Arabidopsis glycerol-1-phosphate acyl-transferase enzyme gene. Arabidopsis is a model plant used in research to determine outcomes for other plants.

6. Molecular Markers

Using molecular markers, it is now possible to detect DNA segments and genes and pinpoint their precise location. The ability to choose agronomic qualities using gene tags or molecular markers has simplified the job of the breeder. At the seedling stage, the plants could be scored for various qualities or disease resistance. Plant breeding makes extensive use of RFLP (Restriction Fragment Length Polymorphism), RAPD (Random Amplified Polymorphic DNA), AFLP (Amplified Fragment Length Polymorphism), and isozyme markers. RFLPs have an advantage over morphological and isozyme markers in that their number is limited only by genome size and they are not affected by environmental or developmental factors. There are currently molecular maps for a variety of crop plants, including corn, tomato, potato, rice, lettuce, wheat, brassica species, and barley.

7. Genetic Modification of Microbes

It has been feasible to genetically alter distinct strains of these bacteria suitable for varied climatic circumstances and to generate strains with traits capable of higher competitiveness and nodulation utilising the DNA recombination technology.

8. Biopesticides

Biopesticides are biological organisms that are used in place of insecticides to manage pests. It is unquestionably a significant accomplishment in plant sciences. Biopesticides are becoming increasingly important in pest management programmes in agriculture, horticulture, and public health.

9. Biocontrol Agents

These are microorganisms that are hostile to numerous pathogenic fungi and can be used in place of fungicides or insecticides. *Bacillus sp*., *Pseudomonas fluorescens*, *Trichoderma*, *Verticillium sp*., *Streptomyces spp*., and others are among them. These organisms are available for purchase.