



Plant Tissue Culture in Crop Improvement

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Plant tissue culture is a technique of growing plant cells, tissues, or organs on a nutrient medium under sterile conditions. It is based on the principle of totipotency, which means a single plant cell can develop into a complete plant. Tissue culture is widely used in agriculture for crop improvement and rapid plant multiplication.

Types of Tissue Culture

1. Callus Culture

Growth of an unorganized mass of cells on nutrient medium.

2. Meristem Culture

Used to produce disease-free plants.

3. Anther and Pollen Culture

Used for producing haploid plants in breeding programs.

4. Embryo Culture

Helps in embryo rescue and overcoming seed dormancy.

5. Micropropagation

Rapid multiplication of plants under laboratory conditions.

Steps in Plant Tissue Culture

1. Selection of explant

2. Sterilization

3. Inoculation into nutrient medium

4. Incubation under controlled conditions

5. Regeneration of shoots and roots

6. Hardening and transfer to soil

Role in Crop Improvement

Rapid Clonal Propagation

Large numbers of identical plants can be produced quickly.

Disease-Free Plants

Meristem culture helps remove viruses and pathogens.

Haploid Production

Helps develop pure lines rapidly for breeding.

Somaclonal Variation

Useful for selecting plants with disease or drought resistance.

Germplasm Conservation

Rare and valuable plant species can be preserved.

Genetic Engineering

Used in developing improved transgenic crops.

Applications

Banana – Micropropagation
Potato – Virus-free seed production
Sugarcane – Mass multiplication
Rice and Wheat – Breeding programs

Advantages

Rapid multiplication
Disease-free plants
Uniform crop production
Faster breeding programs
Conservation of rare species

Limitations

High cost
Risk of contamination
Requires skilled labor

Conclusion

Plant tissue culture is an important biotechnology tool for crop improvement. It helps in rapid propagation, disease-free plant production, conservation of germplasm, and development of improved crop varieties. It plays a major role in modern agriculture and sustainable crop production.