

Course Code	Course Name	Credits
26BY501	PLANT TISSUE CULTURE	04

Course Objectives

- The course purpose is to impart knowledge on the concept, scope, instrumentation, basic requirements and applied aspects of plant tissue culture.
- To understand the principle and basic protocols for Plant Tissue Culture.
- To understand the fundamental aspects of plant tissue culture and molecular biology of plants for the production of transgenic.
- The course also introduces concepts of plant growth regulators, and genetic manipulation.
- To understand how tissue culture can be used for the production of valuable compounds like alkaloids, terpenoids, and pharmaceuticals.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Understand the equipment's required in Tissue culture Lab.
- Prepare media for inoculation of explants.
- Perform sterilization techniques (glasswares/ Explant)
- Understand the basic knowledge of PTC in various fields for conservation, medicine, product development etc.
- Design experiments and apply tissue culture techniques in research and industry.

Unit 1- History and Introduction (12 Hrs).

Introduction - History, scope of plant tissue culture, contribution of Indian Scientists. Definition, principle of tissue culture. Cellular totipotency: differentiation, de-differentiation and re-differentiation. Concept of asepsis and methods of sterilization (physical and chemical methods). Nutrient media (MS) their composition and methods of preparation.

Unit 2 -Plant Growth regulator and Medium (12 Hrs).

General components and their role. Plant growth regulators: Cytokinins, Auxins and Gibberellins. Method of preparation of stock solution of MS medium. Preparation of explants sterilization, inoculation, sub culturing and hardening.

Unit- 3 Types of Cultures (12 Hrs).

Methodology and significance of callus, meristem culture, Haploid culture (anther, pollen and ovary), embryo culture and suspension culture, Organogenesis and factors affecting organogenesis. Somatic embryogenesis, induction of somatic embryos – direct and indirect, factors affecting somatic embryogenesis. Importance of somatic embryogenesis. Method of preparation and importance of synthetic seeds.

Unit 4- Protoplast isolation and applications (12 Hrs).

Mechanical and enzymatic methods, Protoplast culture and regeneration. Somatic hybridization, Methods and applications of somatic hybridization. Single cell culture and its importance- Paper raft nurse technique, the petridish plating technique, the microchamber technique, nurse callus and microdroplet technique.

Unit 5- Somaclonal variation (12 Hrs).

Somaclonal variations, causes and their applications in plant breeding. Bioreactors: Types- batch, continuous and immobilized cell bioreactors. Production of secondary metabolites: Hairy root culture, Upstream and downstream processing. Applications of plant tissue culture in various fields- Agriculture, Horticulture, Floriculture and medicine.

Reference Books:

1. Plant Tissue Culture: Principles, Tools, and Techniques (2024) - Ramrao Sinkar & Mahendra Rai.
2. Advances in Plant Tissue Culture: Current Developments and Future Trends (2020) - Avinash Chandra
3. Advances and Applications in Biotechnology (2026) – Arti Gupta & Ali Asghar Rastegari.
4. R Keshavachandran and K V Peter. (2020) Plant Biotechnology: Methods in Tissue Culture and Gene Transfer. Orient Blackswan.
5. Advances and Perspectives in Plant Tissue Culture (Volume 1) (2021) - Edited by Dr. Ajit Abasaheb Kengar.