

Course Code	Course Name	Credits
26BY007	PLANT BIOTECHNOLOGY	04

Course Objectives

- To introduce students to the fundamental concepts, scope and significance of plant biotechnology and tissue culture.
- To develop understanding of plant tissue culture techniques, media preparation and aseptic laboratory practices.
- To explain the principles and applications of micropropagation and in vitro culture methods for plant improvement.
- To provide basic knowledge of recombinant DNA technology and its applications in agriculture, medicine and environmental management.

Learning Outcomes

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

- Understand and explain key concepts such as totipotency, tissue culture techniques and plant biotechnology applications.
- Prepare culture media, perform sterilization and carry out basic plant tissue culture procedures under aseptic conditions.
- Apply knowledge of micropropagation and in vitro techniques for plant production and conservation.
- Demonstrate basic understanding of genetic engineering tools like PCR, restriction enzymes and their practical applications.

Unit 1 - Introduction to Plant Biotechnology (12 Hrs.)

Definition, scope and importance of biotechnology. History and development of plant biotechnology. Basic concepts of plant tissue culture- totipotency, differentiation, dedifferentiation and redifferentiation. Types of culture - seed culture, embryo culture, organ culture and callus culture. Laboratory organization and aseptic techniques.

Unit 2- Plant Tissue Culture Techniques (12 Hrs.)

Culture media and its components. Preparation of Murashige and Skoog (MS) medium. Role of plant growth regulators in tissue culture. Sterilization techniques- sterilization of glassware, instruments and media. Surface sterilization of explants. Inoculation and incubation under controlled conditions.

Unit 3 - Micropropagation (12 Hrs.)

Concept and importance of micropropagation. Methods of micropropagation- axillary bud proliferation and adventitious shoot formation. Organogenesis and somatic embryogenesis. Stages of micropropagation. Hardening and acclimatization of plantlets. Applications of micropropagation in agriculture, horticulture and forestry.

Unit 4- Applications of Plant Tissue Culture (12 Hrs.)

Callus culture and cell suspension culture. Production of haploids through anther and pollen culture. Protoplast culture and protoplast fusion. Artificial seeds. Production of secondary metabolites in vitro. Advantages and limitations of plant tissue culture.

Unit 5 - Introduction to Recombinant DNA Technology (12 Hrs.)

Basic concept of genetic engineering and recombinant DNA technology. Steps involved in rDNA technology. Restriction enzymes and DNA ligase. Cloning vectors- plasmids and bacteriophages (basic idea). Polymerase Chain Reaction (PCR) and DNA fingerprinting (basic concept). Applications of plant biotechnology in medicine, agriculture and environmental management.

Reference Books:

1. Slater, A., Scott, N. W., & Fowler, M. R. (2003). Plant biotechnology: The genetic manipulation of plants. Oxford University Press.
2. Bhojwani, S. S., & Razdan, M. K. (2004). Plant tissue culture: Theory and practice. Elsevier.
3. Yadav, P. R., & Tyagi, R. (2006). Biotechnology of plant tissues. Discovery Publishing House.
4. Slater, A., Scott, N.W. & Fowler, M.R. (2008). Plant Biotechnology: The Genetic Manipulation of Plants. Oxford University Press.
5. Chawla, H.S. (2009). Introduction to Plant Biotechnology. Oxford & IBH.
6. Smith, R.H. (2013). Plant Tissue Culture: Techniques and Experiments. Academic Press.
7. Dubey, R.C. (2014). A Textbook of Biotechnology. S. Chand.
8. Neumann, K. H., Kumar, A., & Imani, J. (2020). Plant cell and tissue culture: A tool in biotechnology (2nd ed.). Springer.