

Core Course

Semester in which the course will be offered: VIth Semester

Course Title: Fundamentals of Agricultural Biotechnology

Course Credits: 3(2+1)

Objectives

To familiarize the students with the fundamental principles of biotechnology, various developments in biotechnology and its potential applications

Theory

Introduction to Plant Tissue Culture: History of Plant Tissue Culture; Cellular totipotency and cytodifferentiation; Callus culture, Single-cell/suspension culture and their applications; Organogenesis and somatic embryogenesis; Somaclonal variation and its use in crop improvement; Embryo rescue technique and its significance in hybrid development; *In vitro* fertilization, ovule culture and its significance in hybrid development; Protoplast isolation, culture and regeneration; Somatic hybridization (somatic hybrids and cybrids) and its application in crop improvement; Anther and pollen culture for haploid production; Development of disease-free (virus free) plants through apical meristem culture; Micropropagation technique for the generation of quality planting material; Synthetic seeds and its applications; National certification and Quality management of TC plants, secondary metabolite production, *In vitro* germplasm conservation.

Introduction to Molecular Biology: Structure of prokaryotic and eukaryotic gene, DNA structure and function; Central dogma of life, DNA replication, transcription, genetic codes and translation, RNA, types and function; *Lac* Operon concept, Nucleic acid hybridization; Polymerase chain reaction and its applications, DNA sequencing – Sanger method;

Introduction to recombinant DNA technology: DNA modifying enzymes and vectors; Plant genetic transformation – physical (Gene gun method), chemical (PEG mediated) and *Agrobacterium*-mediated gene transfer methods; Transgenic and its importance in crop improvement with successful stories; biosafety.

Introduction to various molecular markers: Concepts of DNA markers, Types of DNA markers, RFLP, RAPD, SSR, SNP etc.; Marker-assisted breeding in crop improvement

Practical

Introduction to Plant Tissue Culture Laboratory; Good Laboratory Practices; Media Preparation and sterilization; Glassware sterilization; Micropropagation; Callus induction and culture; Anther culture; Apical meristem culture; Preparation of synthetic seeds; Isolation of plant genomic DNA; Isolation of Plasmid DNA Quantification of DNA; PCR amplification of DNA, Agarose Gel Electrophoresis and visualization of DNA; Restriction digestion of plasmid DNA; Visit to tissue culture units/biotech labs.