

BACHELOR OF SCIENCE

4th SEMESTER

DISCIPLINE SPECIFIC COURSE - 4 (CORE-4)

BT420C: BIO-TECHNOLOGY: PLANT BIOTECHNOLOGY AND ANIMAL CELL SCIENCE

CREDITS: THEORY - 4, PRACTICAL- 2 (4+2)

THEORY (4 CREDITS: 60 HOURS)

MAXIMUM MARKS: 60, MINIMUM MARKS: 24

Objective: This course has been aimed to introduce students towards advancement in plant and animal biotechnology that can be used for benefit of mankind.

Unit - 1 (15 Hours)

Basic concepts regarding plant cell; Concept of totipotency and plasticity; Plant tissue culture media composition and role of its essential components with specific reference to Murashige and Skoog Medium; Plant hormones and their usefulness in plant tissue culture; Micro-propagation and its applications; Brief account of various culture types - callus culture, cell-suspension culture, anther / microspore culture, ovule culture, embryo culture, shoot tip / meristem culture, root culture; Plant regeneration through organogenesis and somatic embryogenesis.

Unit - 2 (15 Hours)

Overview of plant transformation techniques; Agrobacterium-mediated transformation - biology of *Agrobacterium tumefaciens*, Ti-plasmid & its features (T-DNA & vir region) and mechanism of gene transfer leading to crown-gall disease; Direct gene transfer methods - biolistics, electroporation, polyethylene glycol (PEG)-mediated transformation, transformation using silicon carbide fibres with advantages and limitations of each method; GM crops with specific reference to Golden Rice & Bt cotton; Concerns about GM crops.

Unit - 3 (15 Hours)

Basic facilities and equipment required for setting up a tissue culture facility; Culture media - introduction to balanced salt solutions and complete media along with the role of their essential constituents including serum, advantages of serum-free media, commonly used media formulations with their specific uses; Aseptic technique - objectives & elements, commonly employed techniques in sterile handling; Biology of cultured cells.

Unit - 4 (15 Hours)

Types of tissue culture; Primary and secondary cultures; Suspension and adherent monolayer cultures; Sub-culturing and development of cell lines - criteria for sub-culturing, phases of culture, understanding of cell line / cell strain / passage number / generation number / split ratio, properties of finite and continuous cell lines, transformation and immortalization; Transfection of cell lines, commonly used cell lines with their specific applications; Principles of cryopreservation; Applications of animal cell culture technology - monoclonal antibodies, viral vaccines and therapeutic recombinant glycoproteins.

PRACTICALS (2 CREDITS: 60 HOURS) MAXIMUM MARKS: 30, MINIMUM MARKS: 12

1. Preparation of plant tissue culture media.
2. Preparation of different explants for culturing and steps of explant inoculation.
3. Explant culture (embryo/ovary).
4. Establishment and maintenance of cell lines.
5. Subculture of monolayer cells.
6. Determination of cell viability by trypan blue assay.

BOOKS RECOMMENDED

1. *Plant Biotechnology - The Genetic Manipulation of Plants*: Slater, A., Scott, N. W. and Fowler, M. R. - Oxford University Press.
2. *Introduction to Plant Biotechnology*: Chawla, H. S. - Science Publishers Inc.
3. *Culture of Animal Cells - A Manual of Basic Technique and Specialized Applications*: Freshney, R. I. - Wiley-Blackwell.
4. *Animal Cell Culture and Technology*: Butler, M. - BIOS Scientific Publishers.
5. *Animal Cell Culture - A Practical Approach*: Masters, J. R. W. - Oxford University Press.

Expected Learning Outcomes:

1. Understanding of basic concept of plant and animal tissue culture, and their applications.
2. Practical know-how of basic techniques used for initiation and maintenance of cultured tissues/cells.