

B.Sc., Biotechnology: Choice based credit system

B.Sc., -IV Semester W.E.F. 2020-21

BT-401 (i) Plant and Animal Biotechnology

Course Objectives

The objectives of this course are to introduce students to the principles, practices and application of animal biotechnology, plant tissue culture, plant and animal genomics, genetic transformation.

Unit – I: Plant tissue culture techniques & secondary metabolites production

Plant tissue culture: totipotency, media preparation – nutrients and plant hormones; sterilization techniques; establishment of cultures – callus culture, cell suspension culture, applications of tissue culture-micro propagation; Somatic embryogenesis; synthetic seed production; protoplast culture and somatic hybridization - applications. Plant secondary metabolites- concept and their importance

Unit – II: Transgenesis and Molecular markers

Plant transformation technology-- Agrobacterium mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid, Transgenic plants as bioreactors. Herbicide resistance – glyphosate, Insect resistance- Bt-cotton Molecular markers - RAPD, RFLP and DNA fingerprinting-principles and applications.

Unit – III: Animal tissue culture techniques

Animal cell culture: cell culture media and reagents; culture of mammalian cells, tissues and organs; primary culture, secondary culture cell lines, stem cell cultures; Tests: cell viability and cytotoxicity, Cryopreservation. Transfection methods (calcium phosphate precipitation, electroporation, Microinjection) and applications.

Unit – IV: Transgenic animals & Gene Therapy

Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines), IVF, Concept of Gene therapy, Concept of transgenic animals – Merits and demerits.

Unit V: Bioethics, Biosafety and IPR

Bioethics in cloning and stem cell research, Human and animal experimentation, animal rights/welfare. Bio safety-introduction to biological safety cabinets; primary containment for biohazards; Introduction to IP-Types of IP: patents, trademarks & copyright

Student Learning Outcomes

Students should be able to gain fundamental knowledge in animal and plant biotechnology and their applications.

PLANT AND ANIMAL BIOTECHNOLOGY-PRACTICALS

1. Plant culture media and composition of MS media
2. Raising of aseptic seedlings
3. Induction of callus from different explants
4. Plant propagation through Tissue culture (shoot tip and Nodal culture)
5. Establishing a plant cell culture (both in solid and liquid media)
6. Suspension cell culture
7. Cell count by haemocytometer.
8. Establishing primary cell culture of chicken embryo fibroblasts.
9. Animal tissue culture – maintenance of established cell lines.
10. Animal tissue culture – virus cultivation.
11. Estimation of cell viability by dye exclusion (Trypan blue).
12. ELISA – Demonstration

Mandatory 6 Practicals.

SCHEME OF VALUATION FOR PRACTICALS -50 M

- 1. Major Experiment I- 20M**
- 2. Major Experiment II – 20 M**
- 3. Record – 10M**

List of Reference Books:

1. Introduction to Plant Tissue Culture..M.K. Razdan ,2003,Science Publishers
2. Plant Tissue Culture, kalyan Kumar De,199 M7,New Central Book Agency
3. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan,1998
4. Biotechnology – By U. Satyanarayana ;1997
5. Plant Cell, Tissue and Organ Culture, Applied and Fundamental Aspects By Y.P.S. Bajaj and A. Reinhard ,2001
6. Introduction to Plant Tissue Culture,M. K. Razdan, 2003,Science Publishers
7. A Textbook of Biotechnology,R C Dubey,S. 2014,Chand Publishing
8. Elements of Biotechnology,P. K. Gupta, 1994,Rastogi Publications
9. R. Ian Freshney, “Culture of animal cells – A manual of basic techniques” 4th edition, John Wiley & Sons, 2000 ,Inc, publication, New York
10. Daniel R. Marshak, Richard L. Gardner, David Gottlieb “Stem cell Biology” edited by Daniel 2001,Cold Spring Harbour Laboratory press, New York
11. M.M. Ranga, Animal Biotechnology; Agrobios (India) ,2006.