

SEMESTER VI

6.1 - Plant and Animal cell technology

Hours: 45

Unit 1. Plant tissue culture

08 hrs

In vitro methods in plant tissue culture, aseptic Techniques. Types of nutrient media and use of growth regulators (Auxins, Cytokinins and Gibberellins). *In vitro* fertilization - Ovary and Ovule culture. Micropropagation of elite species. Organ Culture - Anther, Embryo and Endosperm culture and their applications.

Unit 2. Protoplast Culture

08 hrs

Isolation, regeneration and viability test, somatic hybridization, methods of protoplast fusion - chemical and electro fusion, practical application of somatic hybridization and cybridization. Somaclonal variation and their significance. *In vitro* production of secondary metabolites - Techniques and significance.

Unit 3. Transgenic plants

08 hrs

Technique of transformation - biological (Agrobacterium mediated), physical and chemical methods. Applications of transgenic plants. Edible vaccines. Role of tissue culture in agriculture, horticulture and forestry

Unit 4. Animal cell culture

08 hrs

Media and its components - Primary Culture - Cell lines, and cloning disaggregation of tissue, isolation of tissue, enzyme disaggregation, and mechanical disaggregation. Secondary Culture - transformed animal cells and continuous cell lines. Growth factors - Promoting proliferation of animal cells EGF, FGF, PDGF, IL-1, IL-2, NGF and erythropoietin.

Unit 5. Transgenic animals

08 hrs

Transfection of animal cell lines. Selectable Markers and Transplantation of Cultural Cells. Expression of Cloned proteins in animal cell - Expression vector, over production and downstream processing of the expressed proteins. Production of Vaccines in animal Cells. Production and Applications of monoclonal antibodies. Production of transgenic animals

Unit 6. Biotechnology and Intellectual property rights:

05 hrs

Patents, trade secrets, copyright, trademark, Geographical indications, WIPO, TRIPS. Procedure involved in patenting biotechnological inventions.

Reference:

1. Ravishankar G.A and Venkataraman L.V(1997) Biotechnology applications of Plant Tissue & cell culture. Oxford & IBH Publishing co., Pvt Ltd.
2. Bhan (1998) tissue Culture, Mittal Publications, New Delhi.
3. Islan A.C (1996) Plant Tissue Culture, Oxford & IBH Publishing Co., Pvt. Ltd.
4. Lydiane Kyte & John Kleyn (1996) Plants from test tubes. An introduction to Micropropagation (3rd Edition) timber Press, Partland.
5. Kumar H.D (1991) A test book book on Biotechnology (2nd Edition). Affiliated East West Press Private Ltd. New Delhi.
6. Chrispeel M.J. and Sdava D.E. (1994) Plants, Genes and agriculture, Jones and Barlett Publishers, Boston.
7. Reinert J. and Bajaj y.P.S (1997) Applied and fundamental Aspects of Plant Cell, Tissue, and Organ Culture, Narosa Publishning House.

SEMESTER VI**6.2 - Industrial and Environmental Biotechnology****Hours: 45 Hrs****Unit 1. Introduction to industrial Biotechnology****08 hrs**

Basic principles of fermentation technology, Screening and Isolation of Microorganisms, maintainance of strains improvement (Mutant selection, Recombinant DNA methods).

Unit 2. Fermentation technology**10 hrs**

Fermentation Media, Natural and synthetic Media. Fermenters and its operation, Type of Fermentation Solid State, submerged fermentation and continious fermentation, Immobilized enzyme and cell bioreactors, Process Development - Shake flask fermentation, Downstream processing (DSP), Distingration of cells, Separation, Extraction, Concentration and purification of products

Unit3. :Production of Microbial and plant products**08 hrs**

Microbial production of Alcohol, Antibiotic, enzymes, SCP, SCO, Vitamin, xanthan gum and Polyhydroxyalkonoides (PHA). Food additives - Safforn and Capasicin

Unit 4. Introduction to Enviornmental Biotechnology**06hrs**

Modern fuels- Biofuels (Biogas, Microbial hydrogen Production, Gasohol). Bioremediation and its types, Bioleaching. Biofertilizers and its types, Biopesticides

Unit 5. GMO's and Environment**05 hrs**

Environmental significance of genetically modified microbes, plants and animals

Unit 6. Waste manangement**08 hrs**

Treatment of municipal waste and Industrial effluents, solid waste manangement (Composting and Vermi composting)

References:

Industrial Biotechnology

1. Sullia S. B& Shantharam S: (1998) General Microbiology, Oxford & IBH Publishing Co. Pvt. Ltd.
2. Bisen P.S (1994) Frontiers in Microbial Technology, 1st Edition, CBS Publishers.
3. Glaser A.N & Nilaido.H (1995) Microbial Biotechnology, W.H Freeman & Co.
4. Prescott & Dunn (1987) Industrial Microbiology 4th Edition, CBS Publishers & Distributors.
5. Prescott & Dunn (2002) Industrial Microbiology, Agrobios (India) Publishers.

6.3: Plant & Animal cell tech.gy/Industrial & Environmental biotech. Practical-VII/VIII

1. Preparation of culture media (plant and animal)
2. Production of Callus and suspension Culture
3. Plant Protoplast Isolation
4. Plant propogation through Tissue culture (shoot tip and Nodal culture)
5. Planting and Maintenance of Medicinally important plants and its medicinal importance
(1 student, 2 Plants compulsory)
6. Preparation of Synthesis seeds
7. Anther Culture
8. Trypsinization of animal tissue
9. Animal cell culture of trypsinized cells
10. Preparation of wine.
11. Production and Estimation of Alcohol by specific gravity method
12. Algal and fungal culture – Spirulina, Agaricus, Yeast and Apergillus
13. Production and Estimation of citric acid from Aspergillus culture.
14. Production and Estimation of lacatic acid
15. Immobilization of yeast cells.
16. Immobilisation of invertase
17. MPN test
18. Vermi Composting
19. Biopesticides assay