ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

IV SEMESTER **BIOTECHNOLOGY** TIME: 4 HRS/WEEK

BTH 4705(3) **PLANT AND ANIMAL BIOTECHNOLOGY** MAX.MARKS: 100

w.e.f 2021-22(21AI) **SYLLABUS**

**OBJECTIVES:** To enable the students to –

* Acquire knowledge about Plant tissue culture its uses and techniques involved in tissue culture
* Know various gene transfer techniques in r-DNA technology
* Study animal tissue culture and preservation techniques.
* Artificial insemination, in-vitro fertilization and embryo transfer.
* Acquire knowledge about ethics, bio-safety and patent rights

**COURSE OUTCOMES: Students will**

* **CO1:**Capable to identify the economized protocols for both the classical & hybrid varieties, with the available tissue culture concepts.
* **CO2:**Able to develop protocols for the crop enhancement and characterization of specific trait through transgenic tools.
  + - **CO3:**Able to evaluate animal culture media constituents and their role tomanufacture the desired products
    - **CO4:**Accustomed in basic concepts of producing the transgenic animals and gene therapy
* **CO5:**Be proficient on health care products. Also be familiarized in generation and protection of patents, copyrights and trademarks.

**UNIT – I: PLANT TISSUE CULTURE TECHNIQUES & SECONDARY METABOLITES PRODUCTION**

1. Plant tissue culture: totipotency, media preparation – nutrients and plant growth regulators
2. Sterilization techniques.
3. Establishment of cultures – callus culture, cell suspension culture, protoplast culture and anther culture.
4. Applications of tissue culture-micro propagation, somatic hybridization, Somatic embryogenesis; synthetic seed production. Cryopreservation.
5. Plant secondary metabolites- concept and their importance.

**UNIT – II: TRANSGENESIS AND MOLECULAR MARKERS**

1. Plant transformation technology – Agrobacterium mediated Gene transfer (Ti plasmid), hairy root features of Ri plasmid.
2. Transgenic plants as bioreactors.
3. Herbicide resistance – glyphosphate, Insect resistance- Btcotton,,
4. Molecular markers – RAPD, RFLP
5. DNA fingerprinting-principles and applications.

**UNIT – III: ANIMAL TISSUE CULTURE TECHNIQUES**

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

**UNIT – IV: TRANSGENIC ANIMALS & GENE THERAPY**

1. Production of vaccines, diagnostics, hormones and other recombinant DNA products in medicine (insulin, somatostatin, vaccines),
2. IVF (*In-vitro* Fertilization)
3. Concept of Gene therapy, Concept of transgenic animals – Merits and demerits -ethical issues in animal biotechnology

**UNIT V: BIOETHICS, BIO-SAFETY AND IPR**

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

**REFERENCES**

1. Molecular Biology & Biotechnology- 1996, By H.D. Kumar, Publ: Vikas
2. Molecular Biotechnology - 4th edition, 2010, G.R. Click and J.J. Pasternak, Publ: Panima
3. Genes and Genomes – 1991, By Maxine Singer and Paul Berg
4. Plant Tissue Culture, k**Error! Hyperlink reference not valid.**,199 **Error! Hyperlink reference not valid.**7,New Central Book Agency
5. Plant Tissue Culture : Theory and Practice By S.S. Bhojwani and A. Razdan,1998
6. Biotechnology – By U. Satyanarayana ;1997
7. Introduction to Plant Tissue Culture,**Error! Hyperlink reference not valid.**, 2003,Science Publishers
8. A Textbook of Biotechnology,**Error! Hyperlink reference not valid.**,S. 2014,Chand Publishing
9. Elements of Biotechnology,**Error! Hyperlink reference not valid.**, 1994,Rastogi Publications
10. R. Ian Freshney, “Culture of animal cells – A manual of basic techniques” 4th edition, John Wiley & Sons, 2000 ,Inc, publication, New York

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ST.JOSEPH’S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM

IV SEMESTER **BIOTECHNOLOGY** TIME: 2 HRS/WEEK BTH 4755 (2) **PLANT AND ANIMAL BIOTECHNOLOGY** MAX. MARKS: 50

w.e.f 2021-22 (21AI) **PRACTICAL**

**OBJCECTIVE:** To enable the students to

* Get an insight on techniques of plant tissue culture
* Acquire the techniques and inoculation methods in plant tissue culture
* Be proficient in cell counting

**COURSE OUTCOMES: Students will**

* **CO1:** Be expertise in formulating the concentrations of tissue culture media

constituents.

* **CO2:** Capable to identify the economized protocols for both the classical &

hybrid varieties, with the available tissue culture concepts.

* **CO3:** Be able to design the protocol for animal tissue culture systems.
* **CO4:** Competent on viral load characterization.

**COURSE:**

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

**REFERENCES:**

1. Introduction to Plant Tissue Culture**Error! Hyperlink reference not valid.**z**Error! Hyperlink reference not valid.**,2003, Science Publishers

2. Plant Tissue Culture, K**Error! Hyperlink reference not valid.**199 **Error! Hyperlink reference not valid.**7, 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,**Error! Hyperlink reference not valid.**, 2003,Science Publishers

7. A Textbook of Biotechnology,**Error! Hyperlink reference not valid.**,S. 2014,Chand Publishing

8. Elements of Biotechnology,**Error! Hyperlink reference not valid.**, 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 Gottllieb “Stem cell Biology” edited by Daniel 2001,Cold Spring Harbour Laboratory press, New York

11. M.M. Ranga, Animal Biotechnology; Agrobios (India) ,2006.