

**Government College for Men (A), KADAPA
Department of Biotechnology**

SEMESTER-III (W.E.F. 2024-25)

COURSE 2: PLANT AND ANIMAL BIOTECHNOLOGY

Theory

Credits: 3

3 hrs/week

I. Course Objectives:

1. Basics of Plant tissue culture and plant biotechnology, phases involved in micropropagation, secondary metabolites and their production
2. Role of *Agrobacterium* in gene transfer in plants, Transgenic plants, Molecular markers and DNA fingerprinting
3. Culture of animal cells, various methods used for transfection, applications of transgenic animals
4. Production of medicines through transgenic animals, IVF, merits and demerits of transgenic animals
5. Bioethics, Intellectual property rights, Biosafety

II. Course Outcomes

On successful completion of the course, the students will be able to

1. Learn about plant tissue culture techniques and secondary metabolites production.
2. Learn about transgenesis and molecular markers.
3. Learn about animal tissue culture techniques
4. Learn about transgenic animals and gene therapy.
5. Learn about Bioethics, Biosafety and IPR.

III. Syllabus

Unit –I Plant tissue culture techniques & secondary metabolites production

1. Totipotency, Plant tissue culture media preparation – sterilization techniques; establishment of cultures – callus culture, cell suspension culture
2. Applications of tissue culture-micro propagation; Somatic embryogenesis
3. Synthetic seed production; protoplast culture and somatic hybridization - applications. Cryopreservation, Plant secondary metabolites- concept, production and their importance

Unit – II Transgenesis and Molecular markers

1. Plant transformation technology—*Agrobacterium*-mediated Gene transfer (structure of Ti plasmid and Ri plasmid), Transgenic plants as bioreactors.
2. Herbicide resistance – glyphosate, Insect resistance- Bt cotton
3. Molecular markers -RAPD, RFLP, AFLP and DNA fingerprinting-principles and applications.

Unit – III Animal tissue culture techniques

1. Animal Cell culture media ; culture of mammalian cells, primary culture, secondary culture, cell lines, stem cell cultures, Introduction to organoids;
2. Tests: cell viability and cytotoxicity, Cryopreservation.
3. Transfection methods (Retroviral, 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), .
2. IVF in farm animals, Concepts and applications of Gene therapy,
3. Concept of transgenic animals – Merits and demerits;

Unit V Bioethics, Biosafety and IPR

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

III . Skills Outcome

On Successful Completion of this Course, Student shall be able to

1. Learn about different plant tissue media
2. Learn about the induction of callus from explants
3. Learn about plant propagation of through various tissue culture
4. Learn about cell lines
5. Learn about cell viability by various methods