

BACHELORS WITH BOTANY AS MAJOR (CT - II)
7th SEMESTER
BOT722J2: BOTANY _ PLANT BIOTECHNOLOGY

CREDITS: THEORY: 4; PRACTICALS: 2

COURSE OBJECTIVES:

- 1. To give students new knowledge on handling of classical and modern plant biotechnology processes, including tissue culture for healthy plants, plants with improved characteristics.*
- 2. To explore the use of biotechnology to genetic variation in plants and to understand how factors at the cellular level contribute to the expression of genotypes and hence to phenotypic variation.*
- 3. Understanding of biotechnological processes such as recombinant DNA technology and its applicative value in pharmaceuticals, food industry, agriculture, ecology etc. This knowledge is central to our ability to modify plant responses and properties for global food security and commercial gains in biotechnology and agriculture.*

LEARNING OUTCOMES:

- 1. Learn the basic concepts, principles and processes in plant biotechnology.*
- 2. Use basic biotechnological techniques to explore molecular biology of plants*
- 3. Explain how biotechnology is used for plant improvement and discuss the biosafety concern and ethical issue of that use.*

UNIT 1: PLANT TISSUE CULTURE: Historical perspective, Composition of media, Nutrient and hormone requirement, Totipotency, Organogenesis, Embryogenesis (somatic and zygotic); Micro propagation (Clonal propagation of elite species). Somatic hybridization: isolation, culture and fusion of protoplasts; selection, regeneration and utility of somatic hybrids and cybrids.

UNIT II: Soma-clonal Variation, Secondary Metabolite Production: In-vitro production of secondary metabolites: Hairy root cultures and Bioreactors-techniques and significance. Tissue culture applications (micropropagation, androgenesis, Embryo and Endosperm culture, virus elimination, Haploids, Triploids, Synthetic seed production, Cryopreservation; Germplasm Conservation). Transgenic Plants: Technique of transformation-Agrobacterium mediated and physical methods (Micro projectile and electro oration) Application of transgenic plants.

UNIT III: Introduction, scope and applications of recombinant DNA technology, Restriction Endonucleases-characteristics and utility of type-II restriction enzymes in gene cloning, Molecular Probes – preparation and labeling; Cloning vectors – characteristics and construction of Plasmid (PBR, PUC), bacteriophage (Lambda phage) and cosmid vectors, bacterial transformation and selection of recombinant clones,

UNIT IV: Genomic and cDNA libraries – construction and utility; Southern blotting technique for isolation of gene of interest; gel electrophoresis – principle and applications, Polymerase Chain Reaction (PCR) - principle and application; brief account of molecular markers and their utility in DNA fingerprinting

PRACTICAL

1. Preparation of MS medium.
2. Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants.
3. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.
4. Isolation of protoplasts.
5. DNA extraction method in plants/bacteria (CTAB) and quantification
6. Gel electrophoresis apparatus and assembly
7. Construction of restriction map from the data provided
8. Demonstration of different vectors (plasmid, phage, cosmid) using charts, ppts etc.
9. Demonstration of PCR and its applications
10. Demonstration of transgenic plants (Bt cotton, Golden rice, Transgenic Banana as Edible Vaccine, FlavrSavr tomato) through photographs.

SUGGESTED READINGS

- 1) Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
- 2) Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications of recombinant DNA. ASM Press, Washington.
- 3) Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. Vikas Publication House Pvt. Ltd., New Delhi. 5th edition.
- 4) Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.
- 5) Molecular Biotechnology: Principles Application of Recombinant DNA 2nd Edition. Glick, B. R. and Pasternak, J. J. (1998) ASM press Washington DC.
- 6) Genetic Engineering. Ahluwalia, K. B. (2002) New Age International (P) Ltd.
- 7) An Introduction to Genetic Engineering 2nd edition Desmond Nicholl S.T. (2002) Cambridge University Press.
