BHARATHIAR UNIVERSITY : COIMBATORE- 641 046

M.Phil./Ph.D. in Molecular Biology and Biotechnology (DRDO)

PART-I SYLLABUS

PAPER III : Special Papers

1. Plant Biotechnology
2. Molecular Biology

Special Paper - : Plant Biotechnology

Unit – I GENOME ORGANIZATION AND ENGINEERING

Plant genome organization, structure of plant gene, Gene family, Chloroplast genome, Mitochondrial genome. Importance of RELP and RAPD in plant breeding Construction of cDNA library. Protein targeting to chloroplast and mitochondria, heat shock proteins.

Unit –II TISSUE CULTURE TECHNIQUES

Brief historical account: Laboratory organization: Preparation of media: Aseptic manipulation: Sterilization of media, Culture vessels and explants: Single cell culture, Suspension culture. Cellular totipotency, Somatic embryogenesis: Synthetic seeds: Somaclonal and gameticclonal variation. Shoot tip culture, Haploid production: Anther and Pollen culture: Triploid production: In vitro pollination and Fertilization, Embryo culture.

Unit- III APPLICATION OF TISSUE CULTURE

Protoplast isolation and culture: Somatic hybdrization, Cybrid technology, Micropropagation: Gemplasm conservation: Production of secondary metabolites: Genetic engineering of metabolic pathways, Production of secondary metabolites in Bioreactors and downstream procession.

Unit – IV MOLECULAR BIOLOGY OF PLANT MICROBIAL INTERATION AND TRANSFORMATION

Biofertilizers: Symbiotic and Non-symbiotic nitrogen fixation, Biochemistry and Molecular biology of biological nitrogen fixation, Genetic engineering of nif genes and nod genes. Mycorrhizae: Ecto and Endo Mycorrhizae, Agrobacterium and Crown gall tumours, Mechanism of T- DNA transfer. Ti and Ri plasmid vectors Agro infection. Direct transfer of plants by physical methods. Selectable marker and reporter genes, Chloroplast transformation.

Unit- V TRANSGENIC PLANTS AND THEIR APPLICATIONS

Transgenic plants: Genetic engineering of plants for herbicide resistance, Pest resistance, Virus resistance, Disease resistance, Stress tolerant. Cytoplasmic male sterility, Delayed fruit ripening. Genetic engineering in flower industries, Genetic engineering of seed storage proteins. Vaccine production in plants, Edible vaccine, Transgenic plants as bioreactors.

References

1. Chrispeels M.J & Sadava D.E. (2002).Plants, genes and agriculture.The American Scientific publishers.
2. Chawla H.S. (2004) Biotechnology in crop improvement. International book Distribution Co.,
3. Donal Grierson & Convey S.V. (1984). Plant Molecular Biology by Blackie & Son Ltd, Newyork.
4. Hammond J. Mc Garvey P. and Usibov V. Y (Eds) (2000). Plant Biotechnology Springer Verlag.
5. Moncia, A. Hughes. (1999). Plant Molecular genetics by Pearson education limited, England.
6. Razdan M.K. (2003) . Introduction to plant tissue culture Oxford- IBH publishing Co. Pvt.Ltd.
7. Slater, A. Scott, N and Fowler, M. (2003). Plant Biotechnology: The genetic manipulation of plants. Oxford press.

Special Paper -: Molecular Biology

Unit 1: Molecular Cloning

Vectors in Molecular Biology- Modifying Enzyme- Polymerase chain reaction- DNA/Protein sequencing – Mutagenesis- Transposable Elements- rRNA/ Genomic/ c DNA Library construction and screening – Map based cloning

Unit-II: Cloning in Microorganisms

Cloning Techniques: cloning in E-coli- Cloning in *Bacillus subtilis*- Cloning in Yeast Specialized vectors: Artificial chromosomes- Operons- Expression of cloned genes- site directed mutagenesis- fusion proteins- Degradative plasmids.

Unit III: Cloning in higher Organisms:

DNA mediated transformation – Gene transfer by viral transduction – Genetic manipulation of mammals- DNA transfer to other vertebrates- Gene transfer in plants- Direct and indirect gene delivery systems- plant viruses as vectors.

Unit IV: Applications of Genetic Engineering

Nucleic acid sequences as diagnostic tools- New drugs/ Therapies for genetic disease- combating infectious diseases- Protein engineering- Metabolic Engineering- Molecular Breeding of plants- Production of interferon's- DNA vaccines

Unit V Recent advances in Biotechnology

DNA/ Protein micro arrays- DNA/ Protein Markers- DNA finger printing- Gene knock out – RNAi and Gene silencing – Metagenomics- Bioethics and IPR

Reference:

1. Bowtell, D and Sambrook, J.DNA Microarray: A Molecular cloning manual. CSHL press
2. Glick, BR., Pasternak, JJ (1998) Molecular Biotechnology: Principles and Applications of recombinant DNA, ASM Press.
3. Grandi, G (2004) Genomics, Proteomics and Vaccines. Wiley press.
4. Hannon, GJ, RNAi: A guide to gene silencing. CSHL Press
5. Kirby, LT (1990) DNA finger printing: An introduction,. Stockton press.
6. Lewin, B (2004). Genes VIII. Pearson- Prentice Hall Press
7. Primrose, S.B., Twyman, R.M., Old. R.W. (2001) Principles of Gene Manipulation Blackwell Science Limited.
