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

VI SEMESTER **BOTANY**  TIME:3Hrs/week

B-E3-6102(3) **PLANT BIOTECHNOLOGY AND APPLICATIONS** Max.Marks:100

19-20 Admitted Batch (19AG) **SYLLABUS**

**OBJECTIVES:** To enable the students to

1. Understand the basic principles of plant tissue culture
2. Understand the methods in biotechnology
3. Get an insight into Recombinant DNA technology and Methods of gene transfer.
4. Appreciate the applications of Biotechnology

**COURSE:**

**UNIT I: PLANT TISSUE CULTURE – 1**

1. History of plant tissue culture - basic principles of plant tissueculture, Totipotency of cells, differentiation and dedifferentiation.
2. Sterilization Methods: physical and chemical methods; culture media -Murashige and Skoog’s(MS)medium; Phytohormones
3. Callus culture, Callus subculture maintenance,meristem culture/shoot apex culture, root culture, leaf culture
4. Morphogenesis in callus culture – organogenesis, somatic embryogenesis.

**UNIT-II: PLANT TISSUE CULTURE -2**

1. Auther culture
2. Endosperm culture – Embryo culture - culture requirements – applications, embryorescue technique.
3. Production of secondary metabolites.
4. Cryopreservation; Germ plasm conservation.

**UNIT- III: RECOMBINANT DNA TECHNOLOGY**

* + - Steps in r DNA Technology, Restriction Endonucleases - Types
    - Cloning Vectors: Prokaryotic - pBR322,Ti plasmid and Lambda phage, Eukaryotic Vectors -YAC and briefly BAC
    - Gene cloning -Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning
    - Construction of genomic and cDNA libraries

**UNIT- IV: METHODS OF GENE TRANSFER**

1. Methods of gene transfer- Agrobacterium-mediated, direct gene transfer by Electroporation, Microinjection, Micro projectile bombardment.
2. Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).

..2..

B-E3-6102(3) ::2::

**UNIT- V: APPLICATIONS OF BIOTECHNOLOGY**

1. Genetic modifications forcrop improvement:Transgenic plants for pest resistantance –

Bt-cotton

1. Herbicide resistance - Round Up Ready soybean
2. Improved agronomictraits -FlavrSavr tomato, Golden rice
3. Improved horticultural varieties- Moon dustcarnations;Edible vaccines

**TEXT BOOKS:**

Plant Biotechnology-P.K. Gupta, Rasthogi Publications, Delhi, India (2017)

Botany-Plant tissue culture and its biotechnological applications, by B. R. C. Murthy & V. S. T. Sai, Venkateswara Publications, Guntur, 2017

**REFERENCEBOOKS:**

1. Pullaiah. T. and M.V.Subba Rao. 2009. Plant Tissue culture. Scientific Publishers, New Delhi.
2. Bhojwani, S.S. and Razdan, M.K., (1996). Plant Tissue Culture: Theory and Practice. Elsevier Science Amsterdam. The Netherlands.
3. Glick, B.R., Pasternak, J.J. (2003). Molecular Biotechnology- Principles and Applications ofrecombinant DNA. ASM Press, Washington.
4. Bhojwani, S.S. and Bhatnagar, S.P. (2011). The Embryology of Angiosperms. VikasPublicationHousePvt. Ltd., New Delhi. 5th edition.
5. Snustad, D.P. and Simmons, M.J. (2010). Principles of Genetics. John Wiley and Sons, U.K. 5th

edition.

6. Stewart, C.N. Jr. (2008). Plant Biotechnology & Genetics: Principles, Techniques and Applications. John Wiley & Sons Inc. U.S.A.

**SUGGESTED ACTIVITIES:** In vitro initiation of callus on artificial medium, seminars on utilization of rDNAtechnology, debates on applications of Biotechnology (whether it is a boon or bane to the society) studying growth patterns, vegetative characteristics of Bt.cotton and identifying the features of its pest resistance

\*\* \*\* \*\*

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

VI SEMESTER **BOTANY** TIME:3Hrs/week

B-E3-6152(3) **PLANT BIOTECHNOLOGY AND APPLICATIONS** Max.Marks:50

19-20 Admitted Batch (19AG) **PRACTICALSYLLABUS – IV**

**OBJECTIVES:**To enable the student to

* Learn skills to handle different instruments used in Biotechnology laboratory
* Be able to do sterilization processes and tissue culture methods
* Understand and perform isolation methods of DNA
* Study different gene transfer methods

**COURSE:**

1. Preparation of MS medium.
2. Demonstration of in vitro sterilization methods and inoculation methods using leafand nodalexplants of Tobacco/ Datura/ Brassica etc.
3. Study of embryo culture, somatic embryogenesis, Preparation of artificial seeds – Demonstration / photographs.
4. Study of methods of gene transfer through photographs: Agrobacteriummediated, direct genetransfer by electroporation, microinjection, andmicro projectile bombardment.
5. Different steps involved in genetic engineering for production of

Bt.cotton, Goldenrice, FlavrSavrtomato through photographs

1. Isolation of plasmid DNA.
2. Restriction digestion and gel electrophoresis of plasmid DNA (optional)
3. Field visit to a lab involved in tissue culture
4. Study project under supervision of lecturer – tissue culture/ genetic engineering

**EXPECTED DOMAIN SKILLS TO BE ACHIEVED**: Ability to prepare artificial nutrient media, preparingindependently, applying various sterilization procedures for media, glassware and biological materials, in vitro propagation of Banana callus, morphogenesis, clonal propagation methods, isolation of plasmid DNA individually and as a group.

\*\* \*\* \*\*