

Techniques In Plants Molecular Biology (PBT-900) Credit Hrs 3(3-0)

Educational Objectives

1. Objectives of the course under which the proposed course will be conducted are
(1) Provide scientific information about principles and techniques of plants Molecular Biology
(2) Enter advances/trends of research in the field of Plant Molecular Biology and
(3) provide students with an overview of the techniques for manipulating genomes. (4) Laboratory visits to research institutes/ labs where respective techniques are used.

Course Outcomes

2. The purpose of the course of Techniques in Plant Molecular Biology is to provide a unique learning environment. This course includes current concepts of plant molecular biology and how these techniques are used by Plant scientists for the improvement of crop plants. This course will consist of a lecture series and informal discussions which will help them gain the ability to review and discuss potential outcomes associated with this field. They will gain theoretical skills to identify appropriate molecular approaches that can be used to modify important traits in crop plants

Rationale

3. There is need to change the contents to meet the National and International standards So students have recent updated information about this course

Input Obtained from Industry/Corporate Sector

4. Not applicable since these are well established methods

5. Standards/Practice

- a. University of Florida, USA
- b. Cornell University, USA
- c. KU Leuven, Belgium

6. Course Code PBT-900 Credit hours 3(3-0)

7. Contents with proposed contact hours

<u>Existing Course Contents:</u>	<u>Revised Course Contents:</u>
<ul style="list-style-type: none">• Introduction; Plant Molecular Biology• Genomics, systems biology• Plant genomics & Principles• Gene structure of plants• DNA replication & repair• Regulation• Transcription, RNA processing & Translation• mRNA turnover & Gene silencing• Gene expression, and regulation in plants• Molecular genetic approaches	<ul style="list-style-type: none">• Introduction; Plant Molecular Biology• Traditional strategies of crop improvement• Model plants• Molecular Markers in plants• Total Nucleic acid (DNA/RNA isolation Technique)• Gel Analysis and quantification of DNA and proteins• Recovering DNA/RNA product from Gel• Restriction based Molecular Marker

<p>towards</p> <ul style="list-style-type: none"> • Signaling events • Biological Screening of Medicinal plants • Pattern formation • Epigenetic control of plant growth • Plant biotechnology • Expression in Plants - overview of nuclear and organelle gene expression • Transgene Expression in Plants • Comparative Genomics & Metabolism • Model plants 	<ul style="list-style-type: none"> • RFLP • PCR and Types of PCR reactions • PCR Based Molecular Markers • RAPD • AFLP etc • Genomic characterization strategy for different plants • Insilico genes identification using different databases. Uniprot; Genbank Arabidopsis data base (Tair) etc • Hands on training on Alignments for DNA/RNA and Proteins translation, Phylogentic analysis using ClustalW, MAFFT, Expaxy, Multalign, Lalign servers • Cloning prerequisites and methodology • Preparation of competent E coli cells • Ligation • Transformation methods • Restriction digestion of clones • Sequencing (Sanger and Next generation sequencing platforms) • 5' and 3'Random amplification of cDNA ends for plant RNA related work • Plant Tissue culture • • Use of recombinant technologies for improvement of genetically modified plants • Methods for transferring foreign DNA in Plants • Electroporation • Agrobacterium mediated Transformation • Gene expression, and regulation in plants • Gene expression case studies related to flowering control • Molecular identification of medicinal plants and different Plant Pathogens • Immunoassays in Plant disease detection
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	<p>ELISA Based Assays for pathogen detection will be explained</p> <ul style="list-style-type: none"> • Future Implications and emerging techniques will be discussed
<p>Color key Yellow: Unchanged contents Red: Proposed Deleted Content Bright Green; Proposed new content Changes made after Discussion with Dr Iftikhar</p>	

8. **Recommended Books**

- a. Methods in Plant Biochemistry and Molecular Biology By [William V. Dashek](#)
- b. The Molecular Biology of Plant Development By Harry Smith, Donald Grierson
- c. Plant molecular biology By [Donald Grierson](#), [Simon N. Covey](#)
- d. Plant molecular biology: Molecular genetic analysis of plant development and metabolism By [North Atlantic Treaty Organization. Scientific Affairs Division](#)
- e. Plant Molecular Biology : a Laboratory Manual By Melody Clark, Springer 1997
- f. Green MR, J Sambrook, P MacCallum. 2012. Molecular Cloning: a Laboratory Manual. Cold Spring Harbor, N.Y.: Cold Spring Harbor Laboratory Press, 4th Edition. Health Science Library: QU 450 G744m 2012 Science Library: QH442.2.S26 200.

Comments of Academics Dte

9. The WP needs further deliberation. ASAB to have input of industry experts and forward a revised WP after deliberation at institute level
10. The proposal was deliberated and was not endorsed by UCRC on 12 Feb 2021.

Recommendations of Academics Directorate

11. Revision of Course Techniques in Plant Molecular Biotechnology in MS Plant Biotechnology at ASAB is recommended w.e.f Fall 2021
12. Academic Council is requested for the decision