

Minutes of the meeting of Board of Studies in Plant Science

Date: 15-4-2019 Time 10 .00 AM to 5.00 PM

Venue: Department of Plant Science,
Central University of Kerala, Periyar-671316

Ref. CUK/ACA/BoS/187/2013/2019/1714/E5566 dated 05th February 2019

As per the CUK letter cited, Board of studies meeting was conducted on 15-4-2019 from 10.00 AM to 5.00 PM with the following members.

Members present

Dr. K. Arunkumar

Chairman, PLS-BOS

Prof. (Dr.) T. Parimelazhagan

Expert-Member, Department of Botany

Bharathira University, Coimbatore

Prof. (Dr.) G. R. Janardhana

Expert-Member, Department of Botany

University of Mysore

Mysore

Prof. (Dr.) V. Sivaram

Expert-Member, Department of Botany

Bangalore University

Bangalore

Prof. Dr. T. Dennis Thomas

Member

Dr. K. Ramachandran

Member

Dr. Ginny Antony

Member

Draft syllabus submitted by the Department of Plant Science was thoroughly gone through and discussed based on the CUK CBCS regulations. Accordingly the board unanimously passed the following resolutions.

- Resolved to approve the proposed syllabus for M.Sc Plant Science programme to be adopted from the Academic year 2019-2020.
- Specific Textbooks of 10 to 15 are limited to each course.
- The credits for core courses were decided as 60 credits and 12 credits for elective courses.
- Accordingly 13 core courses each carry 4 credits were finalized
- Suggestions in the course content by the expert members were included and courses were accordingly revised.
- Recent topics in all courses were included as per the expert suggestions.

Dr. K. Arunkumar

Chairman, PLS-BOS

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Member

Dr. K. Ramachandran

Member

Dr. Ginny Antony

Member

BTY 5208	PLANT BIOTECHNOLOGY AND PLANT GENETIC ENGINEERING (Credits 4; Theory 4 hrs; Practical 3 hrs)
Aim	To study recombinant DNA (rDNA) technology and plant genetic engineering and, their application in plant biotechnology
Objectives	<ul style="list-style-type: none"> ➤ To Study about various vectors and DNA modifying enzymes used in rDNA technology ➤ To study how molecular cloning is done and its application ➤ To study various methods of plant transformation ➤ To understand the importance and applications of plant biotechnology ➤ To study the biosafety methods, laws, ethical issues of rDNA technology and IPR
Learning outcome	<p>After the completion of this course, the learner will get information on</p> <ul style="list-style-type: none"> ➤ what is rDNA technology and how it can be used in plants to generate better traits ➤ Its applications, biosafety, legal and ethical issues
S.No.	Theory
1.	Vectors in molecular cloning: Plasmids, phages, phagemids, hybrid vectors, cosmids, eukaryotic virus- based vectors, shuttle vectors, expression vectors (especially plant expression vectors), fosmids, PACs, BACs and YACs.
2.	Molecular cloning: Steps - amplification, restriction digestion, ligation, transformation, screening.
	Special molecules and enzymes for DNA modifications - restriction enzymes, ligases, klenow, phosphatases, recombinases, modification of DNA fragments using linkers, adaptors and homopolymer tailing. Recombination based cloning.
3.	Introducing genes into prokaryotes: Transformation, transduction, conjugation, electroporation.
4.	Identifying the right clone: Screening and selection - reporter genes, selectable markers, insertional inactivation of marker genes. Molecular screening - PCR, colony and dot-blot hybridization, nucleic acid hybridization and immunological techniques.
5.	Applications of rDNA technology in biotechnology: Genomic and cDNA libraries, isolation of important genes, Construction of gene cassette, protein engineering, bioprocessing, phytoremediation, agriculture.

6.	Gene transfer to plants: Tissue culture in plant genetic engineering Integrative DNA transfer - direct transformation methods, <i>Agrobacterium</i> -based methods, Organelle engineering. Non-integrative DNA transfer - Plant viruses and Protoplast fusion. Molecular and functional analysis of transgenic plants.
7.	Biotechnological applications of plant genetic engineering: Functional genomics, resistance to abiotic and biotic stresses, crop quality improvement, nutrient enhancement, nitrogen fixation, nutrition up-take, production of male sterile lines, plantibodies, vaccines, commercial oils, plant secondary products, biofuel, bioplastics and plants as bioreactors.
8.	Hazards and impact of GMOs: Biosafety considerations, Biosafety regulations in India. Ethical issues, biological risks, impact on biodiversity, controlled trials. Economic issues, legal issues, intellectual property rights (IPR) in relation to plant biotechnology.
S. No.	Laboratory/Practical
1.	Plasmid restriction digestion and gel electrophoresis to study DNA mobility, stoichiometry, deciding factors for percentage of agarose/polyacrylamide, importance of DNA marker, band size calculation, etc.
2.	Isolation of vector plasmid and, plasmid with insert/ or PCR product, for cloning
3.	Preparation of vector and insert by restriction digestion and elution, for cloning
4.	Ligation for cloning
5.	Preparation of competent cells and transformation
6.	Working out problems on how to calculate restriction-digested band size and construction of to-the-scale plasmid map
7.	<i>Agrobacterium</i> -mediated plant transformation - preincubation
8.	<i>Agrobacterium</i> -mediated plant transformation - infection
9.	<i>Agrobacterium</i> -mediated plant transformation - selection
10.	GUS or GFP detection
11.	Gene amplification using PCR and its confirmation using gel electrophoresis
12.	Southern blotting and transfer

Text Books:

1. Primrose SB, Twyman R. 2016. Principles of Gene Manipulation and Genomics, 8th edition. Wiley-Blackwell.

2. Brown TA. 2016. Gene Cloning and DNA Analysis: An Introduction, 7th edition. Wiley- Blackwell.
3. Cooper G. 2018. The Cell: A Molecular Approach, 8th edition. Sinauer Associates.
4. Glick BR, Patten CL. 2017. Molecular Biotechnology: Principles and Applications of Recombinant DNA, 5th edition. ASM Press.
5. Bourgaize D, Jewell TR, Buiser RG. 1999. Biotechnology: Demystifying the Concepts, 1st edition. Benjamin Cummings.
6. Nicholl DST. 2008. An Introduction to Genetic Engineering, 3rd edition. Cambridge University Press.
7. Gelvin SB, Schilperoort RA. (Eds.). 2000. Plant Molecular Biology Manual. Springer.
8. Clark, Melody S. (Eds.). 1997. Plant Molecular Biology – A Laboratory Manual. Springer.
9. Dale JW, Schantz MV, Plant N. 2011. From Genes to Genomes: Concepts and Applications of DNA Technology, 3rd edition. Wiley.
10. Shah JM. 2012. Strategies to overcome fungal diseases in plants: An enchiridion. Lambert Academic Publishing AG & Co.
11. Kshitij Kumar Singh. 2015. Biotechnology and Intellectual Property Rights: Legal and Social Implications. Springer.
12. Erbisch FH, Maredia K (Eds.). 2003. Intellectual Property Rights in Agricultural Biotechnology, 2nd edition. CABI Publishing.
13. Parashar S, Goel D. 2013. IPR, Biosafety and Bioethics. Pearson India.