Plant Tissue Culture

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Plant Tissue Culture	2	NIL	NIL	2	Class XII	NIL

Learning Objectives

The learning objectives of this course are as follows:

- To discuss the principle of Plant Tissue Culture
- To understand the importance of Plant Tissue Culture and its applications
- To impart hands-on training on various aspects of Tissue Culture
- To understand the importance of aseptic culturing techniques
- To equip the learner to effectively utilize the techniques in various areas like basic research, genetic transformation studies, secondary metabolite production, pharmaceuticals etc

Learning Outcomes

By the end of this course, students will

- Get familiarized with aseptic culture techniques
- Be able to prepare stock solutions and media for experimental purposes
- Comprehend different modes of regeneration
- Have understood the micro propagation mechanism and its intricacies.
- Be able to establish a regeneration protocol using different explant material
- Students will be able to appreciate the applications of plant tissue culture in various domains.
- An industrial visit will give them the required exposure for their holistic understanding of the commercial applications and entrepreneurship avenues in this field of plant tissue culture

Skill development and job opportunities

After completion of this course students may be engaged in following opportunities:

- Entrepreneurship development: Students can start their own Tissue culture set-up
- Tissue culture industry: Individuals can work as researchers, technicians and support staff at tissue culture based industries
- Academia: Individuals can pursue higher education and research opportunities in the field of tissue culture and genetic transformation in universities and research institutions.

SYLLABUS 60 hours

Unit 1: Introduction to Plant tissue Culture 8 hours

Introduction to Plant Tissue culture, Terms and definitions, Historical background, laboratory organization: Design and layout for wash area, media preparation, methods of sterilization, transfer area for aseptic manipulations, Culture rooms, and observation/data collection areas.

Practical:

1. Familiarization with the tissue culture laboratory set-up
2. Familiarization with basic equipment in tissue culture techniques- Autoclave, Laminar Air Flow
3. To understand history, theory and principles of plant tissue culture and concept of cellular totipotency.

Unit 2: Tissue Culture Media 12 hours

Introduction, Types of Media and its importance; Preparation of stock solutions of macronutrients, micronutrients, PGRs and vitamins. pH and buffers- their significance in media. Plant Growth Regulators: Role of PGRs (auxins, cytokinins, abscissic acid, ethylene and Gibberellins) in plant development

Practical:

4. Preparation of stock solutions- Macronutrients, Micronutrients and PGRs
5. Preparation of Murashige and Skoogs medium

Unit 3: Aseptic Techniques 12 hours

Methods of sterilization of equipment's, culture media and explants:-Washing and preparation of glassware's, packing and sterilization, media sterilization, surface sterilization. Precautions to maintain aseptic conditions.

Practical:

6. Study of methods of sterilization A) Moist heat sterilization B) Dry heat sterilization C) Filter sterilization
7. Sterilization of MS medium
8. Surface sterilization of Explant Material

Unit 4: Initiation of Cultures 12 hours

Callus Induction and growth parameters, Callus subculture and maintenance, growth measurements, morphogenesis in callus culture – organogenesis, somatic embryogenesis

Practical:

9. Establishment of callus cultures
10. Establishment of suspension cultures from callus
11. Characterization and sub-culturing of Callus cultures

Unit 5: Micropopagation 12 hours

Micropropagation – stages, advantages, applications, Somatic embryogenesis-induction, factors, comparison with zygotic embryogenesis.

Practical:

12. Establishment of cultures using shoot tip and nodal explants (axillary proliferation)
13. Visit to a Tissue Culture Set-up/ Industry

Unit 6: *Agrobacterium*-mediated genetic transformation **4 hours**

Agrobacterium-the natural plant genetic engineer, understanding the Ti plasmid, selection of recombinants by selectable marker and reporter genes (GUS, luciferase, GFP). Applications.

Recommended Books:

1. Bhojwani, S. S., & Razdan, M. K. (1986). *Plant tissue culture: theory and practice*. Elsevier.
2. Razdan, M. K. (2002). *Introduction To Plant Tissue Culture, 2/E*. Oxford and IBH publishing.
3. Gamborg, O., & Phillips, G. C. (Eds.). (2013). *Plant cell, tissue and organ culture: fundamental methods*. Springer Science & Business Media.
4. Taji, A., Dodd, W. A., & Williams, R. R. (1992). *Plant tissue culture practice*. University of New England.
5. Smith, R. H. (2012). Plant tissue culture: techniques and experiments. Academic press.

Examination scheme and mode:

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi.