

## PLANT TISSUE CULTURE TECHNOLOGY

**Syllabus:** Introduction: Definition and technologies; Plant Cell & Tissue Culture Technologies: A brief description, technology and potential application of organ culture, meristem culture, anther/pollen culture, callus & suspension cultures and protoplast culture; Plant propagation; Regeneration through meristem and callus cultures; Somatic embryogenesis: production, preservation and use of somatic embryos as propagules; Artificial Seeds and Automation of Somatic Embryo Production: Principles, technology of automation and the application; Embryo culture; Haploid plant production; Cryopreservation: Storage of germplasm; Protoplast culture; Somatic hybridization; Induction & utilization of somatic variants; Secondary Metabolite Production Through Cell Cultures: Principles and the technology, pharmaceutical, pigments, other natural products and beverage production; Commercialization of tissue culture technology: Concept of commercialization and the need, design of typical tissue culture laboratory and its management.

**Suggested Reading :** Experiments in Plant Tissue Culture (Dodds, J.H. and Roberts, L.W.) 1985; Plant Tissue Culture methods and application in agriculture (Thorpe, T.A.) 1981; Journal of Plant Cell & Tissue Culture; Plant Cell, Tissue & Organ Culture; Journal of Biotechnology.

# **Plant Tissue Culture and Micropropagation**

## **MSc course**

Course Syllabus

University of Jordan

Department of Biological Science

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### **Course Description**

Prerequisites:	None
Credit Hour:	Three
Contact Hours:	Three hours per week
Course period:	Four months semester

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### **I. GENERAL INFORMATION**

1. Instructor: **Prof. Dr. Sawsan A. Oran**

Office: Dept .of biological sciences office no.106

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### **II. TEXTBOOK**

1. Robert N. Trigiano and Dennis J. Gray. 2000. Plant Tissue Culture Concepts and Laboratory Exercises. 2nd edit., CRC Press LLC, 454 pp.

2. Wenhao Dai. 2006. PLSC 484/684-Plant Tissue Culture and Micropropagation Laboratory Manual.

### **III. COURSE DESCRIPTION**

Overview of principles, techniques, and applications of plant tissue, organ, cell, and protoplast culture.

### **IV. OBJECTIVES**

1. To acquaint students with the principles, technical requirement, scientific and commercial applications of plant tissue and cell culture.
2. To expose students to supporting methodologies of plant tissue and cell culture, micropropagation techniques, and applications of tissue and cell culture to plant improvement.
3. To motivate students to set goals towards pursuing graduate school and higher level positions, such as lab manager and key scientist in plant biotechnological research institutes and industries.

## **V. EDUCATIONAL PHILOSOPHY**

Various opportunities are provided in this course to expand student learning potential. **Students are expected to attend all lectures and lab exercises** . The textbook and laboratory manual are available for student purchase. Additional lecture handout, research papers, and other relevant materials will be provided in the class and lab.

## **VI. COURSE CONTENT**

### Chapter 1. Introduction

1. Definition
2. Applications
3. History

### Chapter 2. Facilities and supplies

1. Organization of a tissue culture laboratory
2. Equipment and supplies
3. Basic techniques

### Chapter 3. Tissue culture medium

1. Medium components
2. Medium preparation

### Chapter 4. Callus and cell culture

1. Introduction
2. Callus induction

3. Callus culture
4. Cell suspension culture

#### Chapter 5. Micropropagation

1. Applications
2. Micropropagation types
3. Micropropagation stages
4. Estimation of yield of propagated plants

#### Chapter 6. Organogenesis

1. Definition
2. Organogenesis process
3. Developmental sequences
4. Examples

#### Chapter 7. Somatic embryogenesis

1. Zygotic embryogenesis
2. Somatic embryogenesis
3. Developmental stages of embryogenesis
4. Synthetic seed technology
5. Example

#### Chapter 8. Haploid culture

1. Related terms
2. Importance of haploid
3. Production of haploid in plants
4. Production of haploid *in vitro*
5. Anther culture

#### Chapter 9. Embryo culture

1. Introduction
2. Type of embryo culture
3. Applications of embryo culture
4. Embryo culture techniques
5. Factors affecting embryo culture

#### Chapter 10. Protoplast culture

1. Introduction
2. Protoplast isolation
3. Protoplast culture
4. Protoplast fusion

#### Chapter 11. Production of virus-free plants

1. Introduction
2. Production of virus-free plants

#### Chapter 12. Somaclonal variation

1. Introduction
2. Epigenetic variation
3. Genetic variation
4. Applications of somaclonal variation
5. Identification of somaclonal variation
6. Example

#### Chapter 13. Plant transformation

1. General introduction
2. Plant transformation
3. *Agrobacterium*-mediated transformation
4. DNA-mediated transformation

#### Chapter 14. Germplasm preservation

1. Definition
2. Importance
3. Methods

### **VII. STUDENT EVALUATION**

1. Lab Report: Eight lab reports are submitted throughout the semester. Each is worth 20 points. The deadline of each lab report will be announced. Each day a lab report is late, two points will be deducted.

2. Examination: There will be one mid-term and one final exam. Each is worth 100 points. Exam coverage begins where previous exam coverage ended. Any exceptions will be announced in class. Exams are scheduled on:

### **VIII. GRADING**

#### **Marks:**

First Hour Examination	25
Second Hour Examination	25

Other Activities	10
Final Exam	40
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Total	100