



ANDHRA PRADESH STATE COUNCIL OF HIGHER EDUCATION

Syllabus for **B.VOC HORTICULTURE (MAJOR)** in consonance with Curriculum framework

(W.E.F. AY-2026-27)

COURSE STRUCTURE (for Semester IV)

Year	Semester	Course	Title	No of Hrs/week	No of Credits
II	IV	8	Basics of Vegetable Science – (T)	3	3
			Basics of Vegetable Science – (P)	2	1
		9	Plant Tissue Culture – (T)	3	3
			Plant Tissue Culture – (P)	2	1
		10	Management of Diseases in Horticultural Crops – (T)	3	3
			Management of Diseases in Horticultural Crops – (P)	2	1


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SEMESTER – IV
COURSE- 9: PLANT TISSUE CULTURE

Credits – 3

3 hrs/week

Theory

I. Learning Objectives

1. Understand the basic principles and history of plant tissue culture.
2. Explain the concepts of totipotency and cellular differentiation.
3. Identify laboratory requirements, aseptic techniques, and culture conditions.
4. Recognize the role of plant growth regulators (auxins, cytokinins, gibberellins) in morphogenesis.
5. Describe different types of tissue culture techniques (callus culture, organ culture, anther/pollen culture, embryo culture, protoplast culture, micro propagation).
6. Learn about sterilization methods, media composition (macro/micronutrients, vitamins, carbon sources, growth regulators).
7. Explore commercial and research applications of tissue culture in horticulture and crop improvement.

II. Learning Outcomes

1. **Define** plant tissue culture and explain its importance in horticulture.
2. **Demonstrate** knowledge of aseptic techniques and media preparation.
3. **Operate** basic tissue culture equipment (laminar airflow, autoclave, pH meter, culture vessels).
4. **Prepare** culture media with appropriate plant growth regulators..

III. Syllabus of Theory:

9 Hrs

Unit-1: Introduction:

1. History, Scope and Concepts of basic techniques in plant tissue culture.
2. Plant tissue culture. Laboratory requirements-the basic facilities of laboratories
3. Layout Of Plant Tissue Culture, Washing Room, Sterilization Room, Media Preparation Room, Inoculation Room, Incubation Room.

Unit-2: Tissue culture media

9 Hrs

1. Media composition -Macro inorganic nutrients, Micro inorganic nutrients,
2. Vitamins, Carbon sources, Organic nitrogen,
3. Plant growth regulators
4. Agar (as gelling substance)
5. Media preparation

Unit-3: Micro propagation

9 Hrs

1. Selection of suitable material
2. Stock plant selection
3. Parts of plant
4. Size of explants


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Unit-4: Types of plant tissue culture

9 Hrs

1. Procedure, Applications of following types:

a. Meristem culture, b. Callus culture, c. Anther culture d. Embryo culture e. Ovary culture, f. Ovule culture g. Pollen culture

2. Organogenesis and morphogenesis.

Unit-5: Benefits of plant tissue culture

9 Hrs

1. Rapid multiplication of clones

2. Genetic uniformity

3. Aseptic condition Controlled environment

Reference Books

1. Bhojwani, S.S. & Razdan, M.K. – *Plant Tissue Culture: Theory and Practice*.
2. Reinert, J. & Bajaj, Y.P.S. – *Applied and Fundamental Aspects of Plant Cell, Tissue, and Organ Culture*.
3. Pierik, R.L.M. – *In Vitro Culture of Higher Plants*.
4. Kalyan Kumar De – *An Introduction to Plant Tissue Culture*.
5. Plant Tissue Culture. 100 years since Gottlieb Haberlandt. Laimer, Margit; Rücker, Waltraud (Eds.) 2003. Springer ISBN 978-3-211-83839-6. Martin, Bernice M. (2013-12-01).
6. Tissue Culture Techniques: An Introduction. Springer Science & Business Media. pp. 29–30. ISBN 978-1-4612-0247-9.



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SEMESTER – IV
COURSE- 9: PLANT TISSUE CULTURE

Practical

Credits – 1

2 hrs/week

I. Laboratory Orientation

1. Study of tissue culture laboratory layout, equipment, and safety practices.
2. Preparation of stock solutions and MS medium.
3. Adjustment of pH and use of autoclave.
4. Demonstration of sterilization methods.
5. Handling of laminar airflow chamber.
6. Initiation of callus from leaf/explant.
7. Sub-culturing and multiplication.
8. Observation of direct and indirect organogenesis.
9. Embryo-like structures from callus.
10. Isolation of protoplasts using enzymatic method.
11. Transfer of regenerated plantlets to soil.
12. Visit to a commercial plant tissue culture laboratory/biotech nursery.

II. Suggested activities:

A. Measurable:

1. Seminar Topics

1. Historical development and scope of plant tissue culture.
2. Laboratory organization and aseptic techniques in tissue culture.
3. Role of plant growth regulators (auxins, cytokinins) in tissue culture.
4. Callus induction and organogenesis in vitro.
5. Micro propagation: Stages, advantages, and limitations.
6. Somatic embryogenesis and synthetic seeds.
7. Somaclonal variation: Causes and applications.
8. Applications of tissue culture in horticulture and crop improvement.

2. Student Study Projects (Mini-projects, measurable by experimental work/report)

1. Preparation of different tissue culture media (Murashige & Skoog, White's medium).
2. Effect of sucrose concentration on callus induction.
3. Role of auxins in root initiation of tissue cultured shoots.
4. Comparative study of explants (leaf, stem, root) for callus formation.
5. Effect of different sterilization techniques on explant survival.
6. Micro propagation of ornamentals (rose, chrysanthemum, orchid).
7. Role of light intensity on in vitro shoot proliferation.
8. Hardening techniques for tissue culture plantlets.
9. In vitro response of seeds vs. vegetative explants.

3. Assignment Topics (Written measurable tasks)

1. Components of tissue culture media and their functions.
2. Differences between organogenesis and somatic embryogenesis.
3. Steps in micro propagation with examples.
4. Advantages of synthetic seed technology in horticulture.
5. Somaclonal variation – definition, causes, and uses.
6. Role of tissue culture in disease-free plant production.
7. Commercial application of tissue culture in fruits (banana, grape).
8. Germplasm conservation through tissue culture.

MODEL QUESTION PAPER
COURSE- 9: PLANT TISSUE CULTURE

Times: 3 Hours

Maximum Marks: 75

SECTION – A

(Answer ANY FIVE questions. Each question carries 3Marks)

(5 × 3 = 15 Marks)

1. What are the basic techniques in plant tissue culture?
2. Write short notes on the importance and scope of plant tissue culture in horticulture.
3. What are the components of plant tissue culture media and their functions?
4. Write short notes Macro nutrients
5. Write short notes on vitamins?
6. Write short notes on the importance of stock plant selection in micro propagation.
7. Differentiate between meristem culture and callus culture.
8. What is organogenesis?
9. Write short notes on the Meristem culture
10. Write short notes pollen culture?

SECTION – B

(Answer any ONE question from each Unit. Each question carries 12 Marks) (5 × 12= 60 Marks)

UNIT – I

11. A. Discuss Plant tissue culture. Laboratory requirements.

OR

- B. Describe the Layout Of Plant Tissue Culture, Washing Room, Sterilization Room

UNIT – II

12. A. Write in detail about the composition of plant tissue culture media

OR

- B. Describe the steps involved in media preparation for plant tissue culture

UNIT – III

13. A. Define micro propagation and explain the different stages involved.

OR

- B. Explain the Parts of plant and importance of explants size and.

UNIT – IV

14. A. Explain the procedure and applications of callus cultures

OR

- B. Describe the concepts of organogenesis and morphogenesis in plant tissue culture.

UNIT – V

15. A. Discuss the rapid multiplication clones

OR

- B. Explain how aseptic conditions and controlled environments contribute to the success of plant tissue culture.

4- Year UG Honours, Major
Syllabus
(2026-27)
Semester-IV

Model Question Paper

Time : 3hrs

Marks:75

Part-A

Answer any Five Questions. Each Question carries 3 Marks.

5x3=15

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.
- 9.
- 10.

Answer the following questions. Each question carries 12 Marks

5x12=60

11. a) Unit-I
(Or)
b) Unit-I

12. a) Unit-II
(Or)
b) Unit-II

13. a) Unit-III
(Or)
b) Unit-III

14. a) Unit-IV
(Or)
b) Unit-IV

15. a) Unit-V
(Or)
b) Unit-V