



Department of Biotechnology		LP: BT22053 Rev. No: 00
B.Tech : Biotechnology	Regulation: 2022	Date: 18-01-2025
PG Specialisation : N/A		
Sub. Code / Sub. Name : BT22053-Plant Tissue Culture and Transformation Techniques		
Unit : I		

Unit Syllabus: INTRODUCTION TO PLANT TISSUE CULTURE 9 Hrs

History of plant tissue culture, Laboratory requirements and organization; Types of media and its composition - inorganic nutrients, organic supplements, carbon source, vitamins, gelling agents, Explants and sterilization techniques- filter, heat, wet and chemical, Plant Growth hormones; Commonly used culture media.

Objective: To know the physical and chemical requirements for plant tissue culture

Session No *	Topics to be covered	Ref	Teaching Aids
1.	Introduction to plant tissue culture	RB1; Pg. (1-2)	GCR/LCD
2.	History of plant tissue culture	RB1; Pg. (2-12)	GCR/LCD
3.	Laboratory requirements and organization	RB1; Pg. (23-26)	GCR/LCD
4.	Types of media and its composition - inorganic nutrients, organic supplements	RB1; Pg. (31-36)	BB/LCD
5.	Types of media and its composition - carbon source, vitamins, gelling agents	RB1; Pg. (36-40)	BB/LCD
6.	Explants and sterilization techniques- filter, heat	RB1; Pg. (45-51) RB2; Pg. (28-30)	BB/LCD
7.	Explants and sterilization techniques- wet and chemical	RB1; Pg. (53-56) RB2; Pg. (30-32)	BB/LCD
8.	Plant Growth hormones	RB1; Pg. (32-36)	BB/LCD
9.	Commonly used culture media.	RB2; Pg. (18-27)	BB/LCD

Content beyond syllabus covered (if any): Nil

* Session duration: 50 minutes



Sub. Code / Sub. Name: BT22053-Plant Tissue Culture and Transformation Techniques

Unit : II

Unit Syllabus:

BASICS OF CULTURE TYPES AND TECHNIQUES

9 Hrs

Suspension culture - Batch and continuous, Synchronization of suspension culture, Micro propagation - Factors affecting morphogenesis and proliferation rate, technical problems in micropropagation; Protoplast isolation and fusion technology and its Viability test

Objective: To gain ample knowledge on different plant culture types involved.

Session No *	Topics to be covered	Ref	Teaching Aids
10.	Suspension culture - Batch and continuous	RB2; Pg. (70-74)	GCR/LCD
11.	Synchronization of suspension culture Synchronization of Embryo Development	RB2; Pg. (74-745) TB1; Pg. (151-152)	GCR/LCD
12.	Micro propagation - Factors affecting morphogenesis and proliferation rate Factors affecting in vitro stages of Micropropagation	RB2; Pg. (49-50) TB1; Pg. (131-148) TB1; Pg. (507-514)	GCR/LCD
13.	Technical problems in micropropagation Limitations of micropropagation	RB2; Pg. (65) TB1; Pg. (515-522)	BB/LCD
14.	Protoplast isolation and fusion technology	RB1; Pg. (147-151)	BB/LCD
15.	Spontaneous Fusion, Induced Fusion, PEG, Electrofusion	RB2; Pg. (112-115)	BB/LCD
16.	Identification and selection of hybrid cells	RB2; Pg. (115-118)	BB/LCD
17.	Verification and Characterization of Somatic Hybrids	RB2; Pg. (118-119)	BB/LCD
18.	Protoplast Viability test and Density	RB2; Pg. (109-111)	BB/LCD

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins



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Unit : III

Unit Syllabus: CELL CULTURE TECHNIQUES FOR REGENERATION OF CROPS 9 Hrs

Organogenesis -formation of shoots and roots, production of virus free plants by Meristem and shoot-tip culture, Embryogenesis - Process of somatic embryogenesis, structure, stages of embryo development, factors affecting embryogenesis; production of artificial seeds; Cryopreservation

Objective: To learn the techniques involved in plant tissue culturing

Session No *	Topics to be covered	Ref	Teaching Aids
19.	Organogenesis -formation of shoots and roots	TB1; Pg. (55-59) RB2; Pg. (55-59)	GCR/LCD
20.	Organogenic Differentiation	TB1; Pg. (104-105)	GCR/LCD
21.	Factors affecting shoot-bud differentiation	TB1; Pg. (105-113)	GCR/LCD
22.	Production of virus free plants by Meristem and shoot-tip culture	RB1; Pg. (119-124) RB2; Pg. (51-53)	BB/LCD
23.	Embryogenesis - Process of somatic embryogenesis	TB1; Pg. (59-63)	BB/LCD
24.	Factors affecting embryogenesis	TB1; Pg. (131-142)	BB/LCD
25.	Production of artificial seeds	TB1; Pg. (155-159)	BB/LCD
26.	Cryoprotectants Cryopreservation Steps - Raising sterile tissue cultures, Addition of cryoprotectants and pretreatment	TB1; Pg. (573-574) RB2; Pg. (148-149)	BB/LCD
27.	Cryopreservation Steps - Freezing, Storage, Thawing, Determination of survival/viability, Plant growth and regeneration	RB2; Pg. (149-151)	BB/LCD

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22053-Plant Tissue Culture and Transformation Techniques

Unit : IV

Unit Syllabus: COMMERCIAL CROPS USING PLANT TISSUE CULTURE 9 Hrs

Herbicide resistance; Pest resistance - BT Crops; Genetic engineering for male sterility- Barnase-Barstar; Delay of fruit ripening - Polygalacturanase, ACC synthase, ACC oxidase.

Objective: To have an exposure on the various real time applications of culturing techniques in GM crop production

Session No *	Topics to be covered	Ref	Teaching Aids
28.	Gene Transfer in Plants – Transient and Stable Expression	RB2; Pg. (398-399)	GCR/LCD
29.	Reporter Genes, Selectable Marker Genes	RB2; Pg. (399-406)	GCR/LCD
30.	Gene transfer methods	RB2; Pg. (407-420)	GCR/LCD
31.	Virus Mediated Gene Transfer	RB2; Pg. (420-425)	BB/LCD
32.	Physical and Chemical Method of Gene Transfer	RB2; Pg. (425-433)	BB/LCD
33.	Herbicide resistance	RB2; Pg. (473-474)	BB/LCD
34.	Pest resistance - BT Crops	RB2; Pg. (460-467)	BB/LCD
35.	Genetic engineering for male sterility- Barnase-Barstar	RB2; Pg. (477-481)	BB/LCD
36.	Delay of fruit ripening - Polygalacturanase, ACC synthase, ACC oxidase	RB2; Pg. (474-477)	BB/LCD

Content beyond syllabus covered (if any): Molecular Pharming

* Session duration: 50 mins



Sub. Code / Sub. Name: BT22053-Plant Tissue Culture and Transformation Techniques

Unit : V

Unit Syllabus: APPLICATIONS OF TISSUE CULTURE 9 Hrs

Application of plant tissue culture in mutant selection, Secondary metabolite production and clonal propagation. Plant products of industrial importance, Recent advances in plant tissue culture.

Objective: To gain knowledge on the application of plant tissue culture in various fields

Session No *	Topics to be covered	Ref	Teaching Aids
37.	Application of plant tissue culture – Transposon gene tagging	RB2; Pg. (328-334)	GCR/LCD
38.	Secondary metabolite production	TB1; Pg. (537-540) RB2; Pg. (76-78)	GCR/LCD
39.	Medium Composition for Secondary Product Formation, Product release analysis and Application	RB2; Pg. (78-84)	GCR/LCD
40.	Strategies used to optimize product yield - culture conditions, Selection of high yielding lines	TB1; Pg. (540-545)	BB/LCD
41.	Strategies used to optimize product yield - Elicitation, Immobilization of cells	TB1; Pg. (544-546)	BB/LCD
42.	Hairy root' culture, Biotransformation, Permeabilization of cells	TB1; Pg. (546-556)	BB/LCD
43.	Clonal Propagation	TB1; Pg. (483-507)	BB/LCD
44.	Plant products of industrial importance	TB1; Pg. (558-561)	BB/LCD
45.	Recent advances in plant tissue culture	RB2; Pg. (470-473)	BB/LCD

Content beyond syllabus covered (if any): Nil

* Session duration: 50 mins



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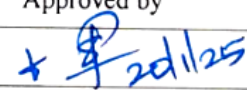
REFERENCES:

Text Books

1. Razdan M K, Introduction to Plant Tissue Culture, 3rd Edition, Oxford & IBH Publishing, 2019

Reference Books

1. Raberta H Smith, Plant Tissue Culture – Technique and experiments, Science Direct, Third Edition, 1992.
2. Chawla H S, Introduction to Plant Biotechnology, 3rd Edition, Oxford & IBH Publishing, 2020.

	Prepared by	Approved by
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Date	18-01-2025	18-01-2025

Remarks *: The Same lesson plan will be followed in subsequent semester

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* If the same lesson plan is followed in the subsequent semester/year it should be mentioned and signed by the Faculty and the HOD