Department of Biotechnology

Revised Syllabus of Diploma Programme (UG)

Preamble:

To educate the students about the basics and various techniques in plant tissue culture and the development of job oriented skill of students to work in commercial plant tissue culture laboratories

Program Objectives of the Course:

1. Know the basics of Plant tissue culture.
2. Study of various culture techniques used in plant tissue culture.
3. Learn the applications of plant tissue culture techniques.
4. Job oriented skill developments of students to starter work in commercial plant tissue culture laboratory.

Program Outcomes:

1. Introduction to plant tissue culture.
2. Study of laboratory organization for plant tissue culture.
3. Preparation of plant tissue culture media.
4. Study of Aseptic techniques for plant tissue culture.

III Year Diploma Programme

1. Title: Plant tissue Culture III
2. Year of Implementation: 2022-2023
3. Duration:One Year
4. Pattern: Semester
5. Medium of Instruction: English
6. Contact hours: 7 hours/week
8. Structure of Course:

A) LIBRARY: Reference and Textbooks, Journals and Periodicals, Reference Books for Advanced Books for Advanced studies. –List Attached

B) SPECIFIC EQUIPMENTS: Computer, LCD, Projector, Visualizer, Smart board

C) Laboratory Equipment's: 1. PCR 2. Flame Photometer 3. Gel -Dock 4. Spectrophotometer 5. Laminar air flow, 6. Plant tissue culture room 7. Autoclave 8. Incubator, etc.

Syllabus Structure (UG)

Year	Semester	Course No.	Course Code	Contact Hours	Credits (1Credit=15 H)	Total Marks
1	I	CT I	BiT 101	30	2	75
		CL I	BiL101	60	2	75
	II	CT II	BiT202	30	2	75
		CL II	BiL202	60	2	75
	Annual	CP I	BiP101	30	1	50
			Total	**210**	**9**	**350**
2	III	CT III	BiT303	30	2	75
		CL III	BiL303	60	2	75
	IV	CT IV	BiT404	30	2	75
		CL IV	BiL404	60	2	75
	Annual	CP II	BiP202	30	1	50
	Industrial and or Incubation and or Research and or Field Training			30	1	-
			Total	**240**	**10**	**350**
3	V	CT V	DBiT505	30	2	75
		CLV	DBiL505	60	2	75
	VI	CT VI	DBiT606	30	2	75
		CL VI	DBiL606	60	2	75
	Annual	CP III	DBiP303	60	2	100
	Industrial and or Incubation and or Research and or Field Training			30	1	-
			Total	**270**	**11**	**400**
Total				**720**	**30**	**1100**

D: Diploma, *: Departmental Code (C: Chemistry, MI: Microbiology, CSE: Computer Science (Entire), etc)

C: Course, T: Theory, L: Lab (Practical), P: Project

Total No. of Courses: 10 (Theory: 06, Practical: 06, Project: 03) Theory and Practical: Semester, Project: Annual

Semester V

CT V: DBiT 505**:**

(Contact Hrs: 30 Credits: 2)

Learning Objectives

1. To understand the implementation of biotechnology in the conservation of medicinally important plants
2. To understand *in vitro* plant rooting, hardening and acclimatization.

Unit I (15)

Biotechnology and medicinal plants: Potential plants for medicine from India and their impact on human health. Natural products (secondary metabolites) Phenolic, Terpenoids, Organic acids, lipids, Nitrogen compounds, sugar and their derivatives, Flavonoids, coumarins, stilbenes and fibres.
Production of secondary metabolites: Introduction, types of secondary metabolites, principle, systems of culture, optimization of yield, commercial aspects, applications, limitations

Unit II (15)

Rooting: *In vitro* rooting: use of PGRs, effect of media, use of alternative substrates (perlite, vermiculite), use of activated charcoal, culture environment *Ex-vitro* rooting: Advantages of microcutting rooting, use, composition of sowing mixtures and additives, culture environment
Hardening: Need for hardening micropropagated plantlets: Reasons: water stress, cuticle, stomata.
Acclimatization: Techniques in acclimatization: Humidity, antitranspirants, Soil and containers, Control of temperature and Light, Control of Diseases

Learning Outcomes

After completion of the unit, Student will able to understand

1. Knowledge about the role of biotechnology in medicinal plants conservation and enhancement of secondary metabolites production naturally.

2. Various techniques of rooting, hardening and acclimatization in micropropagation.

Reference Books

1. Plant Biochemistry and Molecular Biology, Peter J. Lea and Richard C. Leegood, Publisher Wiley & Sons Ltd, Second Edition, 1999
2. Gone to seed. Mellon and Rissler. Union of Concerned Scientists. 2004.

3. Unintended consequences of plant transformation: A molecular insight. Filipecki and Malepszy. J. Appl. Genet. 2006. 47(4): 277-286.
4. Developmental regulation of plant gene expression (Grierson D. ed.) Reviews and current journal, 1991.
5. Plant Physiology; Taiz L and Zeiger E.; 1991
6. Biotechnology in Agriculture, Bajaj series, (Vol 1-20) 1990-1999
7. Introduction to quantitative genetics; Falconer D.S.; 1989

CL V: DBiL505: **(Practical):**
(Contact Hrs: 60 Credits: 02)

Learning objectives

1. To understand the initiation of micropropagation - shoot tip or axillary bud culture technique tissue culture.
2. To understand subculture & multiplication of culture.
3. To understand *in vitro* and *ex vitro* plant rooting.
4. To understand the study of acclimatization and hardening.

List of Practical's

1. Micropropagation stage I-Initiation of micropropagation –Shoot tip or axillary bud culture technique tissue culture. (03)
2. Micropropagation stage II-Subculture & multiplication of culture. (03)
3. Micropropagation stage III-Rooting- *in vitro &ex vitro* *(03)*
4. Micropropagation stage IV-Acclimatization & hardening (03)

Learning Outcomes:

After completion of the unit, Student is able to understand laboratory safety and preparation of solutions, Laboratory Organizations & general techniques, study of methods of sterilization

Reference Books:

1. Plant Biotechnology: The genetic manipulation of plants. 1st edition. Slater A and others, Oxford University Press, New York, 2004
3. Plant propagation by tissue culture: Vol 1. The background. George E.F. Springer, 2007
4. Cell Culture and Somatic Cell Genetics of Plants .Indra K. Vasil. 1980. Academic Press Inc., New York.

5. In vitro culture in higher plants R.L.M. Pierik, 1987...Martinus Nijhoff Publishers, Boston

Semester VI

CT VI: **DBiT606:**

(Contact Hrs: 30 Credits: 2)

Learning Objectives

1. To understand the applications of micropropagation.
2. To understand the process of transgenic plant development.

Unit I (15)

Applications of micropropagation: Virus indexing, Transfer of Plants to Green House; Advantages and Limitations of Micropropagation, Importance of Micropropagation in Crop Improvement. Methods to detect pathogens in propagation sources, Procedures to eliminate pathogens from plant parts

Germplasm storage and cryopreservation: Germplasm resources, Genebanks, Types and Methods of Conservation, Cryopreservation Techniques, revival of cryoprotected materials, Advantages and Limitations

Unit II (15)

Genetic engineering: Introduction to transgenic plants, Agrobacterium tumefaciens mediated, and Agrobacterium rhizogenes mediated transformation, Selectable markers, reporter gene and promoter plant vectors.

Development of transgenic plants: Transgenic plants for molecular farming: edible vaccines, plantibodies, Anti-sense RNA technology and its application in crop improvement.

Learning Outcomes

After completion of the unit, students will able to understand

1. Various applications of micropropagation and germplasm storage
2. Various techniques about plant genetic engineering.

Reference Books

1. An Introduction to Plant Tissue Culture. Kalyanakumar De.; New Central Book Agency 1997.
2. Environmental and ecological impacts from transgenic plants. Unintended effects. Wolfenbarger,

3. Information System for Biotechnology, 2003.
4. Genomics-Assisted Crop Improvement. Varshney RK; Tuberosa R. 2007.

CT VI: DBIL 606: **(Practical):**
(Contact Hrs: 60 Credits: 02)

Learning Objectives:

1. To understand Knowledge about *Agrobacterium tumefaciens* mediated plant transformation

2. To understand Know various techniques about the Polymerase Chain Reaction.

List of Practical's

1. *Agrobacterium tumefaciens* mediated plant transformation (03)
2. Molecular analysis of putative transformed leaf tissue by Polymerase Chain Reaction(04)
3. Study of Sugarcane micropropagation -shoot tip culture and multiplication (03)
4. Study of Sugarcane micropropagation – rooting and hardening (03)

After completion of the unit, Student is able to understand:-

Study of*Agrobacterium tumefaciens* mediated plant transformation, Study of surface sterilization, Sugarcane micropropagation -shoot tip culture and multiplication , Students will be able to understand, To studyMolecular analysis of putative transformed leaf tissue by Polymerase Chain Reaction

Reference Books:

1. The Genetic Analysis of Quantitative Traits; Kearsey, M.J., Pooni, H.S., 1996;
2. Plant Breeding: Theory and Practice; Stoskopf, N.C., Tomes, D.T. and Christie, B.R.; 1993.
3. Plant Biochemistry and Molecular Biology, Peter J. Lea and Richard C. Leegood, Second Edition, Wiley & Sons Ltd, 1999
4. Gone to seed. Mellon and Rissler. Union of Concerned Scientists. 2004.
5. Unintended consequences of plant transformation: A molecular insight. Filipecki and Malepszy. J. Appl. Genet. 2006. 47(4): 277-286.

CP III: DBIP(Project):
(Contact Hrs. 30/60, Credits: 1/2)

BOS Sub-Committee

1. Mr.K.B.Kumbhar Chairman
2. Ms.U.L.Shevale Member

Expert Committee

1. Name of Academic Expert-Dr.Uday sidu pawar
2. Name of Industrial Expert-Mr.Vishwas Chavan