



JYOTI NIVAS COLLEGE AUTONOMOUS BANGALORE – 560 095
DEPARTMENT OF BIOTECHNOLOGY
B.Sc. V SEMESTER BIOTECHNOLOGY PAPER VI SYLLABUS (2021 NEP BATCH)
PLANT BIOTECHNOLOGY

COURSE TITLE	PLANT BIOTECHNOLOGY
COURSE CODE	21VBT6(T)
COURSE CREDITS	04
TOTAL CONTACT HOURS	60 Hours
DURATION OF ESE	2 ½ Hours
CONTINUOUS INTERNAL ASSESSMENT (CIA)	40 Marks
END SEMESTER EXAMINATION (ESE)	60 Marks

COURSE OBJECTIVES:

Through this course, the student is imparted with

1. Understanding about the major areas related to commercial applications of biotechnology in agricultural sectors.
2. Apply the practical knowledge of the techniques involved in the regeneration of plants through in vitro methods.
3. Compare and contrast on the upcoming topics like plant transgenics and plant defense mechanisms.
4. In depth knowledge about the various applications of molecular pharming , metabolic engineering and secondary metabolites .

LEARNING OUTCOMES:

On completion of this course, students will develop skills regarding

1. Describe about plant tissue culture, culture media and callus production.
2. An understanding of the various types of culture and its applications.

3. Critically analyse and effective use of transgenic plants with genetic manipulations for the development in the agricultural sector.
4. Understand and apply the various methods used for the production of various biopharmaceuticals in agricultural sector.

CO NO.	Course outcomes statement	Knowledge level
1	Describe about plant tissue culture, culture media and callus production	K1
2	An understanding about the various types of culture and its applications	K1, K2
3	Critically analyse and effective use of transgenic plants with genetic manipulations for the development in the agricultural sector.	K1,K2,K4
4	Understand and apply the various methods used for the production of various biopharmaceuticals in agricultural sector .	K2,K3

K1 – Remember, K2 – Understand, K3 – Apply, K4 – Analyze, K5 – Evaluate, K6 – Create

Mapping of COs with POs

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	✓				✓					✓
CO2	✓	✓					✓			✓
CO3	✓	✓	✓	✓		✓	✓	✓		✓
CO4	✓	✓	✓	✓			✓	✓		✓

Programme Objectives aligned with Graduate attributes

PO1- Knowledge

PO2- Scientific thinking

PO3- Entrepreneurial skills

PO4- Analytical skills

PO5- Communication skills

PO6- Social commitment

PO7- Research and Inquiry

PO8- Conservation of Environment

PO9- Digital awareness and literacy

PO10- Academic orientation

UNIT 1: Plant tissue cultures

15 Hrs.

- a) **Introduction and basic requirements of plant tissue culture.** Totipotency and their role in in-vitro propagation.
- b) **Culture media**– Definition, chemical composition, role of phytohormones in plant tissue culture and types (Murasighe and Skoog (MS), Nistch, and Whites Media).
- c) **Micropropagation** – General account on Collection, Sterilization and Inoculation of explants (Detailed account on micropropagation of virus free plants through meristem culture).
- d) **Callus** – definition, formation and types (friable and compact), a brief account of organogenesis and embryogenesis. Germplasm storage–Introduction to germplasm, cryopreservation and its applications (Brief account).

UNIT 2: Types of cultures

15 Hrs.

- a) Endosperm, Embryo, Anther culture, Suspension culture and Hairy root culture.
- b) Protoplast culture - Protoplast isolation [Mechanical, Enzymatic method], Protoplast fusion (Mechanical & Chemical Method), Selection of hybrid protoplasts (Visual, Auxotrophic mutants, staining technique, drug sensitivity method).
- c) Applications of protoplast culture. A brief account on somatic Hybridization, Cybrids and its applications.

UNIT 3: Transgenic plants

15 Hrs.

- a) Introduction to plant defense, biotic and abiotic stresses, A brief mention on plant diseases (Microbial), Plant immunity against various microbial infections, role of R – genes and PR proteins.
- b) Production of transgenic plants: herbicide resistant, insect resistant (Bt cotton), virus resistant, fungal resistant, bacterial resistant and drought resistant plants.
- c) Use of transgenic plants for the production of Vaccines, plantibodies, Vitamin A (Golden Rice).
- d) RNAi and CRISPR/Cas edited transgenic plants.

UNIT4: Molecular pharming

15 Hrs.

- a) Plants as host systems for molecular pharming of industrial proteins/ enzymes, therapeutic/ pharmaceutical proteins, edible vaccines etc.
- b) Plant secondary metabolites: Classification and roles of plant secondary metabolites: terpenoids, alkaloids, flavonoids, glycosides, phenolics, Applications of secondary metabolites, Metabolic engineering.

REFERENCES:

1. Introduction to Plant Biotechnology - Chawla H.S., Oxford and IBH Publication Co., Pvt. Ltd, New Delhi; 2nd edition (2005).
2. Plant Biotechnology - Genetic Manipulations of Plants - Slater, Adrian and Others, Oxford University Press, Oxford. (2003).
3. Environmental Biotechnology by Prof. Jogdand, Himalaya Publishing House. (2006).
4. Agricultural Biotechnology – Purohit S.S., Agrobios (India), 2nd edition (2005).
5. Applied Plant Biotechnology by Rev. Fr. Ignacimuthu., Revised Edition Tata McGraw-Hill Publishing Company, New Delhi. (2006).
6. An Introduction to Plant tissue culture - Razdan, M.K., Oxford and IBH Publishing Co. Pvt. Ltd. (Reprint 1996).
7. Applied and Fundamental Aspects of Plant Cell, Tissue and Organ Culture - Reinert J. and Bajaj Y.P.S., Narosa Publishing House (1997).

BIOTECHNOLOGY PRACTICAL PAPER 6

COURSE TITLE	PLANT BIOTECHNOLOGY
COURSE CODE	21VBT6 (P)
COURSE CREDITS	02
TOTAL CONTACT HOURS	4 hours/week
DURATION OF ESE	03 hours
CONTINUOUS INTERNAL ASSESSMENT (CIA)	25 Marks
END SEMESTER EXAMINATION (ESE)	25 Marks

Experiments

1. Requirements and designing of plant tissue culture laboratory.
2. Preparation of Media.
3. Preparation and sterilization of plant Explants
4. Callus and nodal culture
5. Preparation of artificial seeds
6. Extraction of essential oils by Clevenger apparatus.
7. Extraction Phytochemicals from Soxhlation process
8. Cytotoxicity assay and determination of LC₅₀ from name leaf extract
9. Plant viral isolation and determination of infectious dose
10. Phytochemical analysis