

BOARD OF STUDIES IN B.Sc BOTANY

2023-2024

DEPARTMENT OF BOTANY

SYLLABUS FOR B.Sc BOTANY Honours

&

B.Sc BOTANY



PITHAPUR RAJAH'S GOVERNMENT COLLEGE

**Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VI / V Semester End (W.E.F. 2023-24)
PLANT TISSUE CULTURE

Total hours of Teaching 40hrs @ 4 hrs/week

Total Credits:03

Learning outcomes

Students at the successful completion of the course will be able to :

1. Comprehend the basic knowledge and applications of plant tissue culture.
2. Identified the various facilities required to set up a plant tissue culture laboratory.
3. Acquire a critical knowledge on Sterilization techniques related to plant tissue culture.
4. Demonstration skills of callus culture through hands on experience.
5. Understand the biotransformation technique for production of secondary metabolites.

Unit - 1: Basic concepts of plant tissue culture (10h)

1. Plant tissue culture: Definition, history, scope and significance.
2. Totipotency, differentiation, dedifferentiation, and redifferentiation; Organ culture types of cultures.
3. Infrastructure and equipment required to establish a tissue culture laboratory.

Unit - 2: Sterilization techniques and culture media(10h)

1. Aseptic conditions – Fumigation, wet and dry sterilization, UV sterilization, ultrafiltration.
2. Nutrient media: Composition of commonly used nutrient culture media with respect to their contents like inorganic chemicals, organic constituents, vitamins, amino acids etc.
3. Composition and preparation of Murashige and Skoog culture medium.

Unit - 3: Callus culture technique (10h)

1. Explant: Definition, different explants for tissue culture: shoot tip, axillary buds, leaf discs, cotyledons, inflorescence and floral organs, their isolation and surface sterilization; inoculation methods.
2. Callus culture: Definition, various steps in callus culture.
3. Initiation and maintenance of callus - Growth measurements and subculture; soma clonal variations.

Unit – 4: Micropropagation (10h)

1. Direct and indirect morphogenesis, organogenesis, role of PGRs; somatic embryogenesis and synthetic seeds.
2. Greenhouse hardening unit operation and management; acclimatization and hardening of plantlets - need, process, packaging, exports.

Unit – 5: Applications of plant tissue culture (10h)

1. Germplasm conservation: cryopreservation methods, slow growth, applications and limitations; cryoprotectants.
2. Plant transformation techniques and bioreactors; production of secondary metabolites-optimization of yield, commercial aspects, applications, limitations.
3. Transgenic plants- gene transfer methods; Bt-cotton, Flavr Savr tomato, Golden rice.

I. References:

1. Kalyan Kumar De (2001) An Introduction to Plant Tissue Culture, New Central Book Agency (P) Ltd., Calcutta
2. Razdan, M.K. (2005) Introduction to Plant Tissue Culture, Oxford & IBH Publishers, Delhi
3. Bhojwani, S.S. (1990) Plant Tissue Culture: Theory and Practical (a revised edition). Elsevier Science Publishers, New York, USA.
4. Vasil, I.K. and Thorpe, T.A. (1994) Plant Cell and Tissue Culture. Kluwer Academic Publishers, the Netherlands.
5. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc., Degree Examinations at V Semester End
Botany Paper VI: PLANT TISSUE CULTURE
(Course: BO5207 Model Paper w.e.f. 2023-24)

Time: 2Hrs.

Max. Marks: 50

SECTION – A

3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. write about Organ culture in tissue culture
2. Write about sterilization method
3. Give a detailed note on Somaclonal variations

PART –II

4. Write an essay on Somatic embryogenesis.
5. Applications of plant tissue culture
6. General account on Germplasm Conservation & its significance.

SECTION – B

4×5 =20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7. Totipotency
8. Role of hormones in plant tissue culture
9. Shoot tip Culture
10. Organogenesis
11. Cryopreservation
12. Synthetic seeds
13. Bt-cotton

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., BOTANY PRACTICAL

PAPER – VI PRACTICAL SYLLABUS
PLANT TISSUE CULTURE

Total hours of laboratory Exercises 45 hrs @ 2hrs/week

Total credits:03

I. Learning Outcomes: On successful completion of this practical course, student will be able to:

1. List out, identify and handle various equipment in plant tissue culture lab.
2. Learn the procedures of preparation of media.
3. Demonstrate skills on inoculation, establishing callus culture and Micro propagation.
4. Acquire skills in observing and measuring callus growth.
5. Perform some techniques related to plant transformation for secondary Metabolite production.

II. Practical (Laboratory) Syllabus:

(30 hrs)

1. Principles and applications of- Autoclave, Laminar Airflow, Hot Air Oven.
2. Sterilization techniques for glass ware, tools etc.,
3. MS medium - Preparation of different stock solutions; media preparation
4. Explant preparation, inoculation and initiation of callus from carrot.
5. Callus formation, growth measurements.
6. Induction of somatic embryos, preparation of synthetic seeds.
7. Multiplication of callus and organogenesis.
8. Hardening and acclimatization in green house.

II. Lab References:

1. Reinert, J. and M.M. Yeoman, 1982. Plant Cell and Tissue Culture - A Laboratory
2. Manual, Springer-Verlag Berlin Heidelberg
3. Robert N. Trigiano and Dennis J. Gray, 1999. Plant Tissue Culture Concepts and Laboratory Exercises. CRC Press, Florida
4. Ashok Kumar, 2018. Practical Manual for Biotechnology, College of Horticulture & Forestry, Jhalawar, AU, Kota
5. Chawla, H.S., 2003. Plant Biotechnology: A Practical Approach, Nova Science Publishers, New York
6. Web sources suggested by the teacher concerned.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., Botany Practical Examinations at the End of Semester-V

(PLANT TISSUE CULTURE)
Botany Practical Model Paper-VI (w.e.f 2022-24)

Time: 2 hours

Max. Marks: 50

- | | |
|--|------------|
| 1. Demonstration of a sterilization technique 'A' | 8 |
| 2. Preparation of MS medium 'B' | 10 |
| 3. Demonstration of callus culture technique/growth measurements 'C' | 12 |
| 4. Scientific observation and data analysis | 4 x 3 = 12 |
| D. Tissue culture equipment /photograph | |
| E. Morphogenesis or organogenesis - photograph | |
| F. Bioreactor/Secondary metabolite | |
| G. Transgenic plant/photograph | |
| 5. Record + Viva-voce | 5+3=8 |

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ V Semester End (W.E.F. 2023-24)
Plant Tissue Culture
Mapping as per Blooms Taxonomy

S. N O	Subject	Sem ester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employ ability/ entrepreneurship)
1	Botany	V	Plant Tissue culture	Basic concepts of plant tissue culture	Knowledge	Visiting tissue culture laboratory	Skill
2	Botany	V	Plant Tissue culture	Sterilization techniques and culture media	Application	Demonstration	Skill
3	Botany	V	Plant Tissue culture	Callus culture techniques	Application	Demonstration	Skill
4	Botany	V	Plant Tissue culture	Micropropagation	Application	Demonstration	Skill
5	Botany	V	Plant Tissue culture	Applications of Plant tissue culture	Application	Demonstration	Skill

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course6	TITLE OF THE COURSE Plant Tissue Culture				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

Course Outcomes:

On Completion of the course, the students will be able to-	
CO1	Comprehend the basic knowledge and applications of plant tissue culture
CO2	Identified the various facilities required to set up a plant tissue culture laboratory.
CO3	Acquire a critical knowledge on Sterilization techniques related to plant tissue culture.
CO4	Demonstration skills of callus culture through hands on experience
CO5	Understand the biotransformation technique for production of secondary metabolites

CO-PO Mapping:

(1:Slight[Low]; 2:Moderate[Medium]; 3:Substantial[High], '-':No Correlation)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2	PSO3
CO1	2	2	3	3	3	3	3	2	2	2
CO2	3	2	2	2	2	2	2	2	2	2
CO3	3	2	3	2	2	3	3	2	2	2
CO4	2	2	2	2	2	2	2	2	2	2
CO5	2	2	2	3	2	3	3	2	2	2

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ VI Semester End (W.E.F. 2023-24)
MUSHROOM CULTIVATION

Total hours of Teaching 40hrs @ 4hrs/week

Total Credits:03

Learning outcomes

Students at the successful completion of the course will be able to :

1. Understand the structure and life of a mushroom and discriminate edible and poisonous mushroom.
2. Identify the basic infrastructure to establish a mushroom culture unit.
3. Demonstrate the skills preparation of compost and spawn.
4. Acquire a critical knowledge on cultivation of some edible mushrooms.
5. Explain the methods of storage, preparation of value added products and marketing.

Unit – 1: Introduction and value of mushrooms (10h)

1. Mushrooms: Definition, structure of a mushroom and a brief account of life cycle; historical account and scope of mushroom cultivation; difference between edible and poisonous mushrooms.
2. Morphological features of any four edible mushrooms, Button mushroom (*Agaricus bisporus*), Milky mushroom (*Calocybe indica*), Oyster mushroom (*Pleurotus sajor-caju*) and Paddy straw mushroom (*Volvariella volvacea*).
3. Nutraceutical value of mushrooms; medicinal mushrooms in South India - *Ganoderma lucidum*, *Phellinus rimosus*, *Pleurotus florida* and *Pleurotus pulmonaris* – their therapeutic value; Poisonous mushrooms - harmful effects.
4. Structure of *Amantia sps.*

Unit – 2: Basic requirements of cultivation system (10h)

1. Small village unit and larger commercial unit; layout of a mushroom farm - location of building plot, design of farm, bulk chamber, composting, equipment and facilities, pasteurization room and growing rooms.
2. Compost and composting: Definition, machinery required for compost making, materials for compost preparation.
3. Methods of composting- long method of composting and short method of composting.

Unit – 3: Spawning and casing (10h)

1. Spawn and spawning: Definition, facilities required for spawn preparation; preparation of spawn substrate.
2. Preparation of pure culture, media used in raising pure culture; culture maintenance, storage of spawn.
3. Casing: Definition, Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit – 4: Mushroom cultivation**(10h)**

Raw material, compost, spawning, casing, cropping, and problems in cultivation (diseases, pests and nematodes, weed molds and their management strategies), picking and packing for any Four of the following mushrooms:

(a) Button mushroom (b) Oyster mushroom (c) Milky mushroom and (d) Paddy straw mushroom

Unit – 5: Post harvest technology**(10h)**

1. Shelf life of mushrooms; preservation of mushrooms - freezing, dry freezing, drying and canning.
2. Quality assurance and entrepreneurship - economics of different types of mushrooms; value added products of mushrooms.
3. Management of spent substrates and waste disposal of various mushrooms.

I. References:

1. Tewari Pankaj Kapoor, S. C. (1988). Mushroom Cultivation. Mittal Publication, New Delhi.
2. Pandey R.K, S. K Ghosh, (1996). A Hand Book on Mushroom Cultivation. Emkey Publications
3. Nita Bhal. (2000). Handbook on Mushrooms (Vol. I and II). Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi
4. Pathak, V. N. and Yadav, N. (1998). Mushroom Production and Processing Technology. Agrobios, Jodhpur.
5. Tripathi, D.P. (2005) Mushroom Cultivation, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi.
6. Pathak V.N., Nagendra Yadav and Maneesha Gaur (2000), Mushroom Production and Processing Technology Vedams Ebooks Pvt. Ltd., New Delhi
7. Web resources suggested by the teacher concerned and the college librarian including reading material.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III Year B.Sc., Degree Examinations at V Semester End
Botany Paper VII: MUSHROOM CULTIVATION
(Model Paper w.e.f. 2023-24)

Time: Hrs.

Max. Marks: 50

SECTION – A

3×10 =30M

Answer any **THREE** of the following by choosing atleast one question from each Part., draw neat and labeled diagrams wherever necessary.

PART – I

1. Brief account on life cycle of Mushroom
2. Write an essay on layout of mushroom farm.
3. Define spawn and explain the facilities required for spawning

PART –II

4. Essay on cultivation of Milk mushroom & paddy straw mushroom
5. What is shelf life of a mushroom ? What are the conditions required to improve shelf life of a mushroom
6. Brief account on life cycle of Mushrooms

SECTION – B

4×5 =20M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams wherever necessary.

7. Importance of mushroom cultivation
8. Factors effecting composting
9. Preparation of pure culture
10. Post harvest handling of fresh oyster mushrooms
11. Value added products of mushrooms
12. Bulk chamber
13. Storage of spawn

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PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., BOTANY PRACTICAL PAPER – VII PRACTICAL SYLLABUS

MUSHROOM CULTIVATION

Total hours of laboratory Exercises 45 hrs @ 2hrs/week

Total credits:03

Learning Outcomes:

On successful completion of this practical course, student will be able to:

1. Identify and discriminate different mushrooms based on morphology.
2. Understand facilities required for mushroom cultivation.
3. Demonstrate skills on preparation of spawn, compost and casing material.
4. Exhibit skills on various cultivation practices for an edible mushroom.

II. Practical (Laboratory) Syllabus:

(30 hrs)

1. Identification of different types of mushrooms.
2. Preparation of pure culture of an edible mushroom.
3. Preparation of mother spawn.
4. Production of planting spawn and storage.
5. Preparation of compost and casing mixture.
6. Demonstration of spawning and casing.
7. Hands on experience on cropping and harvesting.
8. Demonstration of storage methods.
9. Preparation of value-added products.

III. Lab References:

1. Sushma Sharma Sapna Thakur Ajar Nath Yadav, 2018. Mushroom Cultivation: A Laboratory Manual, Eternal University, Sirmour, H.P.
2. Kadhila-Muandingi, N.P., F. S. Mubiana and K. L. Halueendo, 2012. Mushroom Cultivation: A Beginners Guide, The University of Namibia
3. Gajendra Jagatap and Utpal Dey, 2012. Mushroom Cultivation: Practical Manual, LAMBERT Academic Publishing, Saarbrücken, Germany
4. Deepak Som, 2021. A Practical Manual on Mushroom Cultivation, P.K.Publishers & Distributors, Delhi
5. Web sources suggested by the teacher concerned.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., Botany Practical Examinations at the End of Semester-VI

MUSHROOM CULTIVATION

Botany Practical Model Paper-VII (w.e.f 2023-24)

Time:2 hrs

max marks: 50

- | | |
|--|------------|
| 1. Demonstration of preparing pure culture/mother spawn 'A' | 8 |
| 2. Preparation method for planting spawn and storage/compost and casing material 'B' | 10 |
| 3. Demonstration of spawning and casing/storage and making a value-added product 'C' | 12 |
| 4. Scientific observation and data analysis | 4 x 3 = 12 |
| D. Edible/poisonous mushroom specimen/photograph | |
| E. Infrastructure/tool used in mushroom cultivation | |
| F. Material for compost/casing | |
| G. Storage practice/ a value-added product | |
| 5. Record + Viva-voce | 5+3 = 8 |

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ V Semester End (W.E.F. 2023-24)
MUSHROOM CULTIVATION
Mapping as per Blooms Taxonomy

S. N O	Subject	Sem ester	Title of the course (Paper)	Topic	Parameters as per Blooms Taxonomy (knowledge/ Application / Creativity/ Innovation)	Experiential learning component	Scope (skill/ employa bility/ent reprenue rship)
1	Botany	V	Mushroom Cultivation	Introduction and value of mushroom	Knowledge	Shall be shown photographs & Models	Skill
2	Botany	V	Mushroom Cultivation	Basic Requiremen ts of cultivation system	Application	Visiting mushroom cultivation units	Entrepren ership
3	Botany	V	Mushroom Cultivation	Spawing and Casing	Application	Practicing techniques	Skill & Entrepren ership
4	Botany	V	Mushroom Cultivation	Mushroom Cultivation	Application	Practicing techniques	Skill & Entrepren ership
5	Botany	V	Mushroom Cultivation	Post harvest technology	Application	Practicing techniques	Skill & Entrepren ership

CO-PO Mapping

	Pithapur Rajah's Government College (Autonomous) Kakinada	Program & Semester III B.Sc. (V Semester)			
Course7	TITLE OF THE COURSE Mushroom Cultivation				
Teaching	Hours Allocated: 60 (Theory)	L	T	P	C
Pre-requisites:		3	1	-	3

Course Outcomes:

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CO4	Acquire a critical knowledge on cultivation of some edible mushrooms.
CO5	Explain the methods of storage, preparation of value added products and marketing.

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2:Moderate[Medium];

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CO2	2	2	2	2	3	3	3	3	3	3
CO3	2	3	3	2	3	3	3	3	3	3
CO4	2	2	2	2	3	3	3	3	3	3
CO5	2	2	2	3	3	3	3	3	3	3