

BOARD OF STUDIES IN B.Sc BOTANY

2022-2023

DEPARTMENT OF BOTANY

SYLLABUS FOR 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. 2022-23)

ADVANCED ELECTIVE

PLANT TISSUE CULTURE

Total hours of Teaching 40hrs @ 3 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; some 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.
3. Pathogen (Virus) indexing- significance, methods, advantages, applications.

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.

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 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 Manual, Springer-Verlag Berlin Heidelberg
2. Robert N. Trigiano and Dennis J. Gray, 1999. Plant Tissue Culture Concepts and Laboratory Exercises. CRC Press, Florida
3. Ashok Kumar, 2018. Practical Manual for Biotechnology, College of Horticulture & Forestry, Jhalawar, AU, Kota
4. Chawla, H.S., 2003. Plant Biotechnology: A Practical Approach, Nova Science Publishers, New York
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-V
(PLANT TISSUE CULTURE)
Botany Practical Model Paper-VI (w.e.f 2022-23)

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 Year B.Sc., Degree Examinations at V Semester End
Botany Paper VI: PLANT TISSUE CULTURE
(Course: BO5207 Model Paper w.e.f. 2022-23)

Time: 2 ½ Hrs.

Max. Marks: 60

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 a) Describe the equipments used in tissue culture

OR

b) write about Organ culture in tissue culture

- 2 a) Write about sterilization methods

OR

b) Ingredients and its advantages used in the preparation of tissue culture medium

- 3 a) Illustrate the various steps involved in callus culture

OR

b) Give a detailed note on Somaclonal variations

PART – II

- 4 a) Give a detailed note on Pathogen indexing-methods, Significance & Advantages

OR

b) Write an essay on Somatic embryogenesis.

- 5 a) General account on Germplasm Conservation & its significance

OR

b) Applications of plant tissue culture

SECTION – B

4×5 =20M

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

6. Totipotency
7. Production of Haplod plants
8. Role of hormones in tissue culture
9. Ultrafiltration
10. Shoot tip culture
11. Growth measurements
12. Organogenesis
13. Bt-Cotton

SECTION – C

5×2 =10M

Answer any 5 Questions

- 1.Plant tissue culture
- 2.Redifferentiation
- 3.Autoclave
- 4.Fumigation
- 5.Explant
- 6.callus culture
- 7.Synthetic seeds
- 8.Organogenesis
- 9.Cryoprotectants
- 10.Transgenic plants

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VI / V Semester End (W.E.F. 2022-23)
PLANT TISSUE CULTURE
III B.Sc., -Botany-6 / V Semester Question Bank

UNIT – I: BASICS CONCEPTS OF PLANT TISSUE CULTURE:

Essay Questions

1. Describe the equipments used in tissue culture.
2. Write about Organ culture.

Shorts

1. Totipotency
2. Differentiation, Dedifferentiation & Redifferentiation
3. Production of Haploids

Very short Questions

1. Plant tissue culture
2. Totipotency
3. Dedifferentiation
4. Redifferentiation

Unit - 2: Sterilization techniques and culture media

Essays Questions

1. Write about Sterilization Methods
2. General account on Ingredients and its advantages used in the preparation of tissue culture media

Shorts Questions

1. Role of hormones in Tissue culture
2. Fumigation
3. Ultra filtration
4. Heat sterilization

Very short Questions

1. Autoclave
2. Incineration
3. Flaming
4. Fumigation

Unit - 3: Callus culture technique

Essays Questions

1. Explain callus culture
2. Essay on Somaclonal variation

Shorts Questions

1. Shoot tip culture
2. Growth Measurements
3. Subculturing
4. Floral organ isolation & Sterilization

Very short Questions

1. Explant
2. callus culture
3. axillary bud culture

Unit – 4 : Micropropagation

Essays Questions

1. Illustrate Somatic embryogenesis
2. Pathogen indexing
3. Green house hardening unit operation & management

Shorts Questions

- 1.Organogenesis
- 2.role of PGR in plant tissue culture
- 3.Synthetic seeds
- 4.Packaging & Export of hardening plantlets
- 5.Pathogen indexing

Very short Questions

- 1.Somatic Embryogenesis
- 2.Synthetic seeds
- 3.Hardening
- 4.Pathogen indexing
- 5.Acclimatization
- 6.Organogenesis

Unit –5 : Applications of Plant tissue culture**Essays Questions**

- 1.General account on Germplasm Conservation & its significance
- 2.Detailed note on Production of secondary metabolites
- 3.Transgenic plants

Shorts Questions

- 1.Cryopreservation
- 2.Germplasm Conservation
- 3.BT-cotton
- 4.Bioreactors

Very short Questions

- 1.Cryoproteins
- 2.Cryoprotectants
- 3.Secondary metabolites
- 4.Bioreactors
- 5.Agrobacterium mediated gene transfer
- 6.Transgenic plants

BLUE PRINT FOR QUESTION PAPER SETTER

UNIT NO/ TITLE	LAQ	SAQ	VSAQ	MARKS ALLOTTED TO THE MODULE
UNIT-I: BASIC CONCEPTS OF PLANT TISSUE CULTURE	2	2	2	34
UNIT-II : STERILIZATION TECHNIQUES AND CULTURE MEDIA	2	2	2	34
UNIT-III: CALLUS CULTURE TECHNIQUE	2	2	2	34
UNIT-IV : MICROPROPAGATION	2	1	2	29
UNIT-V: APPLICATIONS OF PLANT TISSUE CULTURE	2	1	2	29
Total marks allotted to all questions including choice				160

NOTE: Question paper setters are requested to adhere strictly to the above blue print while preparing their said paper

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII/ VI Semester End (W.E.F. 2022-23)
ADVANCED ELECTIVE

MUSHROOM CULTIVATION

(Course: BO6209)

Total hours of Teaching 40hrs @ 3 hrs/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 Bosporus*), 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.

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 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 2022-23)

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 Year B.Sc., Degree Examinations at V Semester End
Botany Paper VII: MUSHROOM CULTIVATION
(Course: BO5207 Model Paper w.e.f. 2022-23)

Time: 2 ½ Hrs.

Max. Marks: 60

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 a) Explain morphological features of edible mushrooms (Agaricus biosporous & Calocybe indica)

OR

- b) Brief account on life cycle of Mushroom

- 2 a) Write an essay on layout of mushroom farm.

OR

- b) Give an account on methods of composting

- 3 a) Define spawn and explain the facilities required for spawning

OR

- b) Give a detailed note on casing. Explain the benefits, types and other materials of casing.

PART – II

- 4 a. Essay on the production of button mushrooms.

OR

- b) Essay on cultivation of Milk mushroom & paddy straw mushroom

- 5 a) Detailed note on preservation of mushrooms

OR

- b) .What is shelf life of a mushroom ? What are the conditions required to improve shelf life of a mushroom

SECTION – B

4×5 =20M

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

6. Write the difference between poisonous & harmful mushrooms
7. Importance of mushroom cultivation
8. Write a note on factors affecting composting.
9. Write a short note on design of cropping room.
10. What are the characteristics of a good spawn.
11. Define casing. Why is casing necessary.
12. .Give an account of nematodes associated with mushroom cultivation.
13. Value added products of mushrooms.

SECTION – C

5×2 =10M

Answer any 5 Questions

1. Define mushroom
2. composting
3. Casing
4. Spawning
5. Dry Freezing
6. Pasteurization.
7. Bulk chamber
8. Storage of spawn
9. Raw material for mushroom cultivation
10. Canning.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
III B.Sc., -Botany-VII / V Semester End (W.E.F. 2022-23)
MUSHROOM CULTIVATION
III B.Sc., -Botany-7 / V Semester Question Bank

UNIT – I:INTRODUCTION AND VALUE OF MUSHROOM

Essay Questions

- 1.Brief account on life cycle of Mushroom
- 2.Explain morphological features of edible mushrooms (*Agaricus biosporous* & *Calocybe indica*)
- 3.Illustrate the nutaceutical and medicinal values of mushrooms.

Short Questions

- 1.Write the difference between poisonous & harmful mushrooms
- 2.Write a short note on *Pleurotus florida*
- 3.Importance of mushroom cultivation

Very Short Questions

- 1.Define mushroom
- 2.*Ganoderma lucidium*
- 3.milky mushroom
- 4.paddy straw mushroom
- 5.oyster mushroom

UNIT – II:BASIC REQUIREMENTS OF CULTIVATION SYSTEM

Essay Questions

- 1.Write an essay on layout of mushroom farm.
- 2.What is composting? Write an essay on need and advantages of composting.
- 3.Give an account on methods of composting

Short Questions

- 1.Write short note on materials required for compost preparation.
- 2.Write a note on factors affecting composting.
- 3.Write a short note on design of cropping room.

Very Short Questions

- 1.composting.
- 2.bulk chamber.
- 3.Pasteurization.
- 4.Growing room.

UNIT – III:SPAWNING AND CASING

Essay Questions

- 1.Define spawn and explain the facilities required for spawning
- 2.Give a detailed note on casing. Explain the benefits, types and other materials of casing.

Short Questions

- 1.Define casing. Why is casing necessary.
- 2.What are the characteristics of a good spawn.
- 3.Preparation of pure culture.

Very Short Questions

- 1.spawn
- 2.casing
- 3.quality parameters of casing soil
- 4.storage of spawn

UNIT – IV:MUSHROOM CULTIVATION

Essay Question

- 1.Essay on the production of button mushrooms.
- 2.Essay on production of oyster mushroom

3.Essay on cultivation of Milk mushroom & paddy straw mushroom

Short Questions

1. Write a short notes on post harvest management in button mushrooms.
2. Give an account of nematodes associated with mushroom cultivation.
3. Write note on post harvest handling of fresh oyster mushroom.
4. Write note on post harvest handling of fresh milky mushroom.

Very Short Questions

1. raw material for mushroom cultivation
2. spawning
3. cropping
4. pests & nematodes of mushroom cultivation

UNIT – V: POST HARVEST TECHNOLOGY

Essay Question

1. Detailed note on preservation of mushrooms
2. What is shelf life of a mushroom ? What are the conditions required to improve shelf life of a mushroom.

Short Questions

1. Shelf life of mushrooms
2. canning of mushrooms
3. Value added products of mushrooms

Very Short Questions

1. Drying method.
2. Freeze preservation.
3. Canning.

BLUE PRINT FOR QUESTION PAPER SETTER

UNIT NO/ TITLE	LAQ	SAQ	VSAQ	MARKS ALLOTTED TO THE MODULE
UNIT-I: INTRODUCTION AND VALUE OF MUSHROOM	2	2	2	34
UNIT-II : BASIC REQUIREMENTS OF CULTIVATION SYSTEM	2	2	2	34
UNIT-III: SPAWNING AND CASING	2	2	2	34
UNIT-IV : MUSHROOM CULTIVATION	2	1	2	29
UNIT-V: POST HARVEST TECHNOLOGY	2	1	2	29
Total marks allotted to all questions including choice				160

NOTE: Question paper setters are requested to adhere strictly to the above blue print while preparing their said paper