

**BOARD OF STUDIES IN M.Sc BOTANY
2023-2024**

DEPARTMENT OF BOTANY

SYLLABUS FOR M.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
M.Sc – BOTANY, SEMESTER – III,
PAPER CODE: 301
ETHNOBOTANY AND PLANT DRUGS

Theory

UNIT I

Ethnobotany: Scope and importance, inter disciplinary approaches in Ethnobotany, tribals of Andhra Pradesh and their traditional usage of plants in medicine, food and other purposes. Applications of Ethnobotany. Study of medicinal plants from the following groups: Gymnosperms, Angiosperms (Ranunculaceae, Leguminosae, Apocynaceae, Asclepiadaceae, Solanaceae, Lamiaceae, Liliaceae and Zingiberaceae, etc)

UNIT II

Cultivation, Collection, Processing and Marketing: Macro and Micro Propagation and cultivation of medicinal plants; Methods of collection, Processing, Storage, Market Potential and Trade of Plant Medicines. Ethnobotany as a tool to protect interests of ethnic groups Sharing of wealth concept with few examples from India. Intellectual Patent (property) Rights (IPR) & Intellectual Property Protection (IPP) for the plant medicines.

UNIT III

Phytomedicine: Systems of medicine, brief history, origin and scope of plant medicines, identification of locally available medicinal plants. Macroscopy and microscopy of medicinally useful plant parts such as leaves, stems, underground parts, flowers, fruits and seeds (Senna, Datura, Cinnamon, Cinchona, Ginger, Clove, Fennel, Nux-vomica & Ipecacuanha).

UNIT IV

Formulations, Diagnostic features and Biological activity of Plant

Medicines: Formulations and dosage forms of plant medicines; Study of the important Diagnostic Features of Active Constituents, Quality, Purity; and Pharmaceutical uses of important Plant Medicines. Biological Active Principles of Established Herbal Medicines. Herbal Cosmetics and Dietetics.

Laboratory Exercises

1. Visits to tribal habitats and field Study of medicinal plants used by tribal people.
2. Recording medicinal practices and herbal formulations of tribal medicine.
3. Collection and identification of herbal medicinal plants.
Preservation and submission of herbal medicinal samples.
4. Preparation and submission of herbal practice
Centre tour report. Development of medicinal plant nurseries in botanical garden.
5. Identification of important Medicinal plants and study of Morphological features of the Medicinal plant parts.
6. Field trip to study and identify locally occurring Medicinal plants.
7. Practical Methods of Cultivation, Propagation, Conservation and Protection of important Medicinal plants to develop familiarity. Micro-propagation of Medicinal plants and Production of Callus from different Explants
for Specific Biologically active Ingredients.
8. Practical demonstration of collection, processing and storage of Plant Medicines.
9. Microscopic study of locally available Medicinal plant parts such as leaves, stems, underground parts, flowers, fruits and seeds (Senna, Datura, Cinnamon, Cinchona, Ginger, Clove, Fennel, Nux-vomica & Ipecacuanha).
10. Demonstration of drug adulteration, identification of locally available Plant Medicines.
11. Antibiotic sensitive test of crude drugs.
12. Demonstration of drug Formulation and Herbal cosmetics.
13. Organoleptic examination and physical and chemical properties.

Suggested Books for Laboratory Experiments

1. Jain, S.K. 1968. Medicinal plants. National book trust of India, New Delhi.
2. Rao, P.S. Venkaiah, K. & Padmaja, R. 1999. Field guide on medicinal plants. A. P. Forest department.
3. Trivedi, P.C. 2002. Ethnobotany. Avishkar Publishers, Jaipur, India.
4. Document files creation using MS word. Creating document style.
5. Internet – E-mail and mail attachment i. Downloading webpage; Saving a web page; Printing the web page; Document;
ii. Search engine; Image
6. Visit to genebank database; NCBI; EMBL
7. Visit to protein database; Swiss prot; PDb
8. Use of literature database i. Virtual library; Agricola; Pub med
9. Use of similarity search tools: NBLAST; PBLAST

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc – BOTANY, SEMESTER – III,
PAPER CODE: 302
MOLECULAR PLANT PATHOLOGY

UNIT-I

An overview on plant diseases. A brief history, terminology involved. Flor's hypothesis, Koch postulates. Causal agents- Bacteria, Viruses, Fungi, phytoplasmas. Colonization of pathogen in host – Different stages: Inoculum, Penetration, infection, invasion, Reproduction, Spread and survival of pathogens.

UNIT-II

Plant Defense mechanisms: performed, induced, biochemical and physiological responses, Host- pathogen interactions, disease signaling, pathogen recognition and signal transduction. Physiological changes in diseased plants. Molecular determinants of pathogenicity, virulence, effectors, elicitors, defensins, phytoalexins, common phenolics, plant cell wall degrading enzymes, host specific toxins, host non-specific toxins, hormones and their role in cell signaling and immunity.

UNIT-III

Symptoms, etiology, epidemiology and control measures of certain plant diseases: Citrus canker, Bacterial leaf blight of rice, Angular leaf spot of cotton, Grassy shoot disease of sugarcane, Little leaf of Brinjal, Rice tungro, Club root of Crucifers, Damping off of seedlings, Whip smut of Sugarcane, Coffee rust, Bean rust, Wilt of Cotton, Leaf spot of Turmeric.

UNIT-IV

Plant Disease management: Plant Quarantine, Cultural practices, Chemical control, Biological control, Integrated Pest Management (IPM). Plant Disease resistance, classes of resistance genes. Transgenic and genetic manipulation approaches, molecular marker to tag disease resistance and avirulence genes. Use of databases and application of bioinformatics in plant pathology.

Suggested Laboratory Exercises:

1. Acquaintance with general techniques used in phytopathological work.
2. Study of symptoms, microscopic examination of diseased parts and identification of the pathogens involved in different plant diseases included in the theory part of the syllabus.
3. Isolation and identification of pathogens.

Suggested Readings & Text Books

01. Agrios GN 2001. **Plant Pathology**. Academic Press, London.
02. Richard N Strange 2003. **Introduction to Plant Pathology**. Springer.
03. Lucas 2001. **Host Pathogen Interactions**. Blackwell.
04. Bilgrami KS and Dube HC 2000. **A Text Book of Modern Plant Pathology**. VikasPublications, New Delhi.
05. Rangaswami G 1988. **Disease of Crop Plants in India**. Prentice-Hall of India.
06. Wood RKS 1967. **Physiological Plant Pathology**.
07. Kelman A 1967. **Source Book of Laboratory Exercise in Plant Pathology**.
08. Mehrotra RS 1994. **Plant Pathology**.
09. Mukerji KG and Garg KL 1993. **Bio-control of Plant Diseases**. Vol.I&II
CBS Publishers and Distributors Delhi.
10. Butler EJ 1973. **Fungi and Diseases in Plants**.
11. Roberts RR and Booth Royd LR 1972. **Fundamentals of Plant Pathology**.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc – BOTANY, SEMESTER – III,
PAPER CODE: 303
PLANT ECOLOGY, BIODIVERSITY AND CONSERVATION

Theory

UNIT – I

Ecology – A synthetic approach. Major biomes and Vegetational patterns of the World.

Major Vegetational and Soil types of India.

Community ecology: Methods of study of plant communities, qualitative study of plants communities. Stratification of Life forms and physiognomy, normal biological spectrum.

UNIT – II

Quantitative study of plant communities, distribution pattern frequency, density, canopy, basal area and cover

Synthetic characters of Community, Similarity Index, general account of classification of communities

Population Ecology: Population structure, characteristics of population; population density, Natality, Mortality, Age distribution, Biotic potential, Population growth forms and curves. Population fluctuation and population dispersal

UNIT – III

Plant Biodiversity: Concept, Status in India, Utilization and concerns, World Centers of primary diversity of domesticated plants. The Indo Burmese Centre, plant introduction and secondary centers.

UNIT – IV

Principles of Conservation: Strategies for conservation, in situ conservation, protected areas in India- Biosphere reserves, wetlands, mangroves, conservation of wild biodiversity, strategies for conservation – ex situ conservation. Principles and practices. Botanical gardens, BSI, ICAR and CSIR.

SUGGESTED LABORATORY EXERCISES

1. Study vegetation in the botanical gardens
2. To prepare life forms of local botanical gardens and prepare a biological spectrum
3. To determine the minimal size and number of quadrates required for reliable estimate of biomass in grass land
4. Quantitative analysis of vegetation: relative frequency, density, relative density, basal area and IVI
5. To estimate rate of Carbon dioxide evolution from different soils using soda lime or alkali absorption method
6. Scientific visits:
A protected areas or Biosphere reserve or national park or sanctuary
A wetland, Mangrove, NBPGR (National Bureau of Plant Genetic Resources – New Delhi) BSI, CSIR Laboratories, FRI and Tropical Botanical Gardens

SUGGESTED READINGS & TEXT BOOKS

1. APHA – Standard Methods for the Examination of Water and Waste Water. American Public Health Association, Washington, DC
2. Frankel, OH. Brown, A.H.D. & Burdon, J.J. 1995. The conservation of Plant Diversity, Cambridge University Press, Cambridge, UK
3. Krebs, C.J. 1989. Ecological Methodology. Harper and Row, New York, USA
4. Ludwig, J.A. and Reynolds, J.F. 1988. Statistical Ecology. Wiley, New York
5. Magurran, A.E. 1988. Ecological Diversity and its measurement. Chapman and Hall, London
6. Moore, P.W. and Chapman, S.B. 1986. Methods in Plant Ecology Blackwell Scientific Publication
7. Molles, M.C. 2005. Ecology-concepts and applications. Mc GrawHill. Boston
8. Muller – Dombois, DD. And Ellenberg, R. 1974. Aims and Methods of Vegetation Ecology, Wiley, New York
9. Begon Michael, Colin Townsend & John L. Harper. 2005. Ecology, From Individuals to Ecosystems. 4th ed. Black well Publishing, Oxford.
10. Odum.E.P. & Gary W.Barrett. 2005. Ecology.Tomson Brooks/Cole, Singapore.
11. Sokal, R.R. and Rohit, F.J.1995. Biometry. W.H. Freeman & Co., San Francisco
12. Cunningham, W.P. & M.A.Cunningham 2007. Principles of Environmental Science-Inquiry and applications. Tata Mc GrawHill Pub.New Delhi.
13. Heywood, V.M. and Watson, R.T. 1985. Global Biodiversity Assessment, Cambridge Univ. Press, Cambridge.
14. Ricklefs, R, E. & Gary L. Miller. 2000.Ecology. 4th ed. W.H. Freeman and Company. New York
15. Richard T. Wight 2005. Environmental Science. 9th ed. Pearson Prentice Hall. New Delhi.
16. Given, D.R. 1995. Principles and practice of plant conservation. Timber Press, Oregon
17. Jensen, John R. 2007. Remote Sensing of the Environment: An Earth Resource Perspective.PHI.
18. Sabins, F.F.2007. Remote Sensing-principles and interpretation. 3rded. Waveland Press Inc

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc – BOTANY, SEMESTER – III
PAPER CODE: 304
PLANT PHYSIOLOGY

Theory

UNIT – I

Plant water Relations: Thermodynamic concepts of plant water relations, free energy and chemical, osmotic and water potential, active and passive absorption of water, stomatal physiology and stomatal opening and closing, Soil-plant-atmosphere-continuum concept (SPAC) and mechanism of water transport

Mineral Nutrition: Passive and active uptake of ions, translocation of minerals in plants, essential elements, their functions and symptoms of mineral deficiency, importance of foliar nutrition and use of chelates in agriculture, root microbe interactions in facilitating nutrient uptake and mechanism of assimilation

UNIT – II

The physiology of flowering: Phytochrome structure, photochemical and biochemical properties and role in photo morphogenesis, photoperiodism and its significance, mechanisms of floral induction, role of vernalization, morphological, biochemical and metabolic changes accompanying seed germination, causes and methods of breaking seed dormancy

UNIT – III

Plant growth regulators and Elicitors: Biosynthesis, physiological effects and mechanism of action auxins, gibberellins, cytokinins, ethylene, abscisic acid, brassinosteroids, polyamines, jasmonic acid and salicylic acid, role in agri-horticulture, and hormone receptors

UNIT – IV

Stress Physiology: Plant responses to biotic and abiotic stress, mechanisms of biotic and abiotic stress tolerance, water deficit and drought resistance, salinity stress, metal toxicity, heat stress and oxidative stress

SUGGESTED LABORATORY EXERCISES

1. Effects of high and low temperatures on the permeability of the cytoplasmic membranes
2. Determination of suction force in transpiration
3. Stomatal frequency and Stomatal index of leaves
4. Rate of transpiration in leaves by Cobalt chloride paper method
5. Mechanism of opening and closing of stomata

SUGGESTED READINGS & TEXT BOOKS

1. Sinha SK 2014. A text book of Plant Physiology. Centrum Press, New Delhi.
2. Seema Yadav 2014. Plant Physiology. SBW publishers, New Delhi.
3. Heribert H and Kazuo S (eds) 2010. Plant responses to abiotic stress. Series Topics in Current Genetics, Vol 4. Springer, Berlin.
4. Philip Stewart and Schine Gobig 2011. Plant Physiology. CRC Press.
5. Moore TC. 2011. Biochemistry and Physiology of Plant Hormones. Springer, New York.
6. Mohr H and Schopfer P. 1995. Plant Physiology. Springer-Verlag, New York.
7. Witham FH and Devlin RM. 1986. Plant Physiology. CBS Publishers and Distributors, Bangalore.
8. Wilkins MD. 1987. Advanced Plant Physiology. English Language Book Society, Longman Scientific and Technical, Harlow, UK.
9. Ting IP. 1982. Plant Physiology. Addison-Wesley, Reading, MA.
10. Murthy HNK. 1981. Plant growth substances including applications in Agriculture. Tata McGraw Hill Publishing Company Ltd., New Delhi.
11. Kramer PM and Kozlowski TT. 1980. Physiology of Woody Plants. Academic Press, New York.
12. Hillman WS. 1963. Physiology of Flowering. Holt, Reinhart and Winston, New York.
13. Kocchar and Gujral. 2012. Comprehensive Plant Physiology. McMillan Pub.
14. Salisbury F. B. & C. W. Ross 1992 Plant Physiology. 4 th Edn. Wadsworth Publishing Co., Belmont, California.
15. Wiltmer, C.M. & M. Fricker. 1996. Stomata. 2nd Ed. Chapman Hall. U. K.
16. Audus, L.J. 1972. Plant Growth Substances, Volume 1. Chemistry and Physiology. Leonard Hill, UK
17. Bewley, J.D. and Black, M. 1982. Physiology and Biochemistry of seed in relation to germination and dormancy. Volume 1& 2, Springer – Verlag, Berlin
18. Devlin, R.M. and Witham, F.H. 1986. Plant Physiology
19. Davies, P.J. (Ed) 1987. Plant hormones and their role in Plant Growth and Development. Mertinus Nijhoff Publishers, The Netherlands
20. Epstein, E. 1972. Mineral nutrition of plants, Principles and prospectus, John Wiley & Sons, INC, New York
21. Frank Boyer Salisbury, Cleon Ross. Plant Physiology, 5th Edition.
22. Hess, D. 1974. Plant Physiology
23. Hewit, E.J. and T.A. Smith, 1975. Plant Mineral Nutrition
24. Hooykaas, P.J.J., Hall, M.A. and Libbenga, K.R. (Eds.) 1999. Biochemistry and Molecular Biology of Plant Hormones, Elsevier, Amsterdam, The Netherlands
25. Hopkins, W.G. 1995. Introduction to Plant Physiology. John Wiley & Sons Including New York, USA
26. Hopkins, W.G. 2009. Introduction to Plant Physiology. John Wiley & Sons Including New York, US, 4th Edition.

27. Konrad Mengel, Ernest A. Kirkby, Harald Kosegarten, Thomas Appel. Principles of Plant Nutrition, 5th Edition
28. Khan, A.A. 1982. The Physiology and Biochemistry of Seed Development, Dormancy and Germination. Elsevier, Amsterdam, The Netherlands
29. H.N. Krishna Murthy. 1981. Plant growth substances including applications in Agriculture. Tata McGraw – Hill Publishing Company Ltd
30. Irwin P. Ting, Plant Physiology, 1982, Addison-Wesley Publishing Company.
31. Leopold, A.C. 1964. Plant growth and development. Mc Graw Hill Book Company, Inc, New York.
32. Meyer, A.M. and A. Poljakoff Mayber. 1975. The germination of Seeds
33. Noggle, G.R. and G.J. Fritz. 1991. Introductory plant physiology (2nd edition) Prentice hall of India Limited
34. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th edition). Wordsworth Publishing Company, Belmont, California, USA
35. Slayter, R.O. 1967. Plant Water Relationships. Academic Press, New York
36. Sutcliffe, J.F. 1962. Mineral slats absorption in plants, Bergamen, Press, Oxford, London
37. Taiz, L. and Zeiger, E. 1998. Plant Physiology (2nd edition). Sinauer Associates including Publishers, Massachusetts, USA
38. Thomas and Vince – Prue, D. 1997. PhotoPeriodism in Plants (2nd edition). Academic Press, Sandeigo, USA
39. Wilkins, M.D. 1987. Advanced Plant Physiology. English Language Book Society, Longman
40. Wisthoff, P. 1998. Molecular Plant Development from Gene to Plant. Oxford University Press, Oxford, UK