



RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

(AUTONOMOUS)

AFFILIATED TO

**SWAMIRAMANANDTEERTHMARATHWADAUNIVERSITY,
NANDED**

B. Sc. GENERAL (SEMESTER PATTERN)

B. Sc. THIRD YEAR

BOTANY – CURRICULUM

(MCQ + THEORY PATTERN)

w. e. f. JUNE, 2015

ACKNOWLEDGEMENT

The Chairman , Board of Studies in Botany (UG) acknowledges the contributions of the members, Board of Studies in Botany, in structuring the under graduate Curricula. The abundant support and recommendations from the members for designing different courses have shaped this curriculum to this present nature.

Thanks to all the esteemed.

Chairman

Board of Studies in Botany

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INTRODUCTION

The Board of Studies in Botany (UG) recognizes that curriculum, course content and assessment of scholastic achievement play complementary roles in shaping education. The structured Curriculum for Undergraduate Programme of Botany envisages Undergraduate Education as a combination of general and specialized education, simultaneously introducing the concepts of breadth and depth in learning. It also stresses learning to learn rather than learning of specific lessons. The attempt is to prepare the students for lifelong learning by drawing attention to the vast world of knowledge of plants and introducing him to the methodology of systematic academic enquiry. With this in mind, we aim to provide a firm foundation in every aspect of Botany and to explain a broad spectrum of modern trends in Botany and to develop experimental, observational, computational skills also which lead him / her as an ambassador of sustainable development of our country.

OBJECTIVES

1. To know the importance and scope of the discipline.
2. To inculcate interest in and love of nature with its myriad living forms.
3. To impart knowledge of Botany as the basic objective of Education.
4. To develop a scientific attitude to make students open minded, critical and curious.
5. To develop an ability to work on their own and to make them fit for the society.
6. To expose themselves to the diversity amongst life forms.
7. To develop skill in practical work, experiments, equipments and laboratory use along with collection and interpretation of biological materials and data.
8. To Make aware of natural resources and environment and the importance of conserving it.
9. To develop ability for the application of the acquired knowledge in the fields of life so as to make our country self reliant and self sufficient.
10. To Appreciate and apply ethical principles to biological science research and studies.
11. To enable the students to face NET, SET examinations.
12. To enable the students to face MPSC, UPSC and other competitive examinations successfully.

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B. Sc. GENERAL (SEMESTER PATTERN)

B. Sc. SECOND YEAR

BOTANY – CURRICULUM

(MCQ + THEORY PATTERN)

| Semester | Paper No. | Paper Title | Lectures/ Practicals | Marks | | | Credits |
|-----------|-------------------------|---------------------------------------|-------------------------|-----------------------|------------------------|----------------|-----------|
| | | | | In Sem. Evaluation | End Sem. Evaluation | Total Marks | |
| V | IX | Plant Physiology and Metabolism | 45 | 20 | 30 | 50 | 02 |
| | X | Plant Pathology-I | 45 | 20 | 30 | 50 | 02 |
| | Lab. Course VII | Based on theory paper -IX | 12 | -- | -- | 25 | 01 |
| | Lab. Course VIII | Based on theory paper -X | 12 | -- | -- | 25 | 01 |
| VI | XI | Plant Biochemistry and Bioinformatics | 45 | 20 | 30 | 50 | 02 |
| | XII | Plant Pathology-II | 45 | 20 | 30 | 50 | 02 |
| | Lab. Course IX | Based on theory paper -XI | 12 | -- | -- | 25 | 01 |
| | Lab. Course X | Based on theory paper -XII | 12 | -- | -- | 25 | 01 |
| | | | | | Total | 300 | 12 |

Workload:

1. Theory: Three Lectures / Paper / Week.

2. Practical: One Practical (Three Lectures) / Batch / Week

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year
Semester – V
(MCQ + Theory Pattern)

BOTANY
Theory Paper-IX: Plant Physiology and Metabolism

Periods – 45

Maximum Marks – 50

Objectives:

1. To understand the different physiological phenomenon of plants.
2. To understand the different metabolic processes in plants.
3. To understand the energy flow in plants.
4. To understand carbon cycle in plants.

COURSE OUT COMES

- 1) Able to understand energy flow in plants.
- 2) Able to understand different physiological phenomenon of plants.
- 3) Able to recognize need of mineral nutrients by plants and its recycling.

UNIT-I: PLANT WATER RELATIONS (12 L)

1. Importance of water in plant life,

2. Different bio-physico-chemical phenomenon-Permeability and its importance,

definition of diffusion, osmosis (exosmosis, endosmosis) plasmolysis, imbibition.

3. Absorption of water- Introduction, mechanism of water absorption (active and passive Theories

4 . Ascent of sap- Definition, mechanism of root pressure theory, capillary theory, imbibition and transpiration pull theories.

5. Transpiration- Definition, types, structure of stomata, mechanism of opening and closing of stomata (starch-sugar theory and K^+ pump theory)

UNIT-II: PLANT GROWTH AND DEVELOPMENT (10 L)

I. Vegetative Growth:

1. Seed dormancy : Seed dormancy- Introduction, methods of breaking seed dormancy, factors affecting seed dormancy

2. **Seed germination;** Seed germination- types, factors affecting seed germination.
 3. **Plant growth hormones:** Auxins, gibberellins, cytokinins, abscisic acid, Ethylene (only practical applications).
- II. Reproductive Growth: Physiology of flowering:** Photoperiodism (long day plants, short day plants, day neutral plants),

UNIT-III: PHOTOSYNTHESIS AND PHOTORESPIRATION (13 L):

- I. **Introduction**, ultra structure of chloroplast, biogenesis of chloroplast, photosynthetic pigments, concepts of two Photo systems;
- II. **Mechanism of photosynthesis:**
 1. **Light phase-** Hill reaction, Cyclic and Non cyclic photophosphorylation.
 2. **Dark phase-** Calvin cycle (C₃ pathway), Hatch and Slack cycle (C₄ pathway) and Crassulacean acid metabolism (CAM), significance of photosynthesis;
- III. **Photorespiration:** Introduction, Glycolate metabolism (C₂ cycle) significance.

UNIT-IV: RESPIRATION (10 L):

- I. **Introduction**, ultra structure of mitochondria, respiratory quotient and its significance;
- II. **Types of respiration:**
 1. **Aerobic respiration-** Glycolysis, Krebs's cycle, Electron Transport System (oxidative phosphorylation), ATP structure and function.
 2. **Anaerobic respiration-** Fermentation (alcoholic and lactic acid) significance of respiration.

SUGGESTED READINGS :

1. Gill P.S. (2000) - Plant Physiology, S.Chand& Co. New Delhi
2. Verma V. (1995) - Text book of Plant Physiology, Emkay Publication N.Delhi
3. Salisbury P.B. & W. Ross (1992) - Plant Physiology , New York Pub. Co. California USA
4. Subhash Chandra Dutta (1992) - Plant Physiology, Wiley Eastern, New Delhi
5. Shrivastava H.S.(2000) - Plant Physiology, Rastogi Publication, Meerut
6. Shrivastava H.S. (1993) - Elements of Biochemistry Rastogi Publication, Meerut
7. Rastogi (2000) - Biochemistry Tata McGraw Hill, New York
8. Biochemistry by Mathews C.F. (2003) - Addison Wesley, New Delhi
9. Jayaraman J. (1992) - Laboratory Manual in Biochemistry, Wiley Eastern Ltd., New Delhi

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year
Semester – V
(MCQ + Theory Pattern)

BOTANY
Theory Paper-X: Plant pathology –I

Periods – 45

Maximum Marks – 50

Objectives:

1. To awaken the students about microbial world and the nature of diseases of plants.
2. To understand the principles and concept in plant pathology.
3. To understand the relationships between pathogens and plants.
4. To become familiar with terms and references used to diagnose plant disease.
5. To develop the awareness about the importance of plant disease in human life.
6. To learn the basic biology of major groups of plant pathogens.
7. To explain the concept of plant disease and disease pyramid.
8. To describe main modes of plant disease transmission.

COURSE OUT COMES

- 1) Students able to identify the nature of disease of plants.
- 2) Able to describe modes of plant disease transmission.
- 3) Students are able to prepare plant disease pyramid.

UNIT-I: FUNDAMENTALS OF PLANT PATHOLOGY (10 L)

1. Scope, importance, history and advancement of plant pathology.
2. Classification of plant diseases on the basis of causal organism and symptoms.
3. Field and laboratory diagnosis- Isolation of plant pathogens from infected plant parts, soil and air.
4. Pure culture technique, Koch's postulates for pathogenicity.

UNIT-II: PLANT DISEASES-I (12 L)

Symptoms, causal organisms, disease cycle and control measures of :

- 1 Green ear of Bajra.
- 2 leafspot of tomato.
- 3 Rust of Soybean.

- 4 Red rot of Sugarcane.
- 5 Angular leaf spot of cotton.
- 6 Yellowvein mosaic of Bhendi.

UNIT-III: PLANT DISEASES-II (13 L)

Symptoms, causal organisms, disease cycle and control measures of:

Ergot of Bajara,
 Whip smut of Sugarcane,
 Oil spot disease of pomegranate,
 Leaf spot of Turmeric (*Colletotrichumcapsici*)
 Citrus canker,
 Bunchy top of banana
 Little leaf of Brinjal

UNIT-IV: PLANT DISEASE DEVELOPMENT (10 L)

1. Definition of disease, disease pyramid
2. Disease development- Mode of entry of pathogens (through stomata, wounds, root hairs and buds),
3. Factors affecting disease development- Temperature, moisture, wind and soil pH,
4. Dispersal of plant pathogens (by air, water, insects and animals)

SUGGESTED READINGS:

1. Pathak, Khatri, Pathak, 2003, *Fundamentals of plant pathology*, Agrios
2. Mehrotra, R.S. 1991, *Plant Pathology*, Tata McGraw Hill Co. Delhi
3. Chatterjee, P.B., 1997, *Plant Protection Techniques*, Bharati Bhawan, Publ. Patana
4. Agrios, G.N. 2006-*Plant Pathology*, Elsevier Academic Press.
5. Pandey, B.P. 2009, *Plant Pathology*, S.Chand Co.
6. Dickinson, M. 2008, *Molecular Plant Pathology*, Bios Scientific Publishers, London
7. Trigiano, Windham and Windham, 2003, *Plant pathology, Concepts and laboratory exercises*. CRC Press London
8. Gupta, G.P., 2004, *Text book of plant diseases*, Discovery Publ. House, New, Delhi
9. Aneja, K.R. 2001, *Experiments in Microbiology, plant pathology, tissue culture and Mushroom production technology*, New Age International Publishers.
10. Dubey, R.C., Maheshwari, D.K. 2005, *Practical Microbiology*, S.Chand & CO.
11. Singh, R.S. 2004, *Plant Diseases*, Oxford & IBH Publishing Co. Pvt. Ltd., Delhi.
12. Rangaswami, G., Mahadevan, A., 2002, *Diseases of Crop plants of India*, Prantice Hall of India.

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year
Semester –VI
(MCQ + Theory Pattern)

BOTANY

Theory Paper-XI Biochemistry and Bioinformatics

Periods – 45

Maximum Marks – 50

Objectives:

1. To understand the biochemical constituents of the plant cell.
2. To characterize the biological impacts of different biomolecules on plants
3. to learn an understanding of the methods of biochemical analysis.
4. To understand the technique sequencing.

COURSE OUT COMES OF

- 1) Students are able to characterize the biological.
- 2) Able to learn methods of biochemical analysis
- 3) Able to analyze biochemical constituents of the plant cell

UNIT -I: BASIC BIOCHEMISTRY (10 L):

1. Introduction of different organic constituents of the cell;
2. Introduction and Biological functions of :
 - i. Carbohydrates
 - ii. Lipids
 - iii. Proteins
 - iv. Nucleic acids
3. Importance of essential oils, resins, tannins, alkaloids, organic acids, gums and mucilage.

UNIT -II: MINERAL NUTRITION (12L):

1. Essential elements: Major elements (macro nutrients), trace elements (micro nutrients),
2. Physiological role of essential elements (functions and deficiency symptoms).
phytosedrophores
3. Mineral salt absorption: Introduction, mechanism of passive absorption (ion exchange theory), active absorption (carrier concept theory).
4. Translocation of organic solutes: Introduction, direction of translocation, mechanism of translocation (Munch hypothesis, protoplasmic streaming theory)

UNIT – III: ENZYMOLOGY (12 L):

1. Introduction, nomenclature and classification (IUB).
2. Properties of enzymes.
3. Mechanism of mode of enzyme action (lock and key model, induced fit model)
 4. Factors affecting enzyme activity
5. Concept of holoenzyme, apoenzyme, co-enzymes and co-factors.
6. Abzyme
7. Ribozyme

UNIT – IV BIOINFORMATICS(11L):

1. Introduction
2. History
3. Biological Databases
 - i. protein databases
 - ii. Nucleic acid databases
4. Bioinformatics applications

SUGGESTED READINGS :

1. Gill P.S. (2000) - Plant Physiology, S.Chand& Co. New Delhi
2. Verma V. (1995) - Text book of Plant Physiology, Emkay Publication N.Delhi
3. Salisbury P.B. & W. Ross (1992) - Plant Physiology , New York Pub. Co. California USA
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7. Rastogi (2000) - Biochemistry Tata McGraw Hill, New York
8. Biochemistry by Mathews C.F. (2003) - Addison Wesley, New Delhi
9. Jayaraman J. (1992) - Laboratory Manual in Biochemistry, Wiley Eastern Ltd., New Delhi
10. Bioinformatics Methods and Applications, R.S.Rastogi, NamitaMendiratta, P. Rastogi, PHI pvt.LTD.

RAJARSHI SHAHU MAHAVIDYALAYA,LATUR

B.Sc. Third Year
Semester – VI
(MCQ + Theory Pattern)

BOTANY
Theory Paper-XII Plant pathology –II

Periods – 45

Maximum Marks – 50

Objectives:

1. To understand the aerobiology as a science and its applications
2. To know the sampling techniques used in aerobiology.
3. To learn identification of selected pollen and fungal spores.
4. To know the relationships between aerobiology and human health.
5. To understand strategies for identifying and detecting plant pests and pathogens.
6. To identify major challenges associated with preventing and managing different types of pathogens and pests.
7. To understand principles of plant disease control.
8. To study the seed borne pathogens and the techniques of their detection.

COURSE OUT COMES

- 1) Able to assess relationship between.
- 2) Able to use different techniques for pathogen detection.
- 3) Able to Identify major challenges associated with preventing and managing different types of pests.

UNIT-I: AEROBIOLOGY AND SEED PATHOLOGY (10 L)

1. Aerobiology- Definition, scope and importance
2. Disease forecasting.
3. Seed pathology-Definition,
 - i. Seed borne pathogens (external and internal).

- ii. Detection of seed borne pathogens by blotter paper and agar plate methods.
- iii. Seed treatment (hot water, solar, chemical,)
- iv. Seed certification

UNIT-III: PLANT DISEASES-I (12 L)

Symptoms, causal organisms, disease cycle and control measures of

- 1 Tikka disease of groundnut,
- 2 White rust of Mustard,
- 3 Loose smut of Wheat,
- 4 Rust of Jowar,
- 5 Grain smut of Jowar,
- 6 Leaf curl of tomato

UNIT-IV: PLANT DISEASES-II (13L)

Symptoms, causal organisms, disease cycle and control measures of

Downy mildew of Grape,
Stem rust of Wheat,
Wilt of Tur,
late blight of Potato,
Powdery mildew of pea
Papaya mosaic
Root Knot of vegetables

UNIT –IV: DEFENCE MECHANISM AND PLANT DISEASE MANAGEMENT (10 L)

1. Structural defense (pre existing and post infectious)
2. Biochemical defense- pre existing and postinfectious (phytoalexins)
3. Exclusion and eradication,
4. Chemical control-General account of Sulphur, Copper, systemic fungicides and antibiotics,
5. Integrated pest management
6. Biological control

SUGGESTED READINGS :

1. Pathak, Khatri, Pathak, 2003, *Fundamentals of plant pathology*, Agrbios
2. Mehrotra, R.S. 1991, *Plant Pathology*, Tata McGraw Hill Co. Delhi
3. Chatterjee, P.B., 1997, *Plant Protection Techniques*, Bharati Bhawan, Publ. Patana
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7. **Trigiano, Windham and Windham**, 2003, *Plant pathology , Concepts and laboratory exercises*. CRC Press London
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9. **Aneja, K.R.** 2001, *Experiments in Microbiology,plant pathology, tissue culture and Mushroom production technology*, New Age International Publishers.
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11. **Singh, R.S.**2004, *Plant Diseases*, Oxford & IBH Publishing Co. Pvt. Ltd., Delhi.
12. **Rangaswami,G.,Mahadevan,A.**,2002, *Diseases of Crop plants of India* ,PranticeHall of India.

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year

Semester – V

BOTANY

Lab. Course-VII

(Based on theory paper - IX)

Practicals: Any ten practicals from following

1. Effect of temperature on plasma membrane (Beet root) in terms of pigment leaked out.
 2. Effect of different organic solvents on plasma membrane (Beet root) in terms of pigment leaked out.
 3. Effect of different concentrations of organic Solvent on plasma membrane (Beet root) in terms of pigment leaked out.
 4. Separation of the Photosynthetic pigments by paper chromatography
 5. Determine the Osmotic Potential of Vacuolar Sap by plasmolysis
 6. Determine the water potential of potato tuber.
 7. Demonstrations of Moll's half leaf experiments (Requirements, procedure, workings)
 8. Demonstrations of Kuhne's fermentation tube (Requirements, procedure, workings)
 9. Effect of intensity of light on photosynthesis.
 10. Effect of different colors of light on photosynthesis.
 11. Estimation of chl-a and chl-b from plant leaf extract.
 12. Demonstrations of R. Q (Carbohydrate / fat/ proteins)
 13. Demonstration of osmosis by potato osmoscope.
- 14-15: Botanical Excursions (one Short excursion and one Long excursion and Visits to laboratories / companies/factory etc

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year

Semester – VI

BOTANY

Lab. Course-IX

(Based on theory paper - XI)

Practicals: Any ten practicals from following

1. Estimation of Starch using colorimeter/ Spectrophotometer from given material.
2. Estimation of Glucose using colorimeter/ Spectrophotometer from given material.
3. Estimation of Protein using colorimeter/ Spectrophotometer from given material.
4. Estimate the percentage of oil content in given oilseeds using Soxhlet extractor.
5. Identify the amino acids in a mixture and find out the RF value.
6. Study of catalase activity under different pH
7. Study of catalase activity under different temperature
8. Micro chemical Carbohydrate (Molisch /Fehlings /Benedict's) Glucose, sucrose, starch, Cellulose, Pectin
9. Micro chemical tests for cutin, Latex, Lignin, Tannin Lipid, fats & oils.
10. Micro chemical Test of organic acids – Tartaric acid, Citric acid, Oxalic and Malic acid
11. Micro chemical Test for proteins (Biuret/ Xanthoproteic/ Millon tests)
12. Study of acid phosphatase activity from fruits.

Botanical Excursions (one Short excursion and one Long excursion and Visits to laboratories / companies/factory etc)

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

B.Sc. Third Year

Semester – V

BOTANY

Lab. Course- VIII

(Based on theory paper - X)

Practicals: Any ten practicals from following

1. Study of laboratory equipments- Autoclave, Hot air oven, Inoculating chamber, laminar air flow, Air sampler, Incubator, Centrifuge
2. Preparation of culture media- PDA, NA
3. Micrometry- Calibration of microscope and measurement of fungal spore.
4. Effect of pH on growth of pathogens.
- 5-6. Study of symptoms and causal organisms of Leaf spot of tomato and Leaf spot of turmeric
7. Study of symptoms and causal organisms of Green ear and Ergot of bajra
8. Study of symptoms and causal organism of oil spot disease of pomegranate
9. Study of symptoms and causal organism of Whipsmut of sugarcane
10. Study of symptoms and causal organism of soybean
11. Study of symptomology of the Bunchy top of banana
12. Study of symptoms and causal organism of Red rot of sugarcane.
- 13-14: Study of symptoms and causal organisms of Little leaf of brinjal and Citrus canker.
- 15-16: Study of symptoms and causal organisms of Yellow vein mosaic of bhendi and angular leaf spot of Cotton
- 17-18: Botanical excursions- several local and at least one long excursion.

