

Part -A : Physiology of Mulberry.**Unit -1**

- | | |
|--|--------|
| 1. Absorption of water and solutes by roots; effect of external conditions; root pressure; ion exchange and active absorption. | 4 Hrs. |
| 2. Mineral nutrition- macro and micro nutrients; their physiological role. | 3 Hrs |

Unit -2

- | | |
|---|--------|
| 3. Brief account of photosynthesis: Outline of the process; types of carbon fixation (C3 and C4); brief account of photorespiration and its significance. | 5 Hrs. |
| 4. Role of environmental factors on mulberry growth. | 2 Hrs. |

Unit-3

- | | |
|--|--------|
| 5. Biochemical composition of mulberry leaf | 2 Hrs. |
| 6. Transpiration: Significance; stomata- mechanism of opening and closing; regulation of water loss by stomata; factors influencing the rate of transpiration. | 2 Hrs. |
| 7. Brief account of biological nitrogen fixation; types- importance in mulberry cultivation. | 2 Hrs. |
| 8. Plant growth regulators: Importance and application in mulberry, agriculture and horticulture. | 2 Hrs. |
| 9. Biofertilizers, types and its significance. | 2 Hrs |

Part-B: Developmental Biology and Physiology of Silkworm.**Unit-4**

- | | |
|--|--------|
| 10. Morphology and structure of silkworm egg, fertilization, cleavage, blastoderm, germ band formation, blastokinesis, eye spot and blue egg; diapause development . | 6Hrs. |
| 11. Digestion: structure and function of digestive system; digestive enzyme; process of digestion. | 2 Hrs. |

Unit-5

- | | |
|--|--------|
| 12. Respiration: tracheal systems- spiracles, mechanism of respiration, factors affecting respiration. | 2 Hrs. |
| 13. Excretion: structure and function of excretory system and cryptonephrial arrangement and its significance in water regulation. | 2 Hrs. |
| 14. Neuro -endocrine system: Nervous system; Structure and distribution of endocrine glands; role of nervous system in endocrine function. | 4 Hrs |

Unit-6

- | | |
|---|--------|
| 15. Sense organs: Photoreceptors, Chemoreceptors and Mechanoreceptors. | 2 Hrs. |
| 16. Circulation: heart beat-role of alary muscles; accessory hearts; blood pressure in open circulatory system. Haemolymph. | 2 Hrs. |
| 17. Reproduction: Male and female reproductive systems in insects; role of accessory gland; oviposition. | 2 Hrs. |
| 18. Metamorphosis- types of insect metamorphosis, theories of metamorphosis. | 2 Hrs. |

Physiology of mulberry;

1. Estimation of stomatal index
2. Kranz Anatomy in relation to photosynthesis.
3. Estimation of leaf protein
4. Separation of leaf photosynthetic pigments of mulberry through paper chromatography.
5. Extraction of photosynthetic pigments by solvent wash method.
6. Determination of water potential of potato tubers.
7. Estimation of moisture percentage and moisture retention capacity of mulberry leaf .

1 Prct.
1 Prct.
1 Prct
1 prct
1 Prct
1 Prct
1 Prct

Developmental Biology and Physiology of silkworm;

8. Morphology of silkworm egg and mounting of 7th, 8th and 9th day old embryos.
9. Estimation of proteins in haemolymph/egg, haemolymph glucose level.
10. Morphology of haemocytes in silkworm.
11. Estimation of amylase activity in haemolymph of bivoltine and multivoltine races.
12. Estimation of SDH activity in the eggs/tissue.

2 Prct.
2 Prct
1 Prct.
2 Prct.
1 Prct.

3 hrs/week X 15 = 48 hrs.

IV SEMESTER

PAPER- IV: MULBERRY AND SILKWORM CROP PROTECTION

Part-A: Diseases and pests of Mulberry.

Unit-1

1. Introduction to plant diseases and importance of plant protection.
2. Classification of mulberry diseases.
3. Influence of biotic and abiotic factors on the incidence of plant diseases
4. Mineral deficiency symptoms in mulberry.
5. Pesticides: Forms, formulations, calculation and application.

1 Hrs.
1 Hrs.
1 Hrs.
2 Hrs.
3 Hrs

Unit-2

6. Fungal diseases of mulberry: Occurrence, symptoms, etiology and preventive and control measures of the following diseases :
 - (a) Powdery mildew.
 - (b) Leaf spot.
 - (c) Leaf rust.
 - (d) Leaf blight.
 - (e) Root rot.
7. Root-knot disease of mulberry- occurrence, symptoms and preventive and control measures.
8. Viral, bacterial and dwarf diseases of mulberry- their occurrence- symptoms and preventive and control measures.
9. Pest: Definition: pest outbreak; pest forecasting .

5 Hrs.
1 Hrs.
2 Hrs.
1 Hrs.

Unit-3

10. Major pests: leaf roller, Bihar hairy caterpillar, mealy bug and thrips - their preventive and control measures
11. Minor pests: girdlers, termites and mites-their preventive and control measures.
12. Biological control of mulberry pests.

3 Hrs.
2 Hrs.
2 Hrs.

Part B: Diseases and pests of silkworm.

Unit-4

13. Introduction; classification of silkworm diseases. 1 Hrs.
14. Protozoan disease – symptomatology, structure of pebrine spore, life cycle of *Nosema bombycis*, source, mode of infection and transmission, cross infectivity, prevention and control. 2 Hrs.
15. Bacterial diseases - causative agents, symptoms, factors influencing flacherie, source, mode of infection and transmission prevention and control. 3 Hrs.

Unit-5

16. Viral diseases (grasserie, infectious flacherie, cytoplasmic polyhedrosis, denonucleosis and gattine)- causative agents- symptoms – sources, mode of infection and transmission- prevention and control. 4 Hrs.
17. Fungal diseases: white and green muscardine and aspergillosis- causative agents- symptoms - structure and life cycle of fungal pathogen- mode of infection and transmission- prevention and control. 3 Hrs.
18. Integrated management of silkworm diseases. 2 Hrs.

Unit-6

19. Life cycle of Indian uzifly; seasonal occurrence; oviposition and host-age preference; nature and extent of damage; prevention and control; integrated management of Indian uzifly. 3 Hrs.
20. Cocoon pests of silkworm: Dermestid beetle- life cycle; nature and extent of damage; prevention and control measures. 1 Hrs.
21. Predators of silkworm: Cockroaches, ants, lizards and rodents; prevention and control measures. 2 Hrs.
22. Brief account of methods of pest control: Cultural, mechanical, physical, legislative (Quarantine), chemical, genetical / autocidal, biological and IPM. 3 Hrs.

PRACTICAL -4: MULBERRY AND SILKWORM CROP PROTECTION 15 Practicals -3 hrs each

Diseases and pests of Mulberry;

1. Study of powdery mildew, leaf spot and leaf rust through sectioning, staining and temporary mounting 3 Prct.
2. Study of root-knot nematode in mulberry 1 Prct.
3. Collection, mounting/preservation of insect pests of mulberry (field work). 1 Prct.
4. Identification of mulberry pests. Study of nature of damage of the following pests: Leaf roller, Bihar hairy caterpillar, scale insect, mealy bug, thrips, beetles, jassids and grasshoppers. 2 Prct.
5. Identification of fungicides, pesticides- their formulation. Study of various types of insecticide applicators (sprayers and dusters). 1 Prct.

Diseases and pests of silkworm;

6. Identification of different diseased silkworms based on external symptoms (grasserie, flacherie, muscardine and pebrine). Identification of pathogens associated with silkworm diseases: Staining and preparation of temporary slides of bacteria, spores of pebrine, polyhedra of nuclear polyhedrosis virus and mycelial mat of muscardine. 4 Prct.
7. Methods of application of silkworm bed disinfectants for management of silkworm diseases. 1 Prct.
8. Life cycle of Uzi fly; Identification of uzi-infested silkworms and cocoons. 1 Prct