

**Rayat Shikshan Sanstha's  
Yashwantrao Chavan Institute of Science,  
Satara  
(Autonomous)**

**Syllabus under Autonomy  
For  
B. Sc. III (Plant Protection)**

**From Academic Year June 2020**

Rayat Shikshan Sanstha's

## **Yashavantrao Chavan Institute of Science, Satara (Autonomous)**

### **Syllabus for Bachelor of Science (B. Sc.) Part – III**

1. TITLE: Plant Protection

2. YEAR OF IMPLEMENTATION: 2020 – 2021

3. PREAMBLE:

The B. Sc. III Plant Protection course under autonomy will be effective from the academic year 2020 – 2021. It has been prepared keeping in view the unique requirements of B. Sc. Plant Protection students. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences. The emphasis is to provide students the latest information along with due weightage to the concepts of classical botany so that they are able to understand and appreciate the current interdisciplinary approaches in the study of plant sciences and its role in societal development. The course content also lists new practical exercises so the students gets a hands on experience of the latest techniques that are currently in use. The course will also inspire students to pursue higher studies in botany, for becoming an entrepreneur and enable students to get employed in plant based industries.

4. GENERAL OBJECTIVES OF THE COURSE:

1. To impart the knowledge of science is the basic objective of education.
2. To develop scientific attitude among the students and to make the students open minded, critical and curious.
3. To develop skill in practical work, experiments and laboratory materials.
4. To understand scientific terms, concepts, facts, phenomenon and their relationships.
5. To make the students aware of natural resource and environment.
6. To enable the students to acquire knowledge of plants and related subjects so as to understand nature and environment in the benefit of human beings.
7. To develop ability for the application of acquired knowledge to improve agriculture and related fields to make the country self-reliant.

5. DURATION: 01 year

6. PATTERN: CBCS Semester

7. MEDIUM OF INSTRUCTION: English

8. STRUCTURE OF COURSE:

1) THIRD SEMESTER (NO. OF PAPERS – 02)

Sr. No.	Subject Title	Theory				Paper No. & Paper Code	Practical	
		Paper No. & Paper Code	Title of Paper	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Plant Protection DSC (Com.)	Paper V: BBPT 501	Plant Diseases and their management	06	04	Practical Paper III BBPP 506 (based on BBPT 501 and 502)	10	04
2.	Plant Protection DSE (Elect.)	Paper VI: BBPT 502	Plant Diseases, their Management and Toxicological studies	06	04		Practical Paper III BBPP 506 (based on BBPT 501 and 503)	10
		Paper VI: BBPT 503	Plant Insect Pests, their Management and Apiculture					
		Paper VI: BBPT 504	Plant Insect Pests, their Management and Economically Beneficial Insects					

2) FOURTH SEMESTER (NO. OF PAPERS – 02)

Sr. No.	Subject Title	Theory				Paper No. & Paper Code	Practical	
		Paper No. & Paper Code	Title of Paper	No. of lectures per week	Credits		No. of lectures Per week	Credits
1.	Plant Protection DSC (Com.)	Paper VII: BBPT 601	Field techniques in Plant Protection	06	04	Practical Paper IV BBPP 605 (based on BBPT 601 and 602)	10	04
2.	Plant Protection DSE (Elect.)	Paper VIII: BBPT 602	Laboratory Techniques in Plant Protection and Pathophysiology	06	04		Practical Paper IV BBPP 605 (based on BBPT 601 and 603)	10
		Paper VIII: BBPT 603	Laboratory Techniques in Plant Protection and Horticulture					
		Paper VIII: BBPT 604	Laboratory Techniques in Plant Protection,					

			Agricultural Journalism and Marketing			(based on BBPT 601 and 604)		
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## 2) Structure and titles of papers of B. Sc. Course

### **B. Sc. III Plant Protection Semester III**

Paper V (BBPT 501): Plant Diseases and Their Management

Paper VI (BBPT 502): Plant Diseases, their Management and Toxicological studies

Paper VI (BBPT 503): Plant Insect Pests, their Management and Apiculture

Paper VI (BBPT 504): Plant Insect Pests, their Management and Economically Beneficial Insects

Practical Paper III BBPP 505 (based on BBPT 501 and 502)

Practical Paper III BBPP 505 (based on BBPT 501 and 503)

Practical Paper III BBPP 505 (based on BBPT 501 and 504)

### **B. Sc. III Plant Protection Semester IV**

Paper VII: BBPT 601 Field Techniques in Plant Protection

Paper VIII: BBPT 602 Laboratory Techniques in Plant Protection and Pathophysiology

Paper VIII: BBT 603 Laboratory Techniques in Plant Protection and Horticulture

Paper VIII: BBT 604 Laboratory Techniques in Plant Protection, Agricultural Journalism and Marketing

Practical Paper IV BBPP 605 (based on BBPT 601 and 602)

Practical Paper IV BBPP 605 (based on BBPT 601 and 603)

Practical Paper IV BBPP 605 (based on BBPT 601 and 604)

## 3) OTHER FEATURES:

### A) LIBRARY:

Reference books, Text books, Journals, Periodicals available in Institute and Departmental Library.

(Separate reference lists are attached along with the respective course syllabus)

### B) SPECIFIC EQUIPMENTS:

a) Computer, LCD projector, Visualizer, Smart Board

b) Laboratory Equipments:

1. Microscope with digital camera
2. Trinocular Research Microscope
3. Stereo Zoom Microscope
4. Dissecting microscope
5. Laminar Air Flow
6. UV-VIS Double beam spectrophotometer

7. Refrigerated Centrifuge
8. Digital weighing balance
9. pH meter
10. Microtome
11. Autoclave
12. Hot Air Oven
13. Incubator
14. Refrigerator
15. EC meter
16. Colorimeter
17. Thermal Cycler
18. Gel Electrophoresis unit
19. Gel Documentation unit

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**Syllabus introduced from June 2020**

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**Semester V**  
**PLANT PROTECTION PAPER –V**

**BBPT 501 Plant Diseases and Their Management.**

**Learning objectives:**

1. To impart the knowledge of Plant Pathology, contribution of Plant Pathologists and Research Institutes in India.
2. To impart the knowledge of plant pathogens and important symptoms of plant diseases.
3. To impart the knowledge of plant diseases w.r.t. symptoms, pathogen and management.
4. To impart the knowledge of various methods of management of plant diseases.

**Unit I Plant Pathology**

**11**

Plant Pathology- Historical account, Effects of plant diseases on human civilization. Importance of plant pathology

Contribution of Indian (3) and Foreign (3) plant pathologists. Development of plant pathology in India.

Contribution of Research institutes

- a) IARI (Indian Agricultural Research Institute), New Delhi.
- b) ICRISAT (International Crop Research Institute for Semi-Arid Tropics).
- c) FRI (Forest Research Institute), Dehradun.
- d) Weed Research Institute,
- e) Wheat Rust Research Institute, Mahabaleshwar

General Characters of plant pathogens- Algae, Fungi, Bacteria, Viruses, PPLO and Nematodes. Some important symptoms of plant diseases e.g. smuts, rusts, powdery mildew, downy mildew, damping off, mosaic, yellows, cankers, blights, wilts and anthracnose.

**Unit II Study of Plant Diseases**

**11**

**Study of following plant diseases with reference to symptoms, causal organism, disease cycle and management.**

- a) Black stem rust and loose smut of Wheat
- b) Rust and Head smut of Jowar
- c) Powdery mildew of green pea

- d) Anthracnose of bean / chilly
- e) Leaf spot / Tikka and Rust disease of groundnut

### **Unit III Study of Plant Diseases**

**11**

**Study of following plant diseases with reference to symptoms, causal organism, disease cycle and management.**

- a) Root knot of vegetables
- b) Early blight of tomato
- c) Late blight of potato
- d) Whip smut of sugarcane
- e) Powdery mildew of Teak and Sissum

### **Unit IV Disease Management**

**12**

**Biological control of plant diseases-** concept of biological control, suitable examples of biological control of plant diseases.

**Chemical control of plant diseases-** Introduction, concept of pesticides, types and their examples, characters of ideal fungicide, need and importance of chemical control.

**Study of following fungicides with respect to formulation, methods of application, mode of action and uses**

- a) Sulphur fungicides – Thiram.
- b) Copper Fungicides – Copper Oxychloride
- c) Mercury fungicides – Ceresan
- d) Heterocyclic Nitrogenous Compounds - Captan.
- e) Antibiotics – Streptomycin
- g) Systemic Fungicides – Bavistin and Vitavax

#### **Learning outcomes:**

1. The student learns about Plant Pathology, contribution of Plant Pathologists and Research Institutes in India.
2. The student learns about plant pathogens and important symptoms of plant diseases.
3. The student learns about plant diseases w.r.t. symptoms, pathogen and management.
4. The student learns about various methods of management of plant diseases.

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**Semester V**  
**PLANT PROTECTION PAPER –VI**

**BBPT 502 Plant Insect Pests, their Management and Toxicological Studies**

**Learning objectives:**

1. To impart the knowledge of plant insect pests.
2. To impart the knowledge of methods of management of pests.
3. To impart the knowledge of various insecticides in management of crop pests.
4. To impart the knowledge of toxicological study of pesticides during application.

**Unit I Plant Insect Pests**

**12**

Study of following pests with reference to scientific name, marks of identification, host range, life cycle, perpetuation, nature of damage and management.

- |   |                            |
|---|----------------------------|
| 1. Brown plant hopper of rice                               | 2. Army worm of jowar      |
| 3. Blister beetle of pigeon pea                             | 4. Pod borer of green pea  |
| 5. Fruit borer of bhendi                                    | 6. Cabbage caterpillar     |
| 7. Leaf miner of groundnut                                  | 8. White grub of groundnut |
| 9. Mealy bugs of custard apple                              | 10. White flies of guava   |
| 11. Stored grain pests: Indian mealworm, Saw toothed beetle |                            |
| 12. Polyphagous pests: Termites, Aphids and Jassids         |                            |

**Unit II Management Methods of Crop Pests**

**11**

**A) Biological control-** Suitable examples

**B) Biotechnological approaches-** suitable examples

**C) Chemical control-** Study of following insecticides with respect to formulations, mode of action and uses.

Pesticide formulations: solid, liquid and gaseous

Limitations of chemical control.

- 1: Botanicals- a) Pyrethrum      b) Rotenone



2: Synthetic pyrethroids – Permethrin, Cypermethine, Fenvalrate

### **Unit III Chemical Control of Crop Pests**

**11**

Study of following insecticides with respect to formulations, mode of action and uses.

Chlorinated hydrocarbons: Toxaphene, Chlordane

Organo phosphorus compounds: Phosphamidon, Monocrotophos, Phorate, Quinolphos, Fenitrothion

Carbamets: Carbaryl, Carbofuran

Nematicides: Methyl bromide, DD mixture

Rodenticides: Strychnine hydrochloride, Warfarin

### **Unit IV Toxicological Study**

**11**

1. Explanation of following terms: Toxicity, Acute, Chronic, LD- 50, Antidotes, Colour code and Pesticide residue
2. Precautions during use of pesticides
3. Symptoms of pesticide poisoning
4. Pesticide pollution of soil, water and air
5. Pesticide legislation in India

#### **Learning outcomes:**

1. The student learns about various plant insect pests, damage caused by them and life cycle.
2. The student learns about various ecofriendly methods of management of pests.
3. The student learns about various insecticides in management of crop pests.
4. The student learns about toxicological symptoms of pesticides during application in fields.

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**Semester V**  
**PLANT PROTECTION PAPER –VI**

**BBPT 503 Plant Insect Pests, Their Management and Apiculture**

**Learning objectives:**

1. To impart the knowledge of plant insect pests.
2. To impart the knowledge of methods of management of pests.
3. To impart the knowledge of various insecticides in management of crop pests.
4. To impart the knowledge of toxicological study of pesticides during application.

**Unit I Plant Insect Pests**

**12**

Study of following pests with reference to scientific name, marks of identification, host range, life cycle, perpetuation, nature of damage and management.

- |                                 |                            |
|---------------------------------|----------------------------|
| 1. Brown plant hopper of rice   | 2. Army worm of jowar      |
| 3. Blister beetle of pigeon pea | 4. Pod borer of green pea  |
| 5. Fruit borer of bhendi        | 6. Cabbage caterpillar     |
| 7. Leaf miner of groundnut      | 8. White grub of groundnut |
| 9. Mealy bugs of custard apple  | 10. White flies of guava   |

**Unit II Management Methods Of Crop Pests**

**11**

**A) Biological control-** Suitable examples

**B) Biotechnological approaches- suitable examples**

**C) Chemical control-** Study of following insecticides with respect to formulations, mode of action and uses.

Pesticide formulations: solid, liquid and gaseous

Limitations of chemical control.

1: Botanicals- a) Pyrethrum      b) Rotenone

2: Synthetic pyrethroids – Permethrin, Cypermethine, Fenvalrate

### **UNIT III Stored Grain Pests and Polyphagus Pests**

**11**

**Stored grain pests-** Study of following pests wrt characters for identification, damage, life cycle and management: Indian meal moth, Rice Moth, Saw toothed beetle, Khapra beetle, and Rust red flour beetle  
General spoilage caused by stored grain pests  
Methods of management of stored grain pests.

**Polyphagus pests-** Study of following pests wrt host range, characters for identification, damage, Life cycle and management: Termites, Aphids, White fly, Jassids and Locusts

### **Unit IV Apiculture**

**11**

Introduction and history of beekeeping, present status of beekeeping in India and at International level Honey yielding plants and their cultivation at local level  
Species in genus *Apis*, Morphological description and casts in honeybees,  
Beehives and their description, Commercial production of honey by bee rearing  
Major pests and diseases of honey bees and their management  
Economic importance of honey.

#### **Learning outcomes:**

5. The student learns about various plant insect pests, damage caused by them and life cycle.
6. The student learns about various ecofriendly methods of management of pests.
7. The student learns about various insecticides in management of crop pests.
8. The student learns about toxicological symptoms of pesticides during application in fields.

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**Semester V**  
**PLANT PROTECTION PAPER –VI**

**BBPT 504 Plant Insect Pests, their Management and Economically Beneficial Insects**

**Learning objectives:**

5. To impart the knowledge of plant insect pests.
6. To impart the knowledge of methods of management of pests.
7. To impart the knowledge of various insecticides in management of crop pests.
8. To impart the knowledge of toxicological study of pesticides during application.

**Unit I Plant Insect Pests**

**12**

Study of following pests with reference to scientific name, marks of identification, host range, life cycle, perpetuation, nature of damage and management.

- |                                 |                            |
|---------------------------------|----------------------------|
| 1. Brown plant hopper of rice   | 2. Army worm of jowar      |
| 3. Blister beetle of pigeon pea | 4. Pod borer of green pea  |
| 5. Fruit borer of bhendi        | 6. Cabbage caterpillar     |
| 7. Leaf miner of groundnut      | 8. White grub of groundnut |
| 9. Mealy bugs of custard apple  | 10. White flies of guava   |

**Unit II Management Methods of Crop Pests**

**11**

**A) Biological control-** Suitable examples

**B) Biotechnological approaches-** suitable examples

**C) Chemical control-** Study of following insecticides with respect to formulations, mode of action and uses.

Pesticide formulations: solid, liquid and gaseous

Limitations of chemical control.

1: Botanicals- a) Pyrethrum      b) Rotenone

2: Synthetic pyrethroids – Permethrin, Cypermethine, Fenvalrate

### **Unit III Apiculture**

**11**

Introduction and history of beekeeping, present status of beekeeping in India and at International level,

Honey yielding plants and their cultivation at local level

Species in genus *Apis*, Morphological description and casts in honeybees,

Beehives and their description, Commercial production of honey by bee rearing

Major pests and diseases of honey bees and their management

Economic importance of honey.

Visit to apiculture center. Introduction to various schemes of Government of India and Maharashtra.

### **Unit IV Sericulture**

**11**

Introduction and history of sericulture, present status of sericulture in India and at International level,

Types of silkworms and their host plants, biology of silkworm,

Mulberry cultivation, varieties of mulberry, methods of harvesting and preservation of mulberry leaves.

Silk worm rearing, mounting, harvesting and marketing of cocoons.

Pest and diseases of silk worms and their management.

Visit to sericulture center. Introduction to various schemes of Government of India and Maharashtra.

#### **Learning outcomes:**

9. The student learns about various plant insect pests, damage caused by them and life cycle.
10. The student learns about various ecofriendly methods of management of pests.
11. The student learns about various insecticides in management of crop pests.
12. The student learns about toxicological symptoms of pesticides during application in fields.

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**B.Sc. III- Practical – III BBPP 505**  
**(Based on BBPT 501 and BBPT 502/503/504)**

**Learning objectives:**

1. To impart the knowledge of plant diseases w.r.t. symptoms, pathogen and management.
2. To impart the knowledge of management of plant diseases by fungicides.
3. To impart knowledge of Bordeaux mixture, Burgundy mixture and Bordeaux paste
4. To impart the knowledge of plant insect pests and damage caused by them.
5. To impart the knowledge of various insecticides in management of crop pests.
6. To impart the knowledge about safety measures during application of pesticides.
7. To impart the knowledge about working and contribution of research stations/  
institutes/ insecticide industries by visiting them.

**Practicals based on BBPT 501**

1. Study of plant diseases as per theory
  - a) Black stem rust and loose smut of Wheat
  - b) Rust and Head smut of Jowar
  - c) Powdery mildew of green pea
  - d) Anthracnose of bean / chilly
  - e) Leaf spot / Tikka and Rust disease of groundnut
  - f) Root knot of vegetables
  - g) Early blight of tomato
  - h) Late blight of potato
  - i) Whip smut of sugarcane
  - j) Powdery mildew of Teak and Sisum
2. Study of fungicides as per theory
  - a) Sulphur fungicides – Thiram.
  - b) Copper Fungicides – Copper Oxychloride
  - c) Mercury fungicides – Ceresan
  - d) Heterocyclic Nitrogenous Compounds - Captan.
  - e) Antibiotics – Streptomycin
  - g) Systemic Fungicides – Bavistin and Vitavax
3. Preparation of Bordeaux mixture, Burgundy mixture and Bordeaux paste.

### **Practicals based on BBPT 502**

1. Study of plant insect pests as per theory
  1. Brown plant hopper of rice
  2. Army worm of jowar
  3. Blister beetle of pigeon pea
  4. Pod borer of green pea
  5. Fruit borer of bhendi
  6. Cabbage caterpillar
  7. Leaf miner of groundnut
  8. White grub of groundnut
  9. Mealy bugs of custard apple
  10. White flies of guava
  11. Stored grain pests: Indian mealworm, Saw toothed beetle
  12. Polyphagous pests: Termites, Aphids and Jassids
2. Study of biological control agents (one example from each each group, eg- viruses, bacteria, fungi and insects)
3. Study of Insecticides as per theory
  - 1: Botanicals- Pyrethrum, Rotenone
  - 2: Synthetic pyrethroids –Cypermethine, Fenvalrate
  - 3: Chlorinated hydrocarbons: Toxaphene, Chlordane
  - 4: Organo phosphorus compounds: Monocrotophos, Phorate
  - 5: Carbamets: Carbaryl, Carbofuran
  - 6: Nematicides: Methyl bromide, DD mixture
  - 7: Rodenticides: Strychnine hydrochloride, Warfarin
4. Preparation of botanical pesticides (Nicotine, Neem, Dasahaparni Ark)
5. Study of some common antidotes (3-4 examples as per book)
6. Use of colour codes in pesticide industry.
7. Study of pesticide residue and its analysis.
8. Demonstration of pesticide pollution of soil and water.
9. Visit to pesticide industry or agriculture university and submission of report.

### **Practicals based on BBPT 503**

1. Study of plant insects (as per theory).
2. Study of biological control agents (one example from each each group, eg- viruses, bacteria, fungi and insects)
3. Study of Insecticides as per theory
  - 1: Botanicals- Pyrethrum, Rotenone
  - 2: Synthetic pyrethroids –Cypermethine, Fenvalrate
  - 3: Chlorinated hydrocarbons: Toxaphene, Chlordane
  - 4: Organo phosphorus compounds: Monocrotophos, Phorate

- 5: Carbamets: Carbaryl, Carbofuran
- 6: Nematicides: Methyl bromide, DD mixture
- 7: Rodenticides: Strychnine hydrochloride, Warfarin
- 4. Preparation of botanical pesticides (Nicotine, Neem, Dasahaparni Ark).
- 5. Study of stored grain pests (as per theory).
- 6. Study of polyphagus pests (as per theory).
- 7. Study of beehive and casts of honey bees.
- 8. Study of species of genus *Apis* used in apiculture.
- 9. Survey of honey yielding plants from local area.
- 10. Visit to apiculture centre and report on it.

### **Practicals based on BBPT 504**

- 1. Study of plant insects (as per theory).
- 2. Study of biological control agents (one example from each each group, eg- viruses, bacteria, fungi and insects)
- 3. Study of Insecticides as per theory
  - 1: Botanicals- Pyrethrum, Rotenone
  - 2: Synthetic pyrethroids –Cypermethine, Fenvalrate
  - 3: Chlorinated hydrocarbons: Toxaphene, Chlordane
  - 4: Organo phosphorus compounds: Monocrotophos, Phorate
  - 5: Carbamets: Carbaryl, Carbofuran
  - 6: Nematicides: Methyl bromide, DD mixture
  - 7: Rodenticides: Strychnine hydrochloride, Warfarin
- 4. Preparation of botanical pesticides (Nicotine, Neem, Dasahaparni Ark).
- 5. Study of beehive and casts of honey bees.
- 6. Study of species of genus *Apis* used in apiculture.
- 7. Survey of honey yielding plants from local area.
- 8. Visit to apiculture centre and report on it.

### **Learning outcomes:**

- 1. The student learns about plant diseases w.r.t. symptoms, pathogen and management.
- 2. The student learns about management of plant diseases by fungicides.
- 3. The student learns about Bordeaux mixture, Burgundy mixture and Bordeaux paste
- 4. The student learns about various plant insect pests and damage caused by them.
- 5. The student learns about various ecofriendly methods of management of pests.



6. The student learns about various insecticides in management of insect pests of crops.
7. The student learns about precautions and various safety measures used during application of pesticides.

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**SEMESTER VI**  
**PLANT PROTECTION PAPER –VII**  
**BBPT 601 Field Techniques in Plant Protection**

**Learning objectives:**

1. To impart the knowledge of Plant Protection techniques w.r.t. Seed and Soil treatment and Instruments used.
2. To impart the knowledge of care and maintenance of Plant Protection equipments.
3. To impart the knowledge about Plant clinic, Plant Protection Museum and IPM & IDM.
4. To impart the knowledge about plant breeding techniques to improve plant resistance.

**Unit I Plant Protection Techniques**

**11**

1. Importance of plant protection, various equipment's used in Plant protection.
2. **Seed treatment:** Concept, objectives and importance, Traditional and modern methods, seed dressing equipments: simple seed dresser.
3. **Soil treatment:** Concept, objectives and importance, Traditional and modern methods soil treating equipments-soil injector, chemicals used in soil treatment  
Soil solarization: Eco-friendly technique of soil treatment, Concept, objectives and importance, Description of soil solarization technique

**Unit II Pesticide Application Equipments**

**11**

**Working and uses of following equipment.**

- a) Pneumatic air pump – e.g. Hand pump
- b) Power operated – e.g. Mist blower
- c) Haudrallic energy pump – e.g. Peddle pump.
- d) Types of nozzles– Haudrallic energy, kinetic energy, gaseous energy and centrifugal energy.
- e) Ultra low volume sprayer

## Care and maintenance of plant protection equipment's and their importance.

### Unit III Plant Clinic, Plant Protection Museum, IPM and IDM 10

#### Plant Clinic

Concept, objectives, requirements and importance of plant clinics.

#### Plant protection museum

Concept, collection and preservation of pathological and entomological specimens and their maintenance.

Other exhibits to be displayed in museum like plant protection equipment's and various pesticides,

Role of museum in spreading awareness among farmers.

#### IPM and IDM

Concept need and introduction to Integrated Pest Management (IPM), Integrated Disease Management (IDM) techniques

### Unit IV Breeding Technique for Disease Resistance 08

**Plant Breeding:** Definition, objectives and importance

**Plant introduction and acclimatization:** Concept, definition and objectives, merits, demerits and achievements

**Selection:** Concept, definition, types, merits and demerits.

**Hybridization:** Concept, definition, types, procedure and achievements.

**Back cross method:** Concept, definition, procedure, merits and demerits

Mutation breeding: Concept, definition and achievements.

**Gamma garden:** Role of Gamma garden in crop improvement.

#### Learning outcomes:

1. Student learns about various Plant Protection techniques w.r.t. Seed and Soil treatment and Instruments used.
2. Student learns about care and maintenance of Plant Protection equipments.
3. Student learns about Plant clinic, Plant Protection Museum and IPM & IDM.
4. Student learns about plant breeding techniques to improve plant resistance.

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**SEMESTER VI**

**PAPER VIII**

**BBPT 602 Laboratory Techniques in Plant Protection and Pathophysiology**

**Learning objectives:**

1. To impart the knowledge of techniques in soil microbiology and soil pathology.
2. To impart the knowledge of seed and market pathology and nursery diseases.
3. To impart the knowledge about techniques in pathophysiology, culture and staining of pathogens.
4. To impart the knowledge about recent techniques in plant protection.

**Unit I Soil Microbiology & Pathology**

**11**

**Soil Microbiology**

Introduction to soil microbiology, soil microorganisms common examples and their role in maintaining soil health.

**Methods of studying soil microorganisms:** Culture method, Burried slide method and Respirometer,.

**Soil pathology**

Introduction to soil pathology, soil sickness- Concept, causes and remedial measures

Role of soil pathogens in plant pathology.

**Unit II Seed and Market Pathology**

**11**

**Seed Pathology**

Concept, objectives and importance of seed pathology

Examples of seed borne pathogens and methods to study them.

Seed health management

**Nursery diseases and their management**

**Market pathology:-**

Concept, need and significance.

Common examples of market pathogen and losses caused by them, Methods of management of market diseases.

### **Unit III Pathophysiology, Culture and Staining Techniques**

#### **Pathophysiology**

Concept and importance, causes for changes in physiology of diseased plant.

Paper Chromatographic technique in studying pathophysiology: pigments, amino acids, organic acids, sugars and polyphenols.

#### **Culture techniques**

Different culture media for isolating specific pathogens.

#### **Staining techniques**

Common stains used in plant pathology, their preparation & significance

Fungi: Cotton blue

Bacteria: Gram's stain

Mycoplasma: Dien's stain.

### **Unit IV Techniques in Plant Protection**

**13**

Recent techniques in Plant Protection

- a) GMO's (Genetically Modified Organisms)
- b) B.T. Cotton
- c) Pheromones
- d) Microbial pesticides
- e) Remote sensing
- f) Disease forecasting with computer
- g) E.M.Solution (Effective Microbial Solution)/Eco friendly botanical pesticides.

#### **Learning outcomes:**

1. Student learns about laboratory techniques in soil microbiology and soil pathology.
2. Student learns about laboratory techniques in seed and market pathology and nursery diseases.
3. Student learns about laboratory techniques in pathophysiology, culture and staining of pathogens.
4. Student learns about use of recent techniques in plant protection.

Rayat Shikshan Sanstha's  
**Yashavantrao Chavan Institute of Science, Satara**  
**Syllabus introduced from June 2020**

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**SEMESTER VI**

**PAPER VIII**

**BBPT 603 Laboratory Techniques in Plant Protection and Horticulture**

**Learning objectives:**

5. To impart the knowledge of techniques in soil microbiology and soil pathology.
6. To impart the knowledge of seed and market pathology and nursery diseases.
7. To impart the knowledge about techniques in pathophysiology, culture and staining of pathogens.
8. To impart the knowledge about recent techniques in plant protection.

**Unit I Soil Microbiology & Pathology**

**11**

**Soil Microbiology**

Introduction to soil microbiology, soil microorganisms common examples and their role in maintaining soil health.

**Methods of studying soil microorganisms:** Culture method, Burried slide method and Respirometer,.

**Soil pathology**

Introduction to soil pathology, soil sickness- Concept, causes and remedial measures

Role of soil pathogens in plant pathology.

**Unit II Seed and Market Pathology**

**11**

**Seed Pathology**

Concept, objectives and importance of seed pathology

Examples of seed borne pathogens and methods to study them.

Seed health management

**Nursery diseases and their management**

**Market pathology :-**

Concept ,need and significance.

Common examples of market pathogen and losses caused by them, Methods of management of market diseases.

### **Unit III Post harvest technology of fruits and vegetables.**

Causes of post harvest damage, spoilage of fruits and vegetables

Post harvest management of fruits and vegetables

Techniques of prolonging the life of fruits and vegetables

Dehydration of fruits and vegetables- Seasonal fruits and vegetables

Preservation of Amla, Fig, Kokam, Orange fruit, wild fruits (Locally available)

### **Unit IV Green House technology**

Introduction, Types of green houses, Low cost green houses, Construction of simple polyhouse .

General techniques of seed production in important agricultural crops (Sugarcane, potato, ginger, turmeric, onion) and seedling production of vegetable crops and flowers.

Cultivation techniques for export quality flowers e.g. Gerbera, Gladiolus, Tubrose and Duch rose,

Cultivation of vegetables in polyhouses e.g. Tomato, Brinjal Simla mirch, and Chilli

Cultivation of fodder crops and grasses for animal husbandry

### **Learning outcomes:**

1. Student learns about laboratory techniques in soil microbiology and soil pathology.
2. Student learns about laboratory techniques in seed and market pathology and nursery diseases.
3. Student learns about laboratory techniques in pathophysiology, culture and staining of pathogens.
4. Student learns about use of recent techniques in plant protection.

Rayat Shikshan Sanstha's  
**Yashavantrao Chavan Institute of Science, Satara**  
**Syllabus introduced from June 2020**

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**SEMESTER VI**

**PAPER VIII**

**BBPT 604 Laboratory Techniques in Plant Protection, Agricultural Journalism and Marketing**

**Learning objectives:**

1. To impart the knowledge of techniques in soil microbiology and soil pathology.
2. To impart the knowledge of seed and market pathology and nursery diseases.
3. To impart the knowledge about techniques in pathophysiology, culture and staining of pathogens.
4. To impart the knowledge about recent techniques in plant protection.

**Unit I Soil Microbiology & Pathology**

**11**

**Soil Microbiology**

Introduction to soil microbiology, soil microorganisms common examples and their role in maintaining soil health.

**Methods of studying soil microorganisms:** Culture method, Burried slide method and Respirometer,

**Soil pathology**

Introduction to soil pathology, soil sickness- Concept, causes and remedial measures

Role of soil pathogens in plant pathology.

**Unit II Seed and Market Pathology**

**11**

**Seed Pathology**

Concept, objectives and importance of seed pathology

Examples of seed borne pathogens and methods to study them.

Seed health management

**Nursery diseases and their management**

**Market pathology :-**

Concept ,need and significance.



Common examples of market pathogen and losses caused by them, Methods of management of market diseases.

### Unit III Agricultural Journalism

Definition, nature and scope, Sources of agricultural information

Interviews of experts and writing of agricultural story

Write-up of research and scientific material related to agriculture,

Use of photographs and graphical presentation of data

Style and language of news papers and magazines

Editorial mechanics: Copy reading, proofreading, headline and title writing and lay outing

### Unit IV Agricultural Marketing

Concept and definition, scope and subject matter, new role of agricultural marketing

Markets and markets structure: Components, Dimensions, classification of market, growth of Markets,

Components of market structure, demand and supply, factors affecting demand, supply and rate of farm products, Packaging and transportation of farm products

Scientific marketing of farm products.

### **Learning outcomes:**

1. Student learns about laboratory techniques in soil microbiology and soil pathology.
2. Student learns about laboratory techniques in seed and market pathology and nursery diseases.
3. Student learns about laboratory techniques in pathophysiology, culture and staining of pathogens.
4. Student learns about use of recent techniques in plant protection.

Rayat Shikshan Sanstha's  
**Yashavantrao Chavan Institute of Science, Satara**  
**Syllabus introduced from June 2020**

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**Bachelor of Science (B. Sc.) Part – III: Plant Protection**

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**SEMESTER VI**

**B.Sc. III- Practical IV BBPP 605**  
**(Based on BBPT 601 and BBPT 602/603/604)**

**Learning objectives:**

1. To impart knowledge about laboratory techniques in market pathology.
2. To impart knowledge about laboratory techniques in pathophysiology (Paper chromatography technique and estimation of pigments by colorimeter).
3. To impart knowledge about survey and collection of local diseases and pests.

**Practicals based on BBPT 601**

1. Study of traditional and modern seed dressing techniques.
2. Study of plant protection equipments
  - a) Hand pump
  - b) Pedal pump
  - c) Mist blower
  - d) Seed dresser
  - e) Soil injector
3. Study of techniques in collection and preservation of insect pests and plant pathological specimens and their submission (Atleast 10 specimens representing all groups).
4. Study of breeding technique equipments.
5. Study of hybridization technique in self-pollinated and cross- pollinated crops.

**Practicals based on BBPT 602**

1. Study of soil microbes, e.g. bacteria, algae and fungi (with permanent slides or live specimens, min 5 examples from each group)
2. Study of fungal soil pathogens (Min. 6- Max. 10 examples with permanent slides or live specimens)

3. Study of fungal seed borne pathogens on different types of crop seeds and grains (min. 6- max. 10 examples).
4. Study of Nursery Diseases of vegetable plots by visiting different nurseries.
5. Study of locally available market diseases (only fungal) of fruits and vegetables (min6- max. 10 examples).
6. Pathophysiological study w.r.t. moisture content and RWC in leaves of crop plants (2-3 examples of different diseases).
7. Estimation of pigment composition in healthy and diseased leaves of crop plants (2-3 different diseases).
8. Estimation of sugar composition of healthy and diseased leaves of crop plants (2-3 different diseases).
9. Estimation of polyphenols composition of healthy and diseased leaves of crop plants (2-3 different diseases).
10. Study of GMOs (suitable 3-5 examples).
11. Study of microbial pesticides (1 or 2 examples from each group- virus, bacteria and fungi)
12. Preparation of microbial pesticide from fungal pathogen and its application on weeds.

### **Practicals based on BBPT 603**

1. Study of soil microbes, e.g. bacteria, algae and fungi (with permanent slides or live specimens, min 5 examples from each group)
2. Study of fungal soil pathogens (Min. 6- Max. 10 examples with permanent slides or live specimens)
3. Study of fungal seed borne pathogens on different types of crop seeds and grains (min. 6- max. 10 examples).
4. Study of Nursery Diseases of vegetable plots by visiting different nurseries.
5. Study of locally available market diseases (only fungal) of fruits and vegetables (min6- max. 10 examples).
6. Study of causes of post-harvest damage and spoilage of fruits and vegetables.
7. Study of techniques of prolonging life of fruits and vegetables.
8. Study of preservation techniques of locally available fruits.
9. Study of types of green houses.
10. Study of basic techniques of cultivation in green houses.
11. Visit to a greenhouse and submission of its report.

## **Practicals based on BBPT 604**

1. Study of soil microbes, e.g. bacteria, algae and fungi (with permanent slides or live specimens, min 5 examples from each group)
2. Study of fungal soil pathogens (Min. 6- Max. 10 examples with permanent slides or live specimens)
3. Study of fungal seed borne pathogens on different types of crop seeds and grains (min. 6- max. 10 examples).
4. Study of Nursery Diseases of vegetable plots by visiting different nurseries.
5. Study of locally available market diseases (only fungal) of fruits and vegetables (min 6- max. 10 examples).
6. Study of articles in newspaper related to agriculture w.r.t. style and language.
7. Study of an agricultural field and writing its report layout along with integration of photographs and graphical representation of data.
8. Study of the process of copy reading, proofreading, headline and title writing of the article layout.
9. Study of agriculture related local market.
10. Study of processes involved in the packaging and transportation of agriculture products.

### **Learning outcomes:**

1. Student learns about laboratory techniques in market pathology.
2. Student learns about laboratory techniques in pathophysiology (Paper chromatography technique and estimation of pigments by colorimeter).
3. Student learns about survey and collection of local diseases and pests.
4. Student learns about the basics of post harvest management and green house technology.
5. Student learns about the basics of agricultural journalism and marketing.

### **List of Books Recommended:**

1. Bold, H.C., Alexopoulos, G. J. and Delevoryas, T. 1980. Morphology Plant and
2. Fungi (4th Edition) Harper and Foul Co., New York.
3. Clifton, A. 1958 Introduction to the Bacteria. McGraw Hill Co., New York.
4. Dube, H. C. 1990. An Introduction to Fungi Vikas Publishing House Pvt. Ltd.,
5. Delhi.
6. Mandahar, C. L. 1998 Introduction to plant Viruses Chand & Ltd., Delhi.
7. Rangswamy, G. and Mahadevan A. 1999. Diseases of Crop Plants in India
8. Prentice Hall India Pvt. Ltd., New Delhi.
9. Agrios, G. N. 1997. Plant Pathology Academic Press London.
10. Albajes, R., Gullino, M.L. van Lenteren, J.C. and Elad, Y. 2000. Integrated Pest and Disease Management in Greenhouse Crops, Kluwer Academic Publishers.

11. Bridge. P. et.al 1998. Molecular Variability of Fungal Pathogens. CAB International UK.
12. Bridge. P. et. al. 1999. Application of PCR in Mycology CAB International, UK.
13. Bridge. P. Moore, D.R. and Scott, P.R. 1998. Informational Technology, Plant Pathology and Biodiversity CAB International. UK.
14. Persley, G.J. 1996. Biotechnology and Integrated Pest Management CAB International, UK.
15. Skerritt, J.H. and Apples, R. 1995. New Diagnostics in Crop Sciences. CAB International, UK.
16. Buchanan. B.B. Grussem. W. and Jones. R.L. 2000. Biochemistry and Molecular Biology of Plants. American Society of Plant Physiologists, Maryland, USA.
17. Collins. H.A. and Edwards D.H. Lefebvre. D.D. and Layzell. D.B. (eds) 1997. Plant Metabolism (2nd Edition) Longman, Essex, England.
18. Lodish. H. Berk, A. Zipursky. S.L. Matsudaira. P. Baltimore. D. and Darnel. J. 2000. Molecular Cell Biology (4th Edition) W.H. Freeman and Co. New York USA.
19. Old. R.W. and Primrose, S.B. 1989. Principles of Gene Manipulation. Blackwell Scientific Publications. Oxford. UK.
20. Hackett. P.B. Fuchs. J.A. and Messing J.W. 1988. An Introduction to Recombinant DNA Techniques : Basic Experiments in Gene Manipulation. The Benjamin/Cummings Publishing Co., Inc., Menlo Park California.
21. Eklund C. and Lankford. C.W.E. 1967. Laboratory Manual for General Microbiology. Prentice-Hall Inc. Engle-wood Cliffs. N.J.
22. Cunasekaran.P. 1995. Laboratory Manual in Microbiology. New Age International Pvt. Ltd.
23. Pawsey. R.K. 1974. Techniques with Bacteria-A Guidebook for Teachers. Hutchinson Educational.
24. Pelezor.M.J. and Chan. E.C.S. 1972. :Laboratory Exercises in Microbiology. McGraw Hill Book. Co.
25. Meynell, E and Meynell. G.G. 1970. Theory and Practice in Experimental Bacteriology University Press, Cambridge.
26. Wistreich G.A. and Lechtman. M.D. 1973. Laboratory Exercises in Microbiology. Flencoe Press New York, Deverly Hills Collier Macmillan Publishers, London.
27. Aneja.K.R. 1993 Experiments in Micrology, Plant Pathology and Tissue
28. Culture. Wishwa Publication, New Delhi.
29. Mahadevan A. and Sridhar R. 19986. Methods in Physiological Plant
30. Pathology Sivakami Publication Madras.
31. Schaad N.W. 1988. Plant Pathogenic Bacteria: Laboratory Guide for
32. Identification of Plant Pathogenic Bacteria Academic Press.
33. Plant Protection – P.R. Mehta and Verma.
34. Microbiology – Peicar and Reid.
35. Microbiology life – W.R. Sustrum.
36. Shobel G.A. & D. E. Mathre 1970 – Outline of plant pathology van Nostrakh Ramhold.
37. Agrios G.N. – Plant Pathology AP., N. Y. & London 1969.
38. Wheeler B. E. J. – An Introduction to Plant Diseases.
39. Mehrotra R. S. Plant Pathology, Tata MacHill Co. op. New Delhi. 1980.
40. Tarr. S. A. J. Principles of Plant Pathology Macmillan.