

Rayat Shikshan Sanstha's

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

**Syllabus under Autonomy
For**

B. Sc. II Botany (Plant Protection)

Academic Year 2020 – 2021

Preamble

The B. Sc. Botany (Plant Protection) course under autonomy will be effective from the academic year 2019 – 2020. It has been prepared keeping in view the unique requirements of B. Sc. Botany (Plant Protection) students. The contents have been drawn up to accommodate the widening horizons of the discipline of biological sciences and its applications in agriculture. The emphasis is to provide students the latest information along with due weightage to the concepts of plant protection 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 get a hands-on experience of the latest techniques that are currently in use. The course will also inspire students to pursue higher studies, for becoming an entrepreneur and enable students to get employed in plant-based industries.

Programme objectives:

- i] To nurture academicians with focus and commitment to their subject
- i] To shape good and informed citizens from the students entering into the programme.
- iii] To credit a skilled workforce to match the requirements of the society.
- iv] To impart knowledge of science is the basic objective of this programme.
- v] To develop scientific attitude is the major objective so as to make the students open minded, critical and curious.
- vi] To develop skill in practical work, experiments and laboratory materials and equipments along with the collection and interpretation of scientific data to contribute to science.

Programme outcomes:

- i] The students will graduate with proficiency in the subject of their choice.
- i] The students will be eligible to continue higher studies in their subject.
- iii] The students will be eligible to pursue higher studies abroad.
- iv] The students will be eligible to appear for the examinations for their jobs in government organizations.
- v] The students will be eligible to apply for jobs with a minimum requirement of B. Sc. programme.

Programme specific objectives:

- i] To impart knowledge of plant pathology and disease management is the basic objective of the subject Plant Protection.
- i] To understand scientific terms, concepts, facts, phenomenon and their relationships in plant protection.
- iii] To develop skills in practical work, experiments, laboratory materials and equipment along with the collection and interpretation of scientific data to contribute to development of disease management strategies for plants.
- i. To make the students open- minded, critical and curious about the general health of plants around them.
- ii. To provide practical experience to the students so as to equip them with expertise of identifying diseases, cause and the probable cure in plants.
- iii. To develop ability for the application of the acquired knowledge to improve agriculture and other related fields to make the country self-reliant and sufficient.

Programme specific outcomes:

- i] The students will graduate with proficiency in the subject Botany (Plant Protection).
 - i] The students will be eligible to continue post graduate studies in the subject Botany, AGPM, or other life sciences subjects in India and abroad.
 - iii. The students will be eligible to appear for the examinations for their jobs in government and non- government organizations.
 - iv. The students will be eligible to apply for jobs with a minimum requirement of B. Sc. programme.
 - v. The students will be able to start ventures related to plants viz. plant protection clinics, biopesticide units and integrated pest management units.
- The students equipped with the basics of plant science will be able to apply the knowledge in practising agriculture with a scientific outlook thereby increasing the production and profits.

i. Structure of course:

1] Third semester (No. of papers – 02)

| Sr. No. | Subject Title | Theory | | | | Practical | | |
|---------|------------------|------------------------|---|--------------------------|---------|------------------------------|--------------------------|---------|
| | | Paper No. & Paper Code | Title of Paper | No. of lectures per week | Credits | Paper No. & Paper Code | No. of lectures Per week | Credits |
| 1. | Plant Protection | Paper I: BBPT 301 | Plant Pathology | 6 | 4 | Practical Paper – I BBPP 303 | 8 | 4 |
| | | Paper II: BBPT 302 | Major crops, methods of integrated Plant Protection | | | | | |

2] Fourth semester (No. of papers – 02)

| Sr. No. | Subject Title | Theory | | | | Practical | | |
|---------|------------------|------------------------|--------------------------------------|--------------------------|---------|------------------------------|--------------------------|---------|
| | | Paper No. & Paper Code | Title of Paper | No. of lectures per week | Credits | Paper No. & Paper Code | No. of lectures Per week | Credits |
| 1. | Plant Protection | Paper III: BBPP-401 | Insect pests and their management | 6 | 4 | Practical Paper –II BBPP-403 | 8 | 4 |
| | | Paper IV: BBPP-402 | Introduction to weeds and management | | | | | |

3] Fifth semester (No. of papers – 04)

| Sr. No. | Subject Title | Theory | | | | Practical | | |
|---------|-------------------------------|------------------------------------|--|--------------------------|---------|---|--------------------------|---------|
| | | Paper No. & Paper Code | Title of Paper | No. of lectures per week | Credits | Paper No. & Paper Code | No. of lectures Per week | Credits |
| 1. | Botany DSC (Com.) | Paper IX: BBT 501 | Genetics and Plant Breeding | 06 | 04 | Practical Paper III: BBP 508 (based on BBT 501 and 502) | 10 | 04 |
| | | Paper X: BBT502 | Microbiology, Plant Pathology and Mushroom Cultivation Technology | | | | | |
| 2 | Plant Protection DSC (Spl.) | Paper XI: Special Paper V BBPT 501 | Plant Diseases and their Management | 06 | 04 | Practical Paper IV BBPP 505 (based on BBPT 501 and 502) | 10 | 04 |
| | Plant Protection DSE (Elect.) | Paper VI: BBPT 502 | Plant Insect Pests, 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 | | | | | |
| 4. | Skill Enhancement | SECCBT 507 | Basic Numerical Skills | 01 | 01 | SECCBP 510 | 03 | 01 |
| 5. | AECC | | | 02 | 02 | | | |

4) Sixth semester (No. of papers – 04)

| Sr. No. | Subject Title | Theory | | | | Practical | | |
|---------|-------------------------------|------------------------|--|--------------------------|---------|---|--------------------------|---------|
| | | Paper No. & Paper Code | Title of Paper | No. of lectures per week | Credits | Paper No. & Paper Code | No. of lectures Per week | Credits |
| 1. | Botany DSC (Com.) | Paper XIII: BBT 601 | Plant Biochemistry and Molecular Biology | 06 | 04 | Practical Paper V: BBP 608 (based on BBT 601 and 602) | 10 | 04 |
| | | Paper XIV: BBT 602 | Bioinformatics, Biostatistics and Economic Botany | | | | | |
| 2 | Plant Protection DSC (Spl.) | Paper VII: BBPT 601 | Field techniques in Plant Protection | 06 | 04 | Practical Paper VI BBPP 605 (based on BBPT 601 and 602) | 10 | 04 |
| | Plant Protection DSE (Elect.) | Paper VIII: BBPT 602 | Laboratory Techniques in Plant Protection and Pathophysiology | | | | | |
| | | Paper VIII: BBPT 603 | Laboratory Techniques in Plant Protection and Horticulture | | | | | |
| | | Paper VIII: BBPT 604 | Laboratory Techniques in Plant Protection, Agricultural Journalism and Marketing | | | | | |
| 3. | Skill Enhancement | SECCBT 607 | Entrepreneurship Development | 01 | 01 | SECCBP 610 | 03 | 01 |
| 4. | AECC | | | 02 | 02 | | | |

Structure and titles of papers of B. Sc. Botany (Plant Protection) Course

B. Sc. II Semester III

Paper I (BBPT 301): Plant Pathology

Paper II (BBPT 302): Major crops, method of integrated plant protection

Botany Practical III (BBPP 303): Practicals based on Theory Paper I and II

B. Sc. - II Semester -IV

Paper III (BBPT 401): Insect pests and their management

Paper IV (BBPT 402): Introduction to weeds and management

Botany Practical IV (BBPP 403): Practicals based on Theory Paper VII and VIII

B. Sc. - III Semester - V

Paper IX (BBT 501): Genetics and Plant Breeding

Paper X (BBT 502): Microbiology, Plant Pathology and Mushroom Cultivation Technology

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

Paper VI (BBPT 502): Plant Insect Pests, 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 V BBP 508 (based on BBT 501 and 502)

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)

Skill Enhancement Paper I SECCBT 507 Basic Numerical Skills

Ability Enhancement Compulsory Course Paper III

B. Sc. III Semester VI

Paper XIII: BBT 601 Plant Biochemistry and Molecular Biology

Paper XIV: BBT 602 Bioinformatics, Biostatistics and Economic Botany

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 VII BBP 608 (based on BBT 601 and 602)
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)
Skill Enhancement Paper II SECCBT 607 Entrepreneurship Development
Ability Enhancement Compulsory Course Paper IV

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] ICT - Computer, LCD projector, Visualizer, Smart Board, wi-fi connectivity.

b] Laboratory equipments:

1. Microscope with digital camera
2. Trinocular Research Microscope
3. Stereo Zoom Microscope
4. Dissecting microscope
5. Laminar AirFlow
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

C] Botanical garden, poly house, glass house, plant separator, herbarium

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Syllabus introduced from June 2019

Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: III

Theory Paper I (BBPT 301) Plant Pathology

Learning objectives:

1. To impart the knowledge about Crop diseases.
2. To impart the knowledge of mechanism of plant infection.
3. To impart the knowledge about the agricultural crop diseases.
4. To impart the knowledge about management of crop diseases and pathophysiological and skills.

Total lectures 45

Unit - I: Concept of Plant diseases [12]

Definition and concept of disease, Terminologies in Plant Pathology: Host, pathogen, pathogenicity, pathogenesis, symptoms, infection, incubation period, Etiology, susceptibility, immunity, hypersensitivity, resistance

Classification of plant diseases – Based on a) Pathogens, b) Symptoms, c) Severity of disease – sporadic, epidemic and epiphytotic, d) transmission of pathogens through seed, soil, air and insects

Methods of studying plant pathogens: Koch's Postulates.

Unit - II: Mechanism of Penetration and Plant infection

[06]

Mechanism of Penetration and infection

Mode of infection and Factors affecting infection

Unit - III: Study of selected plant diseases

[16]

- * Little leaf of Brinjal
- * Yellow vein mosaic of Okra (Bhendi)
- * Citrus canker
- * Powdery mildew of Gerbera
- * Blight of Marigold
- * Rust of soybean
- * White Rust of Crucifers
- * Brown rust of Wheat
- * Grain smut of Jowar
- * Tikka disease of Groundnut

Unit - IV: Management of crop diseases

[11]

Mechanical method: Eradication; Chemical method: Classification of fungicides based on chemical nature and mode of action; Study of properties, formulation, mode of action and uses of Carbendazim and Benomyl; Cultural technique: Culture media and its type. Sterilization methods.

Learning outcome:

After completion of Unit - I students are able to:

1. Explain the basic concepts of plant protection.
2. Describe basic terminologies used in plant protection.

After completion of Unit - II students are able to:

1. Explain mechanism of plant infection.
2. Explain mode of infection of plant diseases.

After completion of Unit - III students are able to:

1. Explain the factors affecting infection.
2. Describe the agricultural crop diseases.

After completion of Unit - IV students are able to:

1. Explain Management of crop diseases.
2. Describe the pathophysiological skills.

References:

1. A Text book of Modern Plant Pathology, Bilgrami KS, Vikas Publishing House Pvt. Ltd., New Delhi (1990)
2. Experiments in Microbiology Plant Pathology and Tissue Culture, Aneja KR, New Age International (P) Ltd. Publishers, New Delhi (2005)
3. Fundamentals of Plant Pathology, Mehrotra RS and Aggarwal A, McGraw-Hill Education Pvt. Ltd., New Delhi (1980)
4. Laboratory Manual of Plant Pathology, Jain VK, Oxford Book, Calcutta (2009)
5. Plant Pathology, Agrios GN (4th Edn.), Academic Press, San Diego (1997)
6. Plant Pathology, Butler Edwin, Macmillan & Co. (1949)
7. Plant Pathology, Butler EJ and Jones SG, Macmillan & Co. (1949)
8. Principles and procedures of plant protection, Chattopadhyay SB, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (1987)
9. Text Book of Plant Pathology, Baruah HK, Oxford and IBH Publ. Co., New Delhi (1984)

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Syllabus introduced from June 2019
Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: III
Theory Paper - II (BBPT 302) Major crops,
Method of Integrated Plant Protection

Learning objectives:

1. To impart the knowledge about concept and importance of plant protection.
2. To impart the knowledge of gross morphology & agronomy of agricultural crops.
3. To impart the knowledge about the different methods of plant protection.
4. To impart the knowledge about the recent methods of plant protection.

Total lecture periods (45)

Unit - I: Introduction of plant protection and study of crops [12]

Introduction and importance of plant protection; Study of agronomical practices with reference to following crops: Cereals – Jowar, Oil seed crops – Groundnut, Pulse crops – Gram, Cash crops – Sugarcane

Unit - II: Study of horticultural crops [11]

Study of agronomical practices with reference to following crops: Fruit crop – Mango, Vegetable crops – Brinjal, Spices – Chilli, Floriculture – Marigold; Eco-friendly Agricultural practices: Green manuring
Bio fertilizers and its types, Biofungicides, Biopesticides/Bioinsecticides

Unit - III: Methods of plant disease management [11]

IDM – Integrated Disease management; Cultural methods – Tillage, crop rotation, trap crops, fertilizer applications; Mechanical methods – Field sanitization, Hand picking,; Physical methods – Heat and soil solarisation; Chemical methods – Brief account and uses of Bactericides, Fungicides, Insecticides, Nematicides, Acaricides, Molluscicides and Rhodenticides

Unit - IV: Advanced Methods of Plant protection [11]

Biological methods – Biological control of Insect pests and crop diseases; Legal methods – Plant quarantine in India; Crop resistance – Uses of resistant varieties and their examples.

Learning outcomes:**After completion of Unit - I students are able to:**

1. Describe concept and importance of plant protection.
2. Describe gross morphology and agronomy of agricultural crops.

After completion of Unit - II students are able to:

1. Explain gross morphology and agronomy of horticultural crops.
2. Explain the different methods of plant protection.

After completion of Unit - III students are able to:

1. Understand the concept of integrated disease management.
2. Describe the biological control of insect pest and diseases.

After completion of Unit - IV students are able to:

1. Explain the development of crop resistance.
2. Describe the recent methods of plant protection.

References:

1. Agronomy, Vaidya VJ, Continental Publication New Delhi (2006)
2. Commercial Vegetable Growing, Tindall, Oxford University Press, UK (1972)
3. Crop Production and Field Experimentation, Vaidya, Sahastrabudhe and Khupse (6th Edn.) (2005)
4. Cropping System Theory and Practice, Chattarjee VN, Oxford and BPH publishing Co. Pvt. Ltd., New Delhi (1991)
5. Floriculture, Laurie and Ries, Agrobios Publication, India (2012)
6. Handbook of Agriculture, IARI, New Delhi (2011)
7. Identification of Crop Varieties, Agarwal Science Publishers, US (1997)
8. Plant pathology, Mukundam, Agrobios Publication (2005)
9. Plant Pathology, Pande BP (11th Edn.), S. Chand Publication, New Delhi (1992)
10. Plant protection, Mehrotra, Tata McGraw-Hill Education, New Delhi (2003)
11. Principles and procedures of plant protection, Chattopadhyay SB, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (1987)
12. Scientific Crop Production, Mathur, Himanshu *Publications* (2006)

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Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: III

**Practical Paper I (BBPP 303) Practicals based on
Theory Paper I and II**

Group A based on Paper I

- 1-2. Sterilization and Preparation of PDA culture medium.
- 3-5. Soil dilution technique- Serial Dilution, Isolation, Inoculation and identification of soil fungi.
- 6-7. Separation of amino acids from healthy and diseased plants using paper chromatography technique.
8. Determination of sucrose percentage by Hand refractometer in Sugarcane and Grape.

Group B based on Paper II

- 9-13. Study of following diseases in crops with reference to host, causal organism, symptoms and management. Yellow vein mosaic of Okra (Bhendi), Little leaf of Brinjal, Citrus canker, Rust of Sugarcane, White rust of *Amaranthus* / Crucifers, Rust of Wheat, Rust of Soybean, Grain smut of Jowar, Tikka disease of Groundnut, Powdery mildew of *Gerbera*
- 14-17. Agronomic studies of following crops with reference to gross morphology for crop identification and agronomic conditions- Jowar, Groundnut, Gram, Sugarcane, Mango, Brinjal, Chilli, ~~Gerbera~~

- 18-19. Eco friendly agrobiochemicals: Green manuring: Sunhemp and Delchi; Biofertilizers: *Azolla* and *Nostoc*; Biopesticides: Azadirachtin and Pyrethrin.
20. Tour report / Excursions / Visits to Agricultural institutes / Polyhouse

Learning Outcomes:

1. After completion of practicals 1 to 8 students are able to describe techniques involved in characterization of infections in plants.
2. After completion of practicals 9 to 19, students are able to explain gross morphology agronomy of crops, collection and identification of crop diseases on the field and can describe crop diseases and management.
3. After completion of practical 20 students are able to experience working of the research institutions and polyhouses.

References:

1. Cropping System Theory and Practice, Chattarjee VN, Oxford and BPH publishing Co. Pvt. Ltd., (1991)
2. Experiments in Microbiology Plant Pathology and Tissue Culture, Aneja KR, New Age International (P) Ltd. Publishers, New Delhi. (2005)
3. Handbook of Agriculture, IARI, New Delhi (2011)
4. Laboratory Manual of Plant Pathology, Jain VK, Oxford Book, Calcutta (2009)
5. Principles and procedures of plant protection, Chattopadhyay S.B., Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (1987)

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Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: IV
Theory Paper III (BBPT 401) Insect pests and their management

Learning objectives:

1. To impart the knowledge about concept of entomology.
2. To impart the knowledge of identification of agronomical pests.
3. To impart the knowledge about the different methods of management of insect pests.
4. To impart the knowledge about formulations of insecticides.

Total lectures 45

Unit - I: Introduction to insect pests **[11]**

Definition and losses (qualitative and quantitative) caused by insect pests; General characters of insect

Classification of insect pests based on Nature of damage, Mouthparts, Metamorphosis

Unit - II: Study of insect pests **[12]**

Study of following insect pests of different crops with reference to scientific name, Marks of identification, Nature of damage, Life cycle, management in the following: Jowar – Stem borer, Sugarcane – White grub, Gram – Pod borer, Mango – Jassids, Brinjal – Fruit borer, Rose – Aphids

Stored grain pests and their management with reference to scientific name, Marks of identification, Nature of damage, Life cycle, management in the following: Rice weevil, Pulse beetle

Unit - III: Management of Insect pests **[11]**

Principles of insect pest control; Classification of insecticides based on mode of entry – stomach, contact, systemic, Mode of action – Respiratory, Nervous; Chemical nature- Inorganic and Organic : Sulphur and Organophosphates; Plant origin insecticides: Azadirachtin, Pyrethrin and Nicotine; Nature of formulation – Dusts, Granules, Wettable powder, Emulsifiable concentrates; IPM-Integrated Pest Management

Unit - IV: Recent trends in pest management

[11]

Attractants; Repellents; Antifeedants; Pheromones; Chemosterilants; Precautionary measures used during pesticide application.

Learning outcomes:

After completion of Unit - I students are able to:

1. Describe the concept of entomology.
2. Explain the identification and classification of agricultural pests.

After completion of Unit - II students are able to:

1. Describe identification of agricultural pests.
2. Explain the identification of stored grain pests.

After completion of Unit - III students are able to:

1. Describe the different methods of management of insect pests.
2. Explain formulations of insecticides.

After completion of Unit - IV students are able to:

1. Describe the recent trends in pest management.
2. Explain the precautionary measures used during pesticide application.

References:

1. Agronomy, Vaidya VJ, Continental publication, New Delhi (2006)
2. Commercial Vegetable Growing, Tindall, Oxford University Press, UK (1972)
3. Crop Production and Field Experimentation, Vaidya, Sahastrabudhe and Khupse (6th Edn.) (2005)
4. Cropping System Theory and Practice, Chattarjee VN, Oxford and BPH publishing Co. Pvt. Ltd., New Delhi (1991)
5. Floriculture, Laurie and Ries, Agrobios Publication, India (2012)
6. Handbook of Agriculture, IARI, New Delhi (2011)
7. Identification of Crop Varieties, Agarwal Science Publishers, US (1997)
8. Plant pathology, Mukundam, Agrobios Publication (2005)
9. Plant Pathology, Pande BP (11th Edn.), S. Chand Publication, New Delhi (1992)
10. Plant protection, Mehrotra, Tata McGraw-Hill Education, New Delhi (2003)
11. Principles and procedures of plant protection, Chattopadhyay SB, Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (1987)
12. Scientific Crop Production, Mathur, Himanshu Publications (2006)

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Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: IV
Theory Paper IV (BBPT 402) Weeds and their management

Learning objectives:

1. To impart the knowledge about weeds.
2. To impart the knowledge of identification and morphology of agronomical weeds.
3. To impart the knowledge about the different methods of management of weeds.
4. To impart the knowledge about laboratory techniques.

Total lectures 45

Unit - I: Introduction of weeds **[10]**

Weeds – Definition and losses caused by weeds; Classification of weeds based on Ontogeny, Ecology, crop association; Reproduction and mode of dispersal of weeds; Study of parasitic and poisonous weeds.

Unit - II: Study of following weeds with reference to **[10]**

Gross morphology for weed identification, Reproduction, Ecology, Dispersal, Management *Parthenium hysterophorus* *Argemone mexicana*, *Celosia argentea*, *Euphorbia hirta*, *Amaranthus spinosus*, *Alternanthera sessilis*, *Cyperus rotundus*, *Cynodon dactylon*, *Eupatorium odoratum*, *Lantana camara*.

Unit - III: Methods of weed management **[15]**

Mechanical methods - Ploughing, Hoeing, Hand weeding, Sickling and mowing, Burning and flooding, Mulching; Biological methods - Weed management by bacteria, fungi and insects; Chemical methods - Classification of weedicides on the basis of chemical nature, mode of action, Study of weedicides with reference to properties, mode of action, formulation and uses of i) Glyphosate ii) Gramoxane (Paraquat).

Unit - IV: Weed biology **[10]**

Weed physiology after application of herbicides; Absorption and translocation of herbicides; Mechanism of action of herbicides with reference to photosynthesis; Concept of herbicides resistance.

Learning outcome:**After completion of Unit - I students are able to:**

1. Explain the morphology of weeds.
2. Describe the ecology of weeds.

After completion of Unit - II students are able to:

1. Explain identification of agricultural weeds based on morphology.
2. Explain the reproductive biology of weeds.

After completion of Unit - III students are able to:

1. Describe the traditional methods of weed control.
2. Explain the different methods of management of weeds.

After completion of Unit - IV students are able to:

1. Illustrate laboratory techniques.
2. Describe the weed physiology on application of herbicides.

References:

1. A Compendium of Indian Weed Science Research, Khuspe VS and Subbaiah R, Metropolitan, New Delhi (1982)
2. All About Weed Control, Subramanian S and Ali AM (2nd Edn.), Kalyani Pub., New Delhi (2011)
3. Manual of Weed Control, Joshi NC, Research Publication, Delhi (1974)
4. Modern Weed Management, Gupta OP, Agrobios Publications, India (2011)
5. Principles of Weed Science, Rao VS (2nd Edn.), Oxford & IBH Publishing Co. Pvt. Ltd, New Delhi (2000)
6. Scientific Weed Management, Gupta OP, Today and Tomorrows, New Delhi (2011)
7. Weed Control Handbook Principles, Robert HA (9th Edn.), Blackwell Pub., New Delhi (1990)
8. Weed Management Principles and Practices, Gupta OP, Agrobios Publications, India
9. Weed of The World, King LJ (1st Edn.), Wiley Eastern, Mumbai (1966) Weed Science, Thakur C (2nd Edn.) Metropolitan, New Delhi (1984)

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Bachelor of Science (B. Sc.) Part - II: Botany (Plant Protection)

Semester: IV
Practical Paper II (BBPP 403) Practicals based on
Theory Paper III and IV

Group A based on Paper III

1. Study of attractants and repellents (Any one from each group).
- 2-3. Study of any two insecticides, bactericides and fungicides with reference to chemical nature, mode of action and uses.
4. Technique of collection and preservation of insect pests.
- 5-7. Study of following insect pests with reference to scientific name, life cycle, marks of identification, nature of damage and management in the following: Jowar – Stem borer, Sugarcane – White grub, Gram – Pod borer, Mango – Jassids, Brinjal – Fruit borer, Rose – Thrips
- 8-9. Study of following stored grain pests as per above points: Rice weevil, Pulse beetle.
10. Study of pesticide application equipment: Sprayer and Fogger.
11. Preparation of pesticides for application (Examples).

Group B based on Paper IV

- 12-15. Study of following weeds with reference to gross morphology for identification, reproduction, dispersal and management: **Dicot weeds:** *Argemone Mexicana*, *Parthenium hysterophorus*, *Amaranthus spinosus*, *Alternanthera sessilis*, *Euphorbia* sp., *Celosia argentea*, **Monocot weeds:** *Cyperus rotundus*, *Cynodon dactylon*
16. Study of following weeds with reference to estimation of seeds by seed count method - *Argemonemexicana*, *Celosia argentia* or any locally available weed as per syllabus.

17. Study of mode of dispersal in following weeds: *Parthenium hysterophorus*, *Tridax procumbens*, *Xanthium stromarium*, *Alternanthera* sp., *Achyranthus aspera*, *Cyanodon dactylon*
18. Study of weedicides with reference to properties, mode of action formulation and uses of Glyphosate and Gramoxane
19. Herbarium technique in weed.
20. Visit to agricultural field/ institute.

Learning outcomes:

1. After completion of practicals 1 to 4, students are able to explain techniques of insect pest preservation and storage.
2. After completion of practicals 5 to 9, students are able to describe identification and management of insect and stored grain pests.
3. After completion of practical 10, students are able to describe the equipments used in application of insecticides and pesticides.
4. After completion of practicals 12 to 17, students are able to explain the gross morphology for identification, reproduction, dispersal and management of weeds.
5. After completion of practical 18, students are able to describe weedicides.
6. After completion of practical 19, students are able to explain Herbarium technique for preserving weed collection.

References:

1. Agricultural pests of South East Asia, Atwal and Dhaliwal (4th Edn.), Kalyani Publishers, New Delhi (2003).
2. Manual of Weed Control, Joshi NC, Research Publication, Delhi (1974)
3. Modern Weed Management, Gupta OP, Agrobios Publications, India (2011)
4. Weed Control Handbook Principles, Robert HA (9th Edn.), Blackwell Pub., New Delhi (1990)
5. Weed of The World, King LJ (1st Edn.), Wiley Eastern, Mumbai (1966)
6. Weed Science, Thakur C (2nd Edn.) Metropolitan, New Delhi (1984)
