Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara
(Autonomous)

Syllabus under Autonomy
For

B. Sc. III Botany (Plant Protection)

Academic Year 2020 – 2021

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara
(Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B. Sc.) Part - III: Botany

Semester: V
Theory Paper IX (BBT 501) Genetics and Plant Breeding

Learning Objectives:

1. To impart the basic knowledge of mendelian genetics.
2. To impart the basic knowledge of linkage, recombination and quantitative inheritance.
3. To impart the basic knowledge of variations in chromosome number and structure.
4. To impart the knowledge of crop improvement.

Total Lectures 45

Unit - I: Mendelism and extra chromosomal inheritance [12]

1.1 Introduction

1.2 Principles of inheritance: a) Law of Dominance; b) Law of Segregation; c) Law of Independent Assortment; d) Back Cross and Test Cross

1.3 Gene interaction: a) Complementary gene interaction b) Supplementary gene interaction

1.4 Epistasis: Introduction, Dominant Epistasis, Recessive Epistasis

1.5 Extra-chromosomal Inheritance: Introduction, Plastid Inheritance and Mitochondrial Inheritance (with classical as well as latest examples)

Unit - II: Linkage, Recombination and Quantitative inheritance [11]

2.1 Linkage : Definition, Linkage groups, types, Coupling and Repulsion Phase, significance in plant breeding

2.2 Recombination (Crossing over): Definition, types, mechanism of crossing over, significance in plant breeding

2.3 Quantitative inheritance:

a] Polygene inheritance – Concept, examples
1] Kernel colour in wheat and
2] Ear length in Maize along with latest updates

b] Population genetics – Hardy-Weinberg's Law

Unit - III: Variation in Chromosome Number and Structure [11]

3.1 Chromosome number – Euploidy, Aneuploidy and Polyploidy

3.2 Chromosomal structure – Deletion, Duplication, Inversion and Translocation

3.3 Mutation – Spontaneous and Induced mutation. Types of mutagen – Physical and Chemical, Significance of mutations in plant breeding.

Unit - IV: Plant Breeding [11]

4.1 Introduction, Definition, Aims and objectives

4.2 Methods of Plant Breeding

a] Introduction and Acclimatization

b] Selection – i) Mass Selection; ii) Pure Line Selection; iii) Clonal Selection c] Hybridization techniques in Self- and Cross-pollinated crops

d] Male Sterility and its significance

e] Mutation Breeding – Gamma garden

4.3 Multiple Allelism – Introduction, Definition, Self-incompatibility in plants, significance in plant breeding

Learning Outcomes:

After completion of Unit - I students are able to:

1. Explain genetic basis of inheritance.
2. Explain the extra chromosomal inheritance.

After completion of Unit - II students are able to:

1. Explain the concept of linkage and recombination.
2. Describe the concept of quantitative inheritance.

After completion of Unit - III students are able to:

1. Define concepts regarding chromosome structure and variation.
2. Explain the concept of mutation and its importance in crop improvement.

After completion of Unit - IV students are able to:

1. Understand the concept of plant breeding and its significance.
2. Explain different methods of plant breeding.

References:

1. Cell Biology, Genetics, Evolution and Ecology. Verma, P.S., Agarwal, V.K. S. Chand and Company Ltd., New Delhi (2001)
2. Cytogenetics and Plant Breeding, Singh BD, Cytogenetics and Plant Breeding, Kalyani Publications, New Delhi (2010))
3. Cytogenetics, Gupta PK, Rastogi Publications, Meerut (2018)
4. Genetics, Gupta PK, Rastogi Publications, Meerut (1997)
5. Genetics, Singh BD, Kalyani Publications, New Delhi (2009)
6. Genetics: Principles and Analysis, Hartl DL, Jones EW (4th Edition), Jones & Barlett Publishers, Massachusetts, USA (1998)
7. Plant Breeding: Principles and Methods, Singh BD, Kalyani Publications, New Delhi. (2018)
8. Principles and Procedures of Plant Breeding: Biotechnological and Conventional Approaches, Chahal GS, Gosal SS, Narosa Publishing Co., New Delhi (2010)
9. Principles of Genetics, Gardener J, Simmons HJ, Snustad DP (8th Edn.), John Wiley & Sons, New York (1991)
10. Principles of Plant Breeding, Allard AW, Wiley Publications, (2010)
11. Atext Book of Plant Breeding: Adynamic View Designed for Under Graduate Courses of Indian Universities, Singh BD, (3rd Edn.), Kalyani Publications, New Delhi (2011)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara
(Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B. Sc.) Part - III: Botany

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

Learning Objectives:

1. To impart the knowledge of microbes, different microbial techniques and industrial applications.
2. To impart the basic knowledge of microbial genetics.
3. To impart the knowledge of plant pathology, plant diseases and their management.
4. To impart the knowledge of mushroom cultivation, storage and its economic importance.

Total Lectures 45

Unit - I: Microbiology [10]

1.1 General characters of microbes: Bacteria, Viruses, Actinomycetes and Phytoplasma

1.2 Methods in Microbiology: Staining for microbes-bacteria and, PPLO, Sterilization Methods, Pure Culture Techniques

1.3 Industrial Microbiology: Applications of micro-organisms with reference to production of Antibiotics (Penicillin), Organic Acids (Lactic Acid), Alcohol (Ethyl Alcohol), Microbial Pesticides- Concept, Types and Significance

Unit - II: Microbial Genetics [10]

2.1 Bacterial genome

2.2 Recombination in Bacteria - Transformation and Transduction

2.3 DNA and RNA viruses

2.4 Importance of microbial genetics

Unit - III: Plant Pathology [15]

3.1 Concept and Importance of Plant Pathology, General symptoms of plant diseases

3.2 Transmission of Pathogen- Air, Seed, Soil and Water.

3.3 Methods of plant disease management: Physical, Mechanical, Chemical and Biological.
3.4 Role of quarantine in plant disease management.
3.5 Study of Plant Diseases w. r. t. pathogen, symptoms and management
i] Grassy Shoot of Sugarcane (Phytoplasma),
i] Citrus Canker (Bacterial),
iii] Yellow Vein Mosaic of Bhendi (Viral),
iv] White Rust of Crucifers (Fungal)
v] Early leaf spot (Tikka) disease of ground nut (Fungal)

Unit - IV: Mushroom cultivation technique [10]

4.1 Introduction, History, General life cycle of mushrooms, Economic importance of mushrooms. Types of Mushrooms: Non-edible (Poisonous) mushrooms and Edible (Non-poisonous) - Button, Oyster, Shiitake and Black ear mushrooms.
4.2. Cultivation Technology: Preparationofspawn, Sterilization and preparation ofmushroom bed, Spawning, Factors affecting quality of mushroom beds, Harvesting of mushrooms.
4.3 Storage: Short Term (Refrigeration), Long Term Storage (Canning, Pickles, Papads) and Drying in Salt Solutions
4.4 Nutritional Value: Proteins, Carbohydrates, Mineral Elements, Vitamins, Crude Fibre Content of Mushrooms. Medicinal value of Mushrooms.

Learning Outcomes:

After completion of unit I students are able to:

1. Understands knowledge about microbes and different Microbial techniques.
2. Understand the different application of microbes in industries.

After completion of unit II students are able to:

1. Understands the knowledge about microbial genetics.
2. Explain the application of microbial genetics.

After completion of unit III students are able to:

1. Understands knowledge about plant pathology and plant diseases.
2. Describe the management practices of different plant diseases.

After completion of unit IV students are able to:

1. Understands knowledge about mushroom cultivation, storage and its economic importance.
2. Develop a pilot plant for mushroom cultivation.

References:

1. An Introduction to Recombinant DNA Techniques: Basic Experiments in Gene Manipulation, Hackett, PB, Fuchs JA and Messing JW, The Benjamin /Cummings Publishing Co., Inc., Menlo Park, California (1988)
2. Cultivation Technology and Technical standards of components of Integrated Button Mushroom Unit, Protected Production under NHB Scheme, Anonymous, National Horticulture Board (2011)
3. Diseases of Crop Plants in India, Rangswamy G and Mahadevan A (1999)
4. Economics of mushroom cultivation, Anonymous, National Centre for Mushroom Research and Training, Solan, India (1991)
5. Growing Wild Mushrooms: A Complete Guide to Cultivating Edible and Hallucinogenic Mushrooms. Harris, Bob. Homestead Book Company. Revised edition.
6. Introduction to plant Viruses, Mandahar CL, S. Chand and Company Ltd., New Delhi (1998)
7. Introduction to the Bacteria, Clifton, McGraw Hill Co., New York, (1958)
8. Laboratory Manual in Microbiology, Gunasekaran P, New Age International Pvt., Ltd., (1995)
9. Microbiology, Peicar and Reid,
10. Mushroom Cultivation in India, Suman BC and Sharma VP (2007)
11. Mushroom cultivation the past and the present of oyster mushroom, Kerteszetes Szoleszet. Balazs, S (1985)
12. Plant Pathology, Agrios GN, Academic Press, London, (1997)
13. Plant Protection, Mehta PR and Verma,
14. Principles of Gene Manipulation, Old RW and Primrose SB, Blackwell Scientific Publications, Oxford, UK (1989)
15. Theory and Practice in Experimental Bacteriology, Meynell E and Meynell GG, University Press, Cambridge (1970)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: V

Theory 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.

Total lectures 45

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 pathologyin 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
f] Systemic Fungicides – Bavistin and Vitavax

Learning outcomes:

After completion of Unit - I students are able to:

1. Describe Plant Pathology and contribution of Plant Pathologists.
2. Describe contribution of Research Institutes in India.

After completion of Unit - II students are able to:

1. Explain plant pathogens.
2. Explain important symptoms of plant diseases.

After completion of Unit - III students are able to:

1. Describe methods used in disease management.
2. Explain biological control of plant diseases.

After completion of Unit - IV students are able:

1. Describe formulation, methods of application, mode of action and uses of fungicides.
2. Explain various methods of management of plant diseases.

References:

1. Cytogenetics and Plant Breeding, Chandrashekharan SN and Parthsarthy SV, P Varadachary and Co., Madras (1965)
2. Diseases of Crop Plants in India, Rangaswami G, Prentice-Hall Pub., New Delhi (1975)
3. Diseases of Field Crop, Diskson JC, McGraw-Hill, New Delhi (1964)
4. Diseases of Fruit Crops, Pathak VN, Oxford and IBH, New Delhi (1980)
5. Diseases of Millets, Ramakrishnan TS, ICAR, New Delhi (1974)
6. Dynamics of Plant Diseases, Nagarajan S and Mualidharan K, Allied Publishers, New Delhi (1995)
7. Experiments in Microbiology and Plant Pathology and Biotechnology, Aneja KR, New Age Intenational (P) Ltd. Publishers, New Delhi (2005)
8. Fundamental Plant Pathology, Roberts DA and Bothroyd CW, Freeman & Co. (1995)
9. Plant Diseases and Epidemiology, Nagarajan S, Oxford and IBH, New Delhi (1999)
10. Plant Pathology– Principles and Practices, Jones DG, Opren University Press, Stratford (1987)
11. Plant Pathology, Agrios GN (4th Edn.), Academic press, San Diego (1997)
12. Plant Pathology, Mehrotra RS and Aggarwal A, Tata McGrew-Hill Publishing Co. Ltd., New Delhi (2005)
13. Plant Pathology, Mehrotra RS, Tata McGrew-Hill publishing Co. Ltd., New Delhi (1980)
14. Plant Protection Techniques, Chatterjee PB, Bharti Bhawan, Patana (1997)
15. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi
16. Text Book of Modern Pathology, Bilgrami KS and Dube HC, Vikas Publishing House Pvt. Ltd., New Delhi (1990)
17. Textbook of Plant Pathology, Baruah HK, Brain P and Baruah A, Oxford and IBH Publ. Co., New Delhi (1984)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B. Sc.) Part - III: Botany (Plant Protection)

Semester: V
Theory 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.

Total lectures 45

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. Polyphagus 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.

1. Botanicals – a) Pyrethrum; b) Rotenone
2. Synthetic pyrethroids – Permethrin, Cypermethine, Fenvalrate
   Pesticide formulations: solid, liquid and gaseous Limitations of chemical control.

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:

After completion of Unit - I students are able to:

1. Explain various plant insect pests.
2. Describe the damage caused plant insect pests and their life cycle.

After completion of Unit - II students are able to:

1. Explain various eco-friendly methods of management of pests.
2. Describe biological control methods.

After completion of Unit - III students are able to:

1. Explain biotechnological approaches for management of pests.
2. Describe various insecticides in management of crop pests.

After completion of Unit - IV students are able to:

1. Explain toxicological symptoms of pesticides during application in fields.
2. Describe the legislations for pesticides in India.

References:

1. A Textbook of Applied Entomology, Shrivastava VP, Kalyani Publ., New Delhi (1988)
2. Agricultural Pest of India and South East Asia, Atwal AS, Kalyani Publishers, New Delhi (1936)
3. Applied Agricultural Entomology, Jha LK, New Central Book Agency, Culcutta (1987)
4. Destructive and Useful Insects, Metcalf CL and Flint WP, Tata McGrew-Hill publishing Co. Ltd., New Delhi (1983)
5. Entomology and Pest Management, Pedigo LP, Prentice-Hall Pub. Englewood Clifts NJ (1996)
6. Plant Pathology, Agrios GN (4^{th} Edn.), Academic Press, San Diego (1997)
7. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
8. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987)
9. Trends in Agricultural Pest Management, Dhaliwal GS and Arora R, Commonwealth Publishers, New Delhi (1994)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B.Sc.) Part - III: Botany (Plant Protection)

Semester: V
Theory 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.

Total lectures 45

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. Polyphagus 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 – sstudy 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) Pyrethrumb) 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:

After completion of Unit - I students are able to:

1. Explain various plant insect pests and stored grain pests.
2. Describe the damage caused plant insect pests and their life cycle.

After completion of Unit - II students are able to:

1. Explain various eco-friendly methods of management of pests.
2. Describe biological control methods.

After completion of Unit - III students are able to:

1. Explain biotechnological approaches for management of pests.
2. Describe various insecticides in management of crop pests.

After completion of Unit - IV students are able to:

1. Describe the concept of beekeeping.
2. Explain beekeeping status in India and importance of beekeeping.

References Book:

1. ATextbook ofApplied Entomology, Shrivastava VP, Kalyani Publ., New Delhi (1988)
2. Agricultural Pest of India and South East Asia, Atwal AS, Kalyani Publishers, New Delhi (1936)
3. Applied Agricultural Entomology, Jha LK, New Central Book Agency, Culcutta (1987)
4. Destructive and Useful Insects, Metcalf CL and Flint WP, Tata McGrew-Hill publishing Co. Ltd., New Delhi (1983)
5. Entomology and Pest Management, Pedigo LP, Prentice-Hall Pub. Englewood Clifts NJ (1996)
6. Plant Pathology, Agrios GN (4th Edn.), Academic Press, San Diego (1997)
7. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
8. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987)
9. Trends in Agricultural Pest Management, Dhaliwal GS and Arora R, Commonwealth Publishers, New Delhi (1994)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: V

Theory paper VI (BBPT 504) Plant Insect Pests, their Management and Economically Beneficial Insects

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.

Total lectures 45

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. Polyphagus 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: 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.

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.

Learning outcomes:

After completion of Unit - I students are able to:

1. Describe various plant insect pests and stored grain pests.
2. Explain the damage caused plant insect pests and their life cycle.

After completion of Unit - II students are able to:

1. Explain various eco-friendly methods of management of pests.
2. Describe biological control methods.

After completion of Unit - III students are able to:

1. Explain biotechnological approaches for management of pests.
2. Describe various insecticides in management of crop pests.

After completion of Unit - IV students are able to:

1. Explain the concept of beekeeping.
2. Describe the concept of sericulture.

References Book:

1. ATextbook of Applied Entomology, Shrivastava VP, Kalyani Publ., New Delhi (1988)
2. Agricultural Pest of India and South East Asia, Atwal AS, Kalyani Publishers, New Delhi (1936)
3. Applied Agricultural Entomology, Jha LK, New Central Book Agency, Culcutta (1987)
4. Destructive and Useful Insects, Metcalf CL and Flint WP, Tata McGrew-Hill publishing Co. Ltd., New Delhi (1983)
5. Entomology and Pest Management, Pedigo LP, Prentice-Hall Pub. Englewood Clifts NJ (1996)
6. Plant Pathology, Agrios GN (4^{th} Edn.), Academic Press, San Diego (1997)
7. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
8. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987)
9. Trends in Agricultural Pest Management, Dhaliwal GS and Arora R, Commonwealth Publishers, New Delhi (1994)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: V

Practical Paper – III (BBPP 505)

Practicals 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 Sissum

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
   f] 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
   a] Brown plant hopper of rice
   b] Army worm of jowar
   c] Blister beetle of pigeon pea d]
   Pod borer of green pea
   e] Fruit borer of bhendi
   f] Cabbage caterpillar
   g] Leaf miner of groundnut
   h] White grub of groundnut
   i] Mealy bugs of custard apple
   j] White flies of guava
   k] Stored grain pests: Indian mealworm, Saw toothed beetle
1] Polyphagus 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
   a] Botanicals – Pyrethrum, Rotenone
   b] Synthetic pyrethroids – Cypermethine, Fenvalrate c]
   Chlorinated hydrocarbons: Toxaphene, Chlordane
   d] Organo phosphorus compounds: Monocrotophos, Phorate
   e] Carbamets: Carbaryl, Carbofuran
   f] Nematicides: Methyl bromide, DD mixture
   g] 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 a]
Botanicals –Pyrethrum, Rotenone
b] Synthetic pyrethroids – Cypermethine, Fenvalrate 3: Chlorinated hydrocarbons: Toxaphene, Chlordane
c] Organo phosphorus compounds: Monocrotophos, Phorate d]
Carbamets: Carbaryl, Carbofuran
e] Nematicides: Methyl bromide, DD mixture
f] 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
a] Botanicals – Pyrethrum, Rotenone
b] Synthetic pyrethroids – Cypermethine, Fenvalrate 3: Chlorinated hydrocarbons: Toxaphene, Chlordane
c] Organo phosphorus compounds: Monocrotophos, Phorate
d] Carbamets: Carbaryl, Carbofuran
e] Nematicides: Methyl bromide, DD mixture
f] 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] Study of life cycle of silkworm.
9] Study of species of silkworm.
10] Study of cultivation of morus alba.
11] Visit to apiculture / sericulture centre & submission of report.

Learning outcomes:

1. After completion of practicals based on BBPT 501 students are able to explain plant diseases w.r.t. symptoms, pathogen and management and can describe management of plant diseases by fungicides
2. After completion of practicals based on BBPT 502 students are able to explain various plant insect pests and damage caused by them and can describe various insecticides for management of pests
3. After completion of practicals based on BBPT 503 students are able to explain various plant insect pests, damage caused by them and various insecticides for management of pests and also can explain honey yielding plants and apiculture
4. After completion of practicals based on BBPT 504 students are able to explain various plant insect pests, damage caused by them and various insecticides for management of pests and also can explain honey yielding plants and apiculture

References for Practical based on BBPT 501, 502, 503 & 504:

1. Agricultural Pest of India and South East Asia, Atwal AS, Kalyani Publishers, New Delhi (1936)
2. Experiments in Microbiology and Plant Pathology and Biotechnology, Aneja KR, New Age International (P) Ltd. Publishers, New Delhi0 (2005)
3. Laboratory Exercise in Microbiology, Pelezr MJ and Chan ECS, McGraw Hill Book. Co., New Delhi (1972)
4. Laboratory Exercises in Microbiology, Wistreich GA and Lechtman MD, Flencoe Press New York (1973)
5. Laboratory Manual in Microbiology, Gunasekaran P, New Age International Pvt. Ltd., New Delhi (1995)
6. Morphology of Plant and Fungi, Bold HC, Alexopoulos GJ and Delevoryas T (4th Edn.) Harper and Foul Co., New York (1980)
7. Plant Pathogenic Bacteria: Laboratory Guide for Identification of Plant Pathogenic Bacteria, Schaad NW, Academic Press (1988)
8. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
9. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987)
10. Techniques with Bacteria – A Guidebook for Teachers. Pawsey RK, Hutchinson Educational, (1974)
11. Theory and Practice in Experimental Bacteriology, Meynell E and Meynell GG, University Press, Cambridge (1970)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara

(Autonomous)

Syllabus introduced from June 2020

Bachelor of Science (B. Sc.) Part - III: Botany

Semester: VI

Theory Paper XIII (BBT 601) Plant Biochemistry and Molecular Biology

Learning objectives:

1. To impart the basic knowledge of carbohydrates.
2. To impart the basic knowledge of lipids.
3. To impart the basic knowledge of proteins.
4. To impart the knowledge of Molecular biology.

Total lecture 45

Unit - I: Carbohydrates [11]

1.1 Introduction, broad classification and properties of carbohydrates.

1.2 Isomerism: definition, types of isomers: epimers, anomers and enantiomers with suitable examples.

1.3 Structure of monosaccharaides (pentose and hexose), oligosaccharides (sucrose and lactose), and polysaccharides (starch and cellulose)

1.4 Functions of carbohydrates in biological system

Unit - II: Lipids [12]

2.1 Introduction and Classification of Lipids

2.2 Structure and properties of saturated fatty acids (Stearic and Palmitic acid) and unsaturated fatty acids (Oleic acid, Linoleic and Linolenic acids)

2.3 Beta Oxidation: Gluconeogenesis and its role in mobilization of fatty acids during seed germination

2.4 Significance of Lipids in plants.

Unit - III: Proteins **[11]**

3.1 Introduction, structure**,** properties and classification of amino acids

3.2 Brief outline of biosynthesis of amino acids - proline

3.3 General structure, classification of proteins

3.4 Protein biosynthesis in eukaryotes

3.5 Significance of proteins in plants.

Unit - IV: Nucleic Acids **[11]**

4.1 Composition and structure of nucleotides

4.2 DNA as carrier of genetic information (early experiments)

4.3 DNA: Watson and Crick Model, forms of DNA (A, B and Z)

4.4 DNA replication in eukaryotes

4.5 RNA: types, structure and role of RNA

4.6 Regulation of gene expression- Lac Operon, Tryptophan Operon

Learning outcomes:

After completion of unit - I students are able to:

1. Explain concepts of plant biochemistry.
2. Explain the carbohydrates, classification and their significance.

After completion of unit - II students are able to:

3. Define concepts regarding molecular biology
4. Explain the lipids synthesis, oxidation and biological significance.

After completion of unit - III students are able to:

5. Define concepts regarding structure**,** properties and classification of amino acids.
6. Explain the general classification of protein and their synthesis.

After completion of unit - IV students are able to:

7. Explain the concepts of nucleic acids and their types.
8. Write answers and brief notes about plant biochemistry and molecular biology.

References

1. Biochemistry Simplified Textbook of Biochemistry for Medical Students, Manjeshwar PR, Paras Medical Publishers
2. Biochemistry, Voet D, Wiley Science Ltd. (1995)
3. Cell Biology, Genetics, Molecular Biology, Evolution and Ecology, Verma PS and Agarwal VK, S. Chand & Company Ltd., New Delhi (2004)
4. Cell Biology, Lewis J, Sarup and Sons, New Delhi (2004)
5. Cell Biology, Powar CB, Himalaya Publishing House, New Delhi (1992)
6. Elements of Molecular Biology, Mitra S, McMillan India Ltd., New Delhi
7. Essentials of Biochemistry, Ahmad M, Merit Publisher Multan Ltd.
8. Fundamentals of Biochemistry, Jain JL, Jain S and Jain N, S. Chand & Company Ltd., New Delhi
9. Molecular Biology of Cell, Alberts B, et al., (6^{th} Edn.), Garland Science, Taylor (2014)
10. Principles of Biochemistry, Lehninger AL (4^{th} Edn.), WH Freeman Ltd. (2004)
11. The Cell: Molecular Approach, Cooper GM and Housemen RE (7^{th} Edn.), (2015)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara
(Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B. Sc.) Part - III: Botany

Semester: VI
Theory paper XIV (BBT 602) Bioinformatics, Biostatistics and Economic Botany

Learning objectives:

1. The students should be able to explain different bioinformatics databases and tools.
2. The students should be able to use the bioinformatics tools in biological research.
3. The students should be able to understand and use biostatistics concepts in their academics and research.
4. The students should be able to understand the economic aspects of plants and their use in day to day life.

Total lectures 45

Unit - 1: Bioinformatics [14]

1.1 Introduction, Aim, Scope and Branches of Bioinformatics

1.2 Biological Databases: Classification Formatand Retrievalsystem of Biological Database, National Center for Biotechnological Information (NCBI), Basic Local Alignment Search Tool (BLAST)

1.3 Protein Information Resource (PIR) - Concept, Resources, Databases and Data Retrieval

1.4 Genome Information Resources (GIR) – Concept, Resources, Databases

1.5 Applications of Bioinformatics- BLAST, Molecular Phylogeny (Concept, Methods, Analysis and Consistency, use of MEGA 6 software)

Unit - II: Biostatistics [11]

2.1. Introduction, definition,terminology.

2.2. Collection and presentation of data- Types of data, techniques of data collection- Census method, sampling method- simple random, stratified and systematic sampling. Classification, tabulation, graphical representation- Histogram and polygon.

2.3. Measures of central tendency and Dispersion- Arithmetic mean, Mode, Median, Range, Deviation, Mean deviation, Standard Deviation, Coefficient of Variation.

2.4. Statistical methods for testing the hypothesis- i) Students' T-test; ii) Chi-square test.

Unit - III: Economic Botany: Cereals, Legumes and Oils [10]

3.1 Origin of Cultivated Plants - Concept of centres of origin, their importance with reference to Vavilov's work.

3.2 Cereals: Origin, Botanical Name, Morphology, Sources and Economic importance of Jowar and Wheat.

3.3 Legumes: Origin, Botanical Name, Morphology, Sources and Economic importance of Gram and Pigeon Pea.

3.4 Oils and Fats: Origin, Botanical Name, Morphology, Parts used and uses of Ground nut and soybean.

Unit - IV: Economic Botany: Spices, Beverages and Fibers [10]

4.1 Spices and Condiments - Origin, Botanical Name, Morphology, Parts used and uses of Ginger and Chilly

4.2 Beverages – Origin, Botanical Name, Morphology, Parts used and uses of Tea and coffee.

4.3 Fibre yielding Plants - Origin, Botanical Name, Morphology, Parts used and uses of Cotton and *Agave*.

Learning outcomes:

After completion of unit - I students are able to:

1. Know the basics of bioinformatics tools and databases.
2. Use of different bioinformatics databases and tools in biological research.

After completion of unit - II students are able to:

1. Know the basics of Biostatistics.
2. Do data collection, analysis and use of different statistical programmes in their research work.

After completion of unit - III students are able to:

1. Explain the centers of origin of crop plants.
2. After completion of unit III students are able to explain the different classes of economically important crop plants.

After completion of unit - IV students are able to:

1. Describe the significance of economically important crops with their representative examples.
2. Learn the scope of economic uses of the plants.

References:

1. ATextbook of Economic Botany, SambamurthyAVSS and Subramanyam NS, Wiley Eastern Ltd., New Delhi (1989)
2. Economic Botany - Plants in Our World, Simpson BB and Conner-Ogorzaly M, McGraw Hill, New York (1986)
3. Economic Botany in Tropics, Kocchar SL, (2nd Edn.), Mac Millan India Ltd., New Delhi (1998)
4. Genetics, Gupta PK, Rastogi Publications, Meerut (1997)
5. Hill's Economic Botany, Sharma OP, Tata McGraw Hill Publishing Company Ltd., New Delhi (1996)
6. Introduction to Bioinformatics, Attwood TK, Perry-Smith DJ, and Phukan S, Pearson Education (2008)
7. Introduction to Bioinformatics, Sundara Rajan S and Balaji R, Himalaya Publishing House, New Delhi
8. Statistical Methods for Biologists, Deshmukh SD, Vision Publications (2008)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: VI

Theory 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.

Total lectures 45

Unit - I: Plant Protection Techniques [11]

Importance of plant protection, various equipment's used in Plant protection. Seed treatment: Concept, objectives and importance, Traditional and modern methods, seed dressing equipments: simple seed dresser.

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.

1. Pneumatic air pump – e.g. Hand pump

2. Power operated – e.g. Mist blower
3. Hydraulic energy pump – e.g. Peddle pump.
4. Types of nozzles – Hydraulic energy, kinetic energy, gaseous energy and centrifugal energy.
5. 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:

After completion of Unit - I students are able to:

1. Explain various Plant Protection techniques w.r.t. Seed and Soil treatment.
2. Describe various instruments used in plant protection.

After completion of Unit - II students are able to:

1. Explain care and maintenance of Plant Protection equipments.
2. Describe working of Plant Protection equipments.

After completion of Unit - III students are able to:

1. Explain concept of Plant clinic and Plant Protection Museum.
2. Explain the concepts of IPM & IDM.

After completion of Unit - IV students are able to:

1. Describe plant breeding techniques to improve plant resistance.
2. Describe the concept of gamma garden.

References:

1. Biotechnology and Integrated Pest Management, Persley GJ, CAB International, UK (1996)
2. Experimental and Conceptual Plant Pathology, Singh RS, Singh US, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi
3. Experiments in Microbiology and Plant Pathology and Biotechnology, Aneja KR, New Age International (P) Ltd. Publishers, New Delhi0 (2005)
4. Molecular Biology, SambamurtyAV, Narosa SS Publishing House, New Delhi (2008)
5. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
6. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987) Dictionary of Remote Sensing. Rashid S. N. and M. M. A. Khan: Manak Publication Pvt. Ltd., New Delhi.
7. Text book of Modern pathology, Bilgrami KS and Dube HC, Vikas Publishing House Pvt. Ltd., New Delhi (1990)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: VI

Theory 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.

Total lectures 45

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.

Unit-III: Pathophysiology, Culture and Staining Techniques

Pathophysiology [10]

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 (GeneticallyModified 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:

After completion of Unit - I students are able to:

1. Explain laboratory techniques in soil microbiology.
2. Describe laboratory techniques in soil pathology.

After completion of Unit - II students are able to:

3. After completion of Unit II students are able to describe laboratory techniques in seed andmarket pathology.
4. After completion of Unit II students are able to explain laboratory techniques in nursery diseases.

After completion of Unit - III students are able to:

5. Describe laboratory techniques in pathophysiology of pathogens.
6. Explain laboratory techniques in culture and staining of pathogens.

After completion of Unit - IV students are able to:

7. Explain use of recent techniques in plant protection.
8. Describe use of remote sensing and disease forecasting using computers.

References Book:

1. An Introduction to Fungi, Dube HC, Vikas Publishing House Pvt. Ltd., Delhi (1990)
2. Cytogenetics and Plant Breeding, Chandrashekharan SN and Parthsarthy SV, P Varadachary and Co., Madras (1965)
3. Dictionary of Remote Sensing, Rashid SN and Khan MMA, Manak Publication Pvt. Ltd., New Delhi.
4. Diseases of Crop Plants in India, Rangswamy G and Mahadevan A, Prentice Hall India Pvt. Ltd., New Delhi (1999)
5. Experimental and Conceptual Plant Pathology, Singh RS, Singh US, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi
6. Integrated Pest and Disease Management in Greenhouse Crops, Albajes R, Gullino ML, van Lenteren JC and Elad Y, Kluwer Academic Publishers (2000)
7. Introduction to Plant Viruses, Mandahar CL, S. Chand & Ltd., New Delhi (1998)
8. Introduction to the Bacteria, Clifton A, McGraw Hill Co., New York (1958)
9. Molecular Biology, SambamurtyAV, Narosa SS Publishing House, New Delhi (2008)
10. Morphology of Plant and Fungi, Bold HC, Alexopoulos GJ and Delevoryas T (4^{th} Edn.) Harper and Foul Co., New York (1980)
11. Plant Pathology, Agrios GN (4^{th} Edn.), Academic Press, San Diego (1997)
12. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
13. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987) Dictionary of Remote Sensing. Rashid S. N. and M. M. A. Khan: Manak Publication Pvt. Ltd., New Delhi.
14. Text Book of Modern Pathology, Bilgrami KS and Dube HC, Vikas Publishing House Pvt. Ltd., New Delhi (1990)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)
Syllabus introduced from June 2020
Bachelor of Science (B. Sc.) Part - III: Botany (Plant Protection)

Semester: VI
Theory Paper VIII (BBPT 603) Laboratory
Techniques in Plant Protection and Horticulture

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 post-harvest technology.
4. To impart the knowledge about greenhouse technology.

Total lectures 45

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, Buried 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.

Unit - III: Post harvest technology of fruits and vegetables [11]

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: Greenhouse technology [12]

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

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:

After completion of Unit - I students are able to:

1. Describe laboratory techniques in soil microbiology.
2. Explain laboratory techniques in soil pathology.

After completion of Unit - II students are able to:

1. Explain laboratory techniques in seed and market pathology.
2. Describe laboratory techniques in nursery diseases.

After completion of Unit - III students are able to:

1. Explain post-harvest technology of fruits.
2. Describe post-harvest technology of vegetables.

After completion of Unit - IV students are able to:

1. Explain basic concept of greenhouse technology.
2. Explain cultivation practices of economically important cut flowers and vegetables under greenhouse.

References:

1. An Introduction to Fungi, Dube HC, Vikas Publishing House Pvt. Ltd., Delhi (1990)
2. Cytogenetics and Plant Breeding, Chandrashekharan SN and Parthsarthy SV, P Varadachary and Co., Madras (1965)
3. Dictionary of Remote Sensing, Rashid SN and Khan MMA, Manak Publication Pvt. Ltd., New Delhi.
4. Diseases of Crop Plants in India, Rangswamy G and Mahadevan A, Prentice Hall India Pvt. Ltd., New Delhi (1999)
5. Experimental and Conceptual Plant Pathology, Singh RS, Singh US, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi
6. Integrated Pest and Disease Management in Greenhouse Crops, Albajes R, Gullino ML, van Lenteren JC and Elad Y, Kluwer Academic Publishers (2000)
7. Introduction to Plant Viruses, Mandahar CL, S. Chand & Ltd., New Delhi (1998)
8. Introduction to the Bacteria, Clifton A, McGraw Hill Co., New York (1958)
9. Molecular Biology, SambamurtyAV, Narosa SS Publishing House, New Delhi (2008)
10. Morphology of Plant and Fungi, Bold HC, Alexopoulos GJ and Delevoryas T (4^{th} Edn.) Harper and Foul Co., New York (1980)
11. Plant Pathology, Agrios GN (4^{th} Edn.), Academic Press, San Diego (1997)
12. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
13. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987) Dictionary of Remote Sensing. Rashid S. N. and M. M. A. Khan: Manak Publication Pvt. Ltd., New Delhi.
14. Text Book of Modern Pathology, Bilgrami KS and Dube HC, Vikas Publishing House Pvt. Ltd., New Delhi (1990)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: VI

Theory 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 the concept of agricultural journalism.
4. To impart the knowledge about recent advances in agricultural marketing.

Total lectures 45

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, Buried 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.

Unit - III: Agricultural Journalism [11]

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 newspapers and magazines

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

Unit - IV: Agricultural Marketing [12]

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:

After completion of Unit - I students are able to:

1. Explain laboratory techniques in soil microbiology.
2. Explain laboratory techniques in soil pathology.

After completion of Unit - II students are able to:

1. Describe laboratory techniques in seed and market pathology.
2. Describe laboratory techniques in nursery diseases.

After completion of Unit - III students are able to:

1. Explain concept of agricultural journalism.
2. Explain editorial mechanics in agricultural journalism.

After completion of Unit - IV students are able to:

1. Explain concepts of agricultural marketing.
2. Describe scientific marketing of farm products.

References:

1. An Introduction to Fungi, Dube HC, Vikas Publishing House Pvt. Ltd., Delhi (1990)
2. Cytogenetics and Plant Breeding, Chandrashekharan SN and Parthsarthy SV, P Varadachary and Co., Madras (1965)
3. Dictionary of Remote Sensing, Rashid SN and Khan MMA, Manak Publication Pvt. Ltd., New Delhi.
4. Diseases of Crop Plants in India, Rangswamy G and Mahadevan A, Prentice Hall India Pvt. Ltd., New Delhi (1999)
5. Experimental and Conceptual Plant Pathology, Singh RS, Singh US, Oxford and IBH publishing Co. Pvt. Ltd., New Delhi
6. Integrated Pest and Disease Management in Greenhouse Crops, Albajes R, Gullino ML, van Lenteren JC and Elad Y, Kluwer Academic Publishers (2000)
7. Introduction to Plant Viruses, Mandahar CL, S. Chand & Ltd., New Delhi (1998)
8. Introduction to the Bacteria, Clifton A, McGraw Hill Co., New York (1958)
9. Molecular Biology, SambamurtyAV, Narosa SS Publishing House, New Delhi (2008)
10. Morphology of Plant and Fungi, Bold HC, Alexopoulos GJ and Delevoryas T (4^{th} Edn.) Harper and Foul Co., New York (1980)
11. Plant Pathology, Agrios GN (4^{th} Edn.), Academic Press, San Diego (1997)
12. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
13. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987) Dictionary of Remote Sensing. Rashid S. N. and M. M. A. Khan: Manak Publication Pvt. Ltd., New Delhi.
14. Text Book of Modern Pathology, Bilgrami KS and Dube HC, Vikas Publishing House Pvt. Ltd., New Delhi (1990)

******

Rayat Shikshan Sanstha's

Yashavantrao Chavan Institute of Science, Satara (Autonomous)

Syllabus introduced from June 2020

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

Semester: VI

Practical Paper – IV (BBPP 605) Practical 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 the knowledge of different instruments and equipments used in plant protection practices.
4. 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 (At least 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 diseases leaves of crop plants (2-3 different diseases).
9. Estimation of polyphenols composition of healthy and diseases 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 (min6-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. After completion of Practicals based on BBPT 601 students are able to describe laboratory techniques in pathophysiology (Paper chromatography technique and estimation of pigments by colorimeter) and can handle different instruments and equipments used in plant protection.
2. After completion of Practicals based on BBPT 602 students are able to describe fungal soil pathogens, fruit and vegetable diseases, and can explain effect of pathogen on crop plany physiology

3. After completion of Practicals based on BBPT 603 students are able to describe fungal soil pathogens, fruit and vegetable diseases, and can explain basic techniques of cultivation in green house
4. After completion of Practicals based on BBPT 604 students are able to describe fungal soil pathogens, and can explain recent advances in agricultural marketing

References:

1. Agricultural Pest of India and South East Asia, Atwal AS, Kalyani Publishers, New Delhi (1936)
2. Experiments in Microbiology and Plant Pathology and Biotechnology, Aneja KR, New Age International (P) Ltd. Publishers, New Delhi0 (2005)
3. Laboratory Exercise in Microbiology, Pelezr MJ and Chan ECS, McGraw Hill Book. Co., New Delhi (1972)
4. Laboratory Exercises in Microbiology, Wistreich GA and Lechtman MD, Flencoe Press New York (1973)
5. Laboratory Manual in Microbiology, Gunasekaran P, New Age International Pvt. Ltd., New Delhi (1995)
6. Morphology of Plant and Fungi, Bold HC, Alexopoulos GJ and Delevoryas T (4^{th} Edn.) Harper and Foul Co., New York (1980)
7. Plant Pathogenic Bacteria: Laboratory Guide for Identification of Plant Pathogenic Bacteria, Schaad NW, Academic Press (1988)
8. Plant Protection Techniques, Chatterjee PB, Bharati Bhawan Publishers and Distributors, Patna (1997)
9. Principles and Procedures of Plant Protection, Chattopadhya SP, Oxford and IBH, New Delhi (1987)
10. Techniques with Bacteria – A Guidebook for Teachers. Pawsey RK, Hutchinson Educational, (1974)
11. Theory and Practice in Experimental Bacteriology, Meynell E and Meynell GG, University Press, Cambridge (1970)

******