SOLAPUR UNIVERSITY, SOLAPUR

AGROCHEMICALS AND PEST MANEGEMENT

M.Sc. Part-II (SEMESTER III & IV)

Choice Based Credit System Syllabus

(To be implemented from June, 2017-18)

SOLAPUR UNIVERSITY, SOLAPUR

M.Sc. Part-II SEMESTER III

Agrochemicals and pest Management

Choice Based Credit System Syllabus

w.e.f. June 2017-18

Semester	Code	Title of the Paper	Semester exam			L	T	P	Credits
Third		Hard Core	Theory	IA	Total				
AGPM	HCT3.1	Pesticide Residues and Toxicology	70	30	100	4		-	4
	HCT3.2	Advances in Pest Control-I	70	30	100	4		-	4
		Soft core (Any one)							
	SCT3.1	Pests of Crop Plants-I	70	30	100	4		-	4
	SCT3.2	Diseases of Crop Plants-I	70	30	100	4		-	
	SCT3.3	Plant Protection -I							
		Open elective (Any one)							
	OET3.1	Analysis of Agrochemicals	70	30	100	4		-	4
	OET3.2	Biotechnological Aspects in Plant Protection-II	70	30	100	4		-	
		Tutorial			25		1	-	1
		Practical							
	HCP3.1	Chemistry-V	35	15	50	-	-	2	2
	HCP3.2	Life Science-V	35	15	50	-	-	2	2
	SCP3.1	Chemistry-VI	35	15	50	-	-	2	2
		Open elective (Any one))							
	OEP3.1	Life Science-VI	35	15	50	-	-	2	2
	OEP3.2	Biotechnology-I	35	15	50	-	-	2	
		Total for third semester	420	180	625				25

SOLAPUR UNIVERSITY, SOLAPUR

M.Sc. Part-II SEMESTER IV

Agrochemicals and pest Management

Choice Based Credit System Syllabus

W.e.f. June 2017-18

Semester	Code	Title of the Paper	Semester exam			L	T	P	Credits
Fourth		Hard Core	Theory	IA	Total				
AGPM	HCT4.1	Agro-Based Marketing Management	70	30	100	4		-	4
	HCT4.2	Advances in Pest Control-II	70	30	100	4		-	4
	HCT4.3	Manufacture of Agrochemicals	70	30	100	4		-	4
		Soft core (Any one)							
	SCT4.1	Pests of Crop Plants-II	70	30	100	4		-	4
	SCT4.2	Diseases of Crop Plants-II	70	30	100	4		-	
		Tutorial			25		1	-	1
	MP4.1	Major Project	140	60	200	-	-	-	8
		Total for Fourth Semester	420	180	625				25
	Total								100

L= Lecture T= Tutorials P= Practical IA= Internal Assessment

4 Credits of Theory = 4 Hours of teaching per week

2 Credits of Practical = 4 Hours per week

HCT=Hard Core Theory **SCT= Soft Core Theory**

HCP = Hard Core Practical **OET =Open Elective Theory**

OEP =Open Elective Practical **MP= Major Project**

Sem-III

HCT 3.1
PESTICIDE RESIDUES AND TOXICOLOGY

Unit-I: Residues of Agrochemicals : **(15)**

a)Pesticide Residues in the Atmosphere: **(5)**

Pesticides into the atmosphere and their fate , transport of vapors, precipitation,

effect of residues on life, Photochemistry of pesticides.

b) Pesticide residues in water system: **(5)**

Nature and origin of pollution of aquatic systems, point and non point pollution.

Dynamics of pesticides in aquatic environment.

c) Pesticides residues in the soil: (**5)**

Absorption, retention, transport and degradation of pesticides in the soil, effect

on microorganisms and consequent effect on the soil condition, fertility, interaction in the soil, geohydrological aspects.

Unit-II: Penetration and Distribution of pesticide residues and their effects on quality Of human life. . **(15)**

Model ecosystem studies of Bioconcentration, Biomagnifications and Biodegradation.

Effect of pesticides on life in general and consequent effects on human life.

(15)

Unit-III:Toxicology

Concept and Scope of Toxicology-Introduction, General account, Definition of Toxicology,

History Of Toxicology, Enlisting of various disciplines of toxicology,

Detail account of forensic toxicology-Definition of poison, classification of poisons, their symptoms and treatments.

Mode of Action of toxicants-Introduction, Action of toxicants on Enzymes, Carriers,

Coenzymes, Nucleic Acids, Lipids and receptor concept

Mechanism of action of pyrethroids, organochlorine, organophosphate and carbamate insecticides.

Unit-IV: Analysis of pesticide residues and Toxicological Testing Methods: (15)

Analysis of pesticide residues from fruits and vegetables –Protocols for Gas Chromatography (GC) and High Performance Liquid Chromatography(HPLC) Toxicological Testing Methods- Behavioural tests and Functional Tests.

Reference Books: HCT 3.1

1. Chemical analysis of the environment by Ahuja.
2. Environmental chemistry by A. K. De.
3. Chemistry of our environment by Home (JW).
4. Analysis of pesticides residues by H. A. Moye (JW)
5. Advance in pest control research by R. L. Methcalf (JW)
6. Chemistry of pesticides by K. H. Buchel (JW).
7. Progress in pesticides biochemistry and Toxicology V. I, II, III by D. H. Hutson and T. R. Robert.
8. Evaluation of pesticides in ground water by W. Y. Garnett, R. C. Honeycatt and others.
9. Chemistry of pesticides by Edward
10. Insecticide biochemistry and physiology by C.F. Wilkinson.
11. Progress in pesticide Biochemistry and toxicology WI.I, II, III by D.H. Hutson and T.R.Roberts.
12. Comprehensive insect physiology, Biochemistry and pharmacoilogy WI, 12, by G.A.Kerkut and L.I.Gilbert.
13. Modern toxicology WI.I, II, III by P.K. Gyota and D.K. Salunkhe.
14. Toxicology by C.D. Kiassen, M. D. Amdur and J. Doull.
15) Environmental Toxicology and Biotechnology,S.K.Dubey,S.Ghosh
16) Fundamentals Of Toxicology,K.Pandey,J.P.Shukla,S.P.Trivedi

HCT 3.2
ADVANCES IN PEST CONTROL-I

Unit-I: Introduction to Applied Entomology : (15)
Causes for insect assuming pest status, type of damage to plant by insects and their estimation. Methods and principles of pest control, natural and applied .Prophylactic & Curative methods, cultural, mechanical. Physical, legal and biological.

Unit-II:
a)Bioefficacy of some pesticides against major pests: (7)
Evaluation of toxicity of insecticides, Bioassay methods, Insecticide resistance and Resistance management.

b)Host Plant Resistance: (8)
Introduction, Classification of resistance, mechanism of resistance, Evaluation of Antixenosis and anti-biosis, Morphological & Biochemical basis of resistance, Insect biotypes, Breeding for insect resistance, Factors affecting plant resistance

Unit-III: Recent advance in pest control: Green Chemistry in pesticides: (15)
Recent insect attractants, Chemosterilents and Repellents, Mode of action and Applications. Neem in plant protection:- Introduction, Chemical constituents, Bioefficacy of Neem preparations, Management of pest in Agricultural crops, Management of the forest pest, Management of insects and diseases in stored agricultural commodities, side effects of applications,

Unit-IV
a) Plant protection appliances: (5)
Duster, principles of dusting, spraying, Part of typical sprayer, types of sprayer. Types of nozzles and other equipments

b)Controlled release pesticides fertilizers and their formulations **(10)**

Reference Books: HCT 3.2

1.Text Book of applied Entomology Vol. I & II-K.P.Srivastava.

2.Introduction to Insect Pest Management.-Martin & Luckman

3.Textbook of Insets Toxicology.-Matsmura

4.Introduction to Biological Control.-R.Bosch, D.S.Messenger & A.D.Gutierrez.

5. Principles of Insect Pest Management. –G.S.Dhaliwal and R.Arora.

6.Entomology and Pest Management –Larry P.Pedigo.

7.Element of Economic Entomology –B.V.David and T.Kumarswammy.

8.Insect Pest Management –David Dent.

9.Critical issues in Insect Pest Management –G.S.Dhaliwal and E.A.Heinrich.

10.Emerging trends in biology control of phytophagus Ed.T.N.Anatkrishnan.

11.Toxicology of Insecticide-Fumio Matsumura.

12.Biological Pest Suppression –H.C.Coppelend and J.W.Martin.

13.Neem in plant protection: R.T.Gahukar, Agri-Horticultural Pub.Nagpur,2003.

14.Elements Of Entomology- Rajendra Singh

15.Entomology-M.S.Nalina Sundari and R.Santhi

16.Introduction to General and Applied Entomology-V.B. Awasthi

17.A Text Book Of Entomology-R.Mathur

18. A Text Book Of Entomology-B.D. Patnaik

19.Insect Pests Of Stored Grain And Grain Products-R.T.Cotton,

20.Our Household Insects-E.A.Butler

21.Agricultural Insect Pests Of Crops and Their Control-V.P.S.Panwar

22.Insects and Fruits- D.K.Butani

SCT 3.1 PESTS OF CROP PLANTS-I

(Cereals, oil seeds, Pulses, Cash Crops & Fodder Crops)

Unit-I: **(15)**

A) Pest Management: Tacties and strategies of pest management (IPM) Concept and tools of pest management, Ecosystem concept, Ecological Niche concept, Colonization of island, Crop island in ecosystem, Quantitative basis of pest management, sampling and measuring system, Analysis and Modelling in pest management, Monitoring, Forecasting and Field loss assessment, Design making systems, Constrains and Strategies in implementation of IPM, validation of IPM.Host plant resistance.

B) Pests of cereals :

a)Rice:
I()Major- Brown plant hopper, Yellow stem borer,Swarming Caterpillar.
II) Minor – Rice ear head bug, Armyworm, Blue beetle, Gall midge, Ricehispa.

b)Sorghum :
I) Major – Midge fly, Aphids , Shoofly, Stem borer
II) Minor- White grub

c)Maize:
I) Major- Bug (Deliphacids), Ear head bug, stem borer, pink borer.
II) Minor- Pyrilla, Aphids.

d)Pearl millet:
I) Major- Blister beetle.
II) Minor- Surface grasshopper, Armywarm.

e) Wheat:
I) Major- Jassids, Termites, Stem borers.
II) Minor- Aphids, Nematodes.

Unit-II Pests of pulses & vegetables: **(15)**

a) Pulses: Chickpea, Pigeon pea, Cowpea, Peas, Green gram, Blackguard, Kidney bean Cluster bean etc.

I)Major- Gram pod borer, Tur pod bug, Pea aphidsand spodoptera.
II)Minor- Bean fly, Aphids, Thrips, Mites.

Unit-III Pests of oil-seed Crops: **(15)**

i)Groundnut:

I) Major: Groundnut leaf miner aphid.
II) Minor: Stem borer, Jassid & Bihar hairy caterpillar.

ii)Sunflower:

I) Major: Head borer, Bihar hairy caterpillar.

iii)Safflower:

Major: Aphid & Leaf eating caterpillar.
Minor: Safflower bud fly.

iv)Mustard:

I) Major: Mustard aphid.
II) Minor: Diamond back moth.

v)Soybean:

I) Major: Pod borer, Jassids, Grey weevil,spodoptera.

vi)Caster:

I) Major: caster capsule borer, caster semilooper.
II) Minor: Caster white fly.

vii)Sesame:

I) Major: Til hawk moth, pod sucking bug.

viii)Linseed:

I)Major: Gall-fly
II)Minor: Whitefly & jassids.

ix)Cotton crop:

I) Major: bollworm complex & cotton jassid , Red cotton bug.
II)Minor: Cotton leaf roller, Cotton stem weevil, mealy bug.

Unit-IV- Pests of Forage crops: **(15)**

a)Lucerne or Alfa-alfa:

I)Major: Aphids, Cutworm, Armyworm. II)Minor:
White spotted flea beetle.

b)Bersim:

I) Major: gram pod borer, Hairy catterpillar, Spotted alfalfa aphid.
II) Minor: Red pumpkin beetle, Grass hopper.

c)Pest of Sugarcane:

I) Major:-Stem borer complex, White grubs, White fly, Sugarcane white woolly aphid
II) Minor:-Army worm, Mites, Pyrilla ,Termites.

Reference Books : SCT 3.1

1.Handbook of pest management in Agriculture by Pimental.

2.Principles of insect pest management by Dhaliewal and Arora.

3.Agricultural pest of india & south East Asia by A.Satwal.

4.Introduction to Fungi-S.SundarRajan

5.Mollicutes and Plant Diseases –S.R.Mishra

6.Hand Book Of Agriculture-ICAR Publication

7.Biopesticides and Pest Management-G. S. Dhaliwal and O.Koul

8.Botanical Pesticides in the Management Of Post –Harvest Fruit Diseases-P.Tripathi

9.Alternatives To Chemical Pesticides In Pest Management-H.C.L.Gupta,Ashok Kumar,O.P.Ameta

SCT 3.2 DISEASES OF CROP PLANTS-I

(Cereals, oil seeds, Pulses, Cash Crops & Fodder Crops)

Unit-I: Diseases of the cereal plants: **(15)**

(Study of symptoms, Disease cycles, Nature of Damage and management)

a) Cereals:

i) Rice: Blast of rice, Helminthosporium disease of rice, False smut of rice, Seeding blight, Udbatta disease.

ii)Sorghum: Rust, Smut, Downy mildew diseases, Grain mold.

iii)Wheat: Rust & Smut diseases, & Root rot.

iv)Maize: Rust, Smut, Blight, Ear rot.

v)Bajara: Rust, Ergot, Downey mildew & Blast disease.

Unit-II: B) Diseases of Oil seed crops:

(15)

(Study of symptoms, Disease cycles, Nature of damage and management)

i)Groundnut: Rust, Early and late leaf spot diseases (Tikka), seed rot (Aspergillus sp.)& Seedling blight (Penicillium spp.) Root rots (Sclerotium Rhizoctonia,& Fusarium spp.)

ii)Soybean : Rust, Leaf spot, Brown stem rot, Anthracnose, Pod & Stem blight, Fusarial wilt, Rots, Leaf spot diseases.

iii)Sunflower: Rust, Powdery mildew, Downey mildew, Blight,

iv)Safflower: Rust, Root rot.

v)Mustard: White rust, Powdery mildews, Seedling blight, wilt & Rots.

vi)Castor: Rust, Leaf spot.

vii)Sesame: Leaf spot, powdery mildews, wilt.

Unit-III- C) Diseases of Cash-cops.

(Study of symptoms, Disease cycles, Nature of Damage and management) **(15)**

i)Cotton : Rust , Wilt, Anthracnose & Blights, Leaf spot ,

ii)Sugarcane: Rust, Smut, Downey mildew, Rots-basal, root, and top, Red rot, GSD

iii) Tobacco: Early blight, Black rot &Shank rot, Wilts

Unit-IV) **(15)**

a) Diseases of Forage crops:

(Study of symptoms, Disease cycles, Nature of Damage and management)

i)Monocots : Maize, sorghum spp., Sudan grass, Pennisetum spp., Fodder grasse (Wild & cultivated)-their diseases like Rusts,Powdery mildew ,Wilts, Blights,,Leaf spots,root rot,root knot.

ii)Legumes : Clover, Lucerne, Bersim, Alfalfa, Sesbania sppCow Pea, Leucaen spp.- their **common diseases.** Powdery mildew ,Wilts, Blights, Anthracnose ,root rot, root knot.

b) Diseases of Pulses and vegetables:

(Study of symptoms, Disease cycles, Nature of Damage and management)

Peas-Chickpea, Pigeon pea, CowPea,

Grams- green gram, Black gram,

Beans –Lima,Broad bean,French bean.

Common diseases.: Rusts, Powdery mildew, Wilts, Blights, Anthracnose, Root rots,Root knots.

Reference Books: SCT 3.2

1) Plant pathology by G.N.Agrios.

2) Fungi & plant diseases ,by Mundkur B.B.1995.

3) Tropical plant diseases by Turston H.D.

4) Pathological problems of economics crop plants & their management by Paul Khurana, S.M., 1998.

5) Diseases of millets by Ramkrishnan T.S. I.C.A.R.publ. New Delhi.

6) Fungal diseases of rice in India by Padmanabhan S.Y. I.C.A.R.publ., Delhi.

7) Plant Pathology-G.P.Gupta

8) Experiments in Microbiology,Plant Pathology and Biotechnology-K.R.Aneja.

9) Seed Borne Diseases: Ecofriendly Management-Arun Arya,Cecilia Monaco.

10) Introduction to Fungi-S.SundarRajan

11) Mollicutes and Plant Diseases –S.R.Mishra

12) Molecular Plant Pathology- Lakshman Desai

13) Plant Diseases-S.Ahuja

14) Virus and Plant Diseases-S.R.Mishra

15) Text Book Of Plant Diseases-G.P.Gupta

16) Crop Diseases and Their Control-Mangat Rai

17) Plant Diseases-Rajani Sharma

18) Modern Plant Pathology-K. S. Bilgrami and H. S. Dube

19)Integrated Diseases management and plant health by Gupta V.K.& Sharma R.C.

20)Diseases of millets by Ramkrishnan T.S. I.C.A.R.publ. New Delhi.

SCT 3.3 PLANT PROTECTION-I

UNIT 1:- PLANT PATHOLOGY (15)

1.1 Plant Pathology, History, losses due to pathogens, importance of study of plant pathology
1.2 Contribution of Indian Plant Pathologists (any four)
1.3 Contribution of Research institutes
a) IARI (Indian Agricultural Research Institute)
b) ICRISAT (International Crop Research Institute for Semi Arid Tropics).
c) Agharkar Research Institute Pune

UNIT 2:-PLANT DISEASES AND MANAGEMENT: (15)

(Cereals, pulses, vegetables and oil seed crops) Plant diseases with respect to symptoms, causal organism, disease cycle and their management of following plants.
Cereals : a) Wheat –Alternaria leaf blight b) Jowar- Rust .
Pulse: Bean-Leaf spot Sub unit 2.3:
Vegetables: a) Tomato-Early blight of tomato b) Chilli-Cercospora-leaf spot c) Onion-Aspergillus- Black rot : Oil seed crop : Sunflower: Powdery mildew
(Cash crops, ornamentals, Fruit Plants and forest trees)
Cash crops: a) Sugar cane- Leaf spot disease. b) Potato -Early blight Sub unit :
Ornamentals : a Rose / Nyctanthus - Powdery mildew

FUNGISIDES- Definition, classification, characters of an ideal fungicide. : Study of fungicides with respect to Properties, formulations, methods of application, mode of action and uses. a) Sulphur fungicides – i) Organic – Thiram. b) Copper Fungicides –i) Copper Oxychloride c) Mercury fungicides –i)Ceresan d) Heterocyclic Nitrogenous Compounds - Captan. e) Benzene Compounds – Dexon. f) Antibiotics – Streptomycin g) Systemic Fungicides - i) Carbadanzin(Bavistin) ii) Vitavax .: Biological Control of Plant Diseases Definition, Importance, Biological control agents and their role in plant disease control

UNIT 3:-PLANT INSECT PESTS AND MANAGEMENT (15)

(Study of major pests with reference to scientific name, marks of identification, host range, life cycle, perpetuation, nature of damage and management.)
Cereals: a) Paddy- Leaf hopper b) Jowar- Army worm.
Pulses: a) Green Peas- Pod borer.b) Beans- Aphids
Vegetables : a) Bhendi-Fruit borer b)Cabbage-Caterpillar :
Ornamentals: a) Rose -Aphids b) Chrysanthemum /or any flowering plant – Leaf miner :Polyphagus insect pests :a) Termites b) Jassids

INSECTICIDES- Definition, classification ,characters of an ideal insecticide. : Study of major insecticides with respect to properties, formulations, methods of application, mode of action and uses. A: Plant origin insecticides- a) Azadirachtin b) Nicotin B: Chlorinated hydrocarbons – a) Lindane C: Organophosphate – a) Malathion b) Phorate. D: Carbamate – a) Carbaryl E: Synthetic Pyrethroids. a) Cypermethrin F: Nematicides : a) Nemagon b) Vapam G: Rodenticides : a) Bromodiolone

UNIT 4:- IMPORTANCE OF TOXICOLOGICAL STUDY (15)

Toxicity a) Definition, types: - acute and chronic b) L.D.-50 c) Colour code d) Antidotes e) General precautions regarding to uses of pesticides f) Effect of pesticides on human being Hazards of insecticides a) Symptoms of pesticide poisoning during manufacture and application b) Food contamination and residue pesticides- vegetables and fruits.

CHEMICAL PEST CONTROL AND ENVIRONMENT : Pollution of soil, water and air : Limitations of Chemical control. : Biological control of insect pests:Pesticide legislation in India

References :- (SCT 3.3)

1. Principles and Procedures of Plant Protection –S.B. Chattopadhyay.
2. A Hand book of Plant Protection - D. Seshagiri Rao.
3. Chemistry of Insecticides and Fungicides – U.S. Sreeramulu.
4. Plant Protection - Mukundan –
5. Systemic Fungicide - S.C. Was
6. Fungicides by- Nene & Thapliyal.
7. Fungi and Plant diseases –B.B. Mundkur.
8. Text book of Modern Plant Pathology - K.S. Bilgrami and H.C. Dube.
9. Plant diseases - R.S. Singh.
10. Essentials of Plant Pathology – V.N. Pathak.
11. Plant Pathology –R.S. Mehrotra.
12. Introduction to principle of Plant Pathology- R.S. Singh.
13. Plant Pathology – Agrios.
14. Principles of Plant breeding – H.K. Choudhary.
15. Weed Science – Thakur.
16. Modern Weed Science – O.F. Gupta & P.S. Lamba.
17. Principles of Weed Science - V.S.Rao.
18. Manual of Weed Science – N.C. Joshi.
19. Elements of Economic entomology– Vasantraj Devid and T. Kumar swami.
20. Agricultural Pests of India and South East Asia – A.S. Atwal.
21. General and applied Entomology – K.E. Nayar, B. V. David.
22. Crop protection recommendations published by Department of Agriculture M.S.Pune
23. Plant protection recommendations for Horticulture crops-Directorate of Horticulture M. S. Pune –411005.
24. Crop production and field experiments- Vaidya , Sahastrabudhe and Khuspe.
25. Plant diseases in India- G. Rangaswami.
26. Diseases of cereals and millets – T.S. Ramkrishna.

OET 3.1 ANALYSIS OF AGROCHEMICALS

Unit-I: **(15)**

a) Separation Techniques: Principle, instrumentation applications and Advantages of Thin layer Chromatography, Paper Chromatography and HPLC.

b) Gas analysis :Analysis of SO2, NOx, CO, CO2, NH3, and H2S in the effluent gases.

Unit-II **(15)**

a) Radioactivity- Measurement, Applications of radio isotopes in agriculture, Health hazards, activity ratio, Neutron activation analysis and its applications.

b) Polarography, Voltage current curves, analysis of polarogram, applications of ultraviolet spectrophotometer in the analysis of agrochemicals and pest residue and metabolites.

c) Fluorescence spectroscopy: Basic principles, methodology and applications.

Unit-III **(15)**

a) Ultraviolet Spectroscopy: Principle, Theory, instrumentation and applications.

b) Infrared Spectroscopy: Principle of I.R. spectroscopy, Fundamental modes of vibrations, fundamental group regions of I.R. spectrum, functional group region, finger print region, Types of vibrations, Instrumentation of I.R., I.R. Spectrum, Applications of I.R. spectroscopy in structure determination.

Unit-IV **(15)**

a) Nuclear magnetic resonance spectroscopy: Magnetic & non magnetic nuclei, NMR Instrument schematic diagram, shielding & deshielding, chemical shift, measurement by Delta scale,TMS as reference compound & its advantages, Spin –spin coupling(n+1) rule, PMR spectra of Ethanol, Ethyl acetate, Acetophenone, 2-Butanone, Benzoic acid & Applications in pesticide residue.

b)Mass spectrometry: Schematic diagram of mass spectrometer, ionization and fragmentation of molecules. Interpretation and applications in the pesticide residue and metabolites analysis, GC-MS techniques.

Reference Books : OET3.1

1.Spectroscopic methods in Organic Chemistry –D.H.Williams and I.Flemming.

2. Instrumental methods of analysis –Willard and Merittee, Dean.

3.Application of spectroscopic techniques inorganic Chemistry-P.S.Kalsi.

4. Concept in analytical Chemistry – S. M. Khopkar.

5.Analysis of pesticide residue –H.A.Moye(JW).

6.Advance in pest control research –R.L.Metcalf.

7.Application of absorption in Spectroscopy –J.R.Dyer.

8.Soil and plant analysis –C.S.Piper(Hans pub.)

9.Methods in Environmental Analysis Water,Soil and Air-P.K.Gupta

10. Soil,Plant,Water and Fertilizer Analysis-P.K.Gupta

11. Introductory Soil Science-Dilipkumar Das

12. Industrial chemistry(including chemical engeering)-B.K.Sharma

13. Spectroscopy- B.K.Sharma

14. Basic concepts of Analytical Chemistry-S.M.Khopkar

15. Instrumental methods of chemical analysis-Chatwal and Anand.

16. Instrumental methods of chemical analysis-Gurdeep R.Chatwal,Sham K.Anand

OET 3.2 BIOTECHNOLOGICAL ASPECTS IN PLANT PROTECTION-II

UNIT 1: BREEDING TECHNIQUE FOR DISEASE RESISTANCE (15)

A)Introduction , Selection: Irradiation and Mutation breeding: Back cross method - limitations, advantages and achievements of these methods.

B)Biofertilizers – Definition, Necessity, Types – BGA and Rhizobium

UNIT 2:APPLICATIONS OF TISSUE CULTURE AND GENETIC ENGINEERING IN COMBATING TECHNIQUES. (15)

a) Tissue culture :technique, meristem culture for virus free stock, single cell cultivation, protoplast, isolation and hybridization, screening for disease resistant and toxins.
b) Genetic engineering :concept, recombinant DNA technology, introduction of Bt gene and glyphosate resistant gene,pesticide degradation, plasmid and chromosomal pesticide degrading genes, transgenic technique.

UNIT 3 :- PATHOPHYSIOLOGY AND CULTURE TECHNIQUES (15)

: Pathophysiology :-a) Concept and causes for changes in physiology of diseased plant. b) Paper Chromatographic techniques in studying pathophysiology.

: Culture techniques :- a) Importance and utility in plant pathology. b) Culture media for isolating specific pathogens (two from each fungi and bacteria). c) Axenic culture for rust.

UNIT 4 :- TECHNIQUES IN PLANT PROTECTION (15)

A) Recent techniques in Plant Protection:-

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

B) Staining techniques:- Common stains used in plant pathology, their preparation &significance a) Cotton blue b) Gram’s stain c) Dien’s stain.

C) Plant Quarantine:- Concept and importance as an essential tool in plant Protection.

REFERENCE BOOKS:OET 3.2

1) Reddy S.M., 1997. Microbial Biotechnology.

2) M.K.Razdan,Introduction to Plant Tissue Culture

3) K.K.De,Plant Tissue Culture

4) T.B.Jha and B.Ghosh,Plant Tissue Culture Basic and Applied

5) P.S.Verma and V.K. Agarwal, Genetics

6) Jogdand S.N.,Gene Biotechnology

7) H.Gautam, Genetical modification of plants

8) Gupta P.K.,Elements of Biotechnology

9) R.C.Dubey,A Text Book Of Biotechnology

HCP 3.1 CHEMISTERY: PRACTICAL-V

1. Preparation of formulations

2. Detection of pesticides residue in food stuffs.

3. Detection of pesticides in plants.

4. TLC and Column chromatographic separation of the pesticides or plant products.

   Pesticide Toxicity.

5. Dimethyl Phthalate.

6. Synthesis of Phthalimide.

7. Benzal acetophenone.

8. 1-Naphthoxyacetic acid.

9.Any other suitable experiment may be added when required.

REFERANCE BOOKS: HCP 3.1

1. A Textbook of Inorganic quantitative analysis by A. I. Vogel.

2. Methods of pesticides analysis by Shree Ramulu.

3. A Text book practical Organic Chemistry including qualitative and quantitative analysis by A. I. Vogel.

HCP 3.2 LIFE SCIENCE: PRACTICAL-V

(BASED ON PAPER PESTS OF CROP PLANTS-I)

1. Rearing of pest species. (3 to 4 species).

2. Study of life cycles of important pests of crop plants
(as per syllabu at least 2 of each category and laboratory and field diary).

3. Study of the detection of damage caused by pests.

4. Identification of different casts of termites.

5. Study of insectide appliances.
5.1. Single stroke sprayer
5.2.Hand rotatory duster
5.3.Napsak sprayer
5.4.Engine sprayer

6. Collection of Pest stages.

7.Study of Apiculture.

8.Study of Sericulture.

9.Study of Pheromone traps.

10. Field visits and keeping records of insect pests.

11.Any suitable experiment may be added whenever necessary

(BASED ON PAPER DISEASES OF CROP PLANTS-I)

1) Study of Fungal diseases of Cereals: at least 1 or 2 of each crop (locally available.)

2) Diseases of Oil seed crops: at least 1 or 2 of each crop (locally available.)

3) Diseases of Cash-crops: at least 1 or 2 of each crop (locally available.)

4) Diseases of Forage crops, Pulses and Vegetables: at least 1 or 2 of each crop (locally available.)

5) To calculate VI (Virulence index) at least of two plant diseases.

6) Separation and identification of sugars & Organic acids from healthy and infected plant parts.

7) Estimation of Phenol from infected and healthy plant parts.

8) Isolation of Fungi from the air by Agar plate method.

9) Isolation of Microbes from phylloplane.

10) Collection and submission of diseased plant parts.

11. Estimation of protein content under pathogenesis.

12. Estimation of Ascorbic acid under pathogenesis.

13. Estimation of carbohydrates from healthy and infected leaves.

14. Biological oxygen demand and dissolved oxygen.

15. Chemical oxygen demand.

1

16. Study of Karl-Fisher titration.

17. Study of fungal diseases (at least one/two of the plants as per syllabus.)
    7.1.Field diseases of fruits and fruit trees.
    7.2.Plantation crops

7.3.Forest trees
7.4.Ornamentals

18. Large scale production of Entomopathogenic Fungi-
8.1. *Beauveria bassiana*

19. Collection of diseases from field and its submission.

20)Any suitable experiment may be added whenever necessary.

Reference Books :

1) Handbook of pest management in Agriculture by Pimental.

2) Plant Pathology-G.P.Gupta.

3) Agricultural pest of india & south East Asia by A.Satwal.

4) Introduction to Fungi-S.SundarRajan

5) Principles of Insect Pest Management. –G.S.Dhaliwal and R.Arora.

6) Entomology and Pest Management –Larry P.Pedigo.

7) Element of Economic Entomology –B.V.David and T.Kumarswammy.

8) Insect Pest Management –David Dent.

9) Mollicutes and Plant Diseases –S.R.Mishra 1) Plant pathology by G.N.Agrios.

10) Fungi & plant diseases ,by Mundkur B.B.1995.

11) Tropical plant diseases by Turston H.D.

12) Pathological problems of economics crop plants & their management by Paul Khurana, S.M., 1998.

13) Diseases of millets by Ramkrishnan T.S. I.C.A.R.publ. New Delhi.

14) Fungal diseases of rice in India by Padmanabhan S.Y. I.C.A.R.publ., Delhi.

SCP 3.1 CHEMISTRY: PRACTICAL- VI

1. Preparation p-Nitroacetanilide.

2. Phenyl hydrazide

3. Preparation of Phthalanilic acid.

4. Preparation of Ziram.

5.Preparation of Salicylanilide.

6.Preparation of Nabam, Ferbam, Zineb, Maneb

7.Determination of Quinalphos content.

8.Isolation of caffeine from tea dust.

9. Isolation of β-carotene from carrots

10.Isolation of eujenol from clove oil.

11.Interpretation of IR and PMR spectra of pesticides.

12..Any other suitable experiment may be added when required

REFERANCE BOOKS

1.A Textbook of Inorganic quantitative analysis by A. I. Vogel.

2.Methods of pesticides analysis by Shree Ramulu.

3.A Text book practical Organic Chemistry including qualitative and quantitative

OEP 3.1 LIFE SCIENCE: PRACTICAL-VI

1. Rearing of pest species. (3 to 4 species).

2. Study of life cycles of important pests of crop plants as per syllabus at least two of each category and laboratory and field diary..

3. Study of the detection of damage caused by pests.

4. Identification of different casts of termites.

5. Determination of moisture content of Plant material/soil by using IR moisture balance.

6. Determination of parathion residues in food grains / plant materials and vegetables.

7. Collection of Pest stages.

8. Collection and submission of diseased plant parts.

Reference Books- OEP 3.1

1.Text Book of applied Entomology Vol. I & II-K.P.Srivastava.

2.Introduction to Insect Pest Management.-Martin & Luckman

3.Textbook of Insets Toxicology.-Matsmura

4.Introduction to Biological Control.-R.Bosch, D.S.Messenger & A.D.Gutierrez.

5. Principles of Insect Pest Management. –G.S.Dhaliwal and R.Arora.

OEP 3.2 BIOTECHNOLOGY: PRACTICAL-I

1. Biotechnology in food industry.

2. Study of seed standards:

a) Seed germination

b) Hybrid seeds and their Characteristics.

3. Pest loss Assessment:

Study of stored seed (Pest).Comparative study of the resistant & susceptible cultivars to pathogens

(Bacteria, viruses, fungi etc.) – Structural & chemical study of –

Susceptible & resistant hosts/cvs.

4. Pesticide degradation & residual analysis

5. Collection of seed or plant of varieties availability and its germination and

few growth observations.

6. Study of stored grain fungi (Moist petriplate Method).

7. Preparation of MS media and callus culture(One crop).

8. Visit to Tissue culture lab and report submission.

9. Separation of amino acids by chromatography

10. Any suitable experiment may be added, whenever necessary.

11.Study of Stem cells:uses and advantages.

12. Gram's staining technique.

Sem-IV

HCT 4.1 AGRO-BASED MARKETING MANAGEMNET

Unit-1-INTRODUCTION OF MARKETING:- **(8)**

Meaning, Scope, Importance and function of Marketing.

Marketing Planning,Nature,Process and Content of Marketing Plan

Traditional Marketing Vs Modern marketing.

Unit-2 **(14)**

Marketing Mix

Product,Price ,Promotion,

Place,People,Process

Physical Evidence

Use of 7ps in Agro-chemical and Pest Management.

Unit-3

ROLE MARKETING IN AGRO-BASED BUSINESS. **(14)**

Role of marketing in agro-based business.

Problems of Agro-based Marketing.

Essential of effective Agro-based marketing.

Recent trends in Agro-based marketing management.

Factors influencing Agro-based marketing management.

Unit- 4

MARKETING ENVIRONMENT AND MARKETING SEGMENTATION. **(13)**

Economic Environment ,Political Environment,Technical Environment,Socio-cultural Environment
Types of market,Bases OF Market segmentation. Target marketing
Impact of changing marketing environment on Agro-based business.
Dealing with competition.

Unit-5

CONSUMER BEHAVIOUR IN AGRO –BASED BUSINESS. (11)

Factors determining the consumer Behaviour.

Importance of consumer beahviour in Agro-based business

Explain the buying process.

Types of consumer

Reference books- HCT 4.1

1)Marketing management-philip kotler

2)Agri-culture marketing-premjit Sharma

3)Marketing Management:-Josph

4)service marketing- vasanti venugopal,raghu

5)Agri-culture marketing-s.s.achraya (oxford publication)

HCT 4.2 ADVANCES IN PEST CONTROL-II

Unit-I: **(15)**

a) Biocontrol in Agroecosystem through management & Entamophagous insects:

Introduction,Definition , Role and impact of predators, parasitoids Biological characteristics, Role and impact strategies of biological control, conservation and habitat management.

b) Microbial control of insect:

Introduction,Definition, History principle groups of pathogen, Bacillus thuringensis, fungi, viruses, protozoa, their mode of action and methods of applications.

Unit-II **(15)**

Biorational and other innovative approaches: Introduction, chemicals based on insect cuticle chitine, Protein chemicals: based on Endocrine system- Brain, Juvenile and moulting hormones, chemicals based on communication system: Allelochemicals and pheromones.

Unit-III **(15)**

a) Miscellaneous Approaches:

Light activated pesticides, Pro-pesticides, genetic control, and chemosterilants ,Chemicals with new mode of action.

b)Current status of Biorational use- insect growth regulators &semiochemicals.

Unit-IV **(15)**

Biotechnology approaches in pest management: Introduction, recent advance in use of fungi, viruses and Bt. Methodology in Biotechnology, somaclonal variability and genetic engineering, transgenic plants microbial origin & protenase inhibitor.

Reference Books- HCT 4.2

1.Biological insect control chapter 10-14, by M.S. Quraishi.

2.Biological insect pest suppression by H.C.Cooper (spingler verlag)

3.Agriculture use of anti-biotics by W.A. Moats.

4.Pesticide chemistry by j.Miyamoto and P.C.Kearney (Pergamon)

5.Hand book of pest management in agriculture Wi.II by D. pimentel.

6.Biological pest control by N.W. Hussey and N. Scopes (Glandford press)

7.Safer pesticides by E. Hodgson and R.J.Kuber (Dekker)

8.Insect sex pheromones by M.Jacobson (AP).

9.Control mechanisms in plant development by A.W. Gloston and P.J.Davies. Insect pathogenic fungi as pest control agent in “Biological plant & Health Protection” by Zimmermann,G.

10.Chemicals with Noval mode of action-Isshac.

11.Biopesticides and Pest Management-G. S. Dhaliwal and O.Koul And Books Mentioned In Paper-X

HCT 4.3 MANUFACTURE OF AGROCHEMICALS

Unit-I: **(15)**

Types of unit operations & the study of the following:

Extraction: Principles, equipment of solid-liquid and liquid-liquid extraction.

Evaporation: Purpose, operation of multiple effect evaporators.

Distillation: Fractional distillation, plate and packed columns steam distillation of Azeotropes.

Absorption: Gas absorption in towers.

Filtration: Types of filters, working of centrifuge.

Crystallization: Purpose, Batch and contaminates crystallizers.

Drying: Types of dryers, working of compartment tray and spray dryers.

Unit-II **(15)**

a) Quality control and R&D: Quality control concept, R&D laboratory specifications, ASTM, BIS and ISI specifications and standards.

b) Small Scale Industry: Administration, planning of small scale units economics, licenses, marketing of Agrochemicals, marketing research, man-power, HRD.

c) Neonicotinoid Insecticides: Study of following w.r.t. synthesis, mode of action, environmental effects and applications of: 1) Imidacloprid 2) Thiacloprid 3) Acetamiprid 4) Thiamethoxam.

Unit-III: **(15)**

a) Retrosynthetic analysis and synthesis of pesticides: Retrosynthetic analysis, synthon approaches, synthetic equivalents, types of disconnections, chemo selectivity, Retrosynthesis of : 2,4-D, Endosulphan, IAA and Captan.

b) Study of following fungicides w.r.t. synthesis, mode of action, environmental effects and applications of: Metalaxyl, Thiophenate methyl and Chlorothalonil.

Unit-IV: **(15)**

a) Manufacture of Pesticides and other Agrochemicals:

(Unit processes are to be discussed as they occur in the sequences) typical representative compounds like Captan, dimethoate, Phosphamidon, Maneb and Agro grade sulfur be chosen for detailed study.

b) Occupational Health Hazards and their control in Agrochemicals

Industries: Handling of chemicals and Pesticides, Occupational Hazards like Asthma and pulmonary diseases, Dermatitis & Cancer. First Aid Treatment, Medical organization for major accident hazard control, importance and various kinds of first aids. Health education for workers. Occupational Health Management and Industrial safety.

Reference Book- (HCT 4.3)

1.Unit Operations: W.L.Badger.

2.Unit processes in organic synthesis: P.H.Groggins.

3.Encyclopedia of chemical technology: Kirk and Othmar.

4.A text book of chemical technology: S.D.Shukla &G.N.Pendey.

5.Industrial chemistry by James Kent & Reigel.

6.Survey of industrial chemistry 2 Ed. by P.J.Chenier

7.Industrial chemicals: F.A.Lowheim and M.A.Moran.

8.Encyclopedia of pesticides Manufacture.

9.Industrial organic chemistry

10.Advances in chemical Engeenering-James Wei

11.A Text Book of Chemical Technology-G.N.Pandey

12.Introduction to chemical Engeenering-Walter L Badgar,Juliust T.,Banchero.

13.Shreve's Chemical process industries 5th edition-George T. Austin.

14.Organic Synthesis: The Disconnection Approach 2nd Edition- Stuart Warren and Paul Wyatt (Wiley)
analysis by A. I. Vogel.

SCT 4.1 PESTS OF CROP PLANTS-II
(Fruits, Vegetables & Plantation Crops)

(Pests Biology, Classification, Nature of Damage and integrated control measures)

Unit-I-Pests of Plantation Crops: (15)

a)Coconut:
I) Major: Rhinoceros beetle, Red palm weevil, black headed caterpillar ,mites.
II) Minor: Coconut weevil, White grubs, Rodents.

b)Cashew nut:
I)Major: Leaf miner, Tea mosquito, Thrips.
II) Minor: Stem borer, Scale insects.

c) Rubber trees:
I) Minor: Stem borer, Bark , Scale insects, Termites.

d)Tea plants:
I)Major: Mosquito bug, Bunch Caterpillar.
II) Minor: Thrips, White grub & Leaf feeder.

Unit-II-Pests of Spices and Condiments: (15)

a)Tobacco:
I) Major: Leaf eating Caterpillar, Stem borer, Aphids.
II) Minor: Cut worm, Flea beetle, Bud borer & Nematodes

b)Turmeric &Ginger:
I) Minor: Rhizome fly, Caster capsule borer.

c)Coriander:
I)Major –Cotton white fly, Pentatomid bug
II) Minor: Indigo Caterpillar.

d)Black paper:
Pollu beetle, Mealy bug, Scale insect.

e)Cardamom:
I) Major: Banana aphid, Thrips.
II) Minor: Castor capsule borer, Rhizome weevil.

f) Cinnamon:
I) Major: Butterfly, Tussock Catterpillar.
II) Minor: Leaf miner

g) Chile:
I) Major: Thrips, Mites.
II) Minor: Aphids, Fruit borer, Termites, Nematodes.

h) Onion & Garlic:
I) Major: Onion Thrips.
II) Minor: Onion fly, Cutworms.

i)Betlevine:
I) Major: White fly , Nematodes.
II) Minor: Aphids.

Unit-III-Pests of vegetables: (15)

a) Cabbage, Cauliflower, Nol-Khol, Radish & other cruciferous Vegetable:
I)Major: Diamond back month, Cabbage Semi looper mustard aphid .
II) Minor: Leaf Webber & Cabbage borer.

b) Bringal
I) Major: Shoot & Fruit borer, Jassids aphids.
II) Minor: Stem borer, Melon fruit fly.

c)Tomato:
I) Major: Fruit borer, Aphids, Cotton white fly.
II) Minor: Thrips, Leaf hopper, Mealy bug.

d)Potato:
I) Major: Tuber moth, Golden cyst nematode.
II) Minor: Aphid, Thrips.

e) Ladys finger:
I) Major: spotted bollworm, Aphids, Cotton Jassids.
II) Minor: Leaf roller.

f) Cucurbits:
I) Major: Pumpkin beetle (red, black & yellow), fruit fly.
II) Minor: Blister beetle, red veg mite, aphids,

g)Sweet potato:
I) Major: Weevils.

h)Sugar beet:
I) Major: Army worm, Leaf Webber, Rodents
II) Minor: Painted bug, Cutworm, Aphids, Thrips.

i)Leafy vegetables: (Coriander, Spinach, Fenugreek, Lettuce, Amaranthus etc)
I) Major: aphids, Flea beetle, Stem weevil, Leaf miner.
II) Minor: Grass hopper, Leaf hopper.

Unit-IV-Pests of fruits & fruit Trees: **(15)**

a)Mango:
I) Major: Mango hoppers, Stem borer, Giant mealy bug, Stone Weevil, Fruit fly
II) Minor: Leaf and Shoot gall insects, Red ants, Termites.

b)Grape vine:
I) Major: Thirps, Flea beetle, Mealybugs.
II) Minor: Leaf hopper, Two spotted spider mite

c) Chicku:
I) Major: Leaf Webber, Mealy bugs,Chiku moth.

d)Pomogranate:
I) Major: Anar butterfly, Fruit sucking moth.
II) Minor: Shoot borer, Mites, Thrips, Scale insects

e)Citrus:
I) Major: Black fly, Pyrilla, Mites, Cottony cushion scale.
II) Minor: Fruit sucking moth, Lance nematode, Aphid.

f)Apple:
I) Major: Wooly apple aphid, (Eriosoma spp), Peach leaf curl aphid.

g) Guava:
I) Major: Guava fruit fly, Mealy bugs, Spirling white fly.
II) Minor: Scale insect.

h) Papaya:
I) Major: Aphids & Cotton white fly.
II) Minor: Red spider mite.

i) Banana:
I) Major: Aphid, Turgid bug & Burrowing nematode.
II) Minor: Root stock weevil, Snails.

j) Fig:
I) Major: Jassids, Mealybugs.
II) Minor: Fig borer, Fruit fly.

k) Ber:
I)Major: Fruit fly, Fruit borer, Jassid.
II) Minor: Ber beetle.

l) Pineapple:
I) Major: Thrips.

m) Jack Fruit:
I) Major: White tailed mealy bug, Bark borer.
II)Minor: Pink waxy scale.

Reference Books: **(SCT 4.1)**

1.Agriculture pest of India and Southeast Asia by A. S. Atwal.

2.A textbook of applied Entomology by K. P. Srivastava.

3.Agricultural pest of india & south East Asia by A.Satwal.

4.Hand Book Of Agriculture-ICAR Publication.

5.Biopesticides and Pest Management-G. S. Dhaliwal and O.Koul

6.Botanical Pesticides in the Management Of Post –Harvest Fruit Diseases-P.Tripathi

7.Alternatives To Chemical Pesticides In Pest Management-.C.L.Gupta,Ashok Kumar,O.P.Ameta

8.Books Mentioned in Paper-X and XII-A

SCT 4.2 Diseases of crop plants- II

Unit-I-Fungal diseases of vegetable crops, their symptoms, Life cycle, nature of damage &control measures: (15)

a) Tomato:
1) Blight- *Alternaria solani*
2) Wilt- *Fusarium oxysporium*.

b) Potatoes:
1) Wart of potato- *Synchytrium endobioticum*.
2) Black scurf of tubers –*Rhizoctonia solani*

c) Bhendi:
1) Powdery mildew- *Odium* spp
2) Cercospora disease- *Cercospora* spp.

d) Chilies:
1) Powdery mildew- *Odium* spp.
2) Leaf spot disease- *Cercospora capscia* & Alt. solani

e) Crucifies:
1) Downey mildew- *Peronospora parasitic*.
2) Whit rust- *Alb candida*.

f) Onion:
1) Downey mildew- *Peronospora destructor*, Smut troughs coulee.

g) Peas: 1) Downey mildew- *Peronospora pisi.*

h) Sweet potatoes- Dry Rot- *R.nigricans*.
Fuserial wilt, Pox or soil rot, Java black rot.

i) Cucurbitaceous vegetables: Downey mildew, Powdery mildew, Fruit rot: *Pythium* rot, Stem rot: Diplodia, Root rots, Seedling blight, Wilts, Anthracnose.

j) Suger beet: Leaf spot (*Cercospora*, Ramularia), Black root disease, Downey mildew, Foliage *Rhizoctonia* blight, Rusts *Fusarium* yellows *Sclerotium* root rot, Other root rot (Storage), texas root rot.

k) Peas, Beans & Other Leafy vegetables:
(Coriander, Spinach Fenugreek, Amaranths, Lettuce etc)
Rot-Stem, root & fruit, Anthracnose, Powdery & Downey mildews, Blights wilts.

Unit-II-Fruit trees & Fruit diseases: (15)

i) Mango:

a) Anthracnose of mango- *Colletotrichum gleosporioides.*

b) Fruit root of mango- *Gleosporium ampelofagum*

ii)Apples: Rots: Blue, black, soft, bitter, pink of fungal origin, Powdery Mildew, apple scab, White root rot.

iii) Guava-

Fruit Rot *Gloeosporium pseudo* Delacrox

Black spot disease- *Colletotrichum psidi* Curzi

iv) Grapes:

Anthracnose- *Gloesporium ampleophagum* (Pass) Sacc. (*El.ampelina*) Bitter rot- *Melanconium fulgenium* Botrytis rot- *Botrytis cinerea*.

Doweny and powdery mildew, Black root of fruits, Cotton root Rot, Wilts.

v) Citrus, Lemon & Oranges:

Brown rot – Gloesporium citri Brown watery rot –*Phytopthera palmivora*

Orange rot- *Fusarium .moniliformis*, Orange fruit rot

vi)Coconut: Gray leaf spot – *Pestalotia palmivora*

Wilt- *Ganoderma lucidum*

vii) Chickoo: Leaf spot- *Phamoploeospora indica*

viii) Papaya: Anthacnose- *Colletotrichum gloesporioidus* (Penz) Sacc, Wilt, oily spot Fruit rot- Rhizophus nigricans,

ix)Banana:

Fruit rot –*Colletotrichum musae*, *Fusarium. roseum* (Diamond spot fruit rot),Cigatokka

Leaf spot –*Alternaria alternata*, *Deightoniella torulora, Fusarium oxysporium ,Nigrospora oryzye.*

x)Pomegranate: Brown rot (Storage) –*Phomapsis varsoniana* Sacc, wilt, oily spot.

xi) Figs: Fruit decay- *Rhizophus nigricans* Pink rot- *Trichotheium roseum* (Pers.) Link

xii)Ber: Foliage disease & fruit storage diseases.

Unit-III- Diseases of Forest trees: **(15)**

a)Teak- Rust & Powdery mildew

b)Sisso: Rust, Powdery mildew

c)Bamboo: Rust & Star spot diseases.

d)Eucalyptus: Foliage diseases & Seedling diseases at nursery.

e)Santalum: Powdery mildew & Asterina diseases.

f) Lacuna: Seedling blights.

Unit-IV-Diseases of Ornamental plants: **(15)**

1.Roses: Black spot, Powdery mildew, Cankers, Anthracnose.

2.Gladiolus: Rot of corm, root, Flower blights.

3.Chrysanthemum: Powdery mildew, Rust, Leaf spot, Wilt, Petal blights.

Reference Books: **(SCT 4.2)**

1.Plant pathology by G.N.Agrios.

2.Pathological problems of economics crop plants & their management by Paul Khurana, S.M., 1998.

3.Fungi & plant diseases ,by Mundkur B.B.1995.

4.Tropical plant diseases by Turston H.D.

5.Integrated Diseases management and plant health by Gupta V.K.& Sharma R.C.

6.Diseases of millets by Ramkrishnan T.S. I.C.A.R.publ. New Delhi.

7.Fungal diseases of rice in India by Padmanabhan S.Y. I.C.A.R.publ., Delhi.

8.Plant Pathology-G.P.Gupta

9.Introduction to Fungi-S.SundarRajan

10.Seed Borne Diseases: Ecofriendly Management-Arun Arya,Cecilia Monaco

11.Plant Diseases-S.Ahuja

MP 4.3 MAJOR PROJECT
(140 MARKS U.A. +60 MARKS C.A.)