

Solapur University, Solapur

AGROCHEMICALS AND PEST MANEGEMENT

M. Sc-Part-II

(SEMESTER-III& IV)

SYLLABUS

(To be Implemented from June, 2012)

Solapur University, Solapur
M. Sc. Part – II
Agrochemicals and Pest Management
(Semester III and IV)
(w. e. f. June 2012)

1. TITLE : Subject - Agrochemicals and Pest Management Under the Faculty of Science

2. YEAR OF IMPLEMENTATION:- Revised Syllabus will be implemented from June, 2012

3. PREAMBLE:-

Solapur University since its inception, has successfully tried to meet the regional demands of socio-economic development by introducing need based course. Agrochemicals and Pest Management course is introduced by Solapur University, Solapur. The course content includes analysis and formulations of agrochemicals, applied entomology, plant pathology, biocontrol of pests, extension work, use and marketing of agrochemicals, plant protection equipments, sales and services. Moreover students have to complete one month industrial training especially in pesticide and fertilizer industries, extension and marketing agencies, analytical laboratories, various crop research stations, etc. So that they become acquainted with needs of industries and application of knowledge they have. Today there is a great demand for this applied course, as students have realized that they have better chances of getting jobs in this world of competition, as compared to conventional courses which trained human resources for teaching field only.

4. GENERAL OBJECTIVES OF THE COURSE :

- 1) To create skilled human resource useful for agriculture as well as various industries like fertilizer, micronutrient, seed processing, agrochemicals, pesticide, pharmaceutical etc
- 2) To train the students in the following aspects-
 - i)Preparation of bio and chemical pesticides
 - ii)Setting of analytical and tissue culture laboratories
 - iii)Setting of crop dispensaries
 - iv) Specific seed and crop standards
 - v) Effect of agrochemicals on soil, water, atmosphere and biota
 - vi) Novel methods of composting, vermicomposting and mass production of biofertilizers
 - vii) To determine the medicinal potential of plants and their plantation.

5. DURATION

- The course shall be a full time course.
- The duration of course shall be of Two years (four semesters).

6. PATTERN OF EXAMINATION:-

Pattern of Examination will be Semester system.

7. ELIGIBILITY FOR ADMISSION:-

Admission to the course is open only to the candidates passing B.Sc. degree with Chemistry / Botany / Zoology / Microbiology / Plant protection / Bio-chemistry / Biotechnology / Horticulture / Agriculture as the principal subject and B.Pharm. Candidates will be selected from the students appeared for entrance test and fulfilling the conditions as per the university rules for the entrance examination.

SEMESTER- III: 4papers ,2 practicals, Seminars/Field visit/Industrial visit

SR. NO.	Paper/Practical	Total Marks
1	PAPER -IX: PESTICIDE RESIDUES AND TOXICOLOGY	100
2	PAPER-X: ADVANCES IN PEST CONTROL-I	100
3	PAPER-XI: ANALYSIS OF AGROCHEMICALS	100
4	PAPER-XII: PEST AND DISEASES OF CROP PLANTS-I	100
5	Practical-V :Chemistry III	100
6	Practical-VI :Life science III	100

SEMESTER- IV :4 papers ,2 practicals, Seminars/Field visit/Industrial visit

SR. NO.	Paper/Practical	Total Marks
1	PAPER-XIII: AGRO-BASED MARKETING MANAGEMENT	100
2	PAPER-XIV: ADVANCES IN PEST CONTROL-II	100
3	PAPER-XV: MANUFACTURE OF AGROCHEMICALS	100
4	PAPER-XVI: PESTS & DISEASES OF CROP PLANTS-II	100
5	Practical-VII: Chemistry IV	100
6	Practical-VIII: Life Science IV	100

**12. SCHEME OF TEACHING AND EXAMINATION:-
M.Sc.Part-II (SEMESTER – III and IV)**

		Teaching Scheme(Hrs/W eek)		Total Work load	Univ . Exa m Mar ks
		L	P		
	Semester-III				
1	PAPER -IX: PESTICIDE RESIDUES AND TOXICOLOGY	4	--	4	100
2	PAPER-X: ADVANCES IN PEST CONTROL-I	4	--	4	100
3	PAPER-XI: ANALYSIS OF AGROCHEMICALS	4	--	4	100
4	PAPER-XII: PEST AND DISEASES OF CROP PLANTS-I	4	--	4	100
5	Practical-V :Chemistry III	--	6	6	100
6	Practical-VI :Life science III	--	6	6	100
	Semester IV				
8	PAPER-XIII: AGRO-BASED MARKETING MANAGEMENT	4	--	4	100
9	PAPER-XIV: ADVANCES IN PEST CONTROL-II	4	--	4	100
10	PAPER-XV: MANUFACTURE OF AGROCHEMICALS	4	--	4	70
11	PAPER-XVI: PESTS & DISEASES OF CROP PLANTS-II	4	--	4	100
12	Practical-VII: Chemistry IV	--	6	6	100
13	Practical-VIII: Life Science IV	--	6	6	100

13. SCHEME OF EXAMINATION :-

- The examination shall be conducted at the end of each semester.
- The theory paper shall carry 100marks.
- The evaluation of the performance of the students shall be on the basis of both theory and practicals.
- Question Paper will be set in the view of the /in accordance with the entire syllabus and preferably covering each unit of syllabus.

The scheme of semester examination is as follows :-

Total marks per theory paper 100

M. Sc. II (Semester- III and IV) Theory Examination

(For each semester)

External examination 4 Theory papers

100x 4= 400 marks

Total Marks:400

M. Sc. II (Semester - III and IV) Practical Examination:

Chemistry practical: -100marks

70 experiments + 10 seminar + 10 oral and journal +10Industrial visit= 100marks

Total Marks:100

Life science practical:-100marks

70 experiments + 10 seminar + 10 oral and journal +10 field visit= 100marks

Total Marks:100

16. EQUIVALENCE IN ACCORDANCE WITH TITLES AND CONTENTS OF THEORY PAPERS- (FOR REVISED SYLLABUS)

Sr. No.	Paper No.	Title Of Old Paper	Title Of New Paper
1	Paper-IX	PAPER -IX: PESTICIDE RESIDUES IN ENVIRONMENT	PAPER -IX: PESTICIDE RESIDUES AND TOXICOLOGY
2	Paper-X	ADVANCES IN PEST CONTROL-I	PAPER-X: ADVANCES IN PEST CONTROL-I
3	Paper-XI	ANALYSIS OF AGROCHEMICALS	PAPER-XI: ANALYSIS OF AGROCHEMICALS
4	Paper-XII	PEST AND DISEASES OF CROP PLANTS-I	PAPER-XII: PEST AND DISEASES OF CROP PLANTS-I
5	Paper-XIII	TOXICOLOGY	PAPER -IX: PESTICIDE RESIDUES AND TOXICOLOGY
6	Paper-XIV	ADVANCES IN PEST CONTROL-II	PAPER-XIV: ADVANCES IN PEST CONTROL-II
7	Paper-XV	MANUFACTURE OF AGROCHEMICALS	PAPER-XV: MANUFACTURE OF AGROCHEMICALS
8	Paper-XVI	PESTS & DISEASES OF CROP PLANTS-II	PAPER-XVI: PESTS & DISEASES OF CROP PLANTS-II

17. SPECIAL INSTRUCTIONS , IF ANY.

(i) **Study Tours:**The students have to participate in study tours organized to visit tissue culture laboratories, Biocontrol laboratory, Agricultural research institutes , field farms ,Fertilizer and pesticide industries etc.

(ii) **Field Visits:** – The students along with their teacher should frequently visit the various crop fields to study the agronomy, pest and diseases of crop plants, soil and water quality.

(iii) **Industrial Training:**Every student has to complete one month industrial training in pesticides and fertilizer industries, National agricultural research institutes, field survey in Agrobased industries.

(iv) **Laboratory Work:**Students have to perform all the prescribed laboratory practicals This work will be done by the student with the collaboration with the other science departments in the campus.

(v) **Guest Lectures:** The students have to attend the guest lectures of eminent scientists in the field of agricultural chemistry/ well known farmers/ past students of the department/ Persons in Agricultural and marketing management organized by the department.

AGROCHEMICALS AND PEST MANEGEMENT

M. Sc-Part-II (Semester-III and IV)

SYLLABUS (June 2012)

SEMESTER-III

PAPER -IX: PESTICIDE RESIDUES AND TOXICOLOGY

PAPER-X: ADVANCES IN PEST CONTROL-I

PAPER-XI: ANALYSIS OF AGROCHEMICALS

PAPER-XII: PEST AND DISEASES OF CROP PLANTS-I

CHEMISTERY PRACTICAL-V: BASED ON PAPERS IX & XI

LIFE SCIENCE PRACTICAL-VI: BASED ON PAPERS X& XII.

SEMESTER-IV

PAPER-XIII: AGRO-BASED MARKETING MANAGEMENT

PAPER-XIV: ADVANCES IN PEST CONTROL-II

PAPER-XV: MANUFACTURE OF AGROCHEMICALS

PAPER-XVI: PESTS & DISEASES OF CROP PLANTS-II

PRACTICAL- VII: BASED ON THE PAPERS XIII& XV. (Chemistry)

PRACTICAL- VIII: LIFE SCIENCE

Semester-III**Paper-IX:****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.
- Unit-III: Toxicology** **(15)**
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:

- 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. Moyer (JW)
- 5.Advance in pest control research by R. L. Metcalf (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 pharmacology 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

PAPER-X**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

1. Text Book of applied Entomology Vol. I & II-K.P.Srivastava.
2. Introduction to Insect Pest Management.-Martin & Luckman
3. Textbook of Insects 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.Kumarswamy.
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 phytophagous 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

PAPER-XI
ANALYSIS OF AGROCHEMICALS

Unit-I: (15)

a) Separation Technique: Principle, instrumentation and application of gas Chromatography and HPLC.

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

Unit-II (15)

a) Radioactivity- Measurement, Application of radio isotope in agriculture, Health hazard of activity ratio, Neutron activation analysis and its application.

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

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

Unit-III (15)

a) Ultraviolet spectroscopy: Principle instrumentation and applications

b) Infrared spectrometry: Principle of I.R. spectroscopy ,Fundamental modes of vibration ,fundamental group regions of I.R. spectrum ,functional group region,finger print region ,Instrumentation of I.R.and Spectrum, Applications of I.R. spectroscopy to 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 & Applications in pesticide residue.

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

Reference Books

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 engineering)-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

PAPER-XII

PEST AND DISEASES OF CROP PLANTS-I

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

Unit-I: **(15)**

a) Pest Management: Tactics 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 crops:

(Classification, Biology, nature of damage and control measures).

A) 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, Rice hispa.

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 **(15)**

B) Pests of pulses & vegetables:

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

I) Major- Gram pod borer, Tur pod bug, Pea aphids and spodoptera

II) Minor- Bean fly, Aphids, Thrips, Mites.

c) Pests of oil-seed Crops:

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: I) Major: Aphid & Leaf eating caterpillar.

II) 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.

xiv) Cotton crop: I) Major: bollworm complex & cotton jassid , Red cotton bug.

II) Minor: Cotton leaf roller, Cotton stem weevil, mealy bug.

d) Pests of Forage crops:**Lucerne or Alfa-alfa:**

I) Major: Aphids, Cutworm, Armyworm.

II) Minor: White spotted flea beetle.

Bersim

I) Major: gram pod borer, Hairy catterpillar, Spotted alfalfa aphid.

II) Minor: Red pumpkin beetle, Grass hopper.

e) Pest of Sugarcane:

I) Major:-Stem borer complex, White grubs, White fly, Sugarcane white woolly aphid

II) Minor:-Army worm, Mites, Pyrilla ,Termites.

Unit-III**(15)****Fungal Diseases of the crop plants:**

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

a) Cereals:

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

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

Wheat: Rust & Smut diseases, & Root rot.

Maize: Rust, Smut, Blight, Ear rot.

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

b) Pulses and vegetables: (Chickpea, Pigeon pea, CowPea, green gram, Black gram, beans etc.): Rusts, Powdery mildew, Wilts, Blights, Anthracnose, Rots etc.

Unit-IV

(15)

a) Oil seed crops:

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.

b) Cash-crops:

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

c) Forage crops :

i)Monocots : Maize, sorghum spp., Sudan grass, Pennisetum spp., Fodder grasse (Wild & cultivated)-their diseases.

ii)Legumes : Clover, Lucerne, Bersim, Alfalfa, Sesbania spp, Cow Pea, Leucaen spp.- their common diseases.

Reference Books :

1. Handbook of pest management in Agriculture by Pimental.
 2. Plant pathology by G.N. Agrios.
 3. Principles of insect pest management by Dhaliewal and Arora.
 4. Agricultural pest of india & south East Asia by A. Satwal.
 5. Pathological problems of economics crop plants & their management by Paul Khurana, S.M., 1998.
 6. Fungi & plant diseases ,by Mundkur B.B. 1995.
 7. Tropical plant diseases by Turston H.D.
 8. Integrated Diseases management and plant health by Gupta V.K. & Sharma R.C.
 9. Diseases of millets by Ramkrishnan T.S. I.C.A.R. publ. New Delhi.
 10. Fungal diseases of rice in India by Padmanabhan S.Y. I.C.A.R. publ., Delhi.
 11. Plant Pathology-G.P. Gupta
 12. Introduction to Fungi-S. SundarRajan
 13. Mollicutes and Plant Diseases –S.R. Mishra
 14. Molecular Plant Pathology-Lakshman Desai
 15. Experiments in Microbiology, Plant Pathology and Biotechnology-K.R. Aneja
 16. Seed Borne Diseases: Ecofriendly Management-Arun Arya, Cecilia Monaco
 17. Plant Diseases-S. Ahuja
 18. Virus and Plant Diseases-S.R. Mishra
 19. Text Book Of Plant Diseases-G.P. Gupta
 20. Crop Diseases and Their Control-Mangat Rai
 21. Plant Diseases-Rajani Sharma
 22. Modern Plant Pathology-K. S. Bilgrami and H. S. Dube
 23. Hand Book Of Agriculture-ICAR Publication
 24. Biopesticides and Pest Management-G. S. Dhaliwal and O. Koul
 25. Botanical Pesticides in the Management Of Post –Harvest Fruit Diseases-P. Tripathi
 26. Alternatives To Chemical Pesticides In Pest Management-H.C.L. Gupta, Ashok Kumar, O.P. Ameta Ecology-O.P. Odum
 27. Concepts Of Ecology-P.S. Verma and V.K. Agarwal
 28. Plant Ecology and Soil Science-R.S. Shukla and P.S. Chandel
- And Books Mentioned in Paper-X

SEMESTER-III
CHEMISTRY PRACTICAL-V
BASED ON PAPERS SIX & XI

Pesticide analysis:

1. Estimation of Endosulphan iodometrically.
 2. Estimation of Dicofol content.
 3. Determination of phorate content.
 4. Estimation of Malathion residue in given sample
 4. Saponification and acid values of oil.
 5. Estimation of phosphate from super phosphate.
 6. Estimation of sulfate from super phosphate
 7. Estimation of Simazine by colorimetric method
 8. Estimation of carbendazin in given formulation
 9. Estimation of cabaryl in a given formulation
 10. Determination of caffeine from tea leaves.
 11. Isolation of lactose from milk.
 12. Analysis of soil samples: Estimation of Ca, Mg, carbonate (CO_3^{--}) and bicarbonate (HCO_3^-) by Titrimetric analysis.
 13. Preparation of formulations
 14. TLC and Column chromatographic separation of the pesticides or plant products.
- Pesticide Toxicity
- 15) Detection of pesticides residue in food stuffs.
 - 16) Detection of pesticides in plants.

Reference Books

1. A Textbook of Inorganic quantitative analysis by A. I. Vogel.
2. Methods of pesticides analysis by Shree Ramulu.
3. A Text book of practical Organic Chemistry including qualitative and quantitative analysis by A. I. Vogel.

LIFE SCIENCE PRACTICAL-VII: BASED ON PAPERS X & XII.

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. Study of the plant diseases of the following crops, at least 1 or 2 of each crop- Rice, Sorghum, Bajara, Beans, Oilseeds & Cash-crops. (at least one/two diseases of each crop locally available.)
8. To calculate VI (Virulence index) at least of two plant diseases.
9. Separation and identification of sugars & Organic acids from healthy and infected plant organs.
10. Collection of Pest stages.
11. Collection and submission of diseased plant parts.
- 12 Estimation of Curcumin from Turmeric

Semester-IV

Paper XIII: AGRO-BASED MARKETING MANAGEMENT

Unit-I (15)

a) Marketing definition, concepts, scope, Importance,

Types, Approaches, Models, Principle. Agricultural growth, development, Policy, Role of NABARD, APEDA, RBI.

b) Market process & planning Concept

Creating & delivering customers value Marketing mix, marketing environment & Approaches, Future marketing.

Unit-II (15)

a) Indian marketing environment ,

Challenges, Economy Scope, Importance, Scenario

b) Marketing strategies

Marketing planning & strategies, Analysing industry & competition., competitive advantage & Market risk, Problems & Agri.- Marketing .

Unit-III (15)

a) Analysing consumer & Seleting market:

Bayers behaviour, Indian consumer, Target marketing, STP Segmentation, target, positioning .

b) Distribution channels

Types, Definition, Channels.

c) Direct marketing , Branding

, Globalization & consumer behaviour, Supply chain management , Shoot Analysis, 4 Ps – Product, Price, Place, Promotion , Product life cycle & pricing, new product development, Advertising / Promotion,

d) Sales & Distribution

Demand measurement, Market research & methodology, Market evaluation & controls , sales characters definition, types.

Unit-IV**(15)**

- a) Marketing ethics & Audit ,Storage, After & before sales service
- b) Rural marketing in India cooperatives in Agribusiness Marketing.
- c) Agriculture export & import process, Policies, Taxation, Laws, Packing Norms, etc. use of It or export market.
- d) International marketing, WTO, GATT, etc. Laws.
- e) Details studies on marketing process in the Netherlands, Israel, Japan USA, Australia. Present status of Indian export in comparison to develop countries.
- f) Agricultural project analysis Agrifood, service , Industry.
- g) Case studies, Agri. Input industry, Food, Wholesaling, Retailing, mall.
- h) Group discussion, & group presentation.

Reference books.

- 1) Marketing : Philip kofler
- 2) Marketing : V.S Management by Ramaswami
- 3) Marketing of – Richard L.
- 4) Agricultural Kohls & Products Joseph N. D.
- 5. Agricultural Marketing-Premjit Sharma

PAPER-XIV
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 & proteinase inhibitor.

Reference Books

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

PAPER-XV
MANUFACTURES 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 continuous crystallizers.

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

Reactors: Diagrams and working of a Batch reactor.

Unit-II (15)

a) Quality control and R&D: Quality control concept, specification and analytical procedures control of quality of raw material, intermediates and finished goods, batch inspection, R&D laboratory specifications, ASTM,BIS, ISI Specification and standards

b) Small Scale Industry: Pesticides industries in India, Norms, Government's policy, benefits regulations, administration, marketing and management, planning of small scale units economics, licenses marketing of Agrochemicals, marketing research know-how, man-power, HRD.

Unit-III: (15)

Designing of synthesis of pesticides: Retrosynthetic analysis, synthon approaches, synthetic equivalence, Types of disconnection, chemo selectivity, Retrosynthesis of agrochemicals, pheromones and synthetic plant products.

Unit-IV:**(15)****a) Manufactures of Pesticides and other Agrochemicals: .**

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

b) Occupational Health Hazards and their control in Agrochemical

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

Reference Book

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

PAPER-XVI

PESTS & DISEASES OF CROP PLANT-II

(Fruits, Vegetables & Plantation Crops)

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

Unit-I

(15)

A) Pests of Plantation Crops

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.

B) Pests of Spices and Condiments:

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-II**(15)****A) Pest of vegetables:****a) Cabbage, Cauliflower, Nal-Khol, Radish & other cruciferous****Vegetable:**

I)

Major: Diamond back moth, Cabbage Semi looper
mustard aphid .

II) Minor: Leaf Webber & Cabbage borer.

b) Brinjal 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.

B) Pests of fruits & fruit Trees:**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: Woolly 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.

Unit-III

(15)

A) Fungal diseases of vegetable crops, their symptoms, Life cycle, nature of damage & control measures:

- 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- *Oidium* spp
2) Cercospora disease- *Cercospora* spp.
- d) Chilies:** 1) Powdery mildew- *Oidium* spp.
2) Leaf spot disease- *Cercospora capsicia* & *Alt. solani*
- e) Cruciflies:** 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) Sugar 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.
- B) Fruit trees & Fruit diseases:**
- i) Mango:** a) Anthracnose of mango- *Colletotrichum gleosporioides*.
b) Fruit rot 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 Delacroix*
Black spot disease- *Colletotrichum psidi Curzi*
- iv) Grapes:** Anthracnose- *Gloeosporium ampleophagum* (Pass) Sacc. (*El.ampelina*)
Bitter rot- *Melanconium fulgenium*
Botrytis rot- *Botrytis cinerea*.
Downey 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: Anthracnose- *Colletotrichum gloesporioides* (Penz) Sacc, Wilt, oily spot

Fruit rot- *Rhizopus nigricans*,

ix) Banana: Fruit rot – *Colletotrichum musae*, *Fusarium roseum* (Diamond spot fruit rot), Cigatokka

Leaf spot – *Alternaria alternata*, *Deightonella torulora*, *Fusarium oxysporium*, *Nigrospora oryzae*.

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

xi) Figs: Fruit decay- *Rhizopus nigricans*

Pink rot- *Trichothelium roseum* (Pers.) Link

xii) Ber: Foliage disease & fruit storage diseases.

Unit-IV

(15)

A) Disease plantation trees:

a) Coconut – Bud rots & wilts (*Ganoderma* spp.)

b) Rubber- Foliage diseases & seedling diseases.

c) Coffee- Rust, Leaf spot & Berry anthracnose.

Tea- Blister & rots

d) Cashew nut- Foliage diseases & storage spoilage.

B) Forest trees :

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.

C) Diseases of Ornamental plants:

a) **Roses:** Black spot, Powdery mildew, Cankers, Anthracnose.

b) **Gladiolus:** Rot of corm, root, Flower blights.

c) **Chrysanthemum:** Powdery mildew, Rust, Leaf spot, Wilt, Petal blights.

Reference Books:

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

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

3. Plant pathology by G.N. Agrios.

Books Mentioned in Paper-X and XII

SEMESTER- IV**PRACTICAL- VII: BASED ON THE PAPERS XIII& XV.****Pesticide synthesis (Chemistry)**

1. Preparation of 2,4-D.
2. Dimethyl Phthalate
3. synthesis of Phthalimide
4. Benzal acetophenone
5. 1-Naphoxyacetic acid
6. Phenyl urea
7. Preparation p-Nitroacetanilid.
8. Phthyl hydrazide
9. Preparation of phthalanilic acid.
10. Preparation of Ziram.
11. Preparation of salicylanilide.
12. Preparation of Nabam, Ferbam, zineb, maneb etc.
13. Colorimetric determination of parathion.
14. Colorimetric determination of vanadium in soil sample.
15. Ion exchange chromatographic analysis of Copper, Zn and Cobalt.
16. Estimation of vanadium content from soil.
17. Determination of Quinolphos content.
14. Isolation of caffeine from tea dust.
18. Isolation of B-carotene from carrots
19. Isolation of eugenol from clove oil.
20. Isolation of limonene from citrus fruits.
21. Interpretation of IR, PMR & spectra of pesticides.
22. Any other suitable experiment may be added when required.

SEMESTER-IV
PRACTICAL- VIII:
LIFE SCIENCE (BOTANY&ZOOLOGY)

(Zoology)

- 1.Determination of LC50 and LC90 in given insects.
- 2.Rearing of two to three pests in laboratory. (As per syllabus)
- 3.Field collection of pests stages and its submission.
- 4.Field visits(Minimum four) & field diary.
- 5.Large scale production of
 - a. Bacillus thuriengnis
 - b.Beauveria bassiana
 - c.Apenteles sp.
 - d.Bracon sp.
 - e.Nematodes.

(Botany)

- 6.Estimation of protein content under pathogenesis.
- 7.Estimation of Ascorbic acid under pathogenesis.
- 8.Estimation of carbohydrates from healthy and infected leaves.
- 9.Biological oxygen demand and dissolved oxygen.
- 10.Chemical oxygen demand.
- 11.Study of Karl-Fisher titration.
- 12.Study of fungal diseases(at least one/two of the plants as per syllabus.)
 - a. Field diseases of fruits and fruit trees.
 - b. Plantation crops
 - c. Forest trees
 - d.Ornamentals
- 13.Collection of diseases from field and its submission.
- 14.Field visits.
- 15.Estimation of Lycopene contents
- 16.Any suitable experiment may be added whenever necessary