

SOLAPUR UNIVERSITY,
SOLAPUR

M.Sc.Part-I Syllabus

AGROCHEMICALS AND PEST MANAGEMENT

To be implemented from June-2015

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M. Sc. Part-I (Semester-I)

PAPER-I

CHEMISTRY OF PESTICIDES AND THEIR FORMULATIONS-I

UNIT-I:

A) Study of Organic reactions: (20)

Electrophilic substitution reactions of benzene like nitration, sulphonation, halogenation, Friedel-Craft reaction, alkylation and acylation.

Nucleophilic substitution reactions (SN^1 & SN^2) with their mechanism and energy profile diagrams.

Elimination reactions:- Elimination E_1 and E_2

Additions reactions of alkenes & alkynes eg.-Addition of H_2/Ni , Br_2 , HBr , H_2O , Ozone.

Nucleophilic reactions of carbonyl ($>C=O$) compounds.

B) Study of following reactions with their mechanism:-

Perkin's reaction, Knoevenagel reaction, Benzoin condensation, Pinacol-Pinacolone rearrangement, Reimer-Tiemann reaction, Cannizarro's reaction, Wagner-Meerwein rearrangement, Perkow rearrangement.

UNIT-II:

Chemistry of Pesticides: (03)

Pests and Pesticides, Historical development, chemical and botanical pesticides, classification based on chemical, nature and types of targets, Systemic and non-systemic pesticides.

Following classes of pesticides are to be studied with respect to their synthesis, chemistry, metabolites, environmental fate, formulations and possible uses: insecticides, herbicides, fumigants, rodenticides, pheromones, non-toxic insect controlling agents.

a) Pyrethroids and other natural pesticides: (06)

Synthesis of cyclopropyl carboxylic acids and derivatives, pyrethrins and their synthetic analogues. Synthesis and reactions fenvalerate, fluvalinate, permethrin, deltamethrin, cypermethrin, allethrin.

b) Recent advances in pest control:- Green chemistry in pesticides (06)

Recent insect attractant, chemosterilants and repellents. Mode of actions and applications of plant based products in plant protection.

Introduction :- Use of plants like Neem for pest control, method of application, water extraction, hexane extraction, formulations, neem water extract for plant protections. Use of Neem extract for pest control. Bioefficiency of neem preparations.

UNIT-III:**Organophosphorus pesticides:****(15)****Synthesis, Properties, Uses and environmental fate of Following:-**

Schradan, Malathion, Dimethoate, Monocrotophos, Phosphamidon, Chloropyrifos, Finitrothion, Phorate (Thimate), Quinolphos, Diazinon.

UNIT-IV:**Formulations:- Preparations and applications****(10)**

Purpose of formulation, Adjuvant, Synergism, Solution concentrate, solubility, limitations, emulsions, emulsifiable oils, suspension, wettable and flowable powders, Dusts, Granules, Smokes, Aerosols, attractants and repellents, baits, lures

Reference Books:

- 1) N. N. Melnikov: Chemistry of Pesticides (English) Springer.
- 2) M. B. Green, G. S. Hartley, T. F. West, Chemical for Crop Improvement and Pest Management (Pergamon).
- 3) R. Clemlyn: Pesticides.
- 4) K. H. Buchel: Chemistry of Pesticides.
- 5) H. B. Scher: Advances in pesticides formulation Technology. ACS, NO.254.
- 6) J. Miyamoto & P.C. Jearney : Pesticide Chemistry Vol. IV (Pergamon).
- 7) W. Valukenburg : Pesticide formulations (Dekker).
- 8) U.S.Sree Ramulu, Chemistry of Insecticides
- 9) Gurudeep Chatwal, Reaction Mechanism and reagents in organic chemistry
- 10) A.G.Agarwal, Goel Publishing House Synthetic Organic chemistry,
- 11) Morison and Boyd, Organic chemistry.
- 12) Finar, Organic chemistry, Vol. I and II, I.L.
- 13) Advanced organic chemistry, Jerry March 14, 2011
- 14) Ashgate hand book of pesticides and Agricultural Chemicals, G.W.A. Milne
- !5) John H. Montgomery Agrochemicals Desk References.
- 16) A.K.De., Environmental Chemistry.

PAPER-II
SOIL SCIENCE, FERTILIZERS , MICRONUTRIENTS AND
PLANT GROWTH REGULATORS

Unit- I

Soil Science (15)

Process of soil formation, properties and composition of soil, soil profile, organic matter in soil, soil micronutrients, acid and alkaline soils and soil reclamation, absorption of toxic metals and chemicals by soil, effects of modern agro –technology and pesticides on soil, study of N, P, K , and S transformations,

Unit-II

Fertilizers (15)

Classification and types of fertilizers.

Nitrogenous fertilizers: Introduction,

Ammonium nitrate- Raw materials, manufacturing .

Action of urea, calcium cyanamide, calcium ammonium nitrate, sodium nitrate and ammonium chloride as fertilizers,

Phosphate fertilizers: Normal super phosphate, triple super phosphate, Ammonium phosphate.

Potassic fertilizers: Potassium sulphate and the Muriate of potash).

Positions of fertilizer industries in India.

Unit-III (08)

A) Micro nutrients

Definition, types, properties and uses of micro- nutrients, manufacture of micro-nutrients, deficiency and reclamation.

B)Plant Growth Regulators (07)

Introduction, Definition, Classification. Applications of a) Gibberellins b) Auxins c) Cytokinins d) Ethylene and e)Chloro choline Chloride (CCC) in agriculture.

Unit-IV

(A)Manures : (08)

Introduction, Definition, Humus and decomposing organic matter in soils, Natural organic manures such as Farm yard manure, Compost, Vermicompost , Vermiwash and Green manures. Methods of applications of organic manures to increase the soil fertility

(B)Biofertilizers: (07)

Introduction, Definition,

Rhizobium as Biofertilizer- Isolation of Rhizobium from root nodules ,Mass culture of Rhizobium, Inoculation of seeds with Rhizobium.

Blue Green Algae as Biofertilizers: Production of BGA by Trough method, Pit Method and Field Method, Application of BGA to crop fields

Merits of Biofertilizers

Reference Books:

- 1) Bear , Chemistry of the soil (ACS Remhold)
- 2) M. B. Green, G. S. Hartley and T. F. West: Chemicals for crop improvement and pest management (Pergamon).
- 3) D. N. Shreve: The Chemical process Industries.
- 4) W. L. Badger and J. T. Bandhiro: Introduction to chemical Engineering (McGraw Hill).
- 5) A. M. Deshmukh: Biofertilizers
- 6) Gopal Rao, Outlines in Chemical Technology.
- 7) Shukla and Pandey, Introduction to Chemical Technology.
- 8) B. K. Sharma, Industrial Chemistry .
- 9) Gopal Rao Outline in Chemical Technology .
- 10) Shukla and Pandey Introduction to Chemical. Technology.
- 11) V. Verma, Plant Physiology
- 12) Noggle and Fritz, Introductory Plant Physiology
- 13) P. C. Das, Manures and Fertilizers
- 14) T. D. Biswas and S. K. Mukharjee, A Text Book Of Soil Science
- 15) J. A. Basi. and J. Kadam, A Text Book Of Soil Science
- 16) S. K. Gupta and I. C. Gupta, Management of Saline soil and water.
- 17) D. K. Das, Introductory Soil Science.
- 18) V. N. Sahai, Soil at glance.
- 19) R. K. Bhatnagar and R. K. Palta, Earthworm Vermiculture and Vermicomposting
- 20) E. J. Russel, Hand Book Of Soil and Manures.
- 21) A. J. Pieters, Green Manuring Principles and Practices.
- 22) A. K. Yadav, S. Ray Chaudhari , M. R. Motsara. Recent Advances in Biofertilizer Technology
- 23) Daji, Soil Science.
- 24) C. P. Malik, Text Book Of Plant Physiology.
- 25) Yawalkar and Agarwal, Manures and Fertilizers

SEMESTER-I

CHEMISTRY: PRACTICAL-I: BASED ON PAPER I and II

I) Chemistry of pesticides and their formulation.

II) Soil Science, fertilizers, micronutrients and plant growth regulators

1. Estimation of copper form copper fungicide.
2. Estimation of sulfur form wettable sulphur powder.
3. Estimation of nitrogen form ammonium sulphate.
4. Estimation of Ca form super phosphate.
5. Estimation of Nitro group from organic pesticides.
6. Determination of carbendazim content.
7. Determination of bulk density of soil samples
8. Determination of specific gravity of soil samples
9. Determination of Water Holding Capacity of soil samples
10. Determination of soil pH by pH paper and pH meter method.
11. Determination of salinity of soil by conductometric method.
12. Estimation of phosphorus from soil by colorimetric method.
13. Estimation of potassium from soil by flame photometric method.
14. Estimation of nitrogen from soil by Kjeldahl's method.
15. Determination of organic carbon in compost and vermicompost.
16. Estimation of iron, sulphur, and boron from soil sample.
17. Analysis of mixed fertilizers and micronutrients.
18. Determination of potassium in commercial sample of muriate of potash by
i) Cobaltinitrite method and ii) Perchlorate method.
19. Analysis of organic manures with respect to i) Moisture content,
ii) Organic matter and iii) ash content.
20. To study the effect of plant growth regulators on germination and vegetative growth of crop plants
21. To study the deficiency symptoms of N, K, Mg and Fe in plants
22. Any Suitable experiment may be added whenever necessary.

Reference Books

1. A Text Book of Qualitative Inorganic Analysis by A. I. Vogel.
2. Methods of Pesticide Analysis by Shree Ramulu.
3. Soil and Plant Analysis by C. S. Piper (Hans Publisher).
4. Analytical Agricultural Chemistry by Chopra and Kanwar.

(Paper-III- INTRODUCTORY AND INDUSTRIAL ENTOMOLOGY)

Unit-I (15)

Introduction to insects:-

i General description and morphology of insects:-Head, Thorax and Abdomen – Generalized structure in brief of their appendages.

ii **Definition** of insect pests, General characters, Habitats, Damage, Economic threshold level, Natural enemies, Parasites and Predators.

Unit- II (15)

Anatomy and Physiology of the insect: -

i Classification of pests Based on damage, feeding habits, taxonomy etc

ii Digestive system, respiratory system, Circulatory system, Excretory system, Reproductive systems and Nervous system.

Unit-III (15)

General life cycle patterns in insect pests, Grasshopper, Aphids, Jowar stem borer, Mango stem borer, White grubs, Red hairy caterpillar, Termites, Snails, Slug, Nematodes, Rat.

Unit- IV (15)

Insects of Industrial Importance:-

Sericulture:-Mulberry cultivation and rearing of silkworms; pest and disease management of mulberry and silkworm.

Apiculture: - Types of honey bees,life cycle,bee keeping equipments, honey quality,pest and disease management, Agricultural and non agricultural flora and bee keeping.

Biocontrol: - The production of egg parasitoids of lepidopteran pest. Production of Bioagents: Production of Trichogramma,Production of nuclear polyhydrosis virus (NPV) and muscardine fungal pathogens.

Production of predator: Chrysoperla carnae.

Reference Books:-

- 1) A.S.Atwal, Agriculture pests of India and South East Asia
- 2) K.P.Srivastava, A textbook of applied entomology.
- 3)Larry P.Pdigo, Entomology and pest management
- 4)Sathe and Jadhav Sericulture and pest management –DPH-Delhi.
- 5)S.Pradhan.Agricultural Entomology
- 6) Govt.Maharashtra.Crop pest and how to fight them.
- 7)Pramod Kumar,Entomology.
- 8)B.D.Ratnaik,Text Book Of Entomology.
- 9)R.Mathur Text Book Of Entomology.
- 10)V.B.Avasthi,Introduction to General and Applied Entomology.
- 11)Mathur and Upadhya,A Text Book Of Entomology.
- 12)K.P.Srivastava, The Text Book Of Applied Entomology.
- 13)Abrol D.P.Honey bee diseases and their management.
- 14.Koul O.and Dhaliwal G.S.Biopesticides and Pest Management
- 15)Krishnaswami S.Silkworm rearing sericulture manual
- 16)Luyuplian, Silkworm disease.

M.Sc.I(AGPM) / Sem I PRACTICALS

LIFE SCIENCE (PRACTICALS BASED ON PAPER III and IV)

A) Entomology (Zoology):

1. Rearing of an egg parasite, *Trichogramma sp.*
2. Rearing of predator, *Chrysoperla carnae*
3. Rearing of *Helicoverpa armigera* / Jowar stem borer.
4. Rearing of Silkworm
5. Rearing of White grub
6. Rearing of Hairy caterpillar.
7. Release techniques in parasites, predators and NPV in field
8. Visit to Apiculture/ Sericulture centre.
9. Collection of various crop pests and their submission

Submitted to BOS Section, Solapur University, SOLAPUR.

Date: 01.11.2014.

M.Sc. Part-I/Semester-I

Agrochemicals and Pest Management

Paper-IV- Plant Pathology and Weed Management

Plant Pathology

Unit-I: (A) The concept of plant diseases. Disease causing organisms, their characters and classification. -(Fungi, Bacteria, Viruses, MLBs and Nematode), significance of plant diseases. Basic procedures in plant disease diagnosis (microscopic, histochemicals and molecular basis), Koch's postulates. Stages in plant disease development. Chemical weapons of plant pathogens, defense mechanism of host plants- pre-existence- structural and chemical, induced- structural and biochemical defense. (9)

(B) Epidemiology, assessment and forecasting of plant diseases- Elements of an epidemic, slow and rapid epiphytotic, factors affecting the development of epidemic. Assessment of plant disease and yield loss, measurement of disease intensity, forecasting of plant disease epidemics, disease warning and expert system. (6)

Unit-2: (A) Plant diseases caused by fungi- Symptomology of fungal diseases, mechanism of action, dispersal and control of fungal diseases. Study of fungal diseases- Club root of cabbage, *Rhizopus* soft rot of fruits, Banana leaf spots, Ergot of bajara, red rot of sugarcane, w.r.to symptoms, causal organism, disease cycle and control measures. Study of storage fungi. (8)

(B) Bacteria and bacterial diseases- Symptomology of bacterial diseases, dispersal of bacterial pathogens and control of bacterial diseases, identification and mechanism of infection. Study of bacterial diseases- Bacterial blight of bean, Crown gall of grapes, Wilt of banana, Citrus greening w.r to symptoms, causal organisms, disease cycle and control measures. (7)

Unit-3 (A)-Viruses and viral diseases- Symptomology, transmission of plant viruses, purification detection and identification of plant viruses, mechanism of action and control of plant viruses. Study of viral diseases- Papaya ring spots, Sugarcane mosaic, leaf curl of chillies w.r.to symptomology, cause, disease cycle and control measures. (7)

(B) MLO and MLO diseases- Properties of mycoplasma, symptomology, detection and identification of MLOs, transmission, diseases caused by MLOs- GSD, Sandles spike, little leaf of brinjal w.r. to symptoms, cause, disease cycle and control measures. (3)

(C) Parasitic green algae- Study of red rust of Mango w.r.to symptoms, cause, disease cycle and control measures. (1)

(D) Diseases caused by higher parasitic plants-Dodder, Mistletoes, Broom rape and witchweed w.r.to symptoms, cause, disease cycle and control measures. (4)

Unit-4-(A) Plant quarantine-domestic and international. (2)

(B) Weeds- definition and classification, life cycle, dispersal of weed, growth and development of weed, assessment of losses, factors affecting competitive ability, associations of weeds with certain crops. Methods of weed controls- physical, chemical and biological. (13)

References

1. G.N. Agrios, Plant Pathology.
2. M.B.Green, Chemicals for crop improvement and pest management.
3. T.J.Masik (Tata McGraw Hill) Weed biology and control.
4. Mundkar B.B. (1972, Edition), Fungi and plant diseases.
5. Sharma P.D., Plant pathology Rastogi Publication Merrut.
- 6.Guptoa V.K. and R.C.Sharma, (1988). Integrated disease management and plant health.
7. Marmorosch K., (1982)-Mycoplasma diseases.
8. Taxonomy of plant pathogenic bacteria in India, Journal of Indian phytopathology.
9. A. K. Shriwastav, priciples of plant pathology and diseases.
10. V.S.Rao principles of weed science.
11. L.R.Saha, Hand book of plant protection-Kalyani publishers New Delhi.

Practicals based on paper No. IV

(B) Plant pathology and weed control

1. Classification and identification of weeds.
2. Study of fungal, bacterial, viral and MLO diseases of vegetables (One each).
3. Study of fungal, bacterial, viral and MLO diseases of cash crops (One each).
4. Study of fungal, bacterial, viral and MLO diseases of pulses (One each).
5. Study of measurement of disease intensity/infectivity index.
6. Preparation of culture media.
7. Isolation of soil fungi by dilution technique and their identification.
8. Study of seed borne and storage fungi.
9. Estimation of chlorophylls from healthy and infected leaves of crop plants (any one).
10. Microbial staining techniques- used for bacteria and MLOs.
11. Study of morphological and biochemical defense mechanism in crop plants.
12. Classification and identification of weeds.
13. Collection, identification and submission of weeds.
14. Collection, identification and submission of crop diseases.
15. Field visits (Twice in a term).

M. Sc. Part-I (Semester-II)
AGROCHEMICALS AND PEST MANAGEMENT

PAPER-V CHEMISTRY OF PESTICIDES AND THEIR FORMULATIONS-II

UNIT-I (15)

Carbamate Insecticides:

Synthesis, properties & uses of :

Carbamates ,thiocarbamic acids, oxime carbamates, phenol carbamates, ziram, zineb, maneb, carbaryl, carbofuran, bendiocarb, propoxure (Begoan) Aldicarb, Methomyl.

Isomerism and kinetic studies of hydrolysis of pesticides.

Structure activity relationship of carbamate with reference to acetyl coline.

UNIT-II:

Chemistry and applications of : (15)

Nitro, amino compounds, hydrazine, azo-compounds, phenolic compounds,

Synthesis and applications of :- ureas, thioureas, mercaptans, sulphides, thiocyanates

Chemistry of Captan, propanil, parquat nitrofen and Tetradifon, Acetamiprid, Dimethyl phalate, Diethyl tolumide(odoms)

UNIT-III:

Synthesis & properties of organochlorine Insecticides (10)

BHC (lindane) 2,4-D, Dicofol, Endosulphan , PCNB, Butachlor, The persistence of the pesticides in environment and biota, resistance by pests.

UNIT-IV:

Inorganic pesticides (10)

Preparations and applications of

Fungicides: Sulphur, copper salts, organomercurials and tin compounds.

Fumigants: Hydrogen cyanide, carbon disulphide.

Rodenticide: Arsenic, zinc oxides, Zinc phosphide and Thallium salts.

Herbicides: Copper compounds, and sodium chlorate.

UNIT-V:

Computers in pesticide development:- (10)

Computer assisted correlations analysis in the development of pesticides. Computer optimization in emulsion formulations, computer based application of pesticide development and formulation development. Use of computer based equipments for pesticide analysis. Development of methods for collaborative testing of pesticides.

Reference Book:

1. N. N. Melnikov: Chemistry of pesticides (English) Springer.
2. R. Clemlyn: Pesticides.
3. M. B. Green, G. S. Hartley and T. F. West, Chemicals for crop Improvement and pest management (Pergamon).
4. N. B. Scher: Controlled releases Pesticides ACS Symp. No. 53.
5. N. E. Cardarelli: Controlled Released Pesticides Formulation CRC.
6. Kydonius: controlled release formulation. Technologies, CRC.
7. P. C. Keemey and D. D. Kaufman: Herbicide chemistry, degradation and mode of action. Vol. I, II (Dekker).
8. Miob and Satake ,Chemicals in the environment by Miob and Satake.
9. A. K. De.,Environmental chemistry
10. Sree Ramulu, Chemistry of insecticides and fungicides
11. Text book of Applied Entomology K.P. Shrivastava
12. Hand book of Medicinal Plants Prajapati, Purohit, Sharma, Kumar.

AGROCHEMICALS AND PEST MANAGEMENT

M. Sc. Part I (Semester –II)

PAPER-VI

ANALYTICAL TECHNIQUES FOR AGROCHEMICALS

Unit-I (15)

Separation techniques:

Sampling of solids, liquids and gases; solvent Extraction, Principle, Instrumentation and application of TLC, paper chromatography, column Chromatography, Ion exchange and Ion chromatography.

Unit-II (15)

Non Instrumental Techniques:

Acid base titrations acid-base indicators; Redox titrations determination halide ions by complexometric titration, precipitation titrations methods of determination of Mg, Zn, Ca, Al, Cu, Metallochromic indicators, Gravimetric estimation of SO_4^{2-} and Fe^{++} .

Unit-III (15)

Electrochemical Methods:

- a) Measurement of EMF, potentiometry, pH-metry and their applications in the analysis of agrochemicals, food, juices, water and pesticide residues.
- b) Electrical conductivity: Electrical conductivity of electrolyte, conductivity meter, specific and equivalent conductivities, applications of conductivity measurement in the analysis of salinity, halide and soil moisture.
- c) Voltametry: Principle and methodology of stripping voltametry and its application in trace analysis.

Unit-IV: (15)

Optical Methods:

- a) **Flame emission and atomic absorption spectrometry:** Atomization, flame Photometry and its applications in the estimation of Na, K, Ca; Atomic absorption, instrumentation and applications in the analysis of Soil, water, food and environmental samples.
- b) **Polarimetry:** Principle and application in the analysis of optically active pesticides.
- c) **Nephelometry and Turbidimetry:** Introduction, Principle, Turbidimetry and Colorimetry, Choice between Nephelometry and Turbidimetry, Theory and reflection versus scattering, Factors affecting measurement, Instrumentation, Applications of Nephelometry and Turbidimetry.

Reference book:

- 1) A. I. Vogel. A text of inorganic quantitative analysis
- 2) Shree Ramulu., Methods of pesticide analysis
- 3) A. I. Vogel ,A text book practical organic chemistry including qualitative and quantitative analysis
- 4) Willard, Meritt & Dean, Instrumental methods of chemicals analysis
- 5) Chopra & Kanwar ,Analytical agricultural chemistry.
- 6) H. A. Moye Analysis of pesticide residues
- 7) Robert Brown, Introduction to Instrumental Analysis
- 8) Ausotosh Kar, Pharmaceutical Drug Analysis
- 9) Colin Banwell and M. Mccash, Fundamentals Of Molecular Spectroscopy.
- 10) Gupta P.K., Methods in Environmental Analysis- Water, Soil and Air
- 11) Rastogi S.C. Mendecutta, N., Bioinformatics methods and applications
- 12) Peter Atkins, Physical Chemistry
- 13) Sivasankar, B., Bioseparations Principles and Techniques
- 14) William Merritt, Instrumental methods of analysis
- 15) G.R. Chatwal, Instrumental methods of Chemical analysis
- 16) Sharma B.K., Instrumental methods of Chemical analysis

Agrochemicals and Pest Management
M.Sc. I (Sem-II)
PAPER-VII
ECONOMOC ENTOMOLOGY

Unit-I **(15)**

a) Household pest :

Major: Cockroach, Mosquito, Houseflies, Bed bug and Rat

Minor: Lesser grain borer, Indian meal moth, saw - toothed beetle, Silver fish.

b) Stored grain pests:

Major- Khapra beetle, Rice weevil, Rice moth, Pulse beetle and Rodent.

Minor- Lesser grain borer, Indian meal moth, saw - toothed beetle.

c) Pest of medicinal plants:

Major- Opium capsule borer, Hadda beetle, Mealy bug, Root knot nematodes.

Minor- Pentatomid bug, Ash weevil, Leaf weaver.

Unit- II **(15)**

A) Pest of Livestock:

Major-Sucking cattle louse , Stablefly and Sand fly.

Minor- Blowfly, Black flies, Horse flies.

B) Forest Pest:

Major- Termite, White grub, Teak- defoliator and Subabul psylla.

Minor- Cut worm, Stem and Root borers, Sesame defoliator.

C) Pest of Ornamental plants:

Major-Cotton white fly, Digger wasp, Spiraling white fly, Leaf eating caterpillars

Minor- Thrips, Scale insects, Leaf minors, Lawn web worm.

Unit –III **(15)**

A) Pest of polyhouse, green house plants.

Major-Helicoverpa borer, Mites, Mealy bugs, Aphids, White flies.

Minor- Cutworms, Leaf minor and Army worm.

B) Nematode pest of crops (Polyphagus)

i) Migratory endoparasitic nematodes

ii) Root knot nematodes (Meloidogyne spp.)

iii) Cyst forming nematode (Heterodermia spp.)

iv) Seed gall nematode (Anguina spp.)

v) Molya nematode (Heterodermia spp.)

C) Vertebrate Pests of Agriculture crops

Major: Indian field mouse, Monkey, House sparrow, Wild bear.

Minor: Common green bee eater, Porcupine, flying foxes.

A)Molluscan pests of agriculture crops.

Snails:Helix spp,Achatina fulica & Amarginata.

Slugs:Limax species.

B)Polyphagous Pests.

Major:Termites/Whiter ants,Hairy caterpillars,Locustsand white grubs-Leucopholis
Lepidoptera,Holotrchia serrata,Spodoptera sp.

Minor:Grasshoppers,wire worms,fruit flies.

Reference Books:

- 1)R.T.Cotton; pests of stored grain products.
- 2)M.S.Mani; Introduction to entomology
- 3)Ad.Imm A textbook of entomology.
- 4)Atwal Agricultural pests of India and south east Asia.
- 5)K.M.Smith ,Agriculture entomology.
- 6)K.Shrivastava A Textbook of applied entomology.
- 7)Graham & Night ,Principles of Forest entomology.
- 8)S.Pradhan ,Agricultural Entomology.
- 9)Govt.of Maharashtra Crop pest and how to fight them.
- 10)Khare B.P.Stored grain pests and their management.
- 11)Pramodkumar,Entomology.
- 12)Ghosh S.K. and Durbey S.L.Integrated management of stored grain pests.

Practical's based on paper –VII Entomology(Zoology)

**Study of major and Minor pests of different categories as per syllabus and locally available.
(One /two of each category)**

- 1.Pests of Livestock.
2. Pests of stored grain.
3. Vertibrate Pests of Agriculture crops
4. Nematode pest of crops (Polyphagus
- 5.Rearing of pulse beetle
6. Rearing of cockroach
7. Rearing of scale insect
- 8.Visit to forest ..Poultry etc.
9. Visit to the polyhouse and greenhouse.
- 10.Submission of pests and field diary.
- 11.Any suitable experiment may be added ,whenever necessary.
- 12.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.

AGROCHEMICALS AND PEST MANAGEMENT

M. Sc. Part I (Semester –II)

PAPER-VIII BIOTECHNOLOGICAL ASPECTS IN PLANT PROTECTION

Unit-I

Agronomy of Crop Plants: (15)

Introduction to cultivation of important crops- Sugarcane, Sorghum, Wheat, Groundnut, Pomegranate, Tur, Cabbage, Onion, Tomato in respect to soil, climate, seed rate and varieties. Fertilizer requirement and crop protection

Unit-II

Seed technology: (15)

Seed technology and techniques of producing hybrid seeds for disease resistance. Seed legislation, Indian seed act 1966 and certification

Unit-III

Genetics of resistance (15)

Genetic resistance to pest, horizontal and vertical resistance of plants, infection, biochemical defense, breeding for disease resistance, back cross method and escape of breeding

Unit-IV

Plant tissue culture and Genetic Engineering: (15)

- a) Tissue culture technique, Meristem culture for virus free stock, Single cell cultivation, Protoplast isolation and hybridization, Anther culture, Organogenesis, Screening for disease resistance and hardening technique.
- b) Genetic Engineering: Concept, Recombinant DNA technology, Agro bacterium mediated gene transfer, technique of development of GM plants, Introduction of BT gene, Glyphosate resistance gene, Transgenic plants. (15)

Reference Books:

1. Seed programming management system and concept- Dadheeck. P. K., 1997.
2. Handbook of pure of pure seed definition with illustration - Dadheeck. P. K., 1995.
3. Handbook for seedlings evaluation (IInd Edition) – Schmitt Grob. R, 1997
4. Microbial Biotechnology - Reddy. S. M. 1997.
5. Gene Biotechnology- S. N. Jogdand.
6. Introduction to Plant Tissue Culture- M.K. Razdan.
7. Fungal Protoplast, A Biotechnological Tool. – D.Lalitkulari, 2000.
8. Elements of Biotechnology- Sigh B.D.
9. Plant Tissue Culture-K.K.De
10. Pant Tissue Culture –Basic and Applied- T.B.Jha&B.Ghosh
11. Genetics- P.S.Verma&V.K.Agarwal
12. Genetical Modification of Plants- H.gautam
13. Elements of Biotechnology- Gupta .P.K.
14. A Text Book of Biotechnology-R.C.Dubey

SEMISTER-II

Life Science Practical (Based on Paper VII and VIII)

(Botany and Microbiology practical's & study of pests of Narcotic and other crops) & Entomology (Zoology).

Study of major and minor pests of the different categories as per syllabus and locally available. (One or Two each category)

1. Pests of medicinal importance.
2. Pests of stored grain.
3. Vertebrate pests of agricultural crops.
4. Nematode pests of agricultural crops.
5. Rearing of pulse beetle.
6. Rearing of cockroach.
7. Rearing of Scale insect.
8. Visit to forest and poultry.... etc.
9. Visit to the poly house and green house.
10. Submission of pests and field diary.
11. Any suitable experiment may add whenever necessary.
12. Pests loss Assessment: Study of stored seed (Pest). Comparative study of resistance and susceptible cultivars to pathogens. (Bacteria, Viruses, Fungi etc.)
Structural and chemical study of susceptible and resistant hosts/cvs. Plant pathology (Botany).
13. Study of crop plants as per syllabus.
14. Study of seed standers: a) Seed Germination b) Hybrid seeds and their characteristics.
15. Pesticide degradation and residual analysis.
16. Collection of seeds or plants of varieties availability and its germination and few growth observations.
17. Study of stored grain fungi (Moist petriplate method).
18. Preparation of MS media and callus culture (one crop).
19. Visit to tissue culture lab and submission of report.
20. Separation of amino acids by chromatography in TLC method.
21. Any suitable experiment may be added, whenever necessary.

Reference Books:

1. Introduction of Entomology – M.S. Mani
2. A textbook of Entomology – A.D. Imm
3. Agricultural pests of India and South east Asia – Atwal
4. Agricultural Entomology- K. M. Smith
5. A textbook of Applied Entomology – K. Shrivastava