

SEMESTER – III
PESTICIDES
THEORY

Programme: M.Sc.
Course Code: P20/CHE/DSE/304
Course Type: DSE -4
No. Of Credits: 4

Max. Hours: 60
Hours per week: 4
Max. Marks: 100

COURSE OBJECTIVES:

- To discuss the classification and importance of pesticides. Introduction to Pest control, Biological pheromones, insect juvenile hormones and Environmental pollution from pesticides.
- Different synthetic methods of pesticides, mode of action, formulation and residue analysis of various insecticides.
- Synthesis and importance of Insecticides of plant origin. Concept of Bioinsecticides and pro-insecticides. Synthesis, applications and mode of action of Herbicides
- Classification, synthesis, application and mode of action of Fungicides and Rodenticides

COURSE OUTCOMES:

CO1: Students are able to explain the importance, classification of pesticides and how pesticides leads to environmental pollution

CO2: Sketch the different synthetic methods and outline the mode of action of pesticides.

CO3: Outline the synthesis, applications and mode of action of Bioinsecticides, pro-insecticides and Herbicides.

CO4: Discuss the classification, synthesis, application and mode of action of Fungicides and Rodenticides

MODULE1: INTRODUCTION TO PESTICIDES**(15 Hrs)**

- i) **Definition** ,Classification and importance of pesticides
- ii) **Pest control:** Different methods –chemicalfungicides, herbicidrodenticides,fumigants,
- iii) chitin synthesis inhibitors and insect repellents.

- a) Biological–pheremones: Definition and classDisparlure, Exobrevicomin,Endobrevicomin, frontalín and grandiso pheromones, synthetic sex attractants.

- b) Insect juvenile hormones: JH-A, JH-B,Synthesis of juvabione. Structural formula and importance of methopren.

- c) Moultingharmones-structural formulae and mode of action of ecdysones

- d) Antibiotics and secondary metabolites of microbial origin as insecticides and fungicides in agricultiure. Structural formula and importance of Blastocidin-S, Kasugamycin, Avermectin-B, Invermectin, piercidins and phytoalexins.

- iv) **Environmental pollution from pesticides.**iv) Integrated pest management.

- v) Pesticide formulations: Dusts, Granules, Wettable powders, Emmulsions and Aerosols.

MODULE 2: SYNTHETIC INSECTICIDES**(15 Hrs)**

- i) **Organochlorine insecticides-** synthesis and mode of action of methoxychlor, perthan, Dicofol, Heptachlor, Dieldrin and Endosulfan.
- ii) **Organophosphorous insecticides** –synthesis and mode action of Phosphoric acid derivatives,phosdrin, Dichlorophos, parathion, Zolone, Aninphomethyl, TEPP and Sachradan.
- iii) **Carbamate insecticides-** synthesis and mode of action of carbamyl, Furadan, Baygon,Aldicarb and Zectron.
- iv) Formulation and residue analysis of organochlorine, organophosphorous and carbamate insecticides.

MODULE 3: NATURAL INSECTICIDESAND HERBICIDES**(15 Hrs)**

- i) **Insecticides of palnt origin** –synthesis and importance of pyrethrins (I and II), Rotenone and Nicotine. Main constituentsNeem-structural formula of Azadirachtin. Synthesis of polygodial and warbunganol(Antifeedants). Synthesis of pyrethroids: synthesis of Allethrin, Bioallethrin, Cypermethrin, Fenvalerate, Decemethrin and pyriethrelone.
Concept of Bioinsecticides– Bacillus thuringiensis.

Concept of pro-insecticides-structure and mode of action of propheromones and pre-pro-insecticides.

v) **Herbicides**— synthesis, applications and mode of action of the following

a) Aryloxyalkyl carboxylic acid derivative: 2,4-D, MCPA, 2,4,5-T and 2,4,5-TP. b) Carbamates- prothiam and chloropham, c) Urea derivatives – Monuron and diuron, d) Aliphatic acids- Dalapon, TCA, e) Aromatic acids -2,3,6-TBA, Dicamba and Amiben, f) Nitrogen heterocyclic derivatives – Simazine, Atrazine, Amitrole, Maleichydrazide, Diquat and paraquat, g) Phenols- PCP and Dinoseb, h) Benzonitrile compounds

Module 4: Fungicides, and Rodenticides

15 Hrs

i) **Fungicides** – classification, synthesis, application and mode of action of the following classes:

- a) Carbamates b) Quinones-chloranil, Dichlorone and Benquinox
- c) perchloromethylmercaptan derivative – captan, folpet, Difolatan and Mesulfan
- d) Benzimidazoles-carbendazim, Benomyl and Thiabendazole

ii) **Rodenticides**, a) Anticoagulants-synthesis and application of warfarin, Coumatetralyl, Vacor, Coumatetralyl, Dicoumarol and Bromodiolen. b) Acute poisons- application of pindone, Ratindan, Sodium Fluoroacetate, Barium fluoroacetate, Antu, Tetramine, pindone and castrix.

Reference books:

- 1) Naturally occurring insecticides: M. Jacobson and D.G. Crosby.
Insecticides for future: Jacobson
- 2) Insect juvenile hormone chemistry and action : J.J Mann and M. Beroza
- 3) Polygodial and warburganal. Terpenoid antifeedants part-II rec, Tran, chin 106
- 4) Insect antifeedants : S.V. ley & P.L. Toogood, chemistry in Britain, Jan 1990 P.31
- 5) Synthesis of Insecticides : Metcalf
- 6) Fungicides-Frear
- 7) Fungicides-Nene
- 8) Residue reviews vol.36 : Melnikov
- 9) Safer insecticides : E. Hodgson
Crop protection agents from Nature: Leonard G Copping
Biofertilizers and Bioinsecticides : A.M. Deshmukh
- 10) Insecticides and Fungicides : U. Sriramulu.
Organochlorine insecticides : persistent organic pollutants : F. Moriarty
- 11) Herbicides : P.C. Kearney & D.D. Kaufman
- 12) Analytical Method for pesticides : Z. Weig (Vol III)
- 13) Pesticide formulations : Van Valkenburg
- 14) Insecticides : A.S. Tahori
- 15) Herbicides, fungicides, formulation chemistry - A.S. Tahori
- 16) Environmental pollution by pesticides : C.A. Edwards
- 17) Pesticides management and insecticide resistance : Watson and Brown
- 18) Organophosphorus pesticide