CREDIT DISTRIBUTION, ELIGIBILITY, AND PRE-REQUISITES OF THE COURSE

DISCIPLINE SPECIFIC ELECTIVE COURSE – 05

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Introduction to Natural Pesticides: Biopesticides and Plant Toxins	**4**	**2**	**0**	**2**	-	**NIL**

Course objectives

The Learning Objectives of this course are as follows:

- Define natural pesticide, including biopesticides and plant toxins.
- Differentiate between biopesticides and synthetic chemical pesticides.
- Identify common examples of biopesticides and plant-derived toxins.
  Analyze the advantages and limitations of using natural pesticides.
- Discuss the environmental and health benefits of biopesticides over synthetic pesticides.
- Evaluate real-world applications and case studies of natural pesticides in modern agriculture.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Demonstrate an understanding of biopesticides and plant toxins in pest control.
- Apply knowledge of natural pesticides to sustainable farming practices.
- Assess the role of biopesticides in reducing chemical pesticide dependency.
- Critically evaluate different biopesticide strategies for pest management.

SYLLABUS OF DSE- 05

THEORY COMPONENT-

UNIT 1: (9Hours)

Isolation, characterization, properties and mode of action of important groups of naturally occurring insecticides (pyrethroids, nicotinoids, rotenoids, limonoids, microbial macrolides).Sources of bio pesticides and extraction (ASE, SFE /solvent extraction)

UNIT 2: **(5 Hours)**

A Bacillus thuringiensis and nuclear polyhedrosis virus based insecticides and other biopesticides.

B Semi chemicals, insect hormones, insect growth regulators, feeding deterrents and repellents etc

UNIT 3 **(4Hours)**

Natural nematicides, fungicides, mollusicides and rodenticides

UNIT 4 **(12Hours)**

A Introduction to Plant Toxins Based on Plant Family

B Classification Plant Toxins Based on Chemical Structure

C Biological Activity and Mode of Action of Plant Toxins

PRACTICAL COMPONENT (60Hours)

1. Extraction by hydrodistillation, isolation of pure compounds, their characterization,
2. Extraction of tobacco leaves
3. isolation of nicotine and its identification,
4. Extraction of neem seed kernels, enrichment of azadirachtin, analysis of azadirachtin and its analysis.
5. To extract azadirachtin, a bio-pesticidal compound, from neem seeds using organic solvents.
6. To extract caffeine from tea leaves by solvent extraction method using dichloromethane.
7. To extract and estimate the amount of **allicin**, a bioactive compound, from fresh garlic using spectrophotometry.
8. Writing the assigned an in-depth analysis of at least three biopesticides to be allotted by instructor from different sources from theory portion. It must cover the detailed aspects of: Source, Chemical Structure, extraction /isolation from natural source, Uses, Advantages and disadvantages with respect to synthetic pesticides, Toxicity, Human Health Implications (if any), GHS labelling.

ESSENTIAL/RECOMMENDED READINGS

1. Alexander, M. (1999). Biodegradation and Bioremediation (2nd ed.). Academic Press.

2. Copping, L.G. (1996). Crop Protection Agents from Nature: Natural Products and Analogues. Royal Soc. Chem., London, 136.
3. Dev, S. &Koul, O. (1997).Insecticides of Natural Origin. Harwood Acad. Publishers.
4. Godfrey, C.R.A. (1995). Agrochemicals from Natural Products Marcel Dekker.
5. Hall, J.C., Hoagland, R.E. &Zablotowicz, R.M (2001). Pesticide Biotransformation in Plants and Microorganisms: Similarities and Divergences. ACS Symposium Series, 777. Washington, DC.
6. Hassal, K.A.(1990). The Biochemistry. Plenum Press.
7. Jacobson, M. (1965).Insect Sex Attractants. John Wiley & Sons.
8. Jacobson, M. (1970). Naturally Occurring Insecticides. John Wiley & Sons.
9. Khan, S.U. (1980). Pesticides in the Soil Environment. Elsevier.
10. Leahey, J.P. (1985). The Pyrethroid Insecticides. Taylor & Francis.
11.Matsumura, F. (1975). Toxicology of Insecticides. Plenum Press.
12. Menzie, C.M (1980). Metabolism of Pesticides. Update III US Fish and Wildlife Service Special Scientific Report.
13. Parmar, B.S. &Devakumar, C (1990). In: Botanical and Biopesticides. Westvill Publ. House.
14. Racke, K.D., Skidmore, M.W., Hamilton, D.J., Unsworth, J.B., Miyamoto, J. &Cohen, S.Z. (1997). Pesticide Fate in Tropical SoilsPure and Appl. Chem., 69(6), 1349–1371.
15. Mtewa, A. G., Egbuna, C., & Rao, G. M. N. (Eds.). (2021). Poisonous plants and phytochemicals in drug discovery / edited by Andrew G. Mtewa, (First edition.). John Wiley & Sons
16. Osman, A. M. G., Chittiboyina, A. G., & Khan, I. A. (2013). Plant toxins. In *Foodborne infections and intoxications* (pp. 435-451). Academic Press.
17. Keeler, R. F., &Tu, A. T. (Eds.). (1991). *Toxicology of plant and fungal compounds*. M. Dekker.
18. Dauncey, E. A., & Larsson, S. (2018). *Plants that kill: A natural history of the world's most poisonous plants*. Princeton University Press.

KEYWORDS: Bio pesticides, Bacillus thuringiensis, Nuclear polyhedrosis virus, Semi chemicals, Insect growth regulators, Natural nematicides, mollusicides and rodenticides

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.