

## **Pesticide (Theory)**

### **Lecture (1)**

#### **What is a Pest?**

**Pests** are living organisms that occur where they are not wanted or that cause damage to crops, humans, or other animals including insect, rodent, nematode, fungus, weed, other forms of terrestrial or aquatic plant or animal life or viruses, bacteria, or other microorganisms on or in living man or other animals is a pest),

Chemical Pesticides have been considered an essential component of insect pest control since the early 1950s when Organochlorine insecticides were first widely introduced. Since that time, however, the problems associated with insecticide misuse and the advent of more ecologically sound IPM approaches have raised doubts about the wholesale use of insecticides as a sole means of pest control.

Increasingly the use of chemical insecticides has been considered in terms of judicious applications within the context of a more sustainable IPM approach. Despite this, however, the chemical insecticide market is estimated to be worth us \$ 8 billion annually which ably demonstrates the value placed on insecticide by farmers and other purchasers worldwide. While it may be appropriate to decry insecticides for their poor environmental and safety record, insecticide use remains a cornerstone of pest management and is likely to continue as such for many years to come.

#### **What is a pesticide?**

Any substance or mixture of substances intended for preventing, destroying, repelling, or mitigating any pest, and any substance or mixture of substances intended for use as a plant growth regulator, defoliant, or desiccant.

**Pesticide handler:** Person who directly works with pesticides, such as during mixing, loading, transporting, storing, disposing and applying, or working on pesticide equipment.

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#### Classification of pesticides on the basis of toxicity

Pesticides are classified on the basis of various criteria such as toxicity (Hazardous effects), pest organism they kill and pesticide function, chemical composition, mode of entry, mode of action, how or when they work, formulations and sources of origin.

Toxicity of pesticide mainly depends on two factors namely dose and time. Hence, how much of the substance is involved (dose) and how often the exposure to the substance occur (time) give rise to two different types of toxicity- acute and chronic toxicity.

**A- Acute Toxicity:** Acute toxicity refers to how poisonous a pesticide is to a human, animal or plant after a single short-term exposure. A pesticide with a high acute toxicity is deadly even when a very small amount is absorbed. Acute toxicity may be measured as acute oral toxicity, acute dermal toxicity and acute inhalation toxicity.

**B- Chronic toxicity-** Chronic toxicity is delayed poisonous effect from exposure to a pesticide. Chronic toxicity of pesticides concerns the general public as well as those working directly with pesticides because of potential exposure to pesticides on/in food products, water and the air.

Pesticides are chemical compounds that are used to kill pests, including insects, rodents, fungi and unwanted plants (weeds). Pesticides are mainly used for benefits like crops protection, preservation of food materials and prevention of vector borne diseases. They are also used in different field like agriculture, forestry, aquaculture, food industry, processing, transportation and storage of wood and other biological products.

#### Classification of pesticides on the basis of mode of entry

- 1- Systemic Pesticides : These pesticides which are absorbed by plants or animals and transfer to untreated tissue for example (2,4 –D, glyphosate)
- 2- Contact pesticides: It acts on target pests when they come in contact for example (Paraquat, diquat).
- 3- Stomach poisons: It enters the pest's body through their mouth and digestive system, for example (Malathion).
- 4- Fumigants: Pesticides which acts or may kill the target pests by producing vapour and enter pest's body through tracheal system, for example (Phosphine).
- 5- Repellents: Repellents do not kill but distasteful enough to keep pests away from treated area, they also interfere with pest's ability to locate crop, eg. (Methiocarb).

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#### **Classification according to mode of action:**

- 1- Physical poison: Pesticides bring about killing of one insect by exerting a physical effect, for example (Activated clay)
- 2- Protoplasmic poison: Pesticides are responsible for precipitation of protein., for example (Arsenicals).
- 3- Respiratory poison: Chemicals which inactivate respiratory enzymes, for example (Hydrogen cyanide).
- 4- Nerve poison: Chemicals inhibit impulse conduction, for example (Malathion).
- 5- Chitin inhibition: Chemicals inhibit the chitin synthesis in pests, for example (Diflubenzuron).

#### **Classification of pesticides based on the type of organisms**

- a) Insecticides: Chemicals used to kill or control insects (eg.) endosulfan, malathion
- b) Rodenticides: Chemicals exclusively used to control rats (eg.) Zinc phosphide
- c) Acaricides : Chemicals used to control mites on crops / animals (eg.) Dicofol
- d) Avicides : Chemicals used to repel the birds (eg.) Anthraquinone
- e) Molluscicides : Chemicals used to kill the snails and slugs (eg.) Metaldehyde
- f) Nematicides : Chemicals used to control nematodes (eg.) Ethylene dibromide
- g) Fungicides: Chemicals used to control plant diseases caused by fungi (eg.) Copper oxy chloride
- h) Bactericide: Chemicals used to control the plant diseases caused by bacteria (eg.) Streptomycin sulphate
- i) Herbicide: Chemicals used to control weeds (eg.) 2,4, - D

#### **The insecticides may be divided according to the life stage of the target pest:-**

- 1- Adulticide
- 2- Larvicide
- 3- Ovicide

**Pesticide (Theory)**

**\* The correct and rational use of pesticides is a complex process that draws on a thorough knowledge of:**

- 1- Insect population dynamics and the impact of chemical use.
- 2- The active ingredients of the pesticides, its mode of action and formulation.
- 3- Delivery of the chemical, its application and pick-up at the target site.
- 4- Ease of use, safety and economic.
- 5- Toxicological and Eco-toxicological impact and insecticide resistance.

In general, if used correctly, chemical pesticides are incredibly effective at killing their target pest. If the most appropriate pesticides is selected, if it is targeted effectively when applied and the timing, rate of application and number of applications is optimized in relation to the application costs and subsequent benefits achieved through increased crop yield, then pesticides remain an efficient and economic means of controlling pests. Even when used inappropriately, and applied incorrectly, the perceived benefits of pesticides to the farmer still seem justified in relation to their costs, the yields obtained and the perceived benefits of reduced risk from pest damage. Hence, even in this simplistic way it is easy to understand why pesticides have proved so popular among users as a means of pest control.