

# Recent Methods of Pest Control

Poison Baits

Repellents

Antifeedants

Pheromones

Food lures

Oviposition Lures

**I. Insect Repellents:** Chemicals which cause insects to move away from their source are (or) prevent insect damage to plants by rendering them unattractive, unpalatable (or) offensive

**Desirable traits of a good repellent**

effective for a long time      on a wide range of insect      Weathering effects be the least  
not be toxic (or) irritating to man and animals      harmless to clothes      cheap

**1) Physical repellents**

**i. Contact-** (Such as dusts, granules, water, oils, leaf hairs, spines and waxes)

influence the **surface texture of the plants** to produce a **disagreeable effect on the tactile** sense organs of the insects

**ii. Auditory-** employ sound Eg. **amplified sound** found effective in repelling mosquitoes, pyralid moths and flies

**iii. Visual-** the **yellow color** light is the least attractive and to some extent acts as a **visual repellent** to insects

**iv. Excitatory-** Chemicals such as pyrethrum, DDT, BHC **excite the insect's tarsi** by stimulating the sensory nerves and force them to leave the treated surface

**v. Feeding-** Substances that inhibit feeding in insects are called feeding repellents (or) **Antifeedent**

## 2. Chemical repellents

These are chemicals that affect tactile, olfactory (or) gustatory receptors of insects and could be plant origin (or) synthetic

### i. Repellents of plant origin

- The oil of citronella remained a commonly used mosquito repellent (Odomos)
- extracted from the **lemon grass, Cymbopogon nardus** and contains **citronellol, geraniol** (as the main constituents)
- Pyrethrum in **low concentrations act as a repellent for blood – sucking insects**
- Clothes impregnated with some pyrethroids effective against the attack of many insects vectors like *Aedes aegypti* etc.

### ii. Synthetic repellents

- **Diethyl toluamide**, protects the bearer against mosquitoes, ticks, fleas and biting flies
- The others are Bordeaux mixture, Dimethyl phthalate, and Indalone

**Insect Antifeedants- Inhibits feeding** but does not kill the insect directly

- Insect often may remain on the treated plant material and die of **starvation** also caused as “**Feeding deterrents**”
- Three main sites for the sense of taste in insects located in the **mouth, on the tarsi and on the antennae**
- Distortion of the normal function of neurons which **perceive phagostimulating compounds**

## **Groups of antifeedants**

### **a) Triazines**

- **Acetanilide** is an odourless and tasteless solid and not phytotoxic
- inhibits feeding of most chewing surface feeders

### **b) Organotins**

- **Triphenyl tin acetate** (Brestan) was one of the **earliest organotins**
- Have an antifeedant effect on the foliage – feeding insects such as the cotton leaf worm, colorado potato beetle etc.

### **c) Carbamates**

- Inhibit the feeding of Mexican beetle, Colorado potato beetle and japanese beetle
- **Arprocarb (Propoxur)** is systemic antifeedant against the **boll weevil, Anthonomus grandis**

## d) Botanical Extracts

### i) Pyrethrum

- not only insecticide but in small doses also acts as an antifeedant for the biting fly, *Glossina*.

### ii) Margosa (Neem)- First reported by Pradhan et al. in 1962,

Very effective antifeedant against a large number of insects, particularly **the desert locusts, *Schistocerca gregaria***

### iii) Apple Factor

- genus ***Malus*** yields phenol i.e. **phlorizin** acts as a feeding deterrent for **non- apple feeding aphids** (*Myzus persicae*)

### iv) Solanum alkaloids

- Alkaloids (tomatine, solanine) reduce feeding of **potato leaf hopper, *Empoasca devastans***
- several other substances like non – essential amino acids, tannins, lignins etc. act as antifeedants to many insect pests

## Advantages

1. affect only the **phytophagous insects** and so do not harm the beneficial insects
2. As pest is not killed, its parasites and predators **continue to feed** on it, thrive, and keep it under control
3. **No phytotoxicity (or) pollution**

## Disadvantages

1. Only the **chewing type of insects** are effected
2. **New growths of plant** are not protected
3. insects **move to untreated parts** (or) other plants and damage them

Antifeedants are **not effective enough to become a sole** control measure

They could only be promising when included in the **integrated control schemes**

## Insect Attractants

- Chemicals that cause insects to make oriented movements towards their source are called insect attractants
- Influence **both gustatory (taste) and olfactory (smell)** receptors (or) sensilla

## Types of Attractants

1. Pheromones
2. Natural food lures
3. Oviposition lures
4. Poison baits

### 1) Pheromones- 1959, Karlson and Butenandt coined the term pheromone

Chemical secreted into the external environment by an animal that elicits a specific response in a receiving individual of the same species. It is also referred to as “**ectohormone**”

i) **Releaser effect** - an immediate and reversible behavioural change is produced in the **receiving animal**

ii) **Primer effect** - a chain of physiological changes is triggered off in the receiving animal

Eg : Gustatory stimulation, controlling caste determination and reproductive control in social Hymenoptera (Ants and Bees), Isoptera (Termites)

**Behaviour- releasing pheromones** are typically odorous and act directly on the central nervous system of the receiving animal. Eg: Alarm, trail following, aggregation for mating, feeding (or) oviposition

The pheromones that promote aggregation are **sex pheromones and aggregation pheromones**

## a) Sex pheromones

- released by one sex only triggers off **a series of behavior patterns** in the other sex and thus facilitates mating
- Male insects respond to the odorous chemical released by the **female**
- In certain species, males are known to produce the sex pheromone Ex : **cotton boll weevil Anthonomus grandis**
- The males responding only to a **specific pheromone of the female of the same species**
- Their reactions are directed towards the **air currents carrying the odour**
- time of release by the females and response by male appears to be **specific for each species**
- The following sex pheromones have been isolated and identified
- Bombycol : Silkworm, Bombyx mori
- Litlure : Tobacco cutworm, Spodoptera litura
- Helilure : Red gram pod borer, Helicoverpa. armigera

## Sex pheromones in insect pest management

1) **Monitoring of insect pests:** estimating population and detecting early stages of pests

- Four pheromone traps per acre is recommended

2) **Mass-trapping:** (Male annihilation technique):

to capture male moths of newly emerged and **reduce the number of males for mating**

3) **Mating disruption:**

By higher concentration of the pheromone the opposite sex is rendered **confused and unable to locate their mates**

### **Merits:**

species specific    safe to natural enemies    small doses economical and compatible for IPM.

### **Demerits:**

available only for a few pest species    Replacement of lures    pest specific

## b) Aggregation pheromones

- pheromone released by one sex only **elicits response in both sexes** of a species
- In **scolytid (or) bark beetles** the males secrete the **pheromone into the hind gut**

**which gets incorporated in to the faecal pellets** and through them attracts flying males and females towards the galleries

- In **Trigoderma granaria**- mixture of **fatty acid esters and methyl and oleate**

## c) Trail marking pheromone

- At low concentrations mostly used by **foraging ants and white ants**
- In ants *Formica rupa*, **formic acid** while termites, *Zootermopsis nevadensis* it is **hexanoic acid**

## d) Alarm pheromones

- Secreted by **mandibular glands, sting apparatus, anal glands** which results in **fight or aggression**
- **Dolichoderine ants** – release a **fruity odour** by the worker that results in a erratic behavior of workers



## 2. Natural Food lures

- Chemicals present in plant and animal hosts that attract (lure) insects for feeding
- They stimulate olfactory receptors and may be

1. A **floral scent** in case of the **nectar feeding insects**

2. **Essential oils** for the **phytophagous insects**

3. **Decomposing products** for **the scavenger**

4. **Carbon dioxide, lactic acid and water** for the **blood sucking insects**

## 3. Oviposition Lures

- Chemicals that govern the selection of suitable sites for oviposition by the adult female

Eg. **P-methyl acetophenone** attracts adult **female rice stem borers** to oviposit.

4. **Poison Baits**- mixture of food lures and insecticides

- more attractive to insects than their natural food and also a smaller quantity attract the largest number of insects
- Baits are used when for some reason spraying (or) dusting of insecticides is not practicable