BIO-RATIONAL CONTROL

- Controlling insects using chemicals that affect insect behaviour, growth or reproduction. They do not affect non target organisms.

  Methods used include:
- Pheromones
- Insect attractants/repellents
- Anti-feedants
- Sterile male release
- Insect growth regulators
- Hormones

INSECT ATTRACTANTS

- Chemicals that cause insects to make oriented movements towards their source. They influence both gustatory (taste) and olfactory (smell) receptors.
- In general chemical substances that deliver behavioural messages are called **semiochemicals.** Interspecific semiochemicals that benefit the producer are called **allomones** and those that benefit the receiver are called **kairomones.**

TYPES OF ATTRACTANTS

- **A. Pheromones:** Pheromones are semio-chemicals that are largely used **intra-specifically**. They are secreted into the external environment by an animal which elicit a specific reaction in a receiving individual of **same** species.

PHEROMONES

- Pheromones are used by insects for alarm, sexual attraction, aggregation, tracking or trail-marking, sexual maturation, and individual or colony recognition.
- Pheromones are sometimes named according to the type of behavior they induce. Hence we can have **alarm pheromones**, **sex pheromones**, **aggregation pheromones**, **trail-marking pheromones** etc.

PHEROMONES

- Among these, **sex pheromones** have been most promising in insect control in IPM.
- They are most commonly released by females but may be released by males also.

PHEROMONES

- Insect orders producing sex pheromones include Lepidoptera, Orthoptera, Dictyoptera, Diptera, Coleoptera, Hymenoptera, Hemiptera, Neuroptera and Mecoptera.
- However, in order Lepidoptera, sex pheromonal system is highly developed.

Funnel pheromone trap

Funnel pheromone trap

Delta trap

PHEROMONES

- Examples are the sex pheromone **disparlure** of the gypsy moth, *Porthetria dispar* and **Bombycol** for the silk worm *Bombyx mori*.
- Pheromones are not always intraspecific, some are interspecific.
- The species to be controlled is selectively lured to its death. Mating calls and sex attractants are used to attract insects to baits treated with insecticide.

PHEROMONES

- Alarm pheromones typically induce flight or aggression. They are especially used in order Hymenoptera.
- Trail-marking pheromones are most commonly produced and used by foraging ants and termites.

TYPES OF ATTRACTANTS

- **B. Food lures**: Are natural chemical substances (kairomones) present in many plant and animal hosts that direct the insect pest toward suitable sites for feeding.
- Food lures act as token representatives of the nutritive components of suitable food.
- Examples are floral scents for nectar feeders, essential oils for phytophagous insects, decomposition products for scavengers, and carbon dioxide, water, and lactic acid for bloodsucking insects.

TYPES OF ATTRACTANTS

- **C. Oviposition lures**: Are natural chemical substances that control the selection by the adult female of sites for oviposition.
- Oviposition lures have considerable potential for exploitation, as it has been shown, for example, that maize earworm moths, *Heliothis zea* (Boddie), oviposit on twine impregnated with the juice from maize silk.

USE OF ATTRACTANTS IN IPM

- 3 ways:

  a) Sampling and monitoring pest population.

  b) Luring pests to insecticide coated traps or poison baits.

  c) In Confusing and distracting insects from normal mating, aggregation, feeding or oviposition. E.g. The female if lured to wrong plants for egg laying, the emerging larva will starve to death.

ATTRACTANTS

Advantages

- They are specific to target insects
- NEs are not affected

Disadvantage

They cannot be relied on as the sole method of control and can only be included in IPM as a component.

INSECT REPELLENTS

- Chemicals that induce avoiding (oriented) movements in insects away from their source.
- They prevent insect damage to plants, animals, or materials such as fabrics and timber by rendering them unattractive, unpalatable or offensive.

TYPES OF REPELLENTS

1. **Physical repellents**: produce repellence by physical means.

- Contact stimuli repellents: Substances like wax or oil when applied on leaf surface changes physical texture of leaf which are disagreeable to insects.
- Auditory repellents: Amplified sound is helpful in repelling mosquitoes

TYPES OF REPELLENTS

- Barrier repellents: Tar bands on trees and mosquito nets are examples.
- Visual repellents: yellow light acts as visual repellent to some insects.
- Feeding repellents: Antifeedants are feeding repellents because they inhibit feeding.

TYPES OF REPELLENTS

2. Chemical repellents

   2 types:

a. Plant origin: Essential oils of Citronella, Camphor and cedarwood act as repellents. Commercial mosquito repellent 'Odomos' uses citronella oil extracted from lemon grass, *Andrpogon pardus* as repellent.

   Pyrethrum extracted from Chrysanthemum is good repellent and has been used against tsetse fly, *Glossina morsitans*.

TYPES OF REPELLENTS

b. Synthetic repellents: are chemical repellents that are synthetically produced e.g. naphthalene or moth balls repels fabric eaters.

Use of repellents:

- They can be applied on body to ward off insects.
- Used as fumigants in enclosed area.
- Used as sprays on domestic animals.
- To drive away insects from their breeding areas.