Lec.10

Pheromones of Insects

Definition of pheromones

Pheromones are chemicals produced as messengers that affect the behavior of other individuals of **insects** or other animals. They are usually wind borne but may be placed on soil, vegetation or various items.

A pheromone is a secretion which, if passed to another individual of the same species, causes it to respond, physiologically or behaviorally, in a particular manner.

What insects use pheromones?

Social **insects** have provided some of the most spectacular examples of **pheromone** evolution. **Pheromones** mediate many of the complex interplays within colonies of social **insects** such as bees, wasps, and ants. These include the familiar trails of ants and the honeybee alarm **pheromones** mentioned earlier.

How do insects detect pheromones?

Insects "smell" with their antennae. **Pheromone**-binding proteins (PBP) pick up **pheromones** at pores in the outside of the antenna and carry them through a watery layer to the nerve endings, where they are released.

Why are pheromones important to insects?

pheromones to recruit nest mates to a food source (which explains trails of ants at a picnic or in a kitchen). When laying their eggs, some flies, moths, and beetles use certain **pheromones** to repel **insects** of the same and competing species, thereby protecting their progeny from competition for resources.

Toxicity and other biological effects

Due to their low application rates, the expected low residues and low human exposure, pheromones and most other semiochemicals are considered low-risk pest control products.

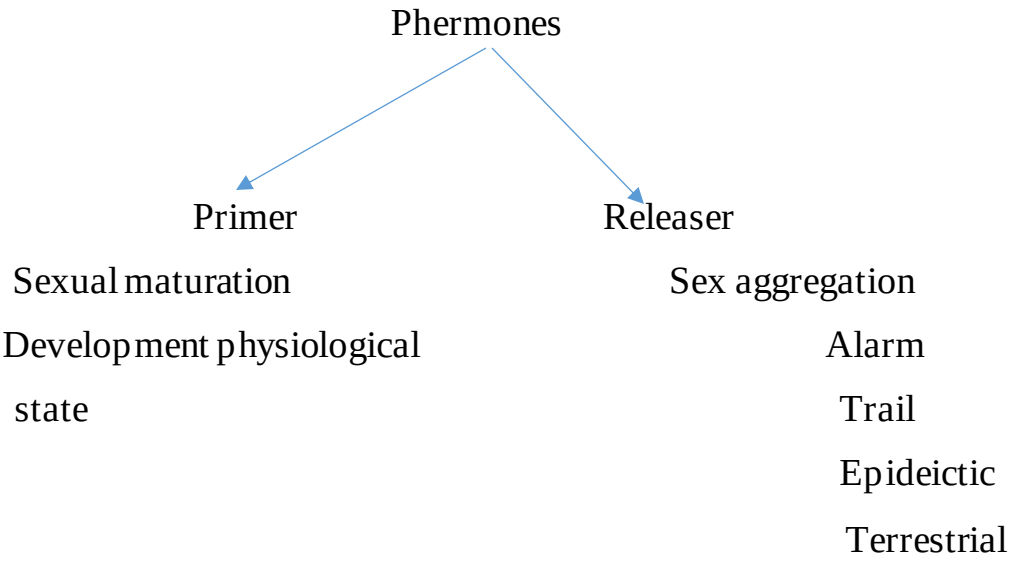
Pheromones: Function and Use in Insects☆

Pheromones are chemical signals used for communication between members of the same species. Some of the most important decisions made by organisms are mediated by **pheromones**. Many of these signals, particularly those produced by insects, are lipid molecules.

Types of phermones

There are two distinct types of pheromones, releasers and **primers**.

Releaser pheromones initiate immediate behavioral responses in insects upon reception, while **primer pheromones** cause physiological changes in an animal that ultimately result in a behavior response.



1. Releaser effect pheromones: operates through the olfactory sensila and regulate the behavior of insects. The pheromones of this category are of the following types in insects: - Sex pheromones , Aggregation pheromones , Alarm pheromones, Trail pheromones.

2. Primer effect pheromones: operate through gustatory sensila and trigger a chain of physiological changes in the body. In insect they regulate cast determination and reproduction in social insect like ant bees and termites.

Pheromone of insects depends upon weather and time of day

Grape beetle *Lobasia bortana* release pheromone at evening

Queen honey bee release the pheromone continuously for male

Honey bee 5-7 days

Structure and distribution of pheromone glands

1-In most insects, pheromones are produced by glandular epidermal cells concentrated in discrete areas beneath the cuticle.

2- In some species, gland cells are scattered through the epidermis of different parts of the body. In male desert locusts (*Schistocerca gregaria*), for example are scattered over the head, thorax and abdomen.

3- In an immature insect, they are small and restricted to the basal part of the epidermis, but as the insect matures they enlarge and extend distally towards the cuticle.

4- In the higher Diptera, the cuticular hydrocarbons forming the sex pheromone are produced by epidermal cells, primarily in the abdomen.

5- The glands are often concealed beneath a fold of cuticle, such as an inter segmental membrane between abdominal segments. They have no reservoir and the pheromone is released directly following its synthesis.

6- In other cases, the glands open into an epidermal invagination which may then serve as a reservoir in which the pheromone accumulates. This is the case with the marking pheromone of social Hymenoptera where larger quantities of pheromone are produced.

Acual properties of pheromone

1- 10-20 large number of carbon atoms.
2- High molecular weight 180-300 Dalton (Narrow specificity& high potency depends
3- Diffusibility decrease with increase molecular weight.
4- Biological activity detected field test male attraction.

Modesof pheromone application

1- Micro encapsulation method
2- Hollow fiber method
3- Phermone baits traps
4- Phermone dispensers

Phermone Reception

1- Exocrine glands
2- Medium (Air or water)

3- Pheromone Receptors

Receptors should be

1- Ol factory (smell or Gustatory) (Taste)

2- Antenna often undergo A Marked sexual dimorphism.

Uses of Pheromones in Pest Management

The use of pheromone for controlling pest insects requires three items:

a pheromone chemical, a trap, and a support to hang the trap in the field.

Technically sex pheromones can be used in three principal ways:

1-Detection and Monitoring:

The principle use of insect pheromones is to attract insects to traps for detection and determination of temporal distribution. In most instances, the males are responders to female-produced pheromones. Trap baits, therefore, are designed to closely reproduce the ratio of chemical components and emission rate of calling females.

2-Mass trapping:

Sex pheromone baited traps can capture male moths continuously, thus preventing mating and multiplication of the pest.

3- **Mating disruption:**

Sex pheromone can be used for disruption of mating, which is achieved by placing high concentrations of pheromone at regular intervals throughout the field.