

Lecture: 3

BIOTIC FACTORS

- **Biotic factor is any living component that affects another organism, including animals that consume the organism, and the living food that the organism consumes.**

Producers : Autotrophs: e.g. plants; they convert the energy (from the sun, or other sources) into food,

Consumers : Heterotrophs: e.g. animals, *insects*; they depend upon producers for food.

Decomposers, e.g., fungi and bacteria; they break down chemicals from **producers** and **consumers** into simpler form which can be reused.

- The biotic factors which affect the **insect behavior, growth, dispersal, distribution and population are.**

1. Food
2. Other organisms

FOOD:

Each insect species has certain natural food requirements for the completion of its life cycle.

Under normal conditions, there is a good adjustment between host and particular species of insects. But in the event of sudden increase in population, the density of population becomes too high to be supported by food availability in the area. Hence, competition for food as well as space will be there.

The **quality** and **quantity** of the food influences, **survival, multiplication, growth** and **development** and **longevity** of insect's species.

Classification of insects based on food requirements:

(Omnivorous, Herbivorous, Oligophorus, Monophagus , Polyphagus Carnivorous, Scavengers, and Saprophagus).

Omnivorous insects: Feed on both plants and animals, e.g., Wasps & Cockroaches.

Carnivorous insects: Feed on other animals, as parasites and predators

Predatory Lady bird beetles, Mantids, *Bracon* spp.

Herbivores insects: Feed on **living plants Crop**, Insect Pests.

Polyphagous: Feed on **wide range of cultivated and wild plants** Locusts, Grasshoppers, Cutworms (*Spodoptera litura*).

Oligophagous: Feed on **plants belong to one family**, Cabbage butterfly *Pieris brassicae*.

Monophagous: Feed on **a single species of Plants**.

Saprophytic insects Feed on **decaying plants** Fruit fly *Drosophila*, and Cecidomyiid flies.

Scavengers Feed on dead organic matter House flies, Scarabaid beetles.

There are two types of feeding relationships among insects

(2) Harmful Relations (Parasites, Predators).

a- Crowding, harmful due to competition for food and space

b- Disease outbreak

c- Cannibalism (Preying mantids, and red flour beetle *Tribolium castaneum* feed on their own eggs, while *Helicoverpa* feed their own larvae.

(1) Beneficial Relations: (Commensalism, Mutualism).

Inter-Specific Associations:

Symbiosis: Inter-relations **between organisms of different species** which live in close and long-term union without harmful effects in known as symbiosis, and each member is known as **symbiont**. One insect feed on the food collected by another insect of the same species e.g., white ants, wasps, bees etc.

Commensalism: One insect is benefitted by living on or inside of another insect without injuring the other is known as commensalism, and it usually lives on the waste or surplus food of its host. The benefitting insect is called **commensal** while the other one is called **host**, e.g., Gall-forming insect.

Mutualism: When the association benefits both the symbionts, it is known as mutualism, e.g. Ants and Aphids, Termites and flagellate protozoans in their guts.

2) Harmful Relations (Parasites, Predators).

Harmful Associations:

Parasites and predators are those that live at the expense of other living organisms.

Parasites:

- Parasite is one, which attaches itself to the body of the other organism, either externally or internally, and gets nourishment and shelter, at least for shorter duration or for entire life- cycle.
- The organism which is attacked by the parasites is called host.

Parasites can be grouped based on Site of Parasitisation/attack

Ectoparasites

This attacks its host from outside of the body of the host. The mother parasite lays its eggs on the body of the host and after the eggs are hatched, the larvae feed on the host by remaining outside only.

Head louse: *Epiricania melanolenca*.

Endoparasites

This enters the body of the host and feeds from inside. The mother parasite either lays its eggs inside the tissue of the host or on the food materials of the host to again entry inside, Braconoids & Ichneumonoids,

Stage of the Host

Egg parasite Attacks egg stage of the host *Trichogramma spp.*

Early larval parasite Attacks early larval stage *Apanteles spp.*

Mid larval parasite Attacks mid larval stage *Bracon hebetor*

Late larval parasite Attacks late larval stage *Gonozus nephantidis*

Pre-pupal parasite Attacks pre-pupal stage *Elasmus nephantidis*

Pupal parasite Attacks pupal stage *Stomatocerus spp.*

Duration of the attack

Transitory Parasite

It is not a permanent parasite but, transitory which spends few stages of its life cycle in one host and other stages on some other species of hosts, or as free living organism, Braconoids and Ichneumonoids

Permanent Parasite

Which spends all the stages of its life cycles on the same host Head louse.

Degree of parasitisation

Obligatory Parasite

Parasite which can live only as a parasite and cannot live away from the host even for short period Bird lice and head louse.

Facultative Parasite

Parasite, which can live away from the host at least for shorter period, Fleas. *Bracon spp.* *Apanteles Spp.* on lepidopteran caterpillars.

There are another harmful relations such as:-

a- **Crowding**, harmful due to competition for food and space

b- **Disease outbreak**

c- **Cannibalism** (Preying mantids, and red flour beetle *Tribolium castaneum* feed on their own eggs, while *Helicoverpa* feed on their own larvae.