

## **Lecture 11: PEST - DEFINITION, CATEGORIES, CAUSES FOR OUTBREAK, LOSSES CAUSED BY PESTS**

PEST - Derived from French word 'Peste' and Latin term 'Pestis' meaning plague or contagious disease

- Pest is any animal which is noxious, destructive or troublesome to man or his interests
- A pest is any organism which occurs in large numbers and conflict with man's welfare, convenience and profit
- A pest is an organism which harms man or his property significantly or is likely to do so (Woods, 1976)
- Insects are pests when they are sufficiently numerous to cause economic damage (Debacli, 1964)
- Pests are organisms which impose burdens on human population by causing
  - (i) Injury to crop plants, forests and ornamentals
  - (ii) Annoyance, injury and death to humans and domesticated animals
  - (iii) Destruction or value depreciation of stored products.
- Pests include insects, nematodes, mites, snails, slugs, etc. and vertebrates like rats, birds, etc.

Depending upon the importance, pests may be agricultural forest, household, medical, aesthetic and veterinary pests.

### **CATEGORIES OF PESTS**

Based on occurrence following are pest categories

**Regular pest:** Frequently occurs on crop - Close association e.g. Rice stem borer, Brinjal fruit borer

**Occasional pest:** Infrequently occurs, no close association e.g. Caseworm on rice, Mango stem borer

**Seasonal pest:** Occurs during a particular season every year e.g. Red hairy caterpillar on groundnut, Mango hoppers

**Persistent pests:** Occurs on the crop throughout the year and is difficult to control e.g. Chilli thrips, mealy bug on guava

**Sporadic pests:** Pest occurs in isolated localities during some period. e.g. Coconut slug caterpillar

### **Based on level of infestation**

**Pest epidemic:** Sudden outbreak of a pest in a severe form in a region at a particular time e.g. BPH in Tanjore, RHC in Madurai, Pollachi

**Endemic pest:** Occurrence of the pest in a low level in few pockets, regularly and confined to particular area e.g. Rice gall midge in Madurai, Mango hoppers in Periyakulam

## **Parameters of insect population levels**

### **General equilibrium position (GEP)**

The average density of a population over a long period of time, around which the pest population over a long period of time, around which the pest population tends to fluctuate due to biotic and abiotic factors and in the absence of permanent environmental changes.

### **Economic threshold level (ETL)**

Population density at which control measure should be implemented to prevent an increasing pest population from reaching the ETL.

### **Economic injury level (EIL)**

The lowest population density that will cause economic damage

### **Damage boundary (DB)**

The lowest level of damage which can be measured. ETL is always less than EIL. Provides sufficient time for control measures.

## **PEST CATEGORIES ACCORDING TO EIL, GEP AND DB**

### **(i) Key pest**

- Most severe and damaging pests
- GEP lies above EIL always
- Spray temporarily bring population below EIL
- These are persistent pests
- The environment must be changed to bring GEP below EIL  
e.g. Cotton bollworm, Diamond backmoth

### **(ii) Major pest**

- GEP lies very close to EIL or coincides with EIL
- Economic damage can be prevented by timely and repeated sprays e.g. Cotton jassid, Rice stem borer

### **(iii) Minor pest/Occasional pest**

- GEP is below the EIL usually
- Rarely they cross EIL
- Can be controlled by spraying e.g. Cotton stainers, Rice hispa, Ash weevils

**(iv) Sporadic pests**

- GEP generally below EIL
- Sometimes it crosses EIL and cause severe loss in some places/periods e.g. Sugarcane pyrilla, White grub, Hairy caterpillar

**(v) Potential pests**

- They are not pests at present
- GEP always less than EIL
- If environment changed may cause economic loss e.g. *S. litura* is potential pest in North India

**CAUSES OF PEST OUTBREAK**

Activity of human beings which upsets the biotic balance of ecosystem is the prime cause for pest outbreak. The following are some human interventions - Reason for outbreak

**i. Deforestation and bringing under cultivation**

- Pest feeding on forest trees are forced to feed on cropped
- Biomass/unit area more in forests than agricultural land
- Weather factors also altered - Affects insect development

**ii. Destruction of natural enemies**

- Due to excess use of insecticides, natural enemies are killed
- This affects the natural control mechanism and pest outbreak occurs, e.g. Synthetic pyrethroid insecticides kill NE.

**iii. Intensive and Extensive cultivation**

Monoculture (Intensive) leads to multiplication of pests

Extensive cultivation of susceptible variety in large area - No competition for food

- multiplication increases

e.g. Stem borers in rice and sugarcane

**iv. Introduction of new varieties and crops.**

Varieties with favourable physiological and morphological factors cause multiplication of insects. e.g.

Succulent, dwarf rice varieties favour leaf folder

Combodia cotton favours stem weevil and spotted bollworm

Hybrid sorghum (CSH 1), cumbu (HB1) favour shoot flies and gall midges

**v. Improved agronomic practices**

- Increased N fertilizer - High leaf folder incidence on rice
- Closer planting - BPH and leaf folder increases
- Granular insecticides - Possess phytotoxic effect on rice

**vi. Introduction of new pest in new environment**

- Pest multiplies due to absence of natural enemies in new area
- Apple wooly aphid *Eriosoma lanigerum* multiplied fast due to absence of *Aphelinus mali* (Parasit)

**vii. Accidental introduction of pests from foreign countries (through air/sea ports) e.g.**

- a. Diamondback moth on cauliflower (*Plutella xylostella*)
- b. Potato tuber moth *Phthorimaea operculella*
- c. Cottony cushion scale *Icerya purchasi* on wattle tree
- d. Wooly aphid - *Eriosoma lanigerum* on apple
- e. Psyllid - *Heteropsylla cubana* on subabul
- f. Spiralling whitefly - *Adeyrodichus dispersus* on most of horticultural crops

**viii. Large scale storage of food grains** Serve

- as reservoir for stored grain pests
- Urbanisation - changes ecological balance
- Rats found in underground drainage

**Resurgence**

Tremendous increase in pest population brought about by insecticides despite good initial reduction in pest population at the time of treatment.

- Deltamethrin, Quinalphos, Phorate - Resurgence of BPH in rice
- Synthetic pyrethroids - Whitefly in cotton
- Carbofuran - Leaf folder in rice

Losses caused by pests

Crop loss from all factors - 500 billion US \$ annually world wide

- Insect pests - 15.6% loss of production
- Plant pathogens - 13.3%
- Weeds - 13.2%

### **Estimated crop loss in various crops in India**

	<b>Crop</b>	<b>Loss in yield %</b>
1.	Wheat	3.0
2.	Rice	10.0
3.	<b>Maize</b>	5.0
4.	Sorghum	5.0
5.	Cotton	18.0
6.	Pulses, groundnut	5.0
7.	Sugarcane	10.0
8.	Coffee	8.0
9.	Fruits	25.0
10.	Coconut	5.0

Source: (Pradhan (1964))

**Estimated annual crop loss in India by insect pests = Rs.29,240 crores**

(Dhaliwal and Arora, 1996)