




**FACULTY OF AGRICULTURAL SCIENCES & ALLIED INDUSTRIES**

## Lecture-4 Method of detection and diagnosis of insect pest and diseases

### METHODS OF DETECTION AND DIAGNOSIS OF INSECT PEST

**INSECTS WITH CHEWING MOUTH PARTS**

- DAMAGE




appears on leaves or stems as ragged edges, holes, or other missing tissue

Eg. caterpillars and grasshoppers

This diagram illustrates the damage caused by insects with chewing mouthparts. It features a blue header with the title 'INSECTS WITH CHEWING MOUTH PARTS' and a bullet point 'DAMAGE'. A blue arrow points from the text to a photograph of a grasshopper on a leaf. Another blue arrow points from the text to the examples 'Eg. caterpillars and grasshoppers'.

**INSECTS WITH PIERCING-SUCKING MOUTHPARTS**

- DAMAGE



have strong mandibles that they move laterally to often cause yellowing or browning on plants, and possible wilting

Eg. aphids, scales, spider mites, and whiteflies.

This diagram illustrates the damage caused by insects with piercing-sucking mouthparts. It features a blue header with the title 'INSECTS WITH PIERCING-SUCKING MOUTHPARTS' and a bullet point 'DAMAGE'. A blue arrow points from the text to a photograph of a leaf with yellow and brown spots. Another blue arrow points from the text to the examples 'Eg. aphids, scales, spider mites, and whiteflies'.

## THE DEFOLIATORS

- DAMAGE



feed voraciously and strip a plant nearly bare.



Many caterpillars fall into this category

## THE BURROWERS

- DAMAGE



burrow into the leaves of plants leaving tell-tale tunnels in the leaves



leafminers

## THE GALL MAKERS

- DAMAGE



insert all or part of their bodies into plant tissue—typically into leaves, stems, or twigs—and cause the tissue to swell



gall midge

## THE WOOD/PHLOEM BORERS

- DAMAGE



cause damage by feeding on living wood and wooden structures.

Eg. twig girdlers and powderpost beetles

## STEPS IN DIAGNOSIS OF INSECT DAMAGE

- **I. DEFINE THE PROBLEM**
- **A. Plant identification and characteristics.** Establish what the “normal” plant would look like at this time of year. Describe the “abnormality”: Symptoms & Signs.
- **B. Examine the entire plant and its community.** Determine the primary problem and part of the plant where initial damage occurred.

## **II. LOOK FOR PATTERNS:**

- **A. Non-uniform damage pattern**-(scattered damage on one or only a few plant species) is indicative of living factors (pathogens, insects, etc.).
- **B. Uniform damage pattern** over a large area and uniform pattern on the individual plant and plant parts indicates nonliving factors (mechanical, physical, or chemical factors).

### **III. DELINEATE TIME-DEVELOPMENT OF DAMAGE PATTERN :**

- **A. Progressive spread of the damage** on a plant, onto other plants, or over an area with time indicates damage caused by living organisms.
- **B. Damage occurs, does not spread to other plants or parts** of the affected plant.' Clear line of demarcation between damaged and undamaged tissues. These clues indicate nonliving damaging factors.

### **IV. DETERMINE CAUSES OF THE PLANT DAMAGE :**

- **A. Distinguish among living factors**
  - 1. Symptoms and signs of PATHOGENS.
  - 2. Symptoms and signs of INSECTS, MITES, and other ANIMALS.
- **B. Distinguish among nonliving factors**
  - 1. MECHANICAL FACTORS
  - 2. PHYSICAL FACTORS
  - 3. CHEMICAL FACTORS

### **CHEWING INSECTS**

- eat plant tissues such as leaves, flowers, buds, and twigs.
- Indications of damage by these insects is often seen by uneven or broken margins on the leaves, skeletonization of the leaves, and leaf mining.
- Chewing insects can be beetle adults or larvae, moth larvae (caterpillars), and many other groups of insects. The damage they cause (leaf notching, leafmining, leaf skeletonizing, etc.)

- **Entire leaf blade consumed** by various caterpillars, canker worms, and webworms. Only tougher midvein remains.
- **Distinct portions of leaf missing.**
- **Leaf surfaces damaged:** “Skeletonization” of leaf surface. Slugs, beetle larvae, pearslug (pear sawfly larvae), elm leaf beetle, and thrips

- **Leaves “rolled”:** Leaves that are tied together with silken threads or rolled into a tube often harbor leafrollers or leaftiers, i.e. omnivorous leaftier.
- Leaf miners feed between the upper and lower leaf surfaces. If the leaf is held up to the light, one can see either the insect or frass in the damaged area

## SUCKING INSECTS

- **Sucking** insects insert their beak (proboscis) into the tissues of leaves, twigs, branches, flowers, or fruit and then feed on the plant’s juices.
- **examples**
- aphids, mealy bugs, thrips, and leafhoppers.
- Damage caused by these pests is often indicated by discoloration, drooping, wilting, leaf spots (stippling), honeydew, or general lack of vigor in the affected plant

## SUCKING DAMAGE

Insect species which secrete phytotoxic substances are called toxigenic (toxin-producing) insects.

- The resulting plant damage is called "**phytotoxemia**" or "**toxemia**".
- **SPOTTING OR STIPPLING** result from little diffusion of the toxin and localized destruction of the chlorophyll by the injected enzymes at the feeding site. Aphids, leafhoppers, and lygus bugs.
- **LEAF CURLING OR PUCKERING** – More severe toxemias such as tissue malformations develop when toxic saliva causes the leaf to curl and pucker around the insect.
- **SYSTEMIC TOXEMIA** – In some cases the toxic effects from toxigenic insect feeding spread throughout the plant resulting in reduced growth and chlorosis. Psyllid yellows of potatoes and tomatoes and scale and mealy bug infestations may cause systemic.

## **INJURY BY INTERNAL FEEDERS**

### **BORERS**

- When the larvae feed on the wood or pith of the plant or part of the plant which may be generally large enough to contain the body of the pest, they are referred to as borers.
- The larvae may bore into the terminal shoots and cause death of the shoots as in the case of the cotton bollworm, *Earias* spp.
- In the case of the rice stem borer and the sorghum stem borer, the larvae enter into the stem and cause death of the central shoots.
- An unique example of an adult beetle 'borer is that of the coconut rhinoceros beetle, *Oryctes rhinoceros*, which bores into the unopened tender fronds biting the fibrous material.

### **WORMS OR WEEVILS**

- The larvae bore into flower buds and cause shedding. Such larvae are usually called bud worms as in the case of the moringa budworm and jasmine budworm.
- The larvae may bore into the bolls, nuts, fruits or the seeds inside capsules.
- The cotton bollworms, the mango nut weevil, the pink bollworm of cotton, the brinjal fruit borer and the castor capsule borer come under this category.

### **LEAF MINERS**

- When the larvae, being very small, live in between the two epidermal layers of the leaves and feed on the food material inside, they are referred to as leaf miners.
- Some of the common examples are the citrus leaf miner, the cashew and mango leaf miner, and the buprestid leaf miner *Trachys* sp. on *Barleria cristata*.



## GALLS

- In their immature and or adult stages certain insects are known to be responsible for the formation of special plant deformities known as galls and these galls provide shelter and food to the insect.
- The nutritious sap secreted inside the gall is either absorbed through the body surface or sucked by the mouthparts.
- The galls may be simple as curling of leaves or simple enlargements of affected portions or of complex structures as in some galls produced by psyllid bugs.
- Mostly some species belonging to the families Cecidomyiidae, Cynipidae, Aphididae, Psyllidae and Aleyrodidae and the order Thysanoptera (thrips) are known to cause plant galls.

## INJURY TO STORED PRODUCTS

- **It may be a continuation of a field** attack as in sweet potato weevil and potato tuber moth.
- The eggs may be laid in the field itself and the damage may occur in storage as in redgram infested by the bruchid beetle.
- **The infestation may continue from the material stored earlier** and be carried over to fresh material stored later in a godown or storage house as in the grain weevil, *Sitophilus oryzae*

## INDIRECT EFFECTS OF FEEDING

- **Making the harvest more difficult**
- **Causing contamination and loss of quality of produce**
- **Disseminate plant diseases**

## INJURY BY OTHER METHOD

- a. Injury by egg-laying
- b. Use of plant parts for making nests
- c. Injurious insects being carried from one plant to another
- d. Use of Plants for Nest Materials