Identification and recognition of insect pests and their damage

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Outline

- Definitions:
- Why identify or recognize?
- How to identify?
- Illustration of different insects and damages

Introduction

- Identification: ability to give a name to a specimen received /picked using various procedures/protocols. The name given is in line with the **scientific nomenclature**

- Why identify? It is like solving the problem half way through . One has a basis to take specific actions to deal with the problem e. g insect and not fungi OR fungi and not bacteria or nematodes (**management very different**)

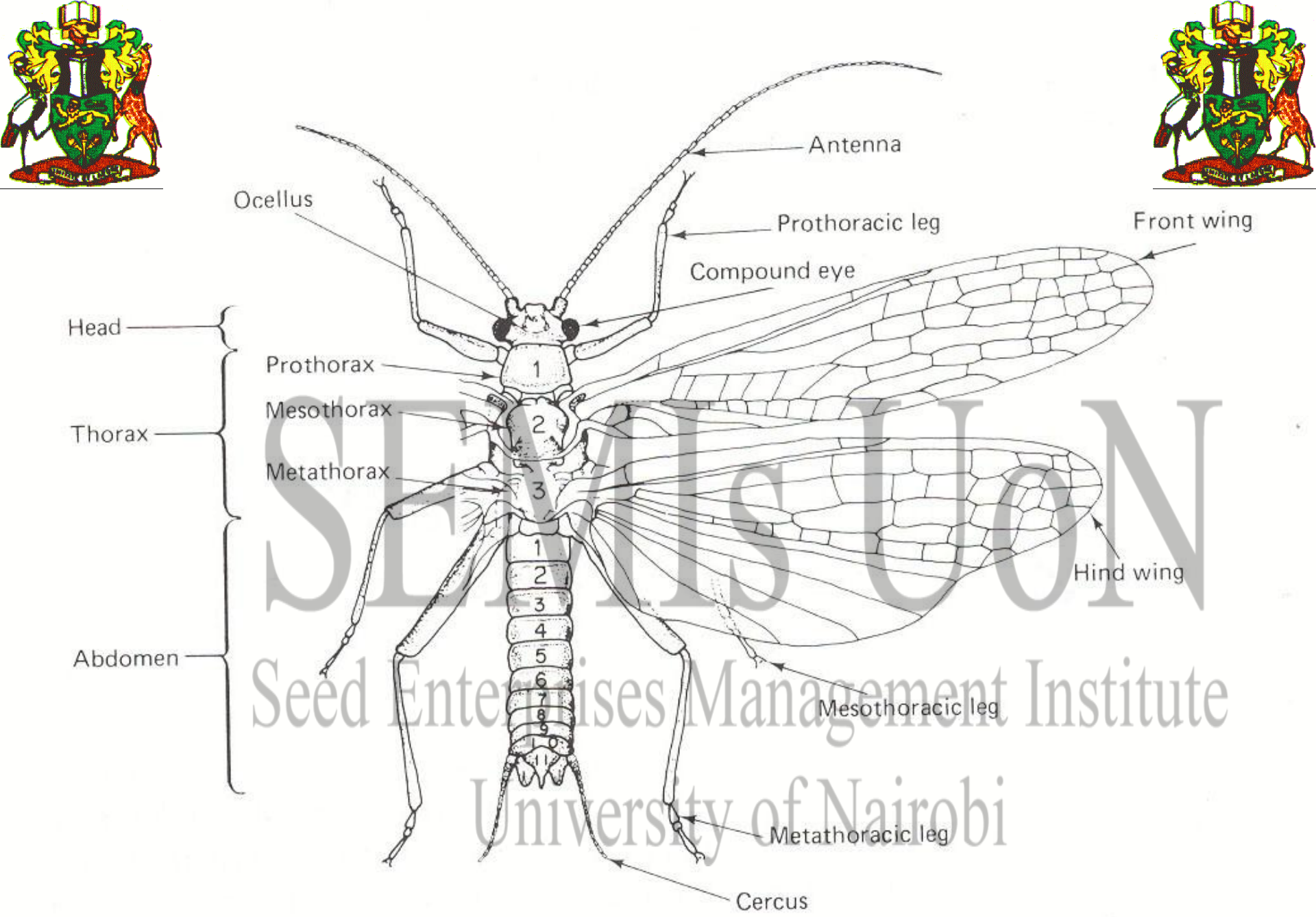
- Recognition: Each pest is associated with **characteristic damage or symptoms** on the plant. Getting to know these makes it easy to deal with certain pest problems in the field. They also help in the process of elimination while getting to know what it is one is dealing with

Recognition

- One has to visually observe various parts of the plant and particularly associated with the pest at certain stages
- Observe whether it is
  - Physical damage: breakage or sunburn or hailstorm
  - Disease symptoms: as caused by various pathogens
  - Arthropod pests : Insects, mites,
  - Molluscs: slugs and snails
  - Vertebrates: Rodents, hare, dik dik, gazelle, elephants

How to identify

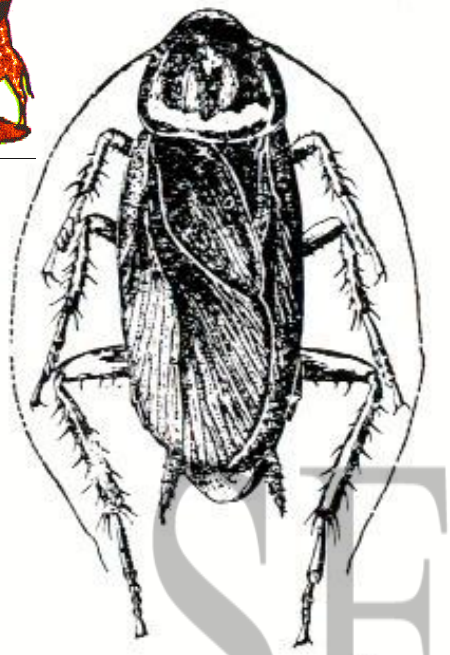
- Use reference materials already collected and identified particularly for insects (insect collection)
- Use experts in the area concerned (individuals and laboratories
- Use morphological descriptions/ characteristics in the form of keys (for insects)
- Use of molecular techniques based on nucleic acid analysis



ORDERS OF IMPORTANT AS INSECT PESTS

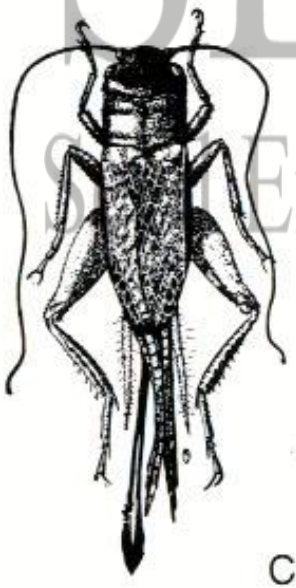
1. **Orthoptera**

- **Characteristics**
  - Medium to large sized with well developed exoskeleton
  - Two pairs of wings, forewings modified as tegmina and hind wings are membranous
  - Hind legs are usually enlarged for jumping.
  - Mouthparts of generalized biting pattern
  - Females have a well-developed ovipositor
  - Special sound producing and receiving organs often present.
  - Development; Incomplete metamorphosis
  - Antennae long and filamentous (crickets) or short (locusts)
  - Cerci well developed
  - Very destructive to crops



A

B



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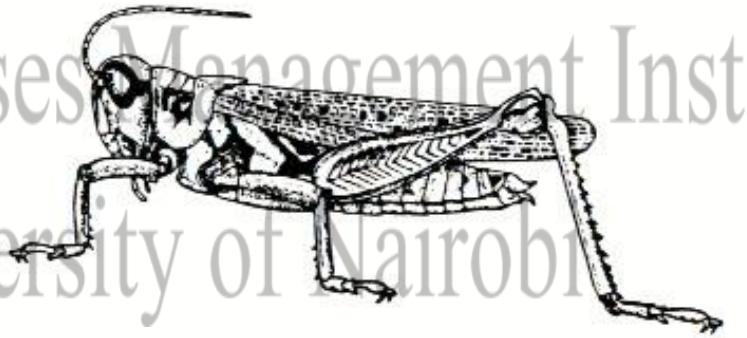
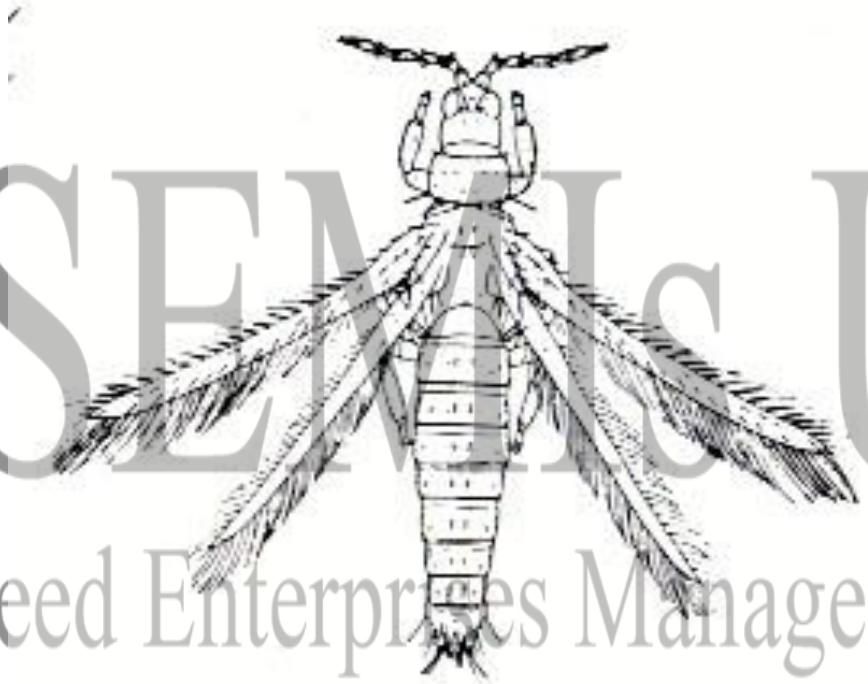


D

Thysanoptera (fringed hairs on the wings)

- **Characteristics**
  - Small, slender bodied, with short 4-9 segmented antennae, and a prominent pro -thorax
  - Asymmetrical mouthparts adapted to rasping and sucking
  - 2 pairs of long narrow wings which have a fringe with long hairs, some spp are wingless
  - Development; Incomplete metamorphosis
  - Mainly feed on leaves and flowers and may spread diseases

Thysanoptera order



D

Hemiptera

Homoptera and Heteroptera

- **Characteristics:**

  - Small to large insects usually with two pairs of wings but apterous (wingless) forms are common

  – Wings when present, have larger forewings and heavier texture than hind wings (uniformity) – (Homoptera) while in sub-order Heteroptera the tip of forewings is more membranous than the base (hemelytra)

  – Piercing – sucking mouthparts (sap feeders)

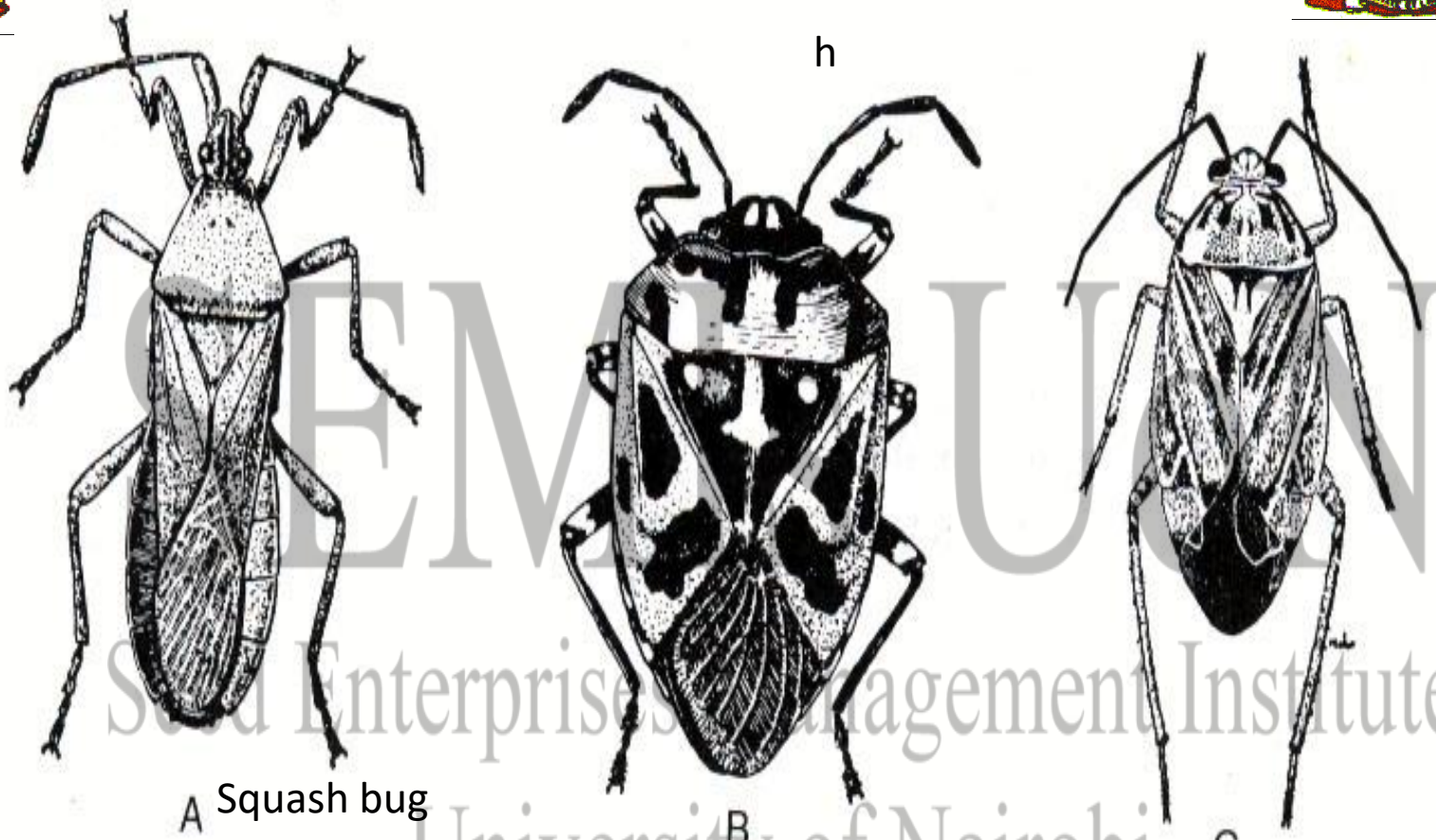
  – Development; Incomplete metamorphosis .

  – Posses toxic saliva

  – Some bugs are aquatic and predaceous, others plant feeders (sap)

  Are important vectors of diseases particularly viruses

Heteropteran Bugs



A Squash bug

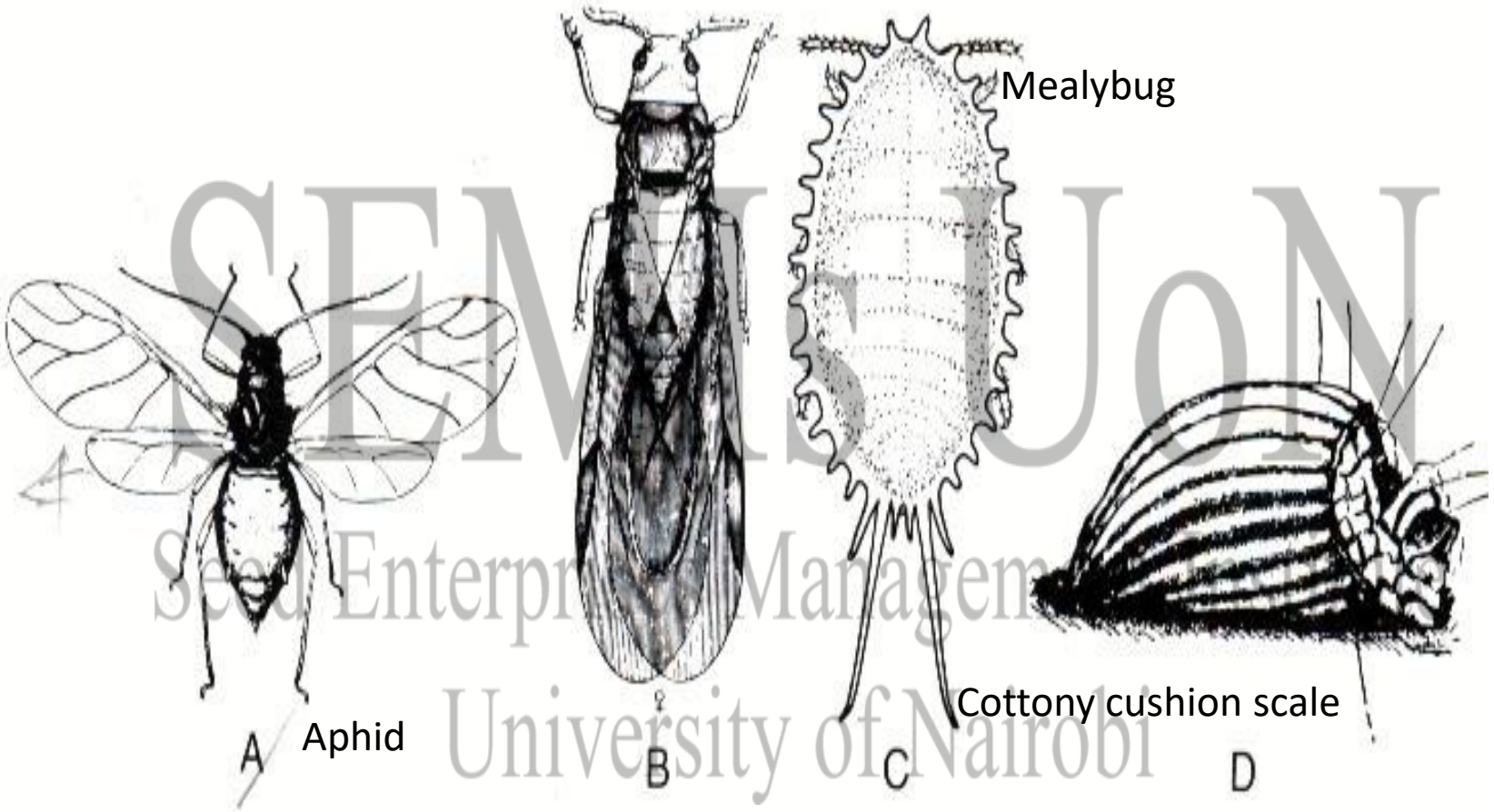
B Harlequin bug

C Plant bug

Homopterans

Grape Phylloxera

Mealybug



Aphid

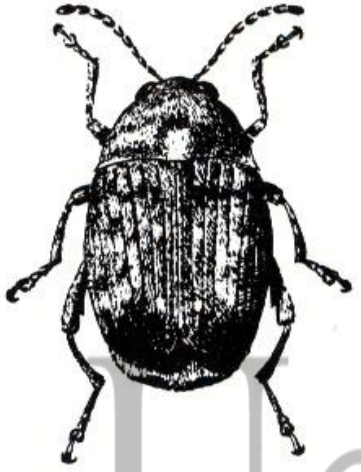
Cottony cushion scale

Coleoptera (beetles)

- Largest order of insects
- Characteristics
  - Minute to large insect (gigantic) insects
  - Two pairs of wings, the forewings are not used for flight, but (hardened) modified into hard horny cases (elytra) protecting the membranes hind wings
  - Development; Complete metamorphosis
  - Aquatic and terrestrial in habit
  - Chewing type mouth parts, well developed mandibles
  - Some are destructive (phytophagous) to plants while others are predaceous (beneficial), a few are scavengers, few parasitic and mould and fungal feeders.

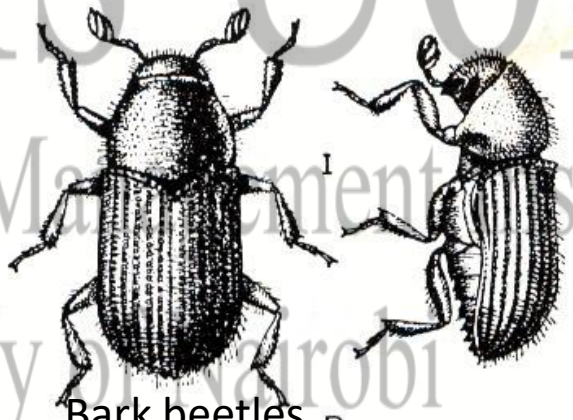
Coleopterans

A Potato beettle



B Bruchid

Leaf weevil C

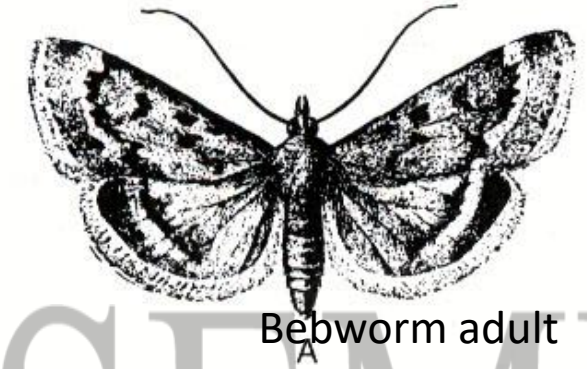


Bark beetles D

Lepidoptera: (Butterflies and moths)

- (11.000spp)
- **Characteristics**
  - Small to large insects with two pairs of large membranous wings, covered with scales
  - Body and legs are also covered with scales and hairs
  - Adults have siphoning mouthparts while larvae have biting chewing mouthparts
  - Clubbed antenna, tapering or feathery
  - Development; Complete metamorhosis
  - Larvae have abdominal prolegs and are generally called caterpillars
  - Pupae with limbs smoothly enclosed usually in a silken cocoon or earthen cell
  - Terrestrial in habit
  - Larvae are very destructive to plants

Lepidopterans



Bebworm adult

A

Sugarcane borer

B

Flour moth

C

Gypsy moth

D

Hymenoptera (sawflies, ants, bees and wasps)

- **Characteristics**
  - Minute to medium – sized with two pairs of membranes wings
  - Biting – chewing mouthparts but may be modified for lapping (chewing-lapping)
  - Development' Complete metamorphosis.
    - Long antennae- contain 10 or more segments
    - Tarsi are usually five-segmented
  - Ovipositor always present and modified for piercing or stinging
  - Larvae bodied and legless, except the sawflies
  - Some spp are social insects (ants and bees)
  - Terrestrial in habit
  - Some are beneficial pollinators, (bees), some are very important biological control agents (wasps) while others are very destructive pests (sawflies)

Hymenopterans

Cherry fruit sawfly

Wheat stem sawfly

Diptera (true flies)

- One of the largest orders
- **Characteristics**

  - Small to medium-sized, soft-bodied, with a single pair of membranous wings (forewings) the hind wings being modified into specialized balancing organs (halteres)

  – Development; Complete metamorphosis
  – Sponging or piercing- sucking mouthparts
  – Larvae are legless, usually with reduced or retracted head.
  – Many are crop pests but most are pests of medical and veterinary importance
  – Dipterous larvae occur in many kinds of habitats – aquatic, within plant tissues, in water, in soil, under barks or stones

Dipterans

Bean fly

Adults

Larvae

Pupa

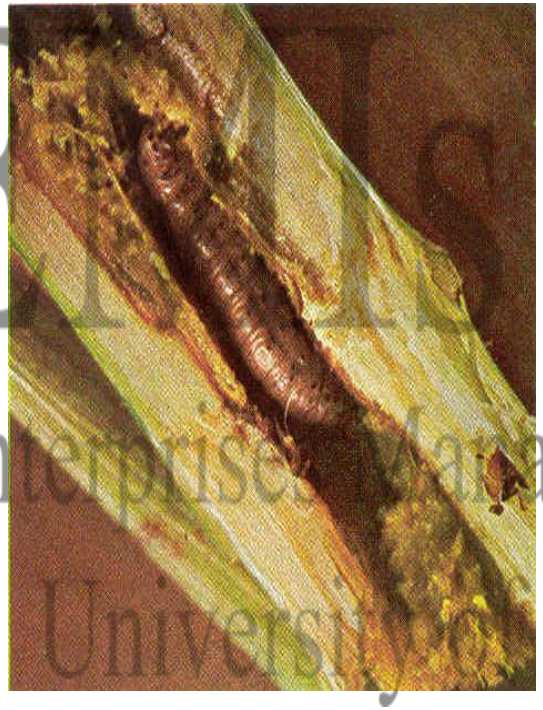
Illustrations of some pests and their damages

Cereal crops

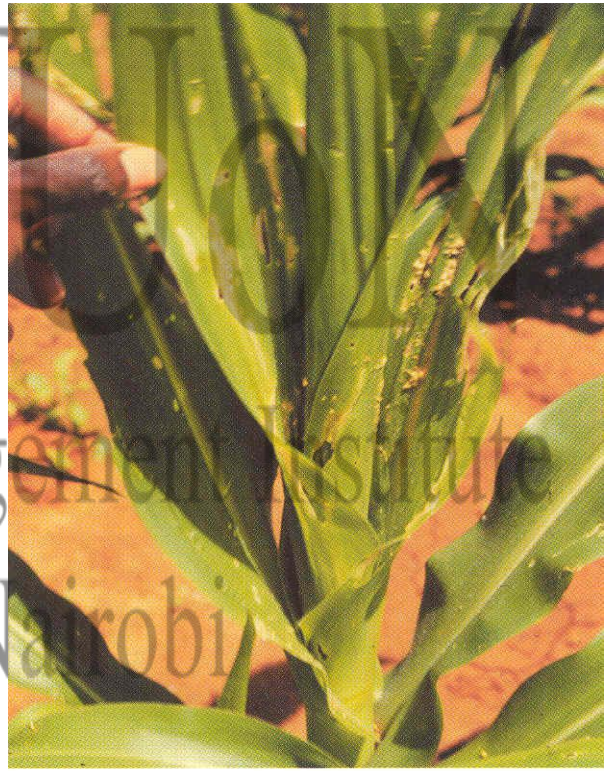
- Maize

Maize aphids (*Ropalosiphum padi*)

Maize stalk borer (*Buseola fusca*)



Stalk borer damage



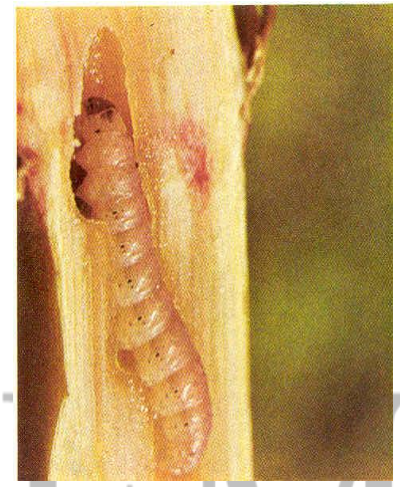
Maize Stem Borers

- major pests of maize and sorghum
- **Alternate hosts**: grasses of *Setaria spp*, *Eleusine spp* and other cereals

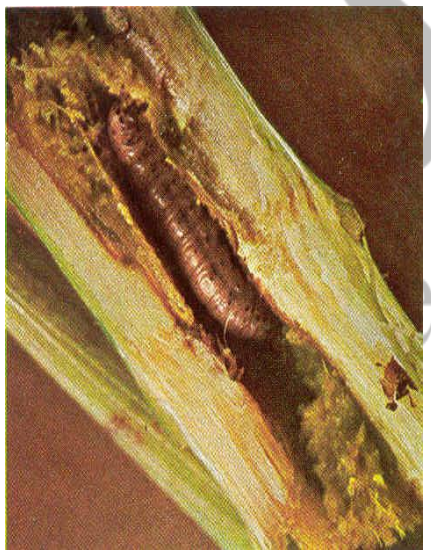
Damage:

- caterpillars feed on the tender leaves in the funnel or central shoot of the plant
- dead hearts' symptoms where the central shoot is killed
- larval feeding on the funnel produces characteristic line of windows across leaves as they unfold

Maize stem borers



Pink stem borer (S. calamistis) adult and larvae



Maize stalk borer (*Buseola fusca*) larvae and its damage on leaves

Stem borer damage: windowing on leaves and tunnelling of stems

Fall army worm

- New pest in Africa said to have migrated from the Americas
- It feeds on 80 different species of plants but preferred host is maize
- Maize feeds over 200 M people in Sub Saharan Africa (SSA)




Tunneling of stems or cobs or harvestable portions

Corn earworm, *Helicoverpa zea* (Boddie) (Lepidoptera: Noctuidae), in sweet corn.
Photo by G. McIlveen, Jr.

Maize Stem borer (*Chilo spp*) that has pupated in the stem

Chilo spp slightly younger larvae

Armyworms and the skeletonizing damage done on cereals and grasses

Other minor pests

Maize aphids (*R. maidis*) late season pests

Aphids are suckers if 50% plants are infested by about 400 aphids/plant at late whorl to early tasseling stage, take control measures

Cutworm (*Agrotis spp)*

larvae cut young seedlings at ground level or hollow out the stem underground then plants wilt and die. Pests are sporadic Control with chemical in the evening by soil drenching areas with the damage (use *Dimethoate)*

Sorghum shoot fly

Damage on sorghum by borers and locusts

Sorghum midge, *Contarinia sorghicola* (Coquillett) (Diptera: Cecidomyiidae). Photo by Drees.

Insect feeds on forming seeds in the milky stage. The head does not fill well and some of the seeds are shriveled lowering sorghum yield.

Insect PESTS OF PADDY

Borer pests of paddy

Yellow stem borer

Scirpophaga incertulas

Gall midge or Gall fly

Orseolia oryzae

Sucking pests of paddy

Green leaf hoppers (GLH)

1. *Nephotettix nigropictus*
2. *N. virescens*

White leaf hopper(WLH)

Cofana spectra

Brown Plant hopper(BPH)

Nilaparvatha lugens

Earhead bug

Leptocorisa oratoria

Thrips

Stenchaetothrips biformis

Mealybugs

Brevennia rehi

Legume crops

Bean Fly (***Ophiomyia phaseoli***)

- Main host: - Beans
- Alternate hosts: - A wide range of leguminous crops

- Damage: new larvae barrow down through the petiole of the leaf through the stem until they reach the ground level where they feed on stem tissue

Result: swollen stems that eventually split, roots recede, plant wilts/wither and die

Bean fly larva tunnelling into the surface of stem (centre, top stem) (Photo: J. Wessels)

Damping off of seedlings

Adult bean fly showing shiny, black body with clear wings (Photo: J. Wessels)

Heavy aphid infestation of growing tips of a dry bean crop

Corn Aphid infestation on maize/ sorghum leaf

Damage done using piercing sucking mouthparts

Two spotted mites

Two spotted mites damage on common bean leaf (yellow colour compared to common bean green leaf)

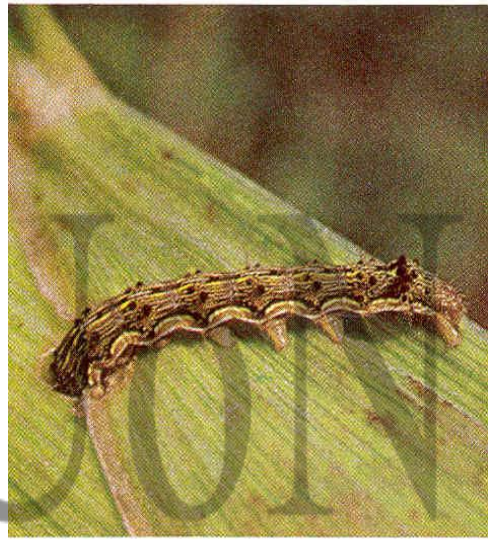
Photo by Richard Clark, Utah

Destruction of plant tissues by eating away leaves or causing stippling or mines on leaf

Serpentine leafminer, (Diptera: Agromyzidae) maggot damage to chrysanthemum.
Photo by H. A. Turney.

Pod Borers (*Maruca testulalis) and Helicoverpa spp*

- major pests of pigeon pea and cowpea



Damage

- caterpillars eat leaves, flowers, flower buds and pods, serious damage on pods where seeds are destroyed
- Spray at flowering with alphacypermethrin, dimethoate, imidacloprid,

African bollworm on pod

African bollworm on pod and damage

Leaf folder in pod and folded leaves

Maruca damage in pod and frass on the pod

Bean pod borer

Pod Fly - *Melanogromyza obtusa*

- wide spread and major pest of pigeon pea, cow pea

Damage

- no obvious external symptoms of pod fly attack till fully grown larvae chew holes in the pod walls leaving a “window” from which adult flies out

Pod flies (Adult and damage)

- Adult fly is black, lays eggs in pods, pupae found in pod

- Larvae chew holes in pods and damage seeds

Pictures courtesy of ICRISAT training resource

Pod fly adult

Aphids

Pod fly maggots

Leaf webber

Pod fly pupae

Pod Sucking Bugs - Acanthomia spp

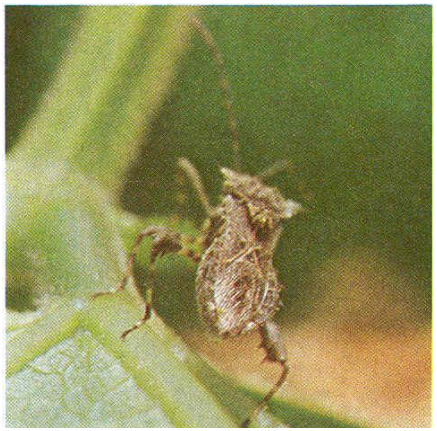
- Pests of beans, pigeon peas, cow peas and *Dolichos lablab* mainly. They also feed on other pulse crops

Damage:

- Bugs suck developing seeds through the pod wall. The seeds become shriveled with dark patches. Such seeds do not germinate and are not acceptable as human food

Pod Sucking Bugs --

- A fungus (*Nematospora coryli*) is often associated with *Clavigralla* damage but it is not certain whether the fungus is introduced by the bug itself or whether it enters the seed via the feeding punctures.
- Spiny brown bug (*Acanthomia spp*)



Pod borer damage

Maruca damage

Healthy grain

Pod bug damage

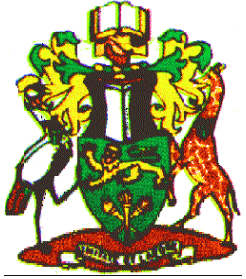
Pod fly damage

Insects eating flowers

Pollen beetle (*Mylabris spp*) feeding on legume flowers
Reduces pod setting and hence yield important to control at flowering

Leaf miner and its damage on groundnut leaves

Damage on groundnut leaves by Spodoptera spp



THANK YOU