Identification and recognition of insect pests and their damage

Prof. F. Olubayo and Dr. D. Kilalo

Department of Plant Science and Crop Protection

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**)

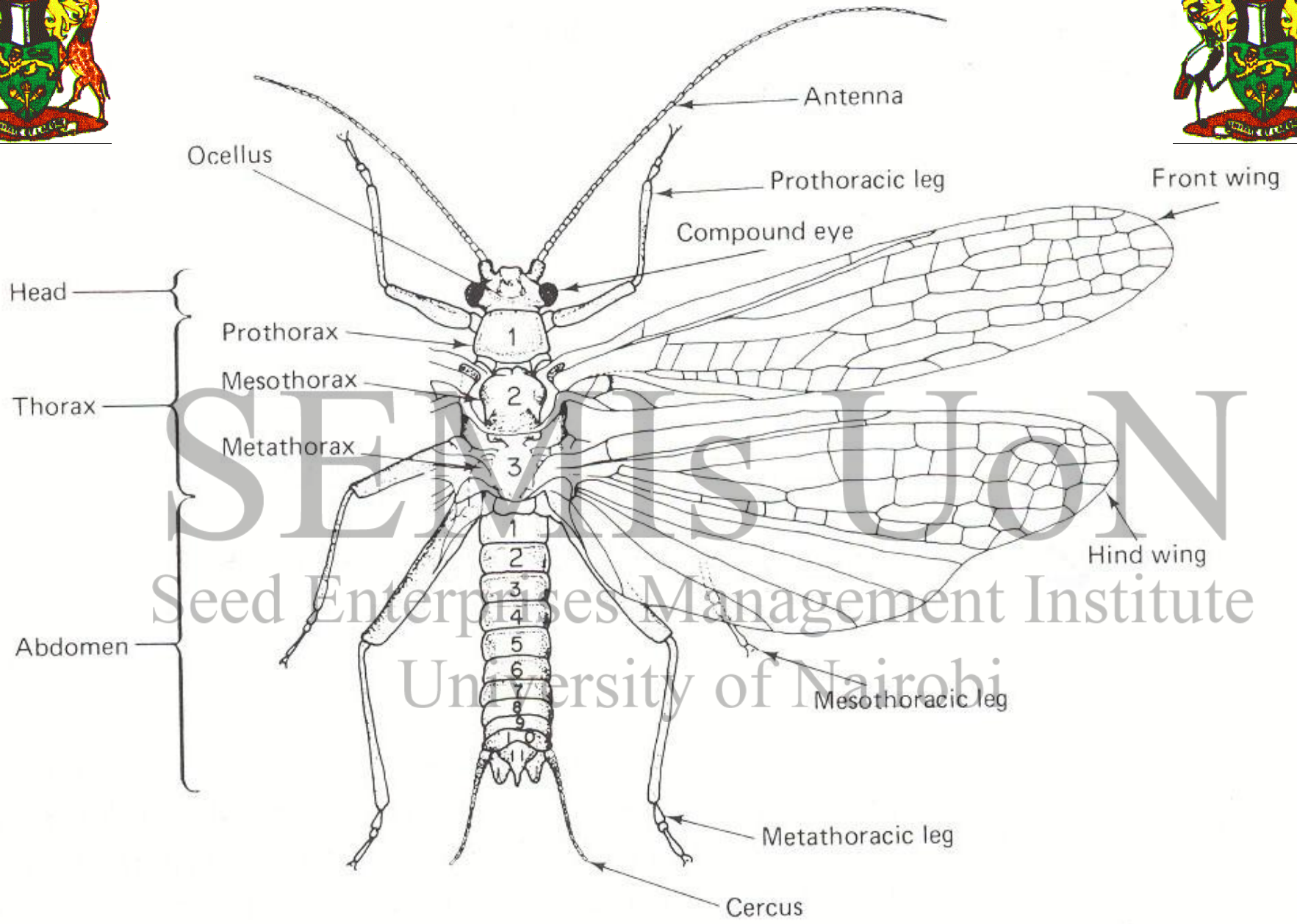
- Recognition: Each pest is associated with **characteristic damage or symptoms** on the plant. Getting to know these makes it easy to deal with certain pest problems in the field. They also help in the process of elimination while getting to know what it is one is dealing with

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

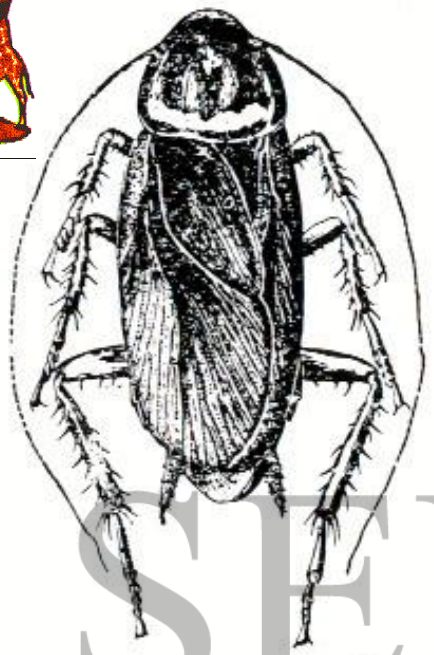
- Use reference materials already collected and identified particularly for insects (insect collection)
- Use experts in the area concerned (individuals and laboratories
- Use morphological descriptions/ characteristics in the form of keys (for insects)
- Use of molecular techniques based on nucleic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

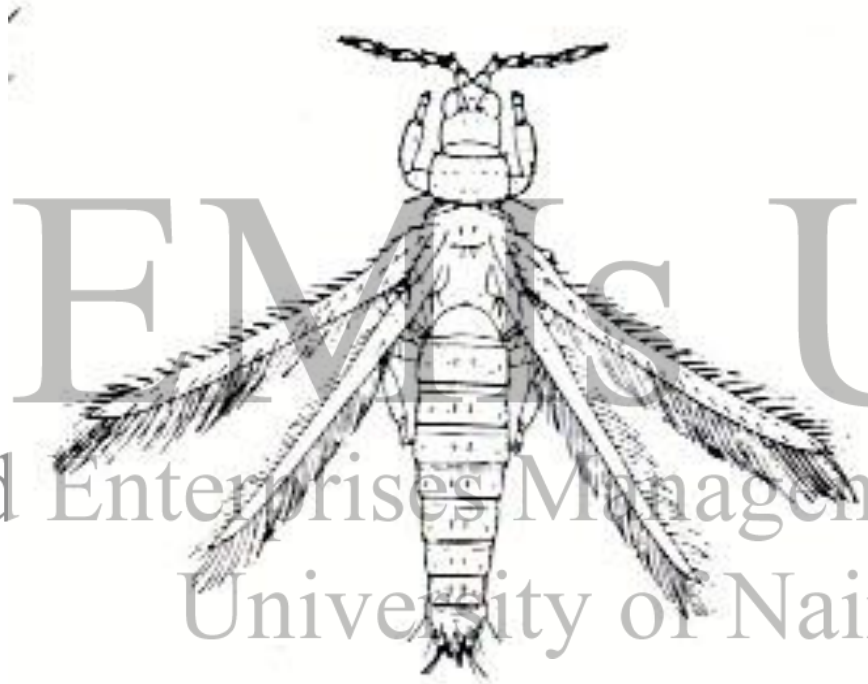
C

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)

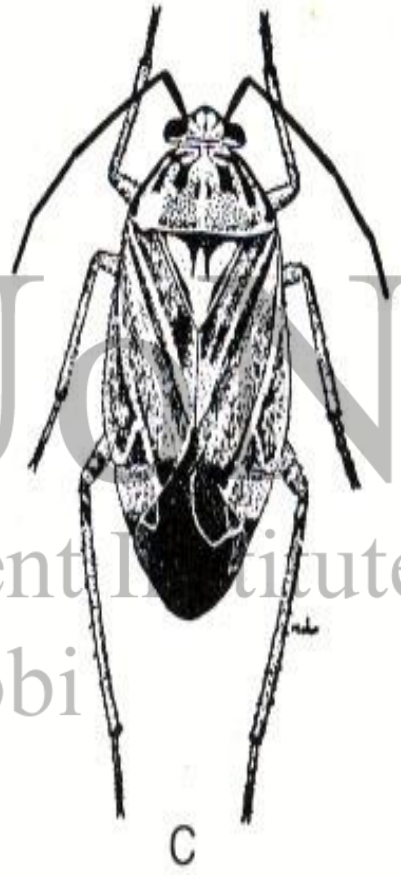
  Are important vectors of diseases particularly viruses

Heteropteran Bugs

A Squash bug

B

Harlequin bug

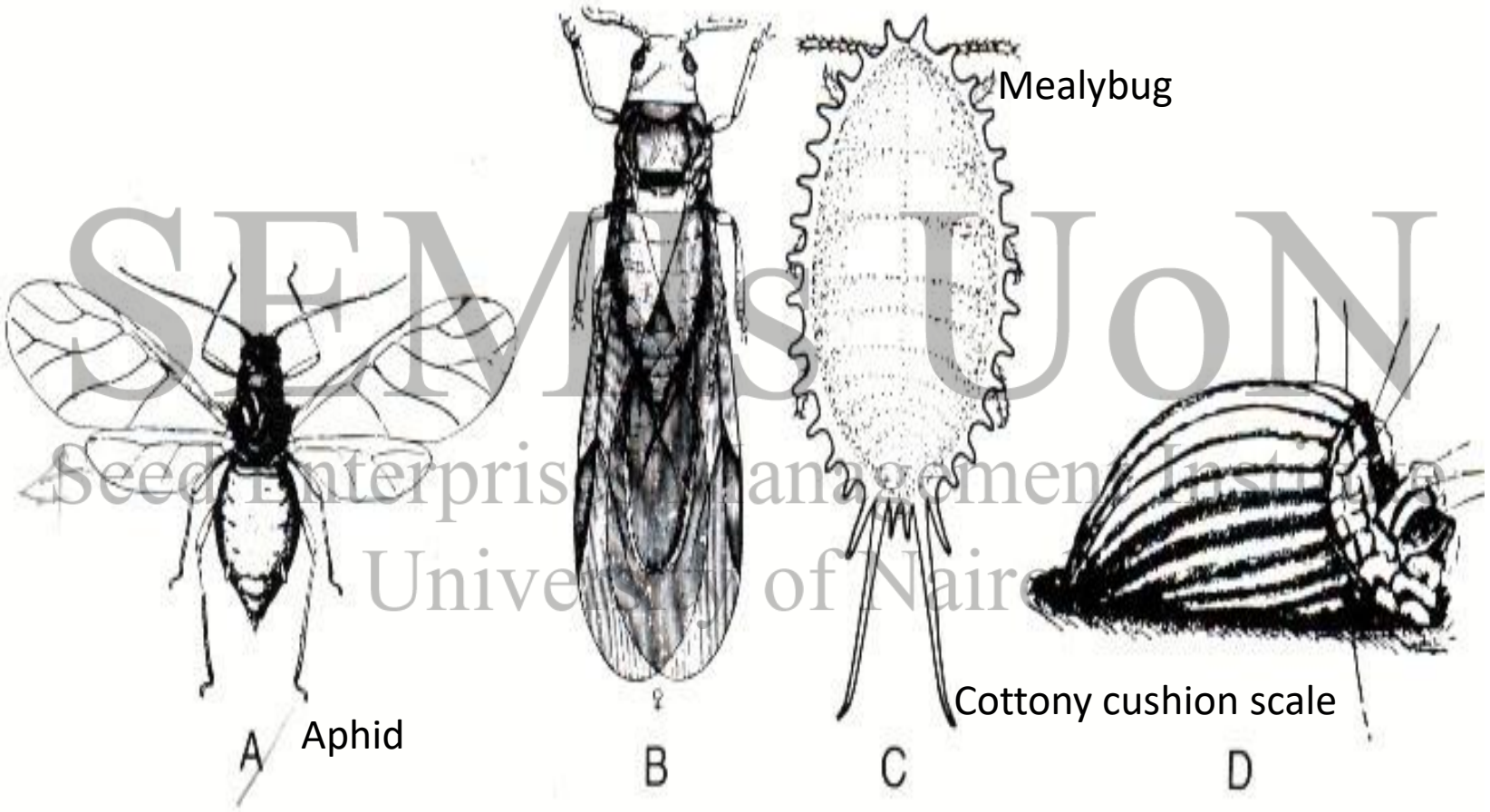


C

Plant bug

Homopterans

Grape Phylloxera

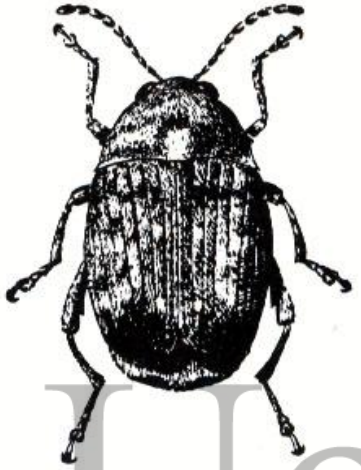


Coleoptera (beetles)

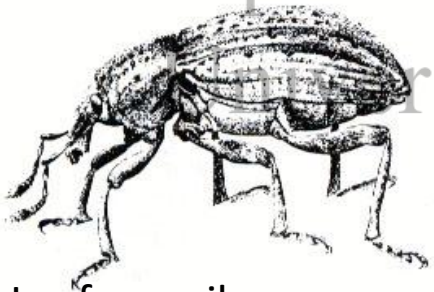
- Largest order of insects
- Characteristics
  - Minute to large insect (gigantic) insects
  - Two pairs of wings, the forewings are not used for flight, but (hardened) modified into hard horny cases (elytra) protecting the membranes hind wings
  - Development; Complete metamorphosis
  - Aquatic and 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

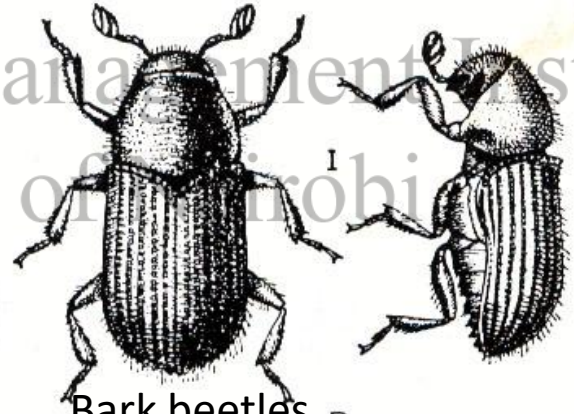
A Potato beettle



B Bruchid



Leaf weevil C

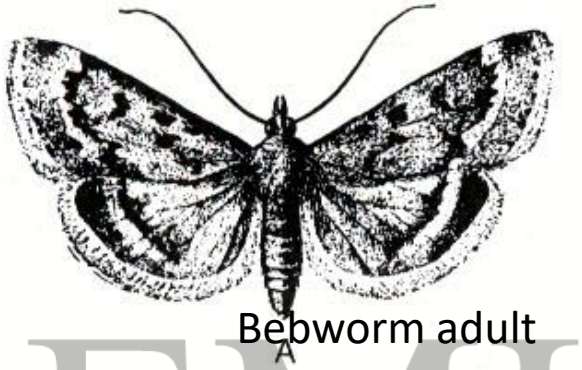


Bark beetles D

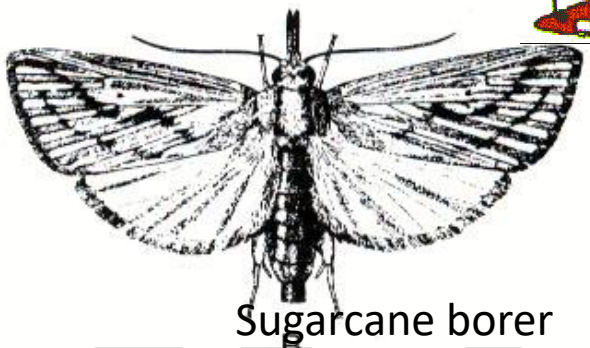
Lepidoptera: (Butterflies and moths)

- (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



Sugarcane borer

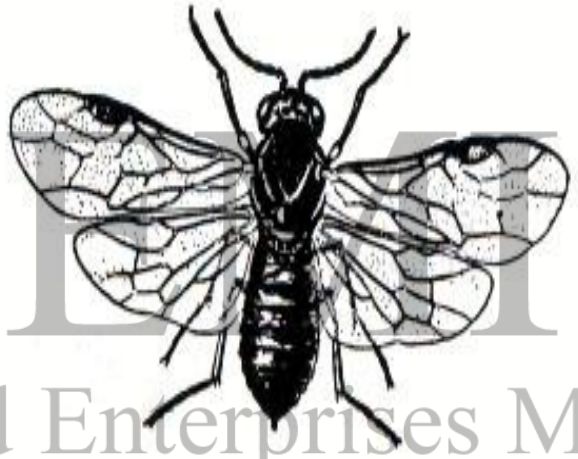
Flour moth

Gypsy moth

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)

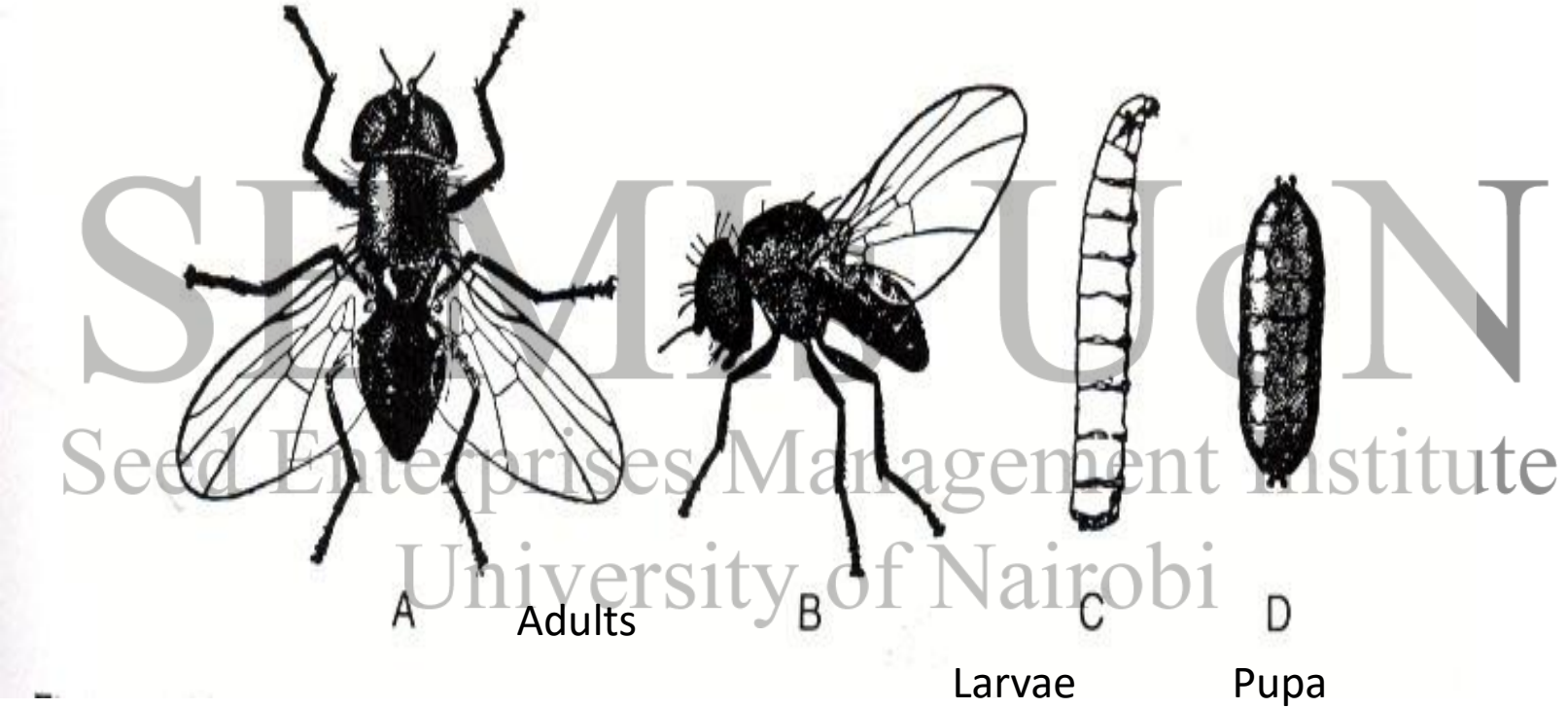
- One of the largest orders
- **Characteristics**

  - 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

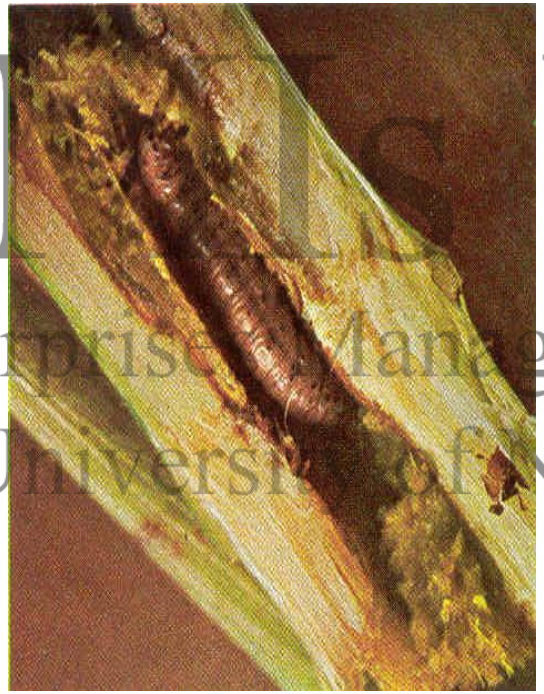
Illustrations of some pests and their damages

Cereal crops

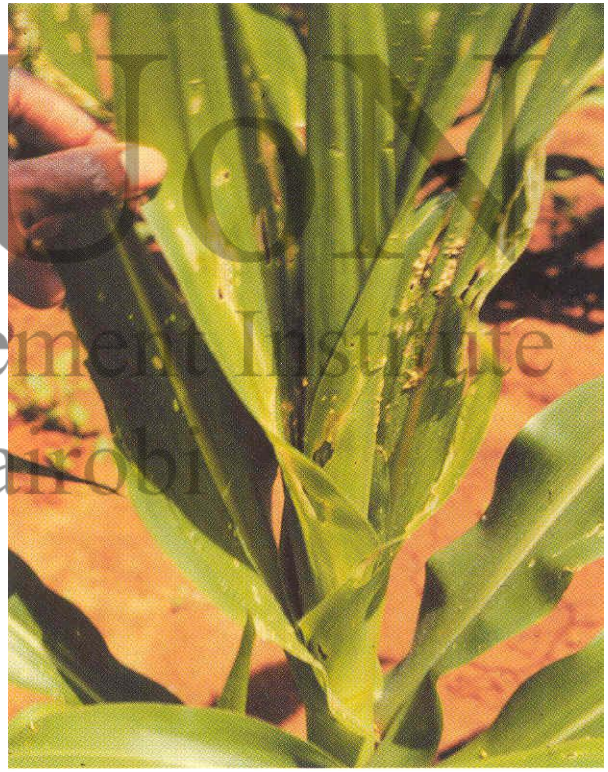
- Maize

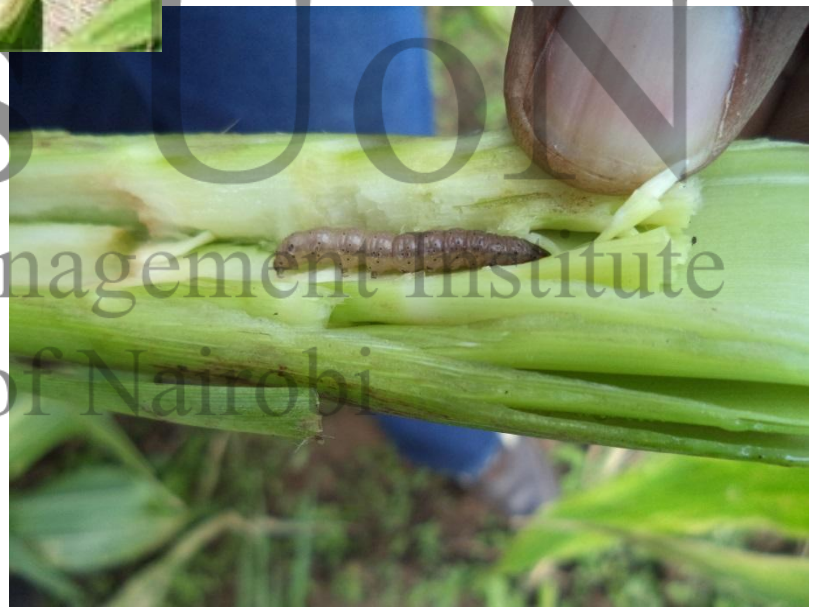
Maize aphids (*Ropalosiphum padi*)

Maize stalk borer (*Buseola fusca*)



Stalk borer damage



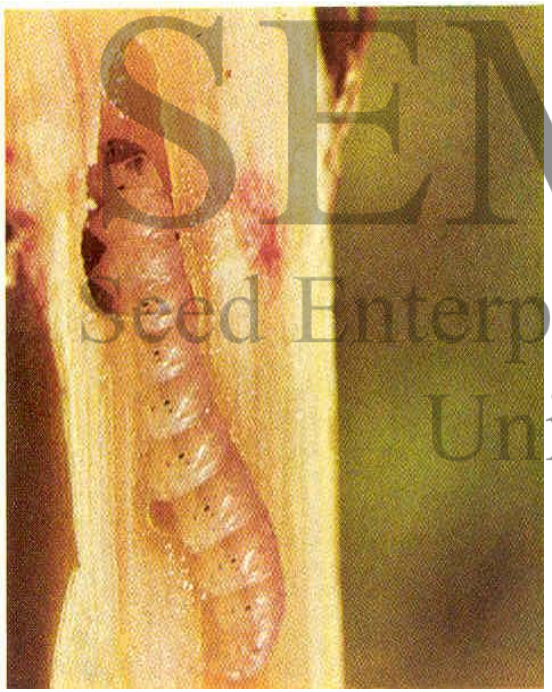


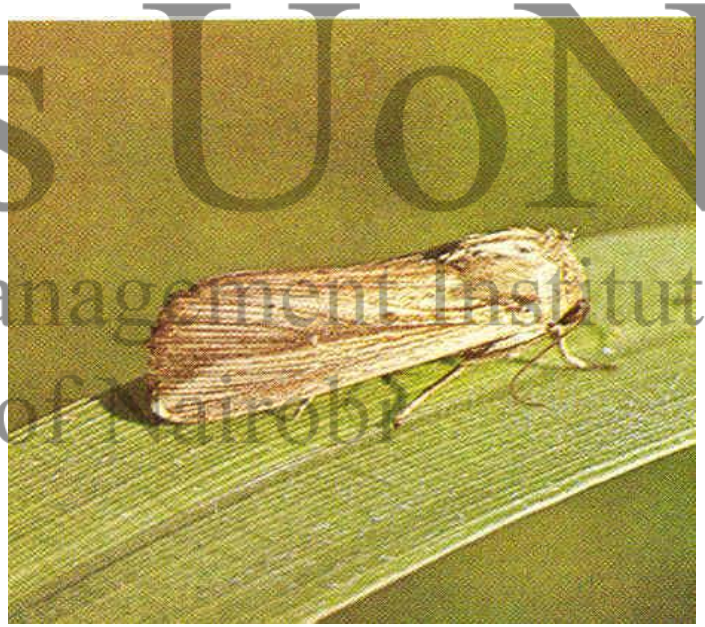
Maize stem borer damage on leaves and stem

Photos by D. Kilalo

Pink stalk borer: caterpillar and adult moth

(S. calamistis)





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

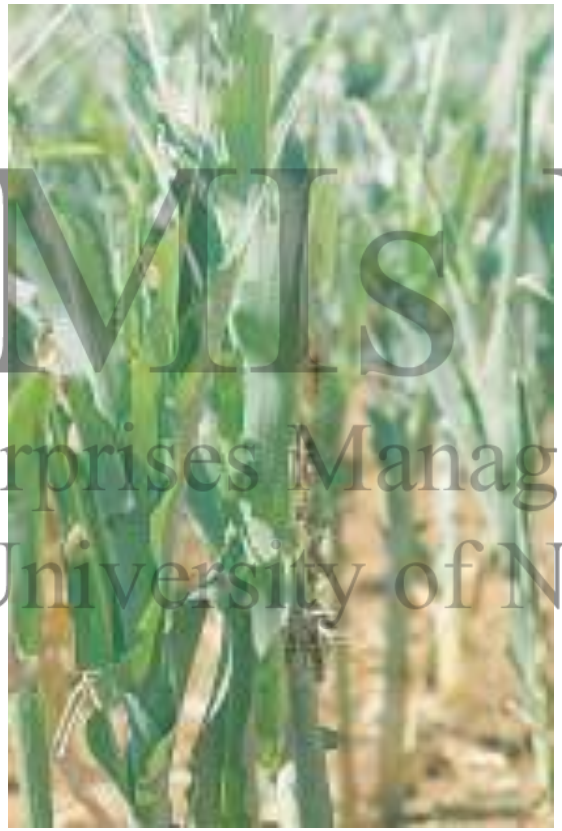
Chilo spp slightly younger larvae

Armyworms and the skeletonizing damage done on cereals and grasses

- Sorghum

African bollworm caterpillar

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.

Corn aphids on sorghum
Biovision website

Sorghum midge damage on seed
30% loss incurred in Kenya 1990

Insect PESTS OF PADDY

Borer pests of paddy

Yellow stem borer

Scirpophaga incertulas

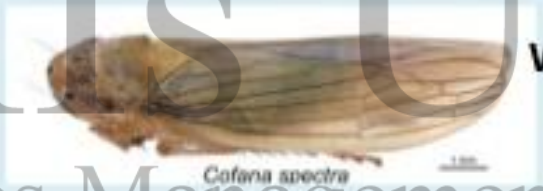
Gall midge or Gall fly

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

Sucking insects : pierce and suck sap from plant

A leafhopper (Homoptera: Cicadellidae)

Photo by C. L. Barr

a

b

c

d

a. Cotton aphid or melon aphid, *Aphis gossypii* Glover

b. Yellow sugarcane aphid, *Sipha flava* (Forbes)

c. Russian wheat aphid, *Diuraphis noxia* (Mordvilko)

d. Corn leaf aphid, *Rhopalosiphum maidis* (Fitch) (Homoptera: Aphididae).

Photos a, b & d by Drees. and Photo b is by P. Morrison

Legume crops

- Beans

Bean stem maggot

(Bean fly damage on stem base)

Seedling dying cause of BSM damage

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.

African bollworm on pod

African bollworm on pod and damage

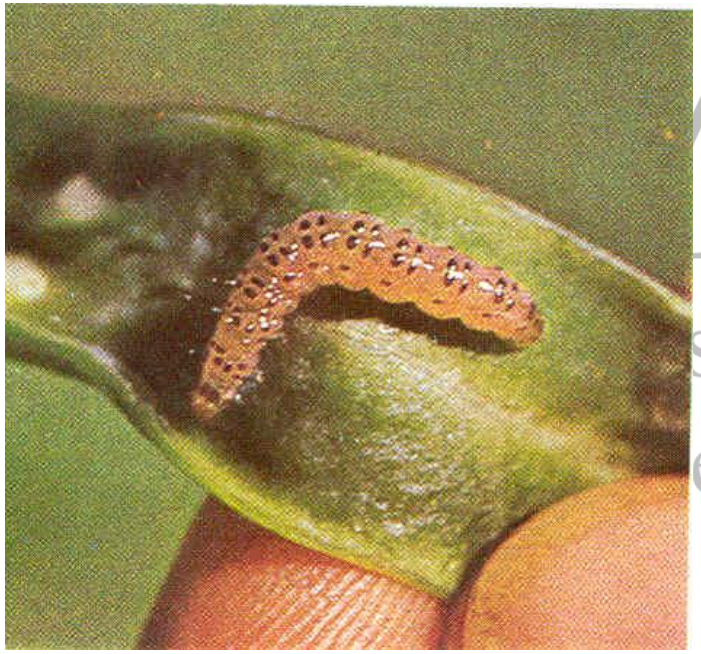
Leaf folder in pod and folded leaves

Blue Butterfly larvae on flowers and young pods

White scales on the stem

Maruca damage on flowers

Maruca spotted borer caterpillar



Maruca damage in pod and frass on the pod

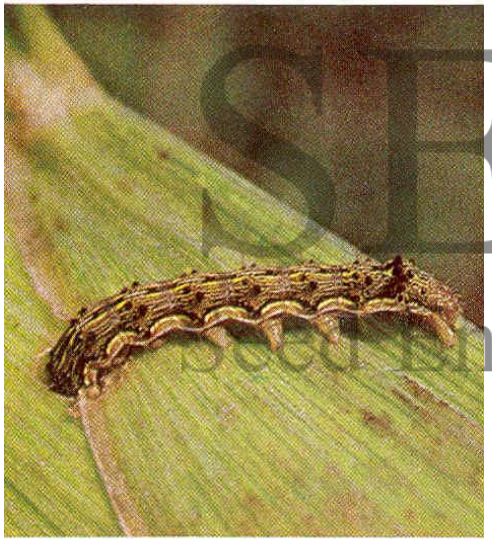
Bean pod borer

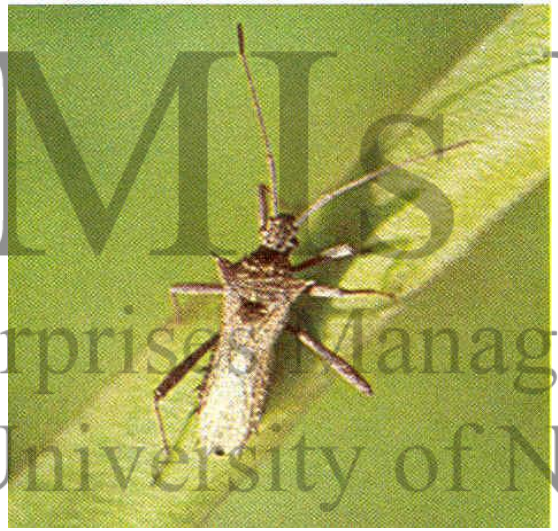
Pigeon peas, cowpeas

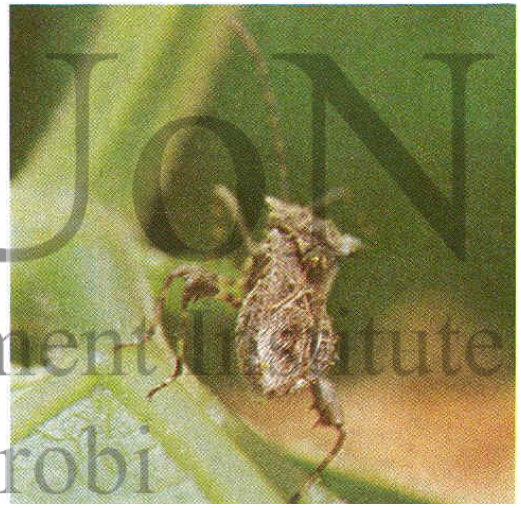
Pod borers

(African bollworm)

Spiny brown bug (Acanthomia spp)







Blister beetles

Pigeon pea flowering

Cow bugs –a sucking bug

Clavigralla nymphs

Riptortus spp

Pod bugs

Nezara spp

Mealybugs

On leaves

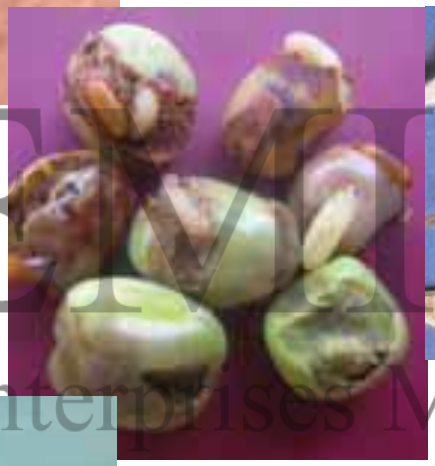
On stems

On flowers

Death due to infestation

Pod fly adult

Aphids



Pod fly maggots

Leaf webber

Pod fly pupae

Pod borer damage

Maruca damage

Healthy grain

Pod bug damage

Pod fly damage

Thrips on florets

Insects eating flowers or seeds that have been stored

Pollen beetle (*Mylabris spp*) feeding on legume flowers
(Photo by D. Botha, Ecoport

Reduces pod setting and hence yield important to control at flowering

Bean bruchid (*Acanthoselides spp*) and its damage on bean seed
Photo by George Geogern Ecoport

Leaf miner and its damage on groundnut leaves

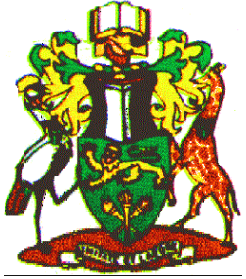
Damage on groundnut leaves by Spodoptera spp

Sucking insects

Adult jassids and their ‘V’ shaped damage on groundnut leaves

Whiteflies (*Bemisia tabaci*) on sweet potato leaves

Silver leaf whitefly (*B. argentifolii)* on tomato leaf



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