

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

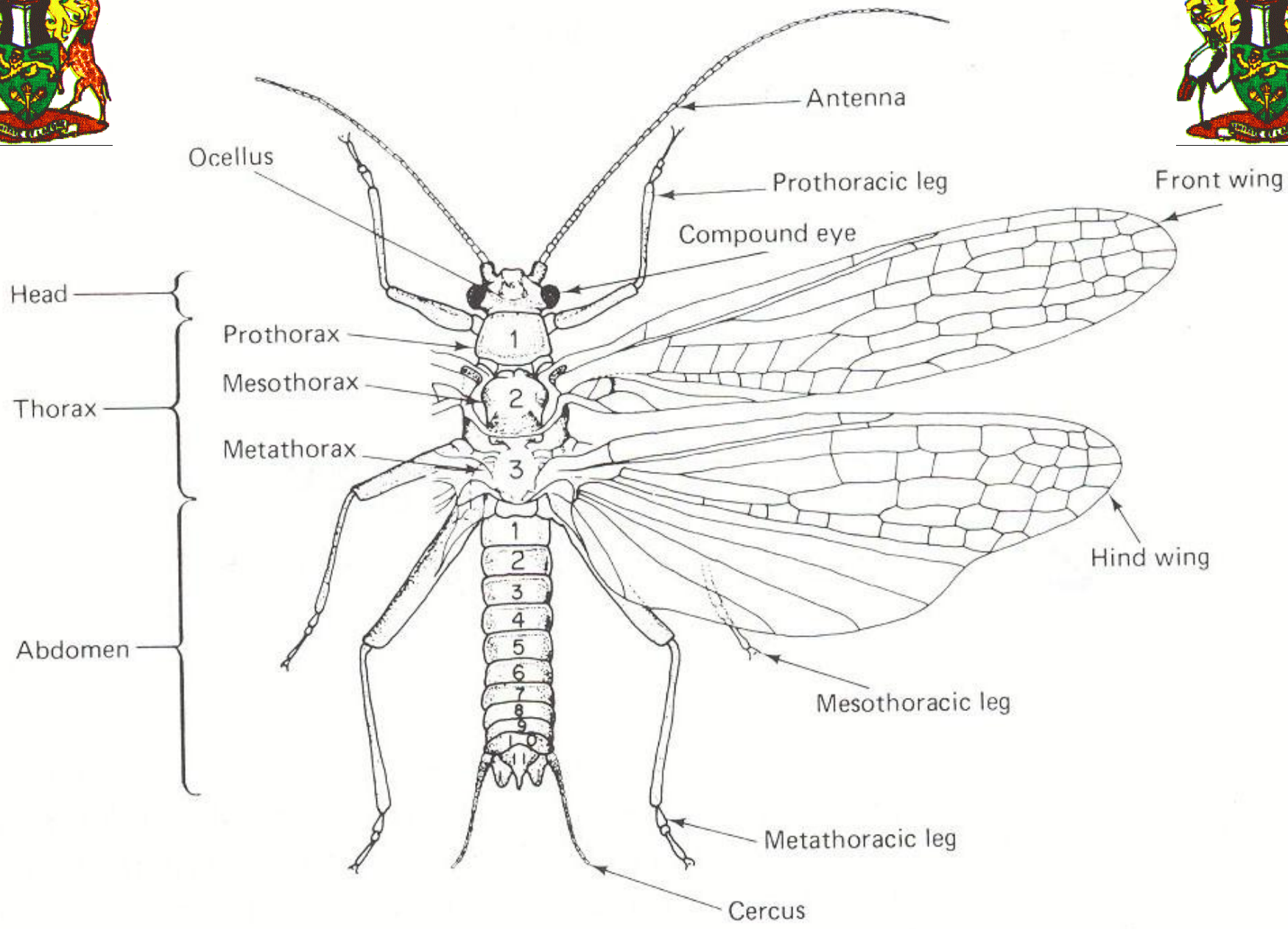
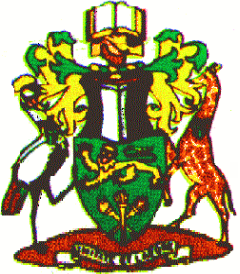


- One has to visually observe various parts of the plant and particularly associated with the pest at certain stages
- Observe whether it is
 - Physical damage: breakage or sunburn or hailstorm
 - Disease symptoms: as caused by various pathogens
 - Arthropod pests : Insects, mites,
 - Molluscs: slugs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



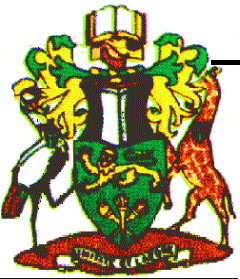
ORDERS OF IMPORTANT AS INSECT PESTS

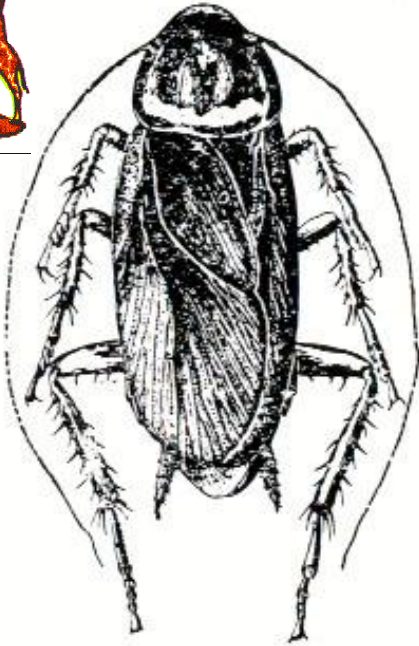
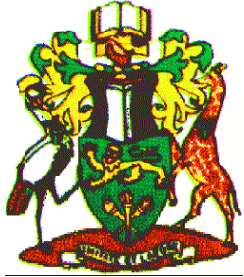


1. Orthoptera

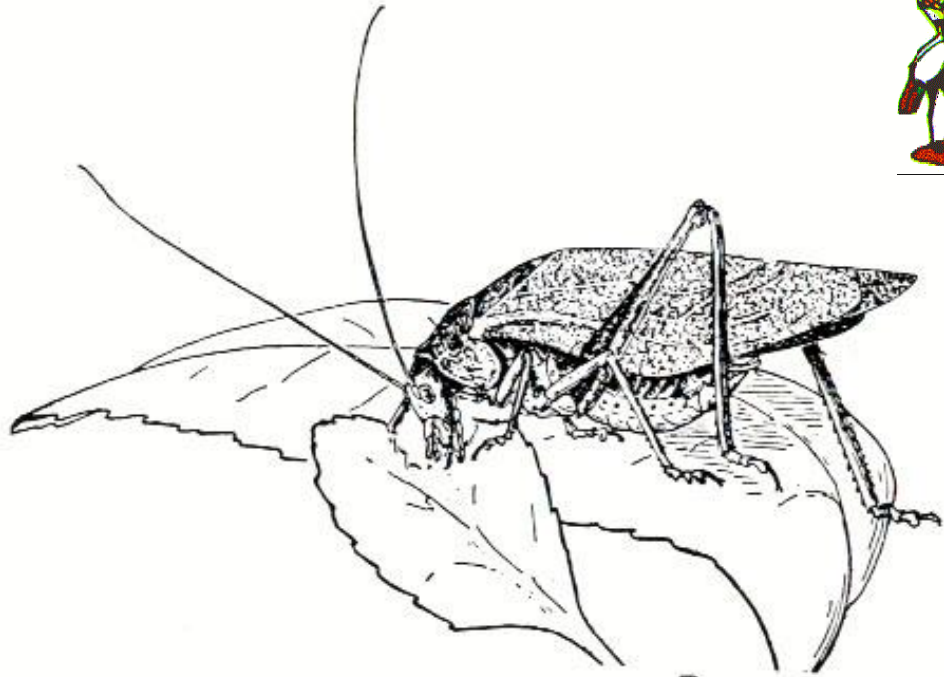
• Characteristics

- 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

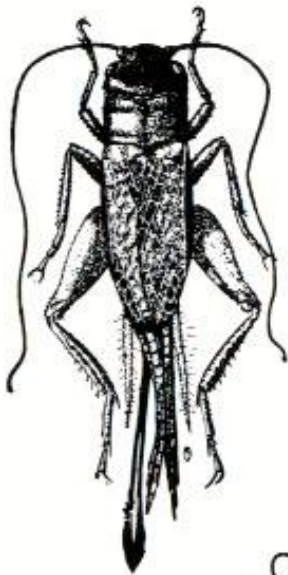




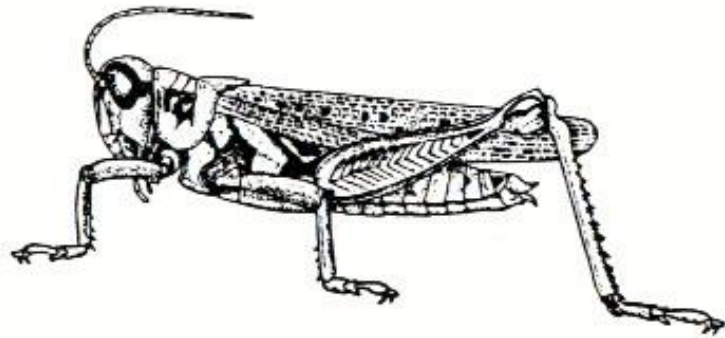
A



B



C



D



Thysanoptera (fringed hairs on the wings)

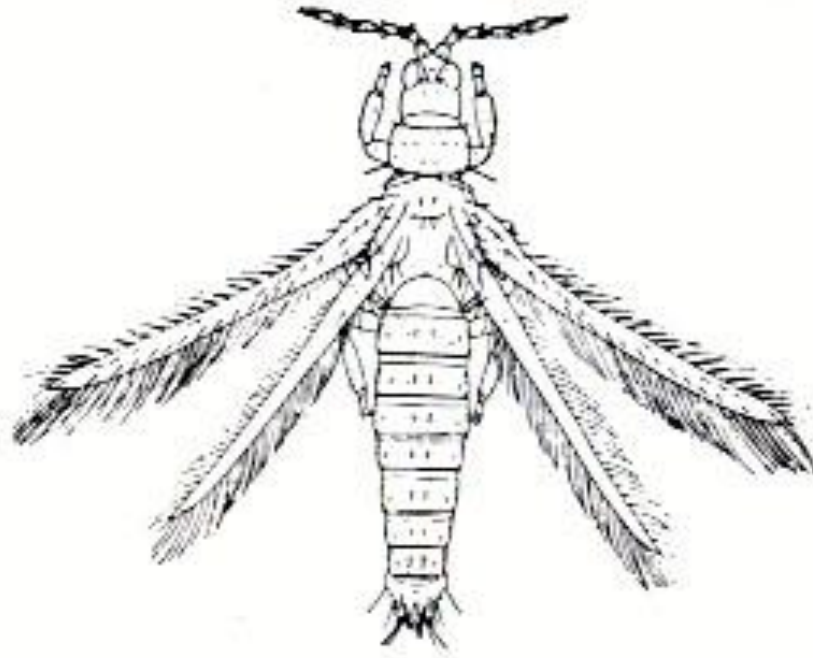


- **Characteristics**

- 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

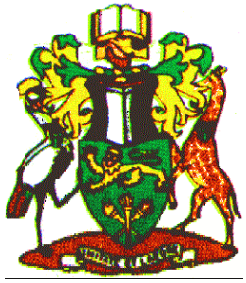
Hemiptera



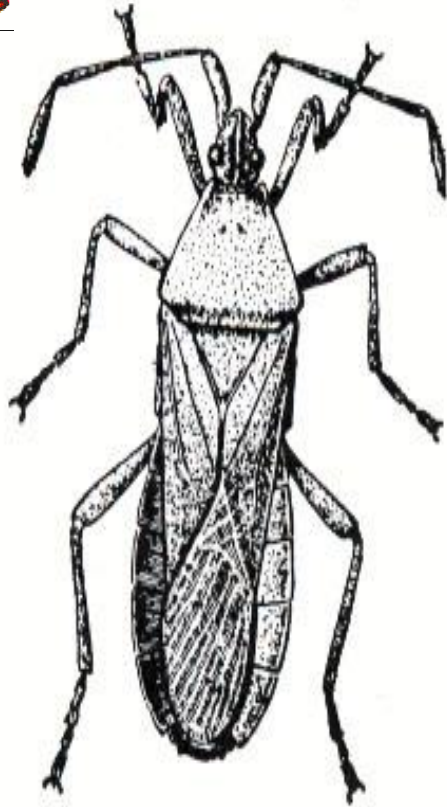
Homoptera and Heteroptera

- **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





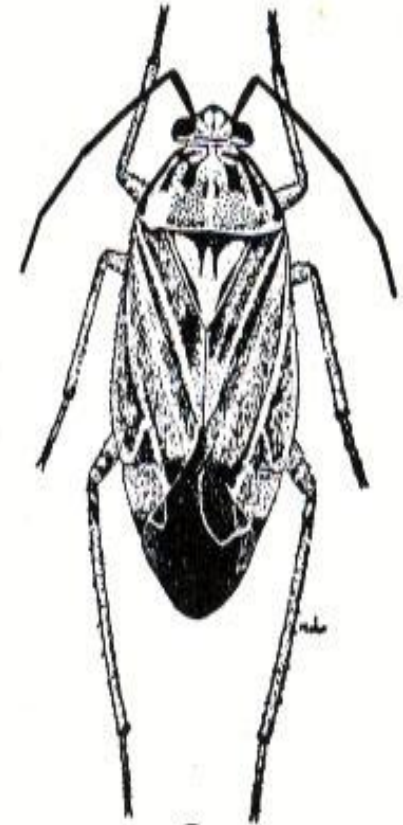
Heteropteran Bugs



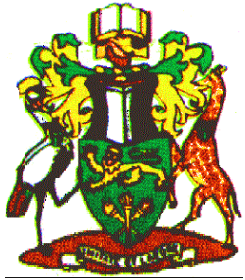
A Squash bug



B
Harlequin bug

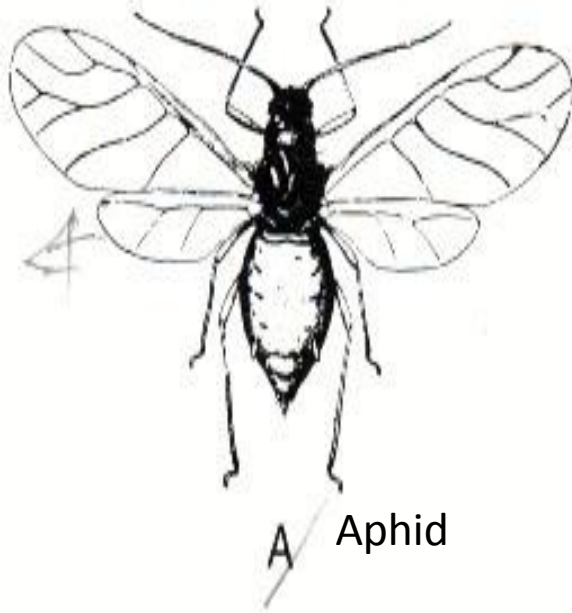


C
Plant bug



Homoptera

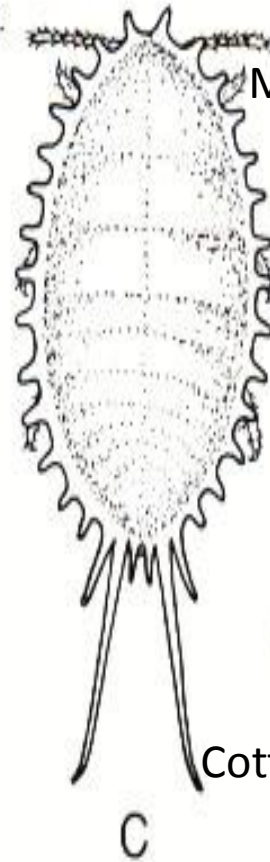
Grape Phylloxera



Aphid

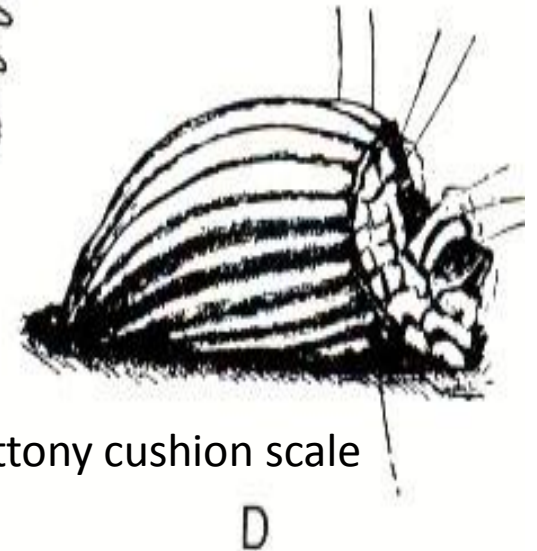


B



C

Mealybug



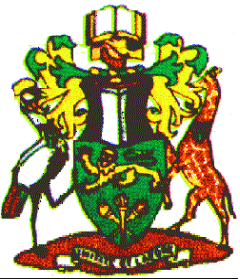
D

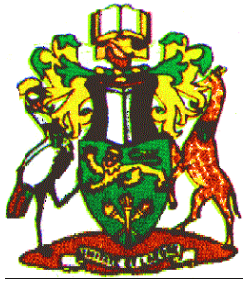
Cottony cushion scale

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.

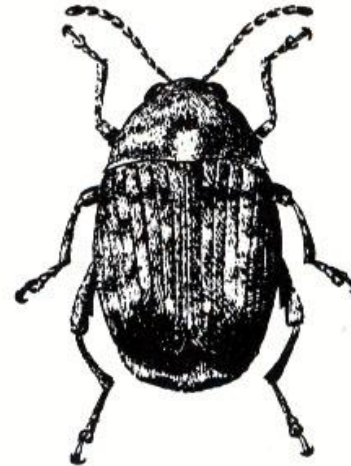




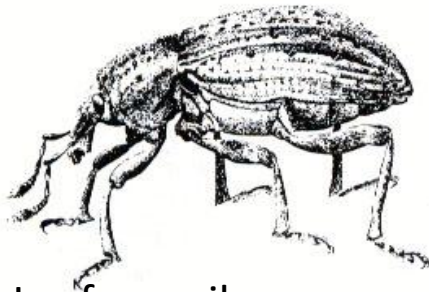
Coleopterans



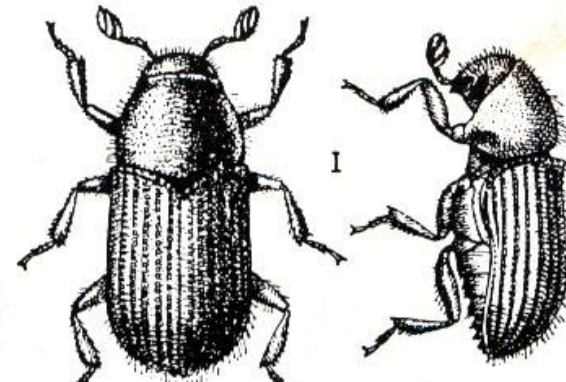
Potato beetle



^BBruchid



Leaf weevil_C



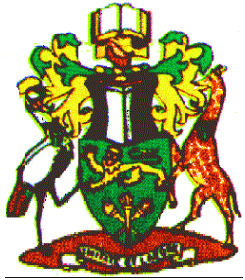
Bark beetles_D

Lepidoptera: (Butterflies and moths)

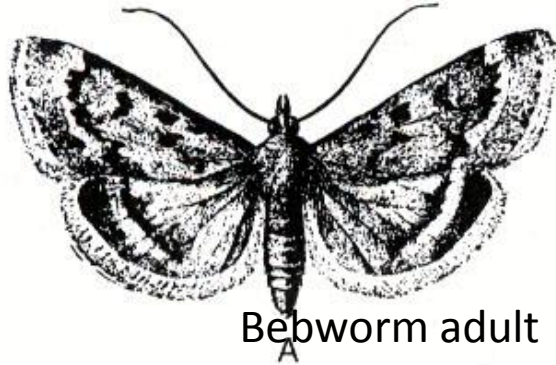


- (11.000spp)
- **Characteristics**
 - Small to large insects with two pairs of large membranous wings, covered with scales
 - Body and legs are also covered with scales and hairs
 - Adults have siphoning mouthparts while larvae have biting chewing mouthparts
 - Clubbed antenna, tapering or feathery
 - Development; Complete metamorphosis
 - 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

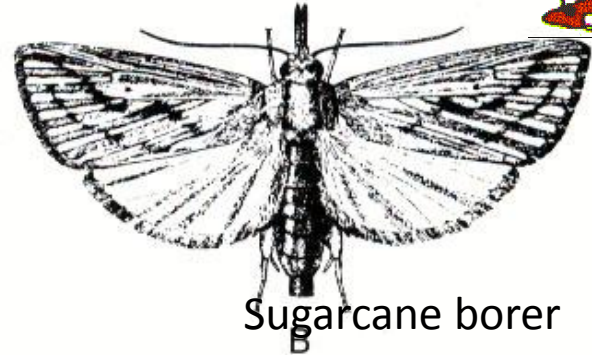




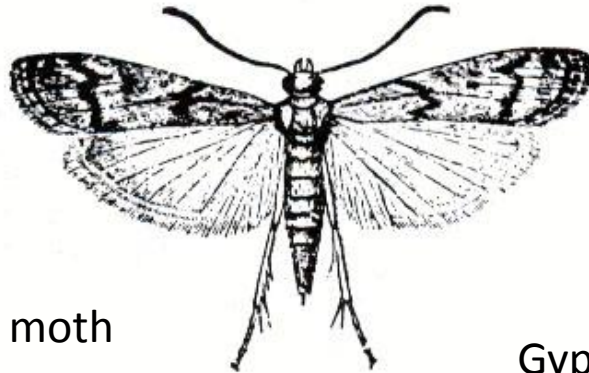
Lepidopteran



Bebworm adult



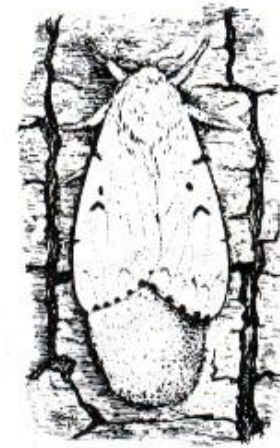
Sugarcane borer



Flour moth

C

Gypsy moth



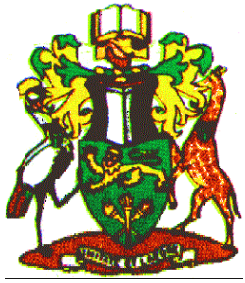
D

Hymenoptera (sawflies, ants, bees and wasps)

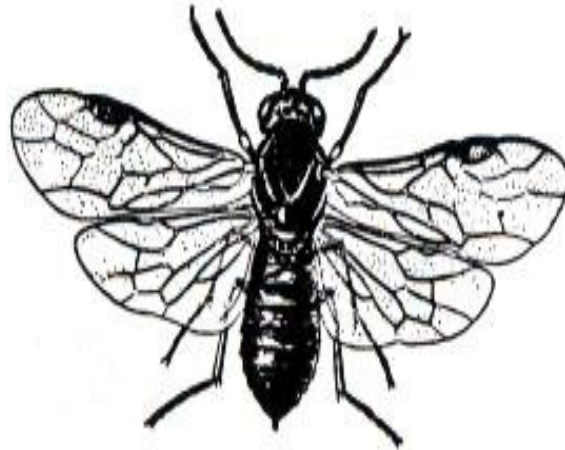


• Characteristics

- 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)

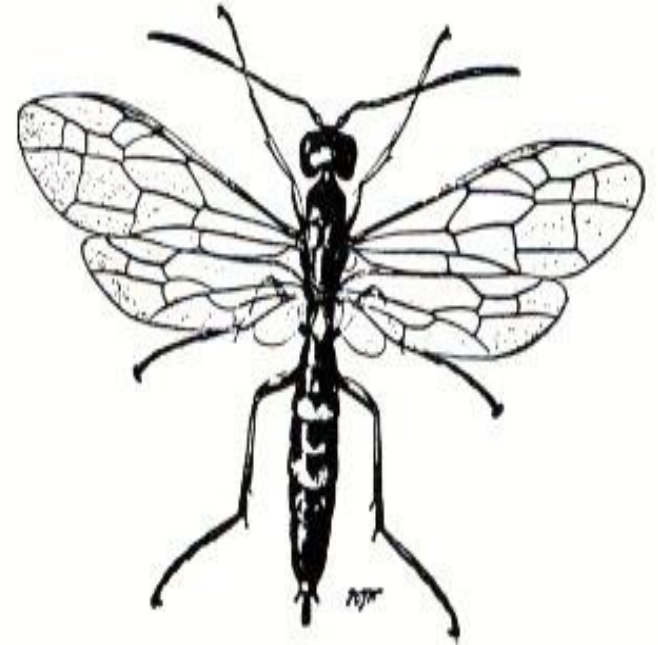


Hymenoptera



A

Cherry fruit sawfly



B

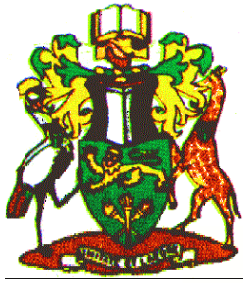
Wheat stem sawfly



Diptera (true flies)



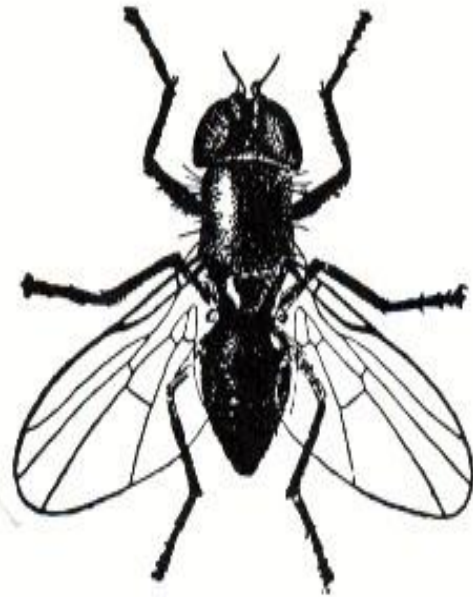
- One of the largest orders
- **Characteristics**
 - Small to medium-sized, soft-bodied, with a single pair of membranous wings (forewings) the hind wings being modified into specialized balancing organs (halteres)
 - Development; Complete metamorphosis
 - Sponging or piercing- sucking mouthparts
 - 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



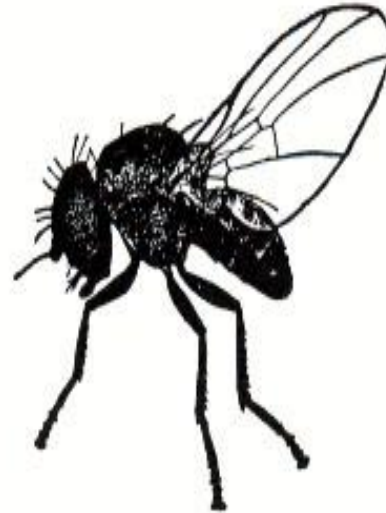
Dipterans



Bean fly



A Adults



B



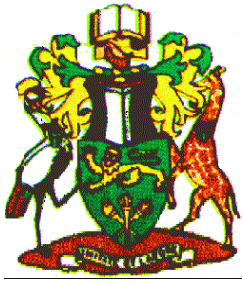
C



D

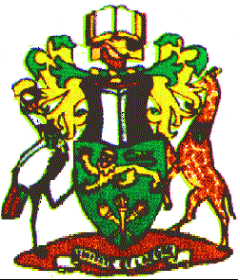
Larvae

Pupa



Illustrations of some pests and their damages





Cereal crops

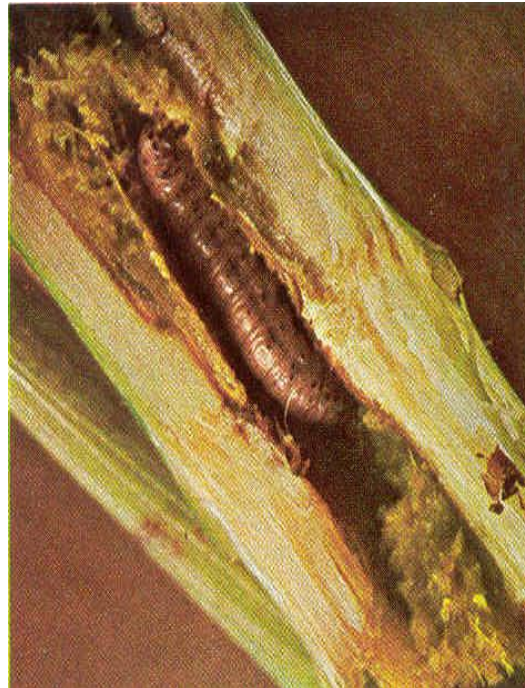
- Maize

Maize aphids

(*Ropalosiphum padi*)

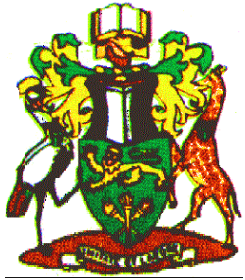


Maize stalk borer (*Buseola fusca*)



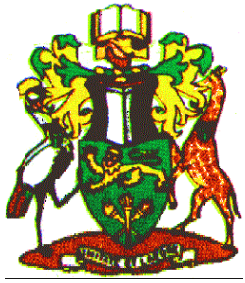
Stalk borer damage





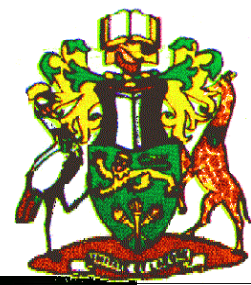
Maize stem borer damage on leaves and stem

Photos by D. Kilalo



Pink stalk borer: caterpillar and adult moth
(*S. calamistis*)





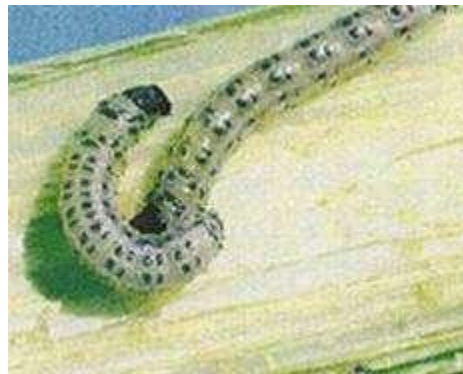
Tunneling of stems or cobs or harvestable portions



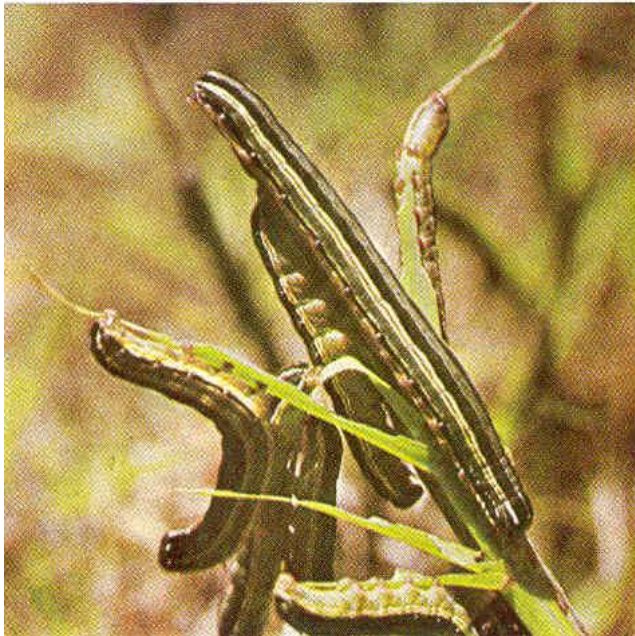
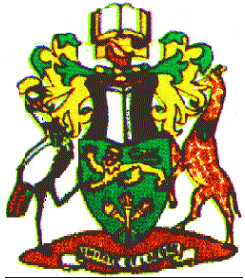
Corn earworm, *Helicoverpa zea* (Boddie)
(Lepidoptera: Noctuidae), in sweet corn.
Photo by G. McIlveen, Jr.



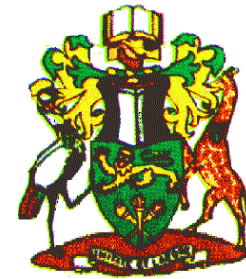
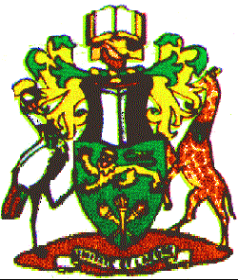
Maize Stem borer (*Chilo spp*)
that has pupated in the stem



Chilo spp slightly younger larvae

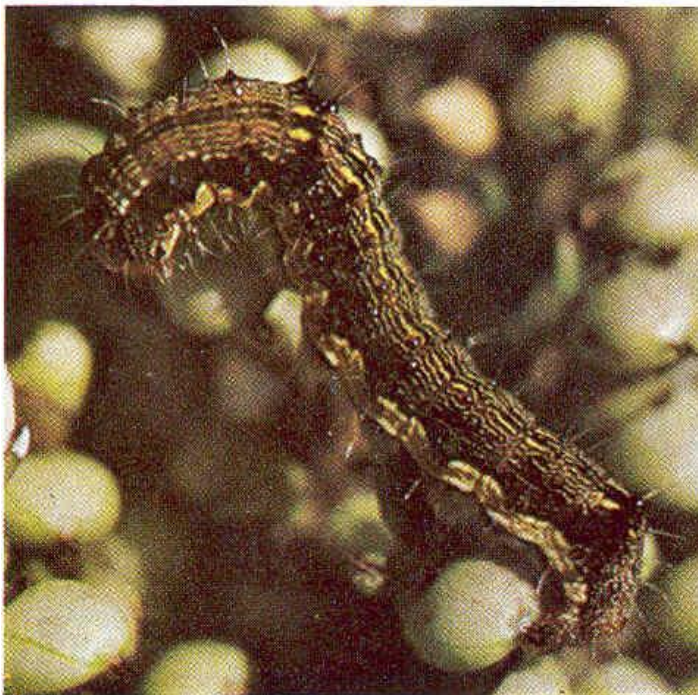


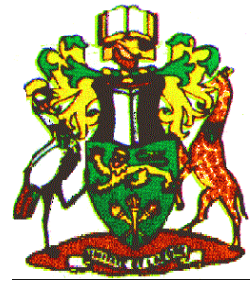
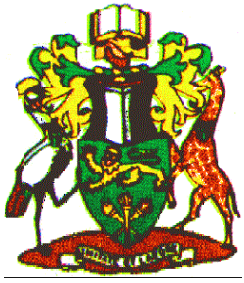
Armyworms and the skeletonizing damage done on cereals and grasses



- 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
Brevinnia rehi

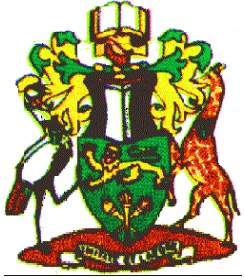


Sucking insects : pierce and suck sap from plant



A leafhopper (Homoptera: Cicadellidae)

Photo by C. L. Barr



a



b



c



d

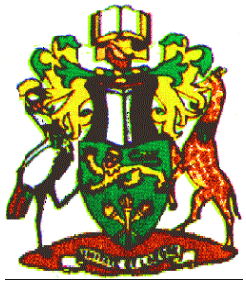
a. Cotton aphid or melon aphid, *Aphis gossypii* Glover

b. Yellow sugarcane aphid, *Siphia 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

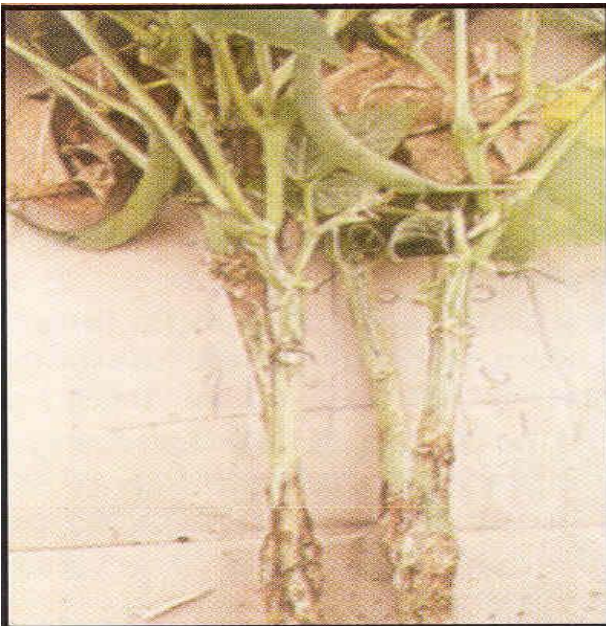


- Beans

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)

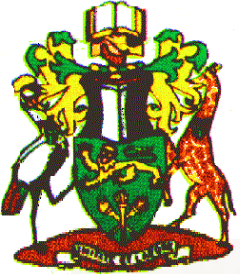




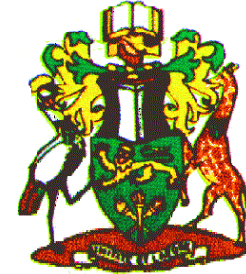
Heavy aphid infestation of growing tips of a dry bean crop



Corn Aphid infestation on maize/sorghum leaf



Damage done using piercing sucking mouthparts

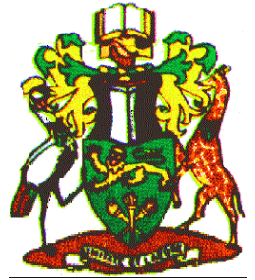


Two spotted mites

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

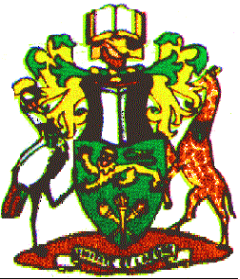


White scales on the
stem

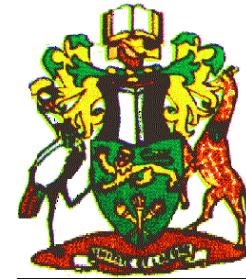


Maruca damage on
flowers





Maruca spotted borer caterpillar



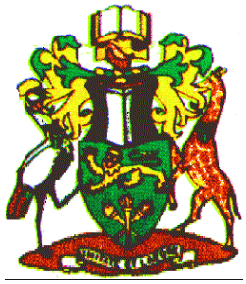


Maruca damage in pod and frass on the pod

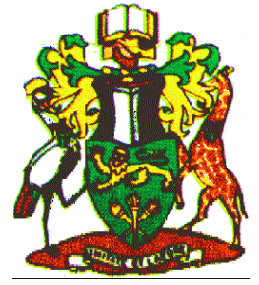


Bean pod borer



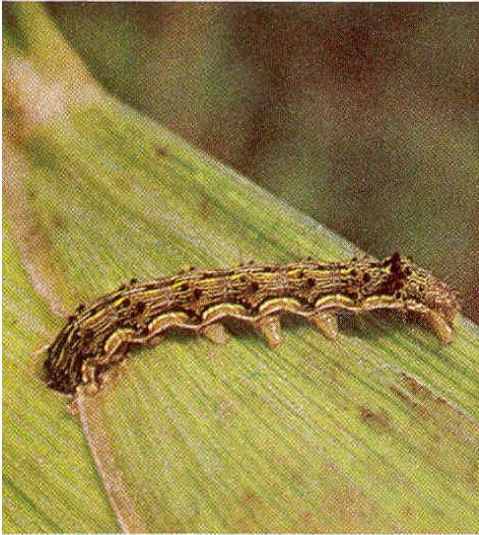


Pigeon peas, cowpeas



Pod borers
(African bollworm)

Spiny brown bug (*Acanthomia* spp)





Blister beetles



Pigeon pea flowering



Cow bugs –a sucking bug





Clavigralla nymphs



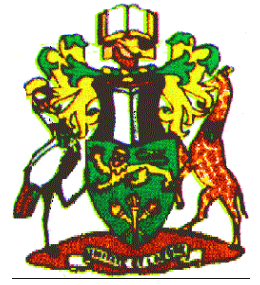
Riptortus spp

Pod bugs

Nezara spp



Mealybugs



On leaves



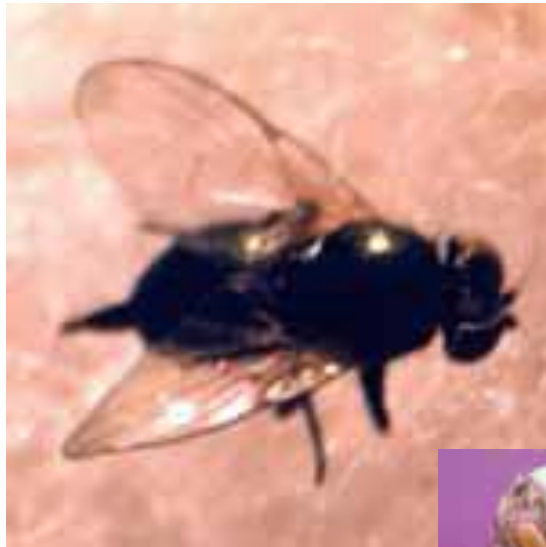
On stems



Death due to infestation

On flowers





Pod fly adult



Aphids



Pod fly
maggots



Leaf webber

Pod fly pupae

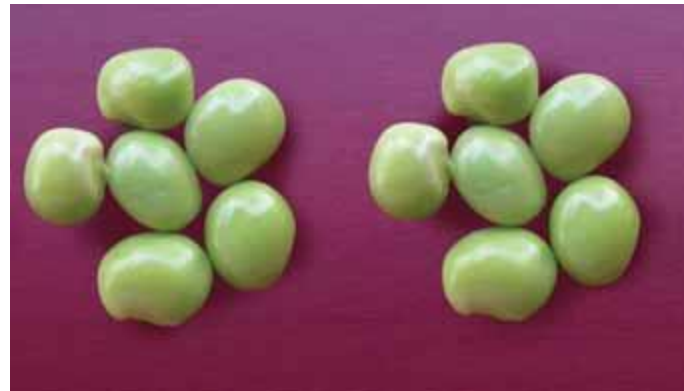




Maruca damage



Pod borer damage



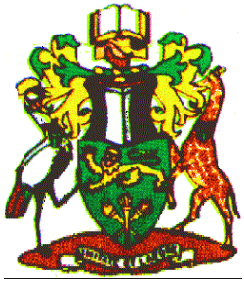
Healthy grain



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

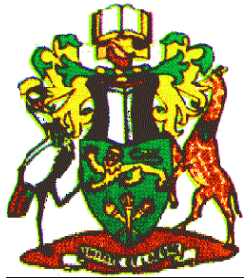
Photo by George Geogern Ecoport



Leaf miner and its damage on groundnut leaves



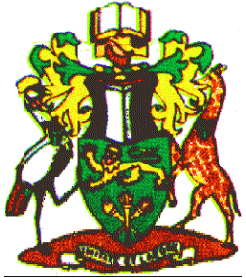
Damage on groundnut leaves by Spodoptera spp



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



THANK YOU