Module 9: Management of Coffee Insect Pests and Responsible use of Pesticides

Objective

i) To enable trainees identify the various insect pests of coffee and understand their economic importance, symptoms of damage and management strategies
ii) To enable the trainees understand the responsible use of pests control products

Content

i) Introduction
ii) Economic importance of coffee pests – effects on yields and quality
iii) Classification of insect pests - major and minor insect pests
iv) Pests Scouting and IPM
v) Management of prevalent insect pests - symptoms of damage and management strategies
vi) Responsible use of pesticides – pesticides classification, chemical poisoning and first aid measures, precautions for purchase, transportation and storage of pesticides and disposal of pesticides

Methodology

i) Lectures sessions on coffee insect pests
ii) Discussions on classification of insect pests, their feeding habits and damage symptoms
iii) Illustrations of various insect pests
iv) Field/laboratory practicals on identification of insect pests and damage symptoms
v) Demonstration on scouting, stripping, de-suckering, use of a spoke

Teaching aids / materials

i) Trainers Manual, slides
ii) Flip chart/ white board and marker pens
iii) Insect pest specimens and damaged stems
iv) Dummies of various insecticides
v) Spraying equipment, protective clothing

9.1 Introduction

Globally, about 1000 insect pest species infest coffee of which 35 are known to attack coffee in Kenya. Of these, some are major while others are minor.

9.2 Economic importance of Insect pests

Insect pests infest coffee flowers, berries, leaves, branches, stems and roots. This leads to reduction of yield and quality. For instance, yield losses as high as 96% have been reported in Africa as a result of Coffee berry borer infestation while a crop loss of 15-27% in total bean weight has been associated with an infestation of 2 - 4 Antestia bugs per tree.

9.3 Classification of Insect pests

9.3.1 Major insect pests

The major coffee insect pests are Antestia Bug, Coffee Berry Borer (CBB), Thrips, Coffee Scales (Green scales, Mealy bugs), Stem Borers (White Stem Borer, Yellow headed Borer), Berry moth, Leaf miner, Root mealybug, and Giant Loopers.

9.2.2 Minor insect pests

Minor insect pests include Capsid bugs, Systates weevil, White Waxy scales, Brown scales, Mites and Cottony scales among others

9.4 Pests Scouting and IPM

- Pest scouting refers to random survey of pest presence and population level and is critical in pest management
- For effective pest management, it is important to take into consideration the economic threshold levels (ETL) i.e. the pest population level beyond which if not controlled is likely to cause crop loss which exceeds the cost of control with an insecticide
- To manage the pests, it is recommended that an integrated pest management (IPM) approach be practiced
- IPM entails combining several pest control methods such as biological (use of biological control agents), cultural and chemical (use of insecticides and bio-pesticides))

It is important to avoid unnecessary insecticide sprays in order to conserve the beneficial insects or natural enemies

9.5 Management of prevalent insect pests

9.5.1. Antestia Bug

It is a broad insect, up to 6mm long (¼ inch long), dark brown in colour with orange and white markings

Symptoms and damage

- Buds leading to abortion
- Rotting of beans within the berries
- Fan branching and short internodes on terminal growth
- Characteristic zebra pattern on beans that grow to maturity causing the beans to be of low quality

Antestia bugs

Good coffee parchment

Antestia damaged beans

Management

Cultural control

- Timely pruning, handling and de-suckering

Chemical control

- Spray when the pest population reaches 2 bugs per tree for East of Rift Valley and 1 bug per tree for West of Rift Valley using any of the PCPB registered insecticides

9.5.2 Coffee Berry Borer (CBB) Symptoms and damage

- One or two small round holes appear near the apex of mature green or ripe berries.
- Adult females and the larvae cause damage by feeding inside the mature berries causing the inside of the fruit to rot
- Damaged beans has distinctive blue-green stains and may contain up to 20 larvae of different sizes

Berry borers

Berry Borer damage

Management

Cultural

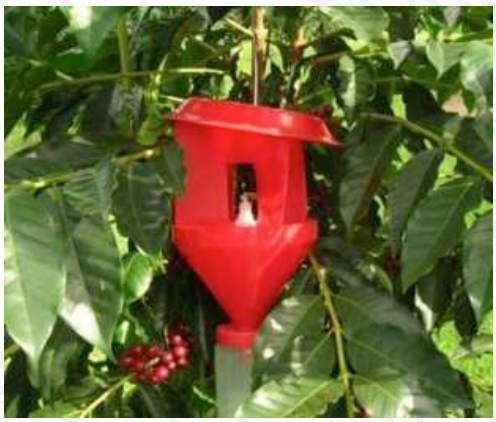
- Regular Pruning
- Practice field hygiene by collecting infested fallen berries to avoid the berries becoming breeding reservoir for CBB
- Strip all the remaining berries at the end of the harvest season. If infested, bury or burn them
- Avoid over-shading (self-shading or bushiness) in order to enhance searching capacity of natural enemies on CBB

Chemical

Ensure timely spraying twice at 3 weeks interval (15th and 18th week from the main flowering (blossoming) using any of the PCPB registered insecticides. This to apply where infestation was severe (above 5%) in the previous season

Integrated method

Use of pheromone traps (Brocap traps) – The traps contain ethanol- methanol (50:50)+ acid fuchsine +Britex 80ppm mixture that attract the CBB



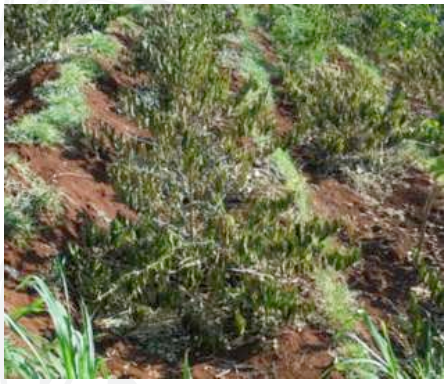
Brocap trap

9.5.3 Thrips

Brocap trap

Symptoms and damage

- White silvery patches with minute black spots on leaves, berries and green shoots
- Heavy infestation cause death of leaves or total leaf fall



Thrips damage

Management

Cultural control

- Mulching, shading and irrigation
- Use of sticky traps

Chemical control

- Spray using a PCPB registered insecticide at ETL of 1-2 per leaf when there is drought and 2-3 when there are rains.

9.5.4 Green scales, Mealy bugs and other scales

Scales and Mealy bugs suck plant sap causing reduction in coffee production and quality. The management of Green scales, Brown scales, White waxy scales and the

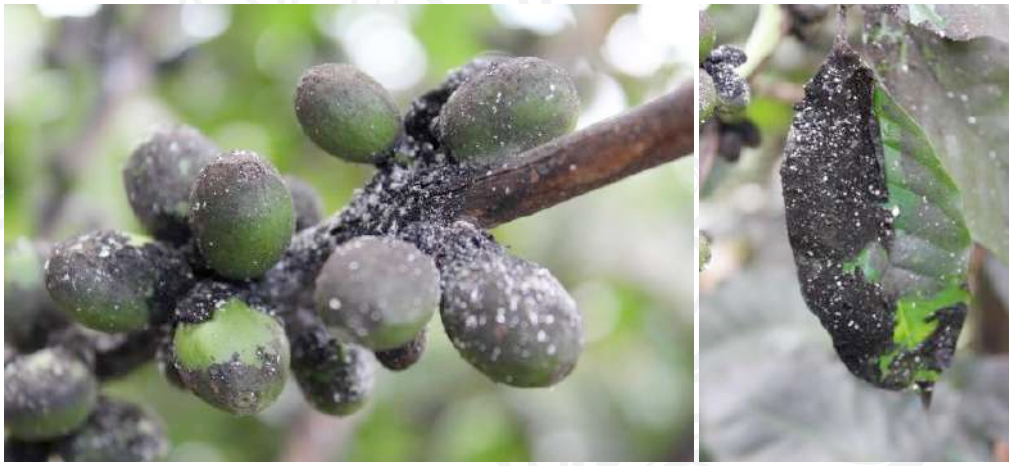
Kenya mealy bugs is similar. Lady birds commonly predate the scales and mealy bugs

Symptoms and damage

- Rows of flat oval Green scales along main leaf veins and near tips of green shoots
- Mealy white masses of insects (Mealy bugs) between clusters of berries and/or flower buds
- Sticky honey dew and sooty mould growing on leaves
- Presence of attendant ants climbing on infested coffee trees

Green scales infestation

Lady bugs



Kenya mealy bugs infestation

Management

Cultural control

- De-suckering and removal of branches touching the ground
- Proper weeding to avoid weeds becoming bridges for the ants

Biological control

- Natural enemies such as parasitoids, parasites, predators and fungal pathogens attack the Scales thus reducing their infestation

Chemical control

- Under severe infestation, spray the infested trees (spot spraying) with a PCPB registered insecticide such as mineral oil e.g. white oil or DC- Tron plus (100ml in 20 litres of water) or any other PCPB registered product for this pest
- Under severe infestation, spray the infested trees (spot spraying) with mineral oil e.g. white oil or DC-Tron plus (100ml in 20 litres of water)

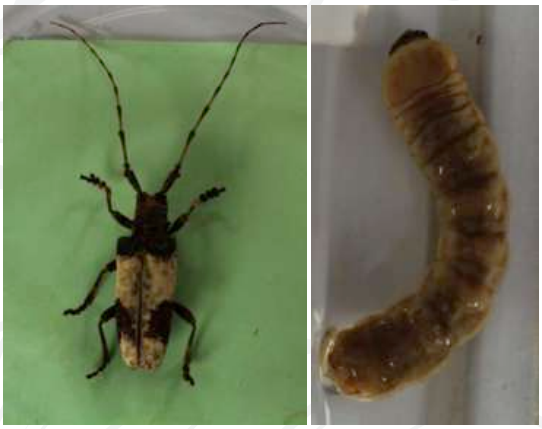
Integrated method

- Combines the cultural, biological and chemical methods. Coffee trees infested by scales are banded (Chemical control) 6 inch at the base of the trunk with a PCPB registered insecticide. Followed by removal of any branches (cultural control) touching the ground that act as the bridges for attendant ants. This creates favourable conditions for natural enemies (Biological control) to attack the scales.

9.5.5 White Stem Borer Symptoms and damage

- Wood shavings extruded by larvae burrowing in the stem
- Ring barking at the base of the trunk
- Oblong holes visible on the trunks left by larvae after entering the trunk
- Visible round holes on trunks left by emerging adults
- Yellowing of foliage and eventual death of trees

White borer damage and frass



White borer adult and larvae

Management

Mechanical control

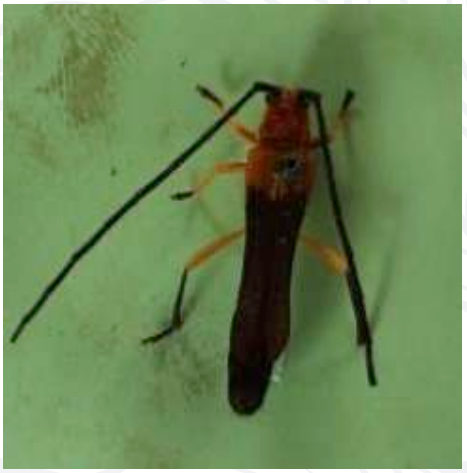
- Kill the larva(e) that is already in the stem by inserting a wire/spoke into the tunnel
- Physically collect and kill the beetle at the onset of rains

Chemical control

- Paint or spray a 90 cm band above the ground on coffee trunk with a PCPB registered insecticide. Repeat after one year and every second year.
- Insert a cotton ball soaked in an insecticide through the tunnel in incidences where the larva has entered into the stem.

9.5.6 Yellow headed borer Symptoms and damage

- Wilted tips of primary branches
- Ejected frass (Sawdust like) visible on the ground
- Series of holes on the underside of primary branches and on the main stem
- Breaking of branches especially when trees carries a heavy crop



Yellow headed borer adult

Larva

damage

Management

Cultural control

- Cut off infested primaries and burn them
- Kill the larva(e) already in the stem by inserting a wire/spoke at the last hole downwards
- Remove and burn the heavily infested heads

Chemical control

- Enlarge the lowest hole and use a pen filler or an oil can to squirt in any PCPB registered insecticide

9.5.7 Berry moth

The larva is a reddish caterpillar 12mm (1/2 inch) long when fully grown.

Symptoms and damage
Webbed berry clusters with one or more berries being brownish black, dry and hollow



Berry moth adults larva Berry moth damage

Management

Cultural control
- Remove infested berries. Destroy them by burning or deep burying

Chemical control
- Spray with a PCPB registered insecticide and repeat 5-6 weeks later if buds or young berries are being infested. Scout for the pest soon after main flowering.

9.5.8 Leaf Miner

The pest is most common in the East of the Rift Valley.

Symptoms and damage
Irregular brown blotches on the upper side of the leaves, covering white caterpillars of size 12 mm (½ in) long within the "mine".

Leaf Miner damage

Management

Chemical control

- Use recommended systemic insecticides that are ground/soil applied
- Foliar spray biological PCPB registered insecticides (Insect Growth Regulators - IGR's)

9.5.9 Root Mealybug Symptoms and damage

- Wilted and yellowish Leaves
- Stunted Roots that are encased in clusters of greenish and white fungal tissue
- White mealy bugs visible after peeling off the fungus.

Management

Cultural control

- Uproot infested trees, leave the holes open for 3 months and replant as recommended under coffee establishment

Chemical control

- Apply the PCPB registered insecticide during establishment and/or infilling
- Ground application along the drip line of infested coffee trees with PCPB registered insecticides. This to be applied when soils are wet

9.5.10 Capsid Bug

This is a common coffee pest in all coffee growing regions

Symptoms and damage
- Blackening of flower buds due to death of stamens and petals
- Club shaped elongated style with pale green shaft and black head

Management

Chemical control
- Use any PCPB registered insecticides

Biological control
- The nymphal stages are attacked by endo-parasites
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9.5.11 Giant Looper

Giant Looper is a widely distributed pest. It is associated with heavy use of Organo-phosphates. The caterpillars are Pale grey to dark brown in colour and they resemble the twigs. They measure 5 cm (2 in) when fully grown. They move with looping motion

Symptoms and damage
- Young caterpillars perforate pits on the leaf surface usually on the upper side.
- Jagged edge leaf margins eaten by older caterpillars.
- Caterpillars prefer young leaves but they also feed on berries and large flower buds.

Management

Chemical control
- Spray the infested coffee trees with PCPB registered bio- pesticides

Mechanical/Physical control
- Manually, collect and kill the caterpillars

Biological control
- The caterpillars are attacked by various predators and parasitic wasps

9.5.12 Other coffee insect pests

Other coffee insect pests that are not of much economic importance include, Jelly grub, Green Loopers, Dusty Brown Beeetle, Fruit fly, Yellow, Green and Red Tortrix, Black Borer, Fried Egg scales, White Waxy scales, Mites, Lacebug, Tip borer, Black borer, Leaf Skelotonizer, Systates weevil, Tailed caterpillar, Stinging caterpillar, Berry butterfly and Cottony scales. These pests occur sporadically and are associated with indiscriminate use of insecticides which leads to elimination of natural enemies such as Ladybird beetles. Consequently, the pest population increases to a level warranting chemical control.

9.6 Responsible use of pesticides

This is the use of pesticides in a way that will not be detrimental to human beings, animals and the environment e.g. water bodies (streams and lakes), soils and beneficial organisms.

Pesticide classification

Class	Description	Label Signal words	Pesticide colour code
Ia	Extremely hazardous	DANGER, POISON, PLUS SKULL AND CROSS BONES SYMBOL	
Ib	Highly hazardous		
II	Moderately hazardous	WARNING/HARMFUL	
III	Slightly hazardous	USE WITH CARE	
IV	Unlikely to present acute hazard in normal use	CAUTION	

Source: World Health Organization (WHO)

9.6.1 Chemical poisoning and First Aid measures

- Chemicals can poison both animals and human beings and may enter into the body system through:
  - **Inhalation** – through the nose
  - **Dermal** – through the skin
  - **Ingestion** – through the mouth
  - **Inoculation** – through wounds and rashes
- Symptoms of chemical poisoning include abdominal pains, dizziness, difficulty in breathing, skin rash, nausea and vomiting
- If the poison was inhaled, move the person so that they can inhale fresh air, but be careful not to expose yourself to the chemical fumes while doing so. If the person is not breathing, call emergency services and start mouth to mouth resuscitation
- In case of ingestion, administer a poison absorbent e.g. activated charcoal mixed with water to absorb the chemical and induce vomiting
- If the poison came into contact with the person's eye, flush the eye with running water for 15 minutes and call for emergency services
- If the poison came into contact with the person's skin, remove any contaminated clothing taking care not to touch the poison. Flood the skin with running water and wash gently with soap
- Seek medical advice and carry the label/container with you

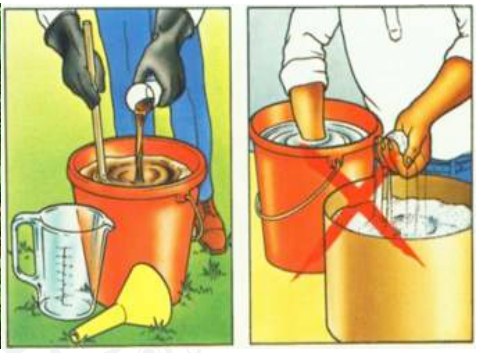
9.6.2 Precautions for purchase, transportation and storage of pesticides

- Purchase reputable products which are labelled in Kiswahili and English. The labels should have the following information:
  - Name of the pesticide
  - Chemical formulation e.g. EC, WP, G
  - Manufacturing/expiry dates
  - Instructions - rate and method of application, precautions, target pest, timing and frequency of application
  - Hazard classification
  - PCPB registration number
  - AAK logo
- Do not purchase chemicals in damaged packages
- Do not carry pesticides in a vehicle that is also used to transport food
- Store pesticides in a place that can be locked and is not accessible to unauthorised people or children
- Pesticides should always be kept in their original containers in a place where they cannot be confused for food or drink

9.6.3 Effective and safe use of chemicals

- Read the label carefully and strictly follow the instructions
- Do not purchase any chemicals without labels
- Always use protective clothing while handling chemicals. This includes overall/ apron, rubber boots, rubber gloves, goggles, respirators/ facemask, hat and a face shield
- Spray towards the wind direction
- Use red flags as labels to indicate where chemicals have been sprayed
- Do not smoke while spraying or handling pesticides
- Wash your body thoroughly after using chemicals
- Do not eat before washing your hands
- Dig a disposal hole at least 100 meters away from streams, wells and houses. In a hilly area, the hole should be on the lower side of the homestead or wells
- Left-over pesticide suspension and hand/sprayer washings should be disposed off safely by pouring into the hole
- Place a cover on the hole
- Card board, paper and cleaned plastic containers can be burned far away from houses and sources of drinking water
- Empty containers should be triple rinsed into the spray tank, punctured and buried or burnt
- Never re-use pesticide containers
- Never discard pesticide containers in the homestead disposal pit

Appropriate protective clothing



Correct and incorrect way of mixing chemicals

9.6.4 Proper disposal of obsolete pesticides

- Obsolete pesticides are those that have expired or have been banned
- Dispose obsolete pesticides in a hole away from water bodies or take them back to distributor/manufacturer
- Empty pesticide bottles should be triple rinsed, punched and buried or collected for disposal

9.6.5 Highlights on responsible and effective use of pesticides

- Breast-feeding and expectant mothers should not handle chemicals
- Chemicals pause a serious health hazard to both the humans and the environment and therefore should be used only if necessary and also in the appropriate minimum amount
- Avoid contamination of any natural resources e.g. streams, ponds and wetlands
- Keep the chemical spray equipment clean after use but ensure the waste water does not contaminate water sources e.g. river, springs
- Have a separate store for chemical storage alone. The store should be well lit, ventilated, rain proofed and well labelled
- Store chemicals in the light order and in a manner not likely to cause spillages
- Keep the stores under lock and key and only allow authorized personnel
- Have a display of procedures for emergency handling and first aid
- People handling glyphosates should undergo health check-ups yearly