Module 8: Management Of Coffee Diseases

Objective

To enable trainees understand the various types of coffee diseases, economic importance and the management strategies.

Content

i) Introduction
ii) Economic importance of coffee diseases – effects on yields and quality, losses due to diseases
iii) Classification of coffee diseases in Kenya – Major and minor diseases
iv) Management of major Coffee diseases - Coffee Berry Disease (CBD), Coffee Leaf Rust (CLR), Bacterial Blight of Coffee (BBC). Fusarium bark disease (FBD), Fusarium root disease(FRD),
v) Management of minor coffee diseases - Armillaria root rot, Botrytis Warty disease, Root rot, Brown eye spot, Leaf blight and stem die back
vi) Appropriate spray equipment, nozzles and protective clothing

Methodology

i) Lectures
ii) Discussions on loses due to various diseases
iii) Illustrations of various diseases and their impacts
iv) Practicals on identification of diseases disease symptoms
v) Display of spray equipment, nozzles, resistant varieties
vi) Visit to coffee farm

Teaching aids / materials

i) Trainers Manual and slides
ii) Flip chart/ white board and marker pens
iii) Disease specimens
iv) Spray equipment nozzles, resistant varieties
v) Fungicide/bactericide samples

8.1 Introduction

There are four major coffee diseases in Kenya namely; Coffee Berry Disease (CBD), Coffee Leaf Rust (CLR), Bacterial Blight of Coffee (BBC) and Fusarium Disease (Fusarium Bark and Fusarium root disease). Minor diseases include, Armillaria root rot, Botrytis Warty disease, Root rot, Brown eye spot, Leaf blight and stem die back.

8.2 Economic importance of coffee diseases

Coffee production is constrained by two fungal diseases namely Coffee Berry Disease (CBD) and Coffee Leaf Rust (CLR). Their management accounts for up to 30% of production costs. Coffee Berry Disease may lead to total crop loss while Coffee Leaf Rust causes indirect loss through leaf fall. Therefore, there is need to apply effective, timely and sustainable control strategies

8.3 Classification of coffee diseases in Kenya

Some diseases are major while others are minor The major coffee diseases in Kenya include

- Coffee Berry Disease (CBD)
- Coffee Leaf Rust (CLR)
- Bacterial Blight of Coffee (BBC)
- Fusarium bark disease (FBD)
- Fusarium root disease (FRD) Minor diseases are:
- Armillaria root rot
- Botrytis Warty disease
- Root rot,
- Brown eye spot,
- Leaf blight and stem die back.

8.4 Management of major Coffee diseases

8.4.1 Coffee Berry Disease (Colletotrichum kahawae)

Symptoms

- **On flowers:** dark brown blotches/streaks on the petals. Flowers may be destroyed but loses from flower infection are generally not serious
- **On green berries:** small dark sunken patches/lesions which spread rapidly and may cover the whole berry. Infected berries may be shed or remain on the trees in a black shrivelled condition
- **On ripe berries:** dark sunken lesions with black dots spreading rapidly on the ripe berries (late Blight)
- **On leaves:** brown marginal spots. However, leaf infection is not common
- Severe infections may cause the die-back of twigs and branches

CBD infected berries

Late-blight

Conditions favouring high disease incidences

- Cool temperatures – 18-200 C
- High humidity - encourages spores production
- Rainfall – rain droplets disperse the spores to the rest of the tree. After the dispersal, at least 5 hours of wetness on the berries are required for the spores to germinate. Rainfall occurring in the late afternoon is therefore likely to provide suitable conditions for infection

Management of CBD

- **Cultural control** – proper and timely pruning, handling and de-suckering, and regular change of cycle. This reduces the initial disease inoculum.
- **Chemical control** – correct and timely use of PCPB registered fungicides for coffee. It is advisable to complete the CRI recommended CBD control program for it to be effective and to avoid development of resistance by the pathogen. Farmers should start spraying before the rains and continue until the rains and the cold spells are over
- **Resistant varieties** – new planting of disease resistant varieties or conversion of susceptible varieties to resistant ones through top working (grafting)

8.4.2 Coffee Leaf Rust (Hemileia vastatrix) Symptoms

- Pale yellow spots appear on the underside of the leaves at the onset of infection
- The spots later change to yellow/orange powdery masses
- Affected leaves fall off prematurely in case of severe infection. This condition may cause dieback if not controlled

Coffee leaf rust

Conditions favouring high disease incidences

- Warm and wet conditions
- Wind and or rain – disperses the spores
- After the dispersal of spores, at least 3 hours of wetness on the leaves are required for them to germinate. Only germinating spores on the lower surface of a leaf can penetrate and cause infection

Management of Leaf Rust

- **Cultural control** - proper and timely pruning and regular change of cycle
- **Chemical control** - this entails the use of PCPB registered Copper-based fungicides. Timing is critical for the control of leaf rust and the sprays should be applied before the commencement and during the early period of the rainy season. For effective management:
  - » Start the 1st round of sprays just before the short rains and repeat 3 weeks later
  - » Start the 2nd round of sprays before the onset of long rains and do 2 more at 3 weeks interval
  - » In case the infection is severe (20% of leaves have rust), it is necessary to use a systemic PCPB registered coffee fungicide. Do not spray more than 2 times a year as it affects production of plant hormones leading to hormonal imbalance such as the balance between floral and vegetal inducing hormones. This may affect flowering and thus production
  - » Adhere to the CRI recommended spray programme. Improper use of fungicides may lead to development of resistance by the pathogen

- **Resistant varieties** - planting of disease resistant varieties or conversion of susceptible varieties to resistant ones through top-working (grafting)

8.4.3 Bacterial Blight of coffee (Pseudomonas syringae pv. garcae)

Symptoms

- **On leaves:** black soaked lesions. Leaves eventually dry out, roll inwards and turn brown but do not shed
- **On twigs and shoot tips:** die back syndrome as infection extends downwards from the terminal bud
- **On flowers and pin head stage:** if attacked, pin heads appear water soaked. Both the flowers and pin heads shrivel, turn black and the entire crop may be lost
- **On internodes of young branches:** dying of branches above the area of infection. Infection may start at the internodes of young succulent branches or green stems as a result of hail damage or through wounds caused by sucking insects

Bacterial Blight of Coffee

Conditions favouring high disease incidences

- Cool and wet weather
- Injuries as a result of hailstorms and insect attack

Management of BBC

- **Cultural control** - proper pruning, minimising use of high N foliar feed formulations, splitting ground N application, sterilising pruning tools (e.g. with Kerol 1% or Lysol 3% or methylated spirit), cutting off and burning infected twigs and branches, frequent de-suckering and avoiding transportation of seedlings from BBC prone areas
- **Chemical control** - use of PCPB registered bactericides (Copper based products are most effective). For example, during the wet weather, use Kasumin Bordeaux (Copper Sulphate plus Lime at 1:1 ratio). A single spray after hailstorm to protect fresh wounds from infections is necessary
- Use the CRI recommended programme to manage the BBC

8.4.4 Fusarium Bark Disease (Fusarium stilboides)

There are 3 distinct forms namely Storeys bark disease, Collar rot and Scaly bark.
Symptoms

- Yellowing and wilting of leaves and eventual death of the tree
- For Storeys bark - suckers are attacked at the base forming lesions that girdle the stem forming a bottle neck at the base
- For Collar rot - a cankerous lesion develops causing a constriction at the base near the ground level
- For Scaly bark – rising up and flaking of the bark on mature stem especially at the point where a primary has been cut off. On old trees, this may be difficult to recognize. However, when seen on young wood or associated with cankerous regions around the base of branches or suckers, it is most likely fusarium. Unless cankerous areas develop or dieback begins, affected stems and branches may survive

Storeys bark

Collar rot

Scaly bark

Conditions favouring high disease incidences

- Poor nutrient status of soil
- Weak trees as a result of poor establishment, drought or scorch
- Scars on trees due to pruning, careless slashing of weeds and herbicide damage on green suckers
- Excessive weed growth and mulching too close to the stem causing a warm moist micro climate around the base
- Failure to destroy affected trees

Management of Fusarium Bark Disease

Cultural control

- Avoid deep planting
- Keep soil pH at optimum (4.4-5.4)
- Proper application of mulch (6" from the stump) to avoid Collar rot
- Sterilising of pruning tools with methylated spirit
- Eliminate wood boring insect pests e.g. yellow headed borer. This can be done by maintaining soil potash at optimal level as per soil analysis recommendations
- Uproot and burn all infected trees having die bark from Collar rot

Chemical Control

- In case of storey bark disease cut off and burn affected suckers or heads. Paint the scars with a PCPB registered fungicide. Make a fungicidal paint such as Captan (1 teaspoonful of Captan plus 150ml vegetable oil)
- In disease prone areas, spray suckers raised for conversion fortnightly with PCPB registered fungicide for coffee such as Captan at 40gm in 10 litres of water from emergence until wood bark matures to about 30 cm (1 foot) from the base
- For scaly bark, no action need to be taken as long as no further signs of disease develop

8.4.5 Fusarium Root Disease (Fusarium solani)

Symptoms

- Sudden wilting of leaves and death of the tree
- Infected trees may remain alive for several years but disease symptom appears once the tree is subjected to water stress. At this stage a cross- section of the stem near the soil level reveals a pink-purplish colouration, sometimes with dry rot at the centre depending on severity of infection on the tree.

Conditions favouring disease incidences

- Injury at the time of planting
- High acidity in soils
- Chemical or mechanical injury to the roots
- Water logging

Management of FSD

- **Cultural control**
  - » Uproot and burn infected trees. Leave the hole exposed for at least six months before replanting
  - » Avoid damaging the roots of seedlings during planting

- **Chemical control**
  - Sterilise the planting holes with a PCPB registered soil fumigant such as Basamid at a rate of 150gm per hole

8.5 Minor Coffee Diseases

8.5.1 Armillaria root rot (Armillaria heimii)

This is a fungal disease commonly associated with new establishments where trees have been uprooted leaving residual lateral roots. The residual roots contain food substrates for Armillaria fungi to multiply. These fungi eventually infect the developing coffee roots.

Symptoms

- Wilting and death of the leaves
- Death of the verticals (shoots, suckers and the stem)
- Subsequent death of affected trees
- In advanced stage of the disease, the wood of the affected tree is decomposed into a white wet mass with characteristic black zone lines running through the wood tissue

Conditions favouring high disease incidences

- Clearing of forest without first ring barking the trees

Management of Amillaria

- Where coffee has to be planted in newly cleared forest land, it is recommended that ring-barking of the forest trees be done 2 to 3 years earlier
- Removal of forest tree stumps and roots
- The infected tree(s) should be uprooted and replanting delayed for 2 years

8.5.2 Other minor coffee diseases

Other minor coffee diseases include Botrytis Warty disease, Root rot, Brown eye spot, Leaf blight and stem die back. However, these are not of major economic importance.

8.6 Appropriate spray equipment, nozzles and protective clothing

For effective chemical control, it is important to use recommended spray equipment - motorised sprayers or knapsack sprayers. The spray equipment should be functioning properly, well calibrated and with appropriate nozzles - Hollow Cone Nozzle. Appropriate personal protective clothing should be used.

For further information on coffee diseases please refer the coffee atlas by Coffee Research Institute