

LEARNING FACILITATING MATERIALS

NATIONAL CERTIFICATE LEVEL 2

TRADE AREA: **CASHEW PRODUCTION**

UNIT 3

PEST AND DISEASE MANAGEMENT IN A CASHEW PLANTATION AND NURSERY



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UNIT INTRODUCTION

Welcome to Unit 3 of your learning journey in cashew production. This guide explains the main steps in pest and disease management in a cashew plantation and nursery.

Do you already know the most common pests and diseases in a cashew plantation and nursery?

In pest and disease management, preventing is as important as treating pests and diseases. If you are able to prevent or identify pests or diseases correctly and decide on the appropriate course of treatment for your cashew trees, seedlings or rootstocks, you can combat large-scale contamination and reduce crop losses. Apply your knowledge and skills perfectly to manage pests and diseases effectively.



In this unit, you will learn about identifying and treating common pests and diseases in a cashew plantation and nursery. The learning material covers four sub-units:

- 1) Identifying pests and diseases in a cashew plantation and nursery
- 2) Controlling pests and diseases in a cashew plantation and nursery
- 3) Preparing the application of chemicals
- 4) Applying chemicals in a cashew plantation and nursery

Each sub-unit contains theoretical and practical exercises. Each module includes written materials, visuals as well as self-assessments to test your knowledge and skills.

You can prevent most pests and diseases by keeping your plantation and nursery clean and by following good maintenance and sanitation practices such as weeding and pruning of trees, appropriate watering and nursing of grafts.

In case you identify a pest or disease on your farm or nursery, follow the recommended treatment practices and follow the instructions on the use of chemicals closely. The correct mixture of clean water and chemical substance determines the success of the treatment.

If you use too little of the chemical substances, you might not be able to fight the identified pest or disease effectively. If you use too much of the chemical substances, you might intoxicate your farm and crop with chemicals. Both scenarios result in large-scale contamination and heavy crop loss.

Even though this learning material provides essential information on pest and disease management in a cashew plantation and nursery for National Certificate Level 2, you should also look out for new information, innovations and technological advances during your practical work that expand your knowledge and skills.

Do you want to become an expert in cashew? This is your chance!

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ICONS



LEARNING
OBJECTIVES



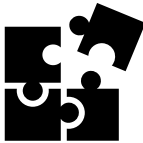
ATTENTION



PRACTICALS
HANDS ON



CHEMICAL
APPLICATION



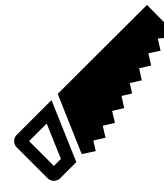
SELF ASSESSMENT



WELL DONE!



TAKE A BREAK!



DEMONSTRATE
USE OF
TOOLS

ABBREVIATIONS

Here are some commonly used abbreviations.

CRIG	Cocoa Research Institute of Ghana
GAP	Good Agricultural Practices
IPM	Integrated Pest Management
ml	Millilitres (<i>1000 ml = 1 litre</i>)
MOFA	Ministry of Food and Agriculture
PPE	Personal Protective Equipment

1. DEMONSTRATE SKILLS FOR IDENTIFYING PESTS AND DISEASES IN A CASHEW PLANTATION AND NURSERY

a) Explain pests and diseases

Pests and diseases are living organisms that are invasive and harmful to humans, animals, plants and forestry.

Pests are:

- Animals
- Insects
- Weeds

Diseases are:

- Fungi
- Bacteria
- Viruses

In order to manage pest and diseases it is important to:

- keep your farm and nursery clean to prevent the occurrence of pests and diseases (e.g. weeding)
- follow Good Agricultural Practices in farm maintenance to prevent the occurrence of pests and diseases (e.g. pruning, thinning, harvesting)
- follow recommended nurturing practices of rootstocks, seedlings and grafts
- determine distribution patterns of pests and diseases
- design strategies to treat pests and diseases



Source: Awudzi (2018) – Sap-sucking bugs

b) State the characteristics of pest-infested cashew plants, seedlings and rootstocks

Symptoms for pest infestation of plants, seedlings and rootstocks are:

- change in physical properties of the plant
 - e.g. yellow, reddish-brown, black leaves
- damaged tree trunks and branches
- dead flowers
- rotting fruits
- immature and shrivelled nuts (panicles)



Source: Awudzi (2018) – Cashew leaf miner



Source: Awudzi (2018) – Stem borers



Source: Awudzi (2018) – Leaf footed bug



Source: Awudzi (2018) – Cashew apples attacked by pests

c) **State the characteristics of disease-infested cashew plants, seedlings and rootstocks**

Symptoms for disease infestation of plants, seedlings and rootstocks are:

- change in physical properties of the plant
 - e.g. yellow-brown leaves
- dead flowers
- dead nuts and fruits (panicles)



Source: GIZ/ComCashew – Leaf Blight



Source: GIZ/ComCashew – Fungi (left) and Anthracnose (centre and right)

d) **State the names of diseases and pests of cashew plants, seedlings and rootstocks**

In this section, the most common pests and diseases, their mode of attack and symptoms are presented. However, not all pests and diseases have been studied in the same detail by researchers. Therefore, the availability of information on the various pests and diseases differ slightly.

Pests of cashew plants:

1. Sap-sucking bugs

A. A. curvipes (Aeroplane)



Source: Awudzi (2018) – Aeroplane

Mode of attack and symptoms:

- The insects suck young shoots, especially at the tip causing them to shrivel and die.
- Damages by aeroplane can also be identified by wilting and withering of tender shoots and inflorescences.

B. *Helopeltis* spp. (Cashew Mosquito Bug)



Source: Awudzi (2018) – Cashew Mosquito Bug

Mode of attack and symptoms:

- Both nymphs and adults feed on young shoots, leaves, young nuts and apples.
- The injection of toxic saliva into the plant tissue results in:
 - blackened and blistered tissue with drops of gum marking the punctuated leaves
- Feeding lesions turn brown after 24 hours and black in 2 - 3 days.
- In severely damaged trees, all leaves and inflorescence are destroyed. This can be recognised from a distance by the scorched or burnt appearance of the tree.

C. *Pseudotheraptus devastans* (Leaf footed bug)



Source: Awudzi (2018) – Leaf footed bug

Mode of attack and symptoms:

- Adults and nymphs suck sap from flushing shoots, inflorescence, apples and nuts, and this causes lesions to develop.
- Damaged tips stop growing and young nuts tend to be aborted.

2. Stem borer

Apate terebrans



Source: Awudzi (2018) – Stem borer

Mode of attack and symptoms:

- The larva of the beetle bores tunnels through the trunk and branches of the tree, causing internal damage.
- As a result of their feeding, the vascular tissue is damaged, and this hampers the upward movement of water and minerals from roots to the crown of the tree.
- Visible symptoms include:
 - the collection of wood-dust at the base of infested trees
 - entry holes on the trunk and branches
 - gum exudation
 - leaves of infested trees become yellow and drop
- Multiple infestation could occur on a single tree and result in the death of the tree.
- The pest is prevalent in neglected and weedy farms.

3. Cashew branch girdler

Analeptes trifasciata



Source: Awudzi (2018) – Cashew branch girdler

Mode of attack and symptoms:

- Adult beetles girdle to provide suitable breeding sites, in the form of deadwood.
- Eggs are laid on cut branch. On hatching the larvae burrow into the wood and feed on the cut branches.
- Damaged branches are completely girdled resulting in the breaking of affected branches.
- When the branches are girdled, yield is adversely affected in the succeeding year.
- The wound created by scraping and girdling also predisposes the tree to secondary infections.

4. Thrips

Selenothrips sp.



Source: <https://www.infonet-biovision.org/PlantHealth/Crops/Cashew>

Source: http://www.eagri.org/eagri50/ENTO331/lecture18/cashew_007.html

Mode of attack and symptoms:

- Both nymphs and adults suck and scrape the underside of leaves, usually along the main veins.
- Feeding habits result in the formation of yellow patches along feeding points making the leaves appear silvery.
 - Heavily-attacked leaves drop off.
- Severe infestations can result in growth retardation.
- Heavily-infested flowers may not open for fertilization, thus dramatically lowering crop yields.
- Heavy rains wash them off, so their damage is observed mainly in the dry periods of the year.

5. Cashew leaf miner



Source: Awudzi (2018) – Cashew leaf miner

Mode of attack and symptoms:

- Larvae from hatched eggs feed in between the epidermal layers of leaves.
- The injury by the larvae, as a result of feeding, becomes visible as markings on the leaves (channels).
- Old leaves develop large holes due to the drying and crumbling of affected portions of the leaf surface.
- Damage is most severe in nursery and young plantations (“netted leaves”).
- The damage caused by miners reduces the plants’ photosynthetic capacity.
- Large holes develop after damage by miners,

Diseases of cashew plants:

1. Leaf blight / Anthracnose

Colletotrichum gloeosporioides



Source: GIZ/ComCashew – Anthracnose

Mode of attack and symptoms:

- Anthracnose is prevalent from January to March, when flushing shoots, inflorescence and young fruits are abundant.
- It attacks leaves, twigs, flowers, peduncles, young nuts and apples.
- Anthracnose affects young and tender leaves, apples, panicles, nuts.
- Symptoms are reddish-brown, water-soaked lesion with exudation.
- Leaves crinkle, flowers wither, blacken and drop.
- Fruits darken, dry and fall or rot.

2. Inflorescence blight caused by fungi and insect complex



Source: GIZ/ComCashew – Inflorescence blight

Mode of attack and symptoms:

- Cashew mosquito bugs are the initial cause of the disease and fungi are mainly secondary.
- Small water-soaked lesions in the leaves.
- Leaves turn pinkish-brown, enlarge and coalesce.
- Affected floral parts dry up and darken.
- Affects yield through flower loss and immature fruit drop.

3. Twig Dieback

Lasiodiplodia theobromae & *Phomopsis anacardii*



Source: GIZ/ComCashew – Twig Dieback

Mode of attack and symptoms:

- Infection begins at the growing tips and progresses down the main stem.
- Leaves wither and drop.

4. Leaf rust

Cephaeleuros virescens



Source: GIZ/ComCashew – Leaf rust

Mode of attack and symptoms:

- Reduce photosynthetic activity of leaves and lead to defoliation.

5. Leaf blight

Colletotrichum spp



Source: GIZ/ComCashew – Leaf blight

Mode of attack and symptoms:

- Angular lesions, dark tan with a dark reddish-brown margin, are formed on leaves.
- Lesions subsequently enlarge and unite causing blighting and defoliation.
- Older lesions become papery, silver/grey in colour and develop holes.
- During fruit setting, infection of young nuts causes rapid blackening and dropping of fruits, resulting in significant yield losses.
- Infection of older nuts results in a characteristic dark, slightly sunken, 'tar spot' like lesion that frequently extends onto the apples.

6. Gummosis

Lasiodiplodia (Diplodia)



Source: GIZ/ComCashew – Gummosis

Mode of attack and symptoms:

- Affects main stem and branches.
- Exudation of reddish-brown liquid that turns black along longitudinal cracks.

7. Leaf spot



Source: GIZ/ComCashew – Leaf spots

8. Leaf mosaic and rosette



Source: GIZ/ComCashew – Leaf mosaic and rosette

9. Chlorosis (Nutrient Deficiency)



Source: GIZ/ComCashew – Chlorosis

10. Fruit rot

Lasiodiplodia; Cladosporium & Fusarium spp



Source: GIZ/ComCashew – Fruit rot

11. Fruit crack

Xanthomonas



Source: GIZ/ComCashew – Fruit crack

Mode of attack and symptoms:

- Spreads through thrips infestation.

Pests of seedlings and rootstocks:

1. Cashew leaf miner

Acrocerops sp.



Source: Awudzi (2018) – Cashew leaf miner

Mode of attack and symptoms:

- The larva of the leaf miner scrapes and covers the upper leaf surface with a gelatinous secretion which dries to give a silvery appearance.

2. Cashew Mosquito Bug

Helopeltis spp.



Source: Awudzi (2018) – Cashew mosquito bug

Mode of attack and symptoms:

- Both nymphs and adults feed on young shoots and leaves.
- The injection of toxic saliva into the plant tissue results in damage to flush leaves and stems by the presence of brownish-black patches which result in dieback.
- In severely damaged seedlings, all leaves are destroyed.

3. Cricket

Gryllus sp.



Source: <https://bugguide.net/node/view/846888>

Mode of attack and symptoms:

- Crickets cut the stem of young cashew seedlings which, in many cases, results in the death of the plant.

4. Caterpillars / Defoliators



Source: http://invasives.wsu.edu/defoliators/galleries/gallery_larvae.html

Mode of attack and symptoms:

- Caterpillars feed on young developing leaves of cashew seedlings.
- These caterpillars are the larval stage of moths.

5. Termites



Source <https://www.orkin.com/termites>: <https://www.orkin.com/termites>

Mode of attack and symptoms:

- Termites destroy seedlings and young plants by biting on fresh stems.
- This results in the wilting of leaves and death of the plant.

Diseases of seedlings and rootstocks:

1. Damping off

Mode of attack and symptoms:

- Damping off caused by *Pythium spp.* is usually found in wet, nursery conditions. The disease causes rotting, collapse and death of seedling at soil level.

2. Root Rot

Mode of attack and symptoms:

- The disease caused by *Pythium ultimum* results in yellowing of lower leaves and stunting of the seedling.

3. Seedling blight

Mode of attack and symptoms:

- The disease caused by *Septocylindrium sp.* causes wilting and withering of leaves as a result of the root rotting.



Source: GIZ/ComCashew – Diseased cashew seedlings

e) **Identify pests and diseases on cashew plants, seedling and rootstocks**



Practical Exercise: Go to the farm and the nursery to inspect cashew trees, seedlings and rootstocks for pests and diseases.



SELF ASSESSMENT

1. State the characteristics of pest-infested cashew plants, seedlings and rootstocks.

2. State the characteristics of disease-infested cashew plants, seedlings and rootstocks.

3. State the names of diseases and pests of cashew plants, seedlings and rootstocks.



Congratulations! You have completed the first set of questions. Take a break before you move on to the next chapter.

2. DEMONSTRATE SKILLS FOR CONTROLLING PESTS AND DISEASES IN A CASHEW PLANTATION AND NURSERY

a) State the methods of pest and disease control

The five (5) methods for pest and disease control are:

1. Cultural control – soil preparation, mulching, plant selection for intercropping, application of good agricultural practices
2. Biological control – use of living organisms such as red ants to prevent pests
3. Chemical control – application of pesticides and fungicides
4. Physical / Mechanical control – physical elimination of a pest (cultivating, pruning, hoeing, weed removal, mowing and hand picking)
5. Preventative control – Purchase of certified seeds, following farm maintenance and sanitation practices

The use of all five methods is referred to as Integrated Pest Management (IPM).

b) Outline the procedure for pest and disease control

The choice of chemicals for pest and disease control is dependent on existing and future research in cashew-growing countries and regulations on the use of pesticides and fungicides on agricultural produce.



Inform yourself about the most recent developments on the acceptable use of pesticides and fungicides on agricultural produce in Ghana before you apply any chemicals on your farm!

Pest control of cashew plants:

1. Sap-sucking bugs

A curvipes (Aeroplane)



Source: Awudzi (2018) – Aeroplane

Helopeltis spp. (Cashew Mosquito Bug)



Source: Awudzi (2018) – Cashew mosquito bug

Pseudotheraptus devastans (Leaf footed bug)



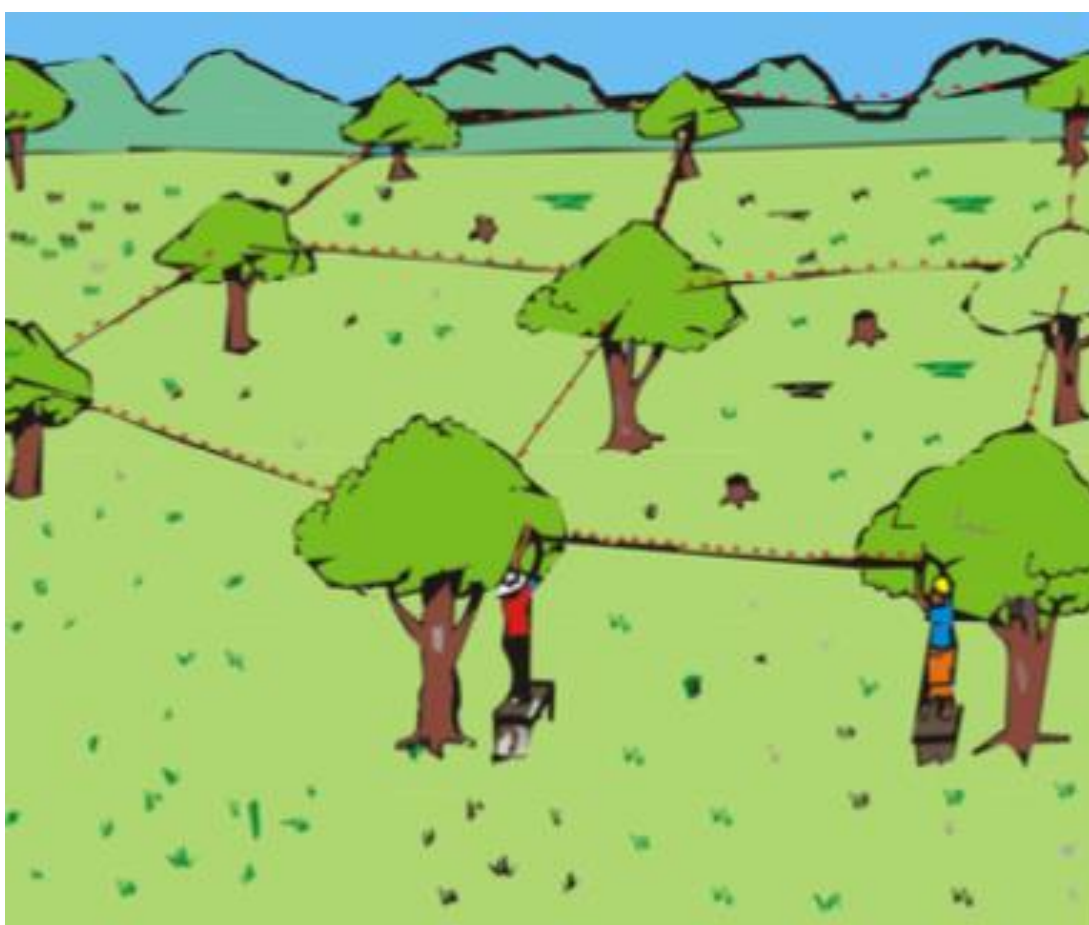
Source: Awudzi (2018) – Leaf footed bug

Procedure for pest control:

- Biological control
 - Red ants (*Oecophylla longinoda*) by transfer of nests or by building of ropes or bamboo bridges to obtain a uniform distribution of the ants on the farm
 - Avoid intercropping with alternative host plants (e.g. cowpea, cotton and cocoa)



Source: Awudzi (2018) – Red ants protecting cashew tree / fruit



Source: GIZ/ComCashew – Building bridges of ropes or bamboo for ants on cashew farms

- Chemical control
 - Take 35 ml of Cyperdim or Cymethoate Super EC
 - Add 11.5 litres of clean water
 - Mix both substances in a mist blower
 - Spray farm 3 times:
 - Pre-flowering (November)
 - Flowering (December)
 - Fruit setting (January)

2. Stem borer

Apate terebrans



Source: Awudzi (2018) – Stem borer

Procedure for pest control:

- Preventative control
 - Practice good farm sanitation.
 - Regular weeding and disposal of refuse, especially pruned branches.
- Physical control
 - Remove affected tissue.
 - Burn heavily infested trees to avoid population build up.
 - Prod the exit holes with a rod to kill the grubs and adults.
 - Plug exit holes.

3. Cashew branch girdler

Analeptes trifasciata



Source: Awudzi (2018) – Cashew branch girdler

Procedure for pest control:

- Preventative control
 - Practice good farm sanitation.
 - Conduct regular weeding.
- Physical control
 - Adults which are visible can be destroyed physically.
 - Cut off and burn infested branches.
 - Collect and burn fallen trees to slow down population build up as the pest has a long developmental period.
- Chemical control
 - Insecticide application is the most effective control measure.
 - Take 40ml Acowood (Imidacloprid).
 - Add 11.5 litres of clean water.
 - Mix both substances in a mist blower.
 - Spray soon after adult emergence in May-June.

4. Thrips

Selenothrips sp.



Source: <https://www.infonet-biovision.org/PlantHealth/Crops/Cashew>

Source: http://www.eagri.org/eagri50/ENTO331/lecture18/cashew_007.html

Procedure for pest control:

- Chemical control
 - Take 35 ml of Cyperdim.
 - Add 11.5 litres of clean water.
 - Mix both substances in a mist blower.
 - Mixture can be used for 10 mature trees.

5. Cashew leaf miner



Source: Awudzi (2018) – Cashew leaf miner

Procedure for pest control:

- Physical control
 - Practice good farm sanitation.
 - Prompt removal & destruction of affected leaves to prevent spread of the infestation (Practicable at the nursery stage).
- Chemical control
 - Take 45 ml of Cyperdim or Cymethoate Super EC or any other recommended insecticide.
 - Add 11.5 litres of clean water.
 - Mix both substances in a mist blower.

Disease control of cashew plants:

1. Leaf blight / Anthracnose

Colletotrichum spp.



Source: GIZ/ComCashew – Anthracnose

Procedure for disease control:

- Preventative control
 - Good farm sanitation.
 - Control cashew mosquito bug to reduce incidence of the anthracnose.
 - Proper spacing of trees during planting to avoid overcrowding.
- Physical control
 - Prune and remove affected branches and burn.
 - Paint pruned surface with fungicides.
- Chemical control
 - Take 25 g of Shavit F 71.5 WP, or 6 ml of Goldazim.
 - Add 11.5 litres of clean water.
 - Mix both substances in a mist blower.
 - or
 - Take 100g Nordox 75 WP.
 - Add 15 litres of clean water.
 - Mix both substances in a mist blower.
 - Use a knapsack sprayer and spray at the new flushes after the rains.
 - Maximum 3 consecutive sprays, 4 times weekly.

2. Inflorescence blight caused by fungi and insect complex



Source: GIZ/ComCashew – Inflorescence blight

Procedure for disease control:

- Combined spraying of fungicides (e.g. Carbendazim) and insecticides (e.g. Cymethoate) is recommended.

3. Twig Dieback

Lasiodiplodia theobromae & *Phomopsis anacardii*



Source: GIZ/ComCashew – Twig Dieback

Procedure for disease control:

- Physical control
 - Prune affected branches below point of infection and burn them.
- Chemical control
 - Spray pruned surfaces with copper-based fungicides.
 - Spraying may be done twice in a year (May - June and October - November).

4. Leaf rust

Cephaeleuros virescens



Source: GIZ/ComCashew – Leaf rust

Procedure for disease control:

- Best control is achieved by combining e.g. cultural and chemical control by the use of fungicides (e.g. Carbendazim).

5. Leaf blight

Colletotrichum spp



Source: GIZ/ComCashew – Leaf blight

Procedure for disease control:

- Best control is achieved by combining e.g. cultural and chemical control by the use of fungicides (e.g. Carbendazim).

6. Leaf mosaic and rosette



Source: GIZ/ComCashew – Leaf mosaic and rosette

Procedure for disease control:

- Physical control
 - Cut trees and use as fire wood.

7. Gummosis

Lasiodiplodia (Diplodia)



Source: GIZ/ComCashew – Gummosis

Procedure for disease control:

- Physical control
 - Remove affected tissue.
- Chemical control
 - Apply copper fungicide Ridomil Gold.
 - 20 gallons per acre for ground application.
 - 3 gallons per acre for air spraying.
 - Apply once a year, before the rains start or during rains because the rains will seep the chemical down into the soil.

8. Fruit rot

Lasiodiplodia; Cladosporium & Fusarium spp



Source: GIZ/ComCashew – Fruit rot

Procedure for disease control:

- Best control is achieved by combining e.g. cultural and chemical control by the use of fungicides.

9. Fruit crack

Xanthomonas



Source: GIZ/ComCashew – Fruit crack

Procedure for disease control:

- Preventative control.
 - Practice good farm sanitation.
- Chemical control
 - Take 35 ml of Cyperdim.
 - Add 11.5 litres of clean water.
 - Mix both substances in a mist blower.
 - Mixture can be used for 10 mature trees.
- Physical control
 - Farm inspection and removal of affected apples.

Pest control of seedlings and rootstocks:

1. Cashew leaf miner

Acrocerops sp.



Source: Awudzi (2018) – Cashew leaf miner

Procedure for pest control:

- Physical control
 - Practice good farm sanitation.
 - Prompt removal and destruction of affected leaves to prevent spread of the infestation (Practicable at the nursery stage).
- Chemical control
 - Take 35 ml of Cyperdim or Cymethoate Super EC or any other recommended insecticide.
 - Add 11.5 litres of clean water.
 - Use knapsack sprayer.

2. Cashew Mosquito Bug

Helopeltis spp.



Source: Awudzi (2018) – Cashew mosquito bug

Procedure for pest control:

- Chemical control
 - Take 45 ml of Cyperdim or Cymethoate Super EC.
 - Add 15 litres of clean water.
 - Use knapsack sprayer.

3. Cricket

Gryllus sp.



Source: <https://bugguide.net/node/view/846888>

Procedure for pest control:

- Chemical control
 - Drench soil before placing the seedlings in the poly bags on it with Hercules (Fipronil).
 - Take 60ml of Hercules (Fipronil).
 - Add 15 litres of clean water.
 - Water the seedlings once every month with the Hercules solution using a knapsack sprayer.

4. Caterpillars / Defoliators



Source: http://invasives.wsu.edu/defoliators/galleries/gallery_larvae.html

Procedure for pest control:

- Chemical control
 - Take 45 ml of Cyperdim, or 40 ml of Karate.
 - Add 15 litres of clean water.
 - Use knapsack sprayer.

5. Termites



Source: <https://www.orkin.com/termites>

Procedure for pest control:

- Chemical control
 - Drench soil before placing the seedlings in the poly bags on it with Hercules (Fipronil).
 - Take 60ml of Hercules (Fipronil).
 - Add 15 litres of clean water.
 - Water the seedlings once every month with the Hercules solution using a knapsack sprayer.

Disease control of seedlings and rootstocks:

1. Damping off

Procedure for pest control:

- Preventative control
 - Ensure good soil drainage to reduce disease incidence.
- Chemical control
 - Take 100g of Kocide 101.
 - Add 15 litres of clean water.
 - Use knapsack sprayer.

2. Root Rot

Procedure for pest control:

- Chemical control
 - Take 100g of Kocide 101 or Nordox 75WP or 100g Champion
 - Add 15 litres of clean water
 - Use knapsack sprayer

3. Seedling blight

Procedure for pest control:

- Preventative control
 - Ensure good soil drainage to reduce disease incidence
 - Ensure seedlings germinate promptly
 - Avoid over shading
- Chemical control
 - Drench the beds/bags with 0.3 % Ridomil Gold (Cuprous Oxide + Mefonoxam) or Mancozeb, 1% Bordeaux mixture (Cu) or
 - Take 50 g of Ridomil Gold (Cuprous Oxide + Mefonoxam)
 - Add 15 litres of clean water
 - Use knapsack sprayer



Source: GIZ/ComCashew – Diseased cashew seedlings

c) **Demonstrate the safe use of equipment and application of chemicals for pest and disease control**



Practical Exercise: Go to the farm or the nursery. Use any of the equipment available to you and start spraying the appropriate chemicals on your trees, seedlings and rootstocks.

The following equipment, chemicals and personal protection equipment are required to fight pests and diseases on cashew plantations and in nurseries:

- **Mist Blower**



Source: <https://www.runnings.com/stihlr-sr-450-backpack-blower-sprayer.html?v=2019.05.20>

- **Knapsack Sprayers**



Source: <https://www.indiamart.com/proddetail/5l-kisankraft-hand-operated-pressure-sprayers-16365077412.html>

- **Hand Sprayer**



Source: <https://www.greenmylife.in/shop/gardening-tools/watering-tools/sprayer/kisan-kraft-2-liter-sprayer/>

- **Dursban 4**



Source: <https://www.hepsiburada.com/dow-dursban-4-ec-1-litre-insektisit-tarim-bocek-ilaci-pm-HB0000057QXD>

- **Cyperdim**



Source: http://www.agrotrust.net/baozhuang_en.html

- **Liquid Copper-based Fungicide**



Source: <https://www.domyown.com/southern-ag-liquid-copper-fungicide-p-8941.html>

- **Nordox 75 WG**



Source: <https://agrosimex.pl/product/nordox-75-wg/>

- **Ridomil Gold**



Source: <https://www.agritell.com/fungicide-ridomil-gold>

- **Karate**



Source: <https://www.kisspng.com/png-insecticide-the-karate-kid-pesticide-syngenta-kara-6163757/>

d) **Control pest and disease in a cashew plantation and nursery**



Practical Exercise: Go to the farm and the nursery to identify pests and diseases on cashew trees. Treat pests and diseases in the cashew plantation and in the nursery.



Source: <https://de.depositphotos.com/93296784/stock-photo-pesticide-spraying-fruit-tree-spraying.html>



SELF ASSESSMENT

1. State the methods of pest and disease control.

2. Outline the procedure for pest control of sap-sucking bugs.

3. Outline the procedure for disease control of anthracnose.



Well done! You are doing great on your path to success.

3. DEMONSTRATE SKILLS FOR PREPARING THE APPLICATION OF CHEMICALS IN A CASHEW PLANTATION AND NURSERY

a) Explain chemical application

Chemical application is the use of fertilizers, pesticides, weedicides and insecticides on a farm or in a nursery to protect your plants from environmental contamination through insect pests and diseases.



The use of chemicals has negative effects on the environment, therefore it is recommended to conduct preventative, cultural, biological and physical control as part of integrated pest management by following good agricultural and sanitation practices to prevent the occurrence of pest and disease attack in farms and nurseries.

b) State the importance of chemical application

When climatic conditions and cropping practices result in an increase in pests and diseases, a quick and effective action is needed to prevent population build up, virus and bacterial spreading to reduce economic losses.

Chemical application is the most cost effective and efficient method to fight insect pests and diseases that attack your farm and nursery.

The application of chemical pesticides, weedicides and insecticides is important to protect your trees, seedlings and rootstocks from insect pest and disease attacks.

c) State the methods of chemical application

Manual application on smaller farms and nurseries:

- Area spraying with knapsack sprayers and pressure pumps
- Fumigation with mist blowers
- Direct application of chemicals on the attacked spot
- Soil incorporation

The two main methods for manual application of chemicals are knapsack sprayers on farms and hand sprayers in nurseries.

Mechanical application on large farms:

- Tractors with rope wick applicators
- Tractors with boom sprayers
- Aerial spraying with a spray plane

d) State the types of chemicals used for application

The types of chemicals required, depend on the insect pests and diseases that you have identified.



There is not one solution to treat all pests and diseases.

The following chemicals are mentioned in this manual for the treatment of pests and diseases in a cashew plantation and in a nursery:

- Acowood
- Cyperdim
- Cymethoate Super EC
- Goldazim
- Hercules (Fipronil)
- Karate
- Kocide 101
- Nordox 75 WP
- Ridomil Gold
- Shavit F 71.5 WP



Consult an extension officer from the Ministry of Food and Agriculture (MOFA) or the Cocoa Research Institute of Ghana (CRIG) for detailed information on the use of chemicals and their application regulations.



The choice of chemical for pest and disease control is dependent on existing and future research in cashew-growing countries and regulations on the use of pesticides and fungicides on agricultural produce.



Inform yourself about the most recent developments on the acceptable use of pesticides and fungicides on agricultural produce in Ghana before you apply any chemicals on your farm!

e) **Identify the required equipment and chemicals for application**

The following equipment and chemicals are required to fight pests and diseases on cashew plantations and in nurseries:

- **Mist Blower**



Source: <https://www.runnings.com/stihl-sr-450-backpack-blower-sprayer.html?v=2019.05.20>

- **Knapsack Sprayers**



Source: <https://www.indiamart.com/proddetail/5l-kisankraft-hand-operated-pressure-sprayers-16365077412.html>

- **Hand Sprayer**



Source: <https://www.greenmylife.in/shop/gardening-tools/watering-tools/sprayer/kisan-kraft-2-liter-sprayer/>

- **Dursban 4**



Source: <https://www.hepsiburada.com/dow-dursban-4-ec-1-litre-insektisit-tarim-bocek-ilaci-pm-HB0000057QXD>

- **Cyperdim**



Source: http://www.agrotrust.net/baozhuang_en.html

- **Liquid Copper-based Fungicide**



Source: <https://www.domyown.com/southern-ag-liquid-copper-fungicide-p-8941.html>

- **Nordox 75 WG**



Source: <https://agrosimex.pl/product/nordox-75-wg/>

- **Ridomil Gold**



Source: <https://www.agritell.com/fungicide-ridomil-gold>

- **Karate**



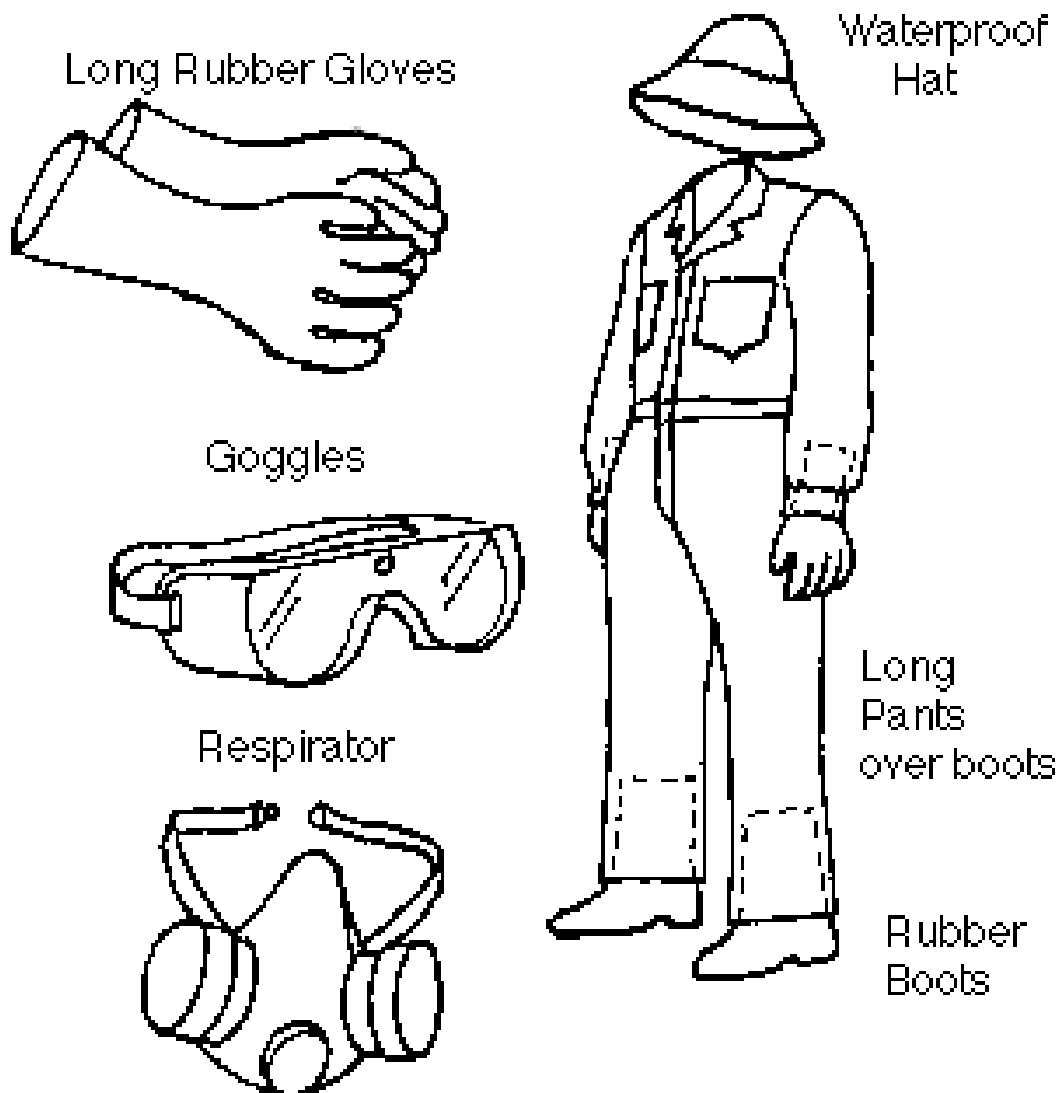
Source: <https://www.kisspng.com/png-insecticide-the-karate-kid-pesticide-syngenta-kara-6163757/>

f) **Demonstrate appropriate use of Personal Protective Equipment for chemical applications in a cashew plantation and nursery**



Practical Exercise: Go to the farm or nursery and put on your Personal Protective Equipment. Make sure that you wash the Personal Protective Equipment after you handle any type of chemical.

- **Personal Protection Equipment**



Source: <http://www.pesticides.montana.edu/reference/ppe.html>



SELF ASSESSMENT

1. Explain chemical application.

2. State the methods of chemical application.

3. State the types of chemicals used for application.



Congratulations! You have completed more than half of this training unit already. Take a deep breath and continue to the last chapter. You are doing great!



4. DEMONSTRATE SKILLS FOR APPLYING CHEMICALS IN A CASHEW PLANTATION AND NURSERY

a) Prepare equipment for applying chemicals



Practical Exercise: Go to the farm or nursery and prepare your knapsack sprayer and/or hand sprayer.

b) Outline the procedure for mixing chemicals

Use the checklist to follow steps 1 to 8 in mixing chemicals. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Go to the farm or nursery to inspect your trees, seedlings and/or rootstocks	
2. Determine the type of pest or disease that attacked your trees, seedlings and/or rootstocks	
3. Decide on the appropriate chemical to fight the identified pest or disease	
4. Put on your Personal Protective Equipment before you start mixing the chemicals	
5. Follow the mixing instructions in this manual or on the packaging of the chemical	
6. If you cannot find the instruction in this manual or on the packaging material, consult an advisor from MOFA or CRIG for guidance	
7. Most often you need to mix the chemical with a lot of clean water	
8. Mix the chemicals at the recommended ratio inside the knapsack sprayer or hand sprayer	

You do not need to master everything in one day. Take your time and progress at your own pace.

c) Outline the procedure in applying chemicals

Use the checklist to follow steps 1 to 8 in applying chemicals. Rate your own performance critically and honestly after you have completed each activity.



Excellent



Okay



Try Again

Activities	Rate
1. Put on your Personal Protective Equipment before you start applying the chemicals.	
2. Use a knapsack sprayer or hand sprayer to apply the chemicals on your trees, seedlings and/or rootstocks.	
3. Move around the tree to spray the tree on all sides before moving to the next tree.	
4. In the case of pests, spray your entire plantation / nursery to kill the entire insect population.	
5. In the case of diseases, treat the attacked tree / seedling / rootstock individually.	
6. In case of heavy pest and/or disease attack, cut and remove the tree or remove seedlings / rootstocks from the nursery to avoid further contamination.	
7. After chemical application, clean your Personal Protective Equipment and spraying equipment.	
8. Store your Personal Protective Equipment and spraying equipment in a safe location and out of reach of children.	

Be gentle with yourself. You are doing the best you can.

d) Demonstrate safe application of chemicals



Practical Exercise: Go to the farm or nursery and demonstrate the safe application of chemicals. Apply the knowledge and skill that you have already gained.

e) Demonstrate cleaning of equipment after chemical application



Practical Exercise: After applying the chemicals, clean all your spraying equipment and Personal Protection Equipment with clean water. Rinse your equipment 2 – 3 times with clean water before storage.

f) Demonstrate safe disposal of pesticide wastes



Practical Exercise: After applying the chemicals, safely dispose chemical wastes. Read the instruction for disposal on the label of the chemical before disposing it. Wear your Personal Protection Equipment while you dispose the chemical waste.



SELF ASSESSMENT

1. Outline the procedure for mixing chemicals.

2. Outline the procedure in applying chemicals.



Bravo! You have completed this entire unit.



REFERENCES

Awudzi. Dr. G.K. (2018). *Overview of Cashew Insect Pest Management in Ghana*.

ComCashew. (2018). *Cashew Disease Management*.

ComCashew. (n.d.). *Cashew Nursery Management and Grafting Technical Manual*.

ComCashew. (n.d.). *Guide to Cashew Pests and Diseases and their Control*.

MOFA. (2009). *Guide to Cashew Pests and Diseases and their Control*.