



**UNIT**  
**8**



# Pests & Diseases Management



LEARNING / FACILITATING MATERIALS

CITRUS PRODUCTION  
NATIONAL CERTIFICATE I



implemented by







## Introduction

Pests and diseases can cause significant plant damage which will affect the growth, yield, quality and also the economic value of citrus fruits. Pests and diseases management can be a real challenge because damage done by pests and diseases can never be completely avoided; hence this unit will help the learner to understand best practices to adopt in managing pests and diseases in citrus farming.

This learning material covers all the Learning Outcomes for pests and disease management in citrus farming for the Certificate I programme.



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## Demonstrate understanding of the effects of pests and diseases on citrus

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In this LO, you will learn to identify root pest and disease, foliar and stem pests and diseases, fruit pests and diseases, demonstrate how to manage the major pests and diseases and explain the benefits and importance of integrated pests and diseases management.

Pests are organisms that damage or interfere with desirable plants on the field. A pest can be a plant (weed), vertebrate (bird, rodent, or other mammal), invertebrate (insect, tick, mite, or snail), nematode, pathogen (bacteria, virus, or fungus) that causes disease, or other unwanted organism.

A disease on the other hand is any disorder that interferes with the normal functions of plants.

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### PC (a) Explain the benefits and importance of pests and diseases management.



#### Importance of Managing Pests and Diseases

The purpose of a citrus pest and disease management is to achieve satisfactory long-range pest and disease control, maximizing net profit to growers in an environmentally compatible manner. Some of the importance of managing pests and diseases are as follows:

- For healthy plants
- To increase yields
- For higher income

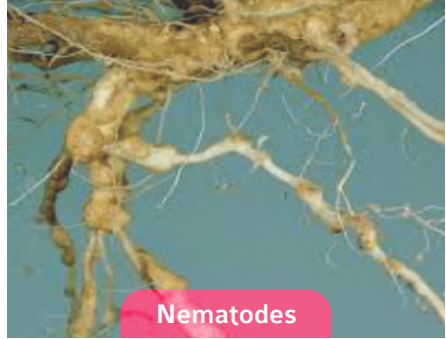
## PC (b) Identify root pests and diseases

Below shows some examples of root pests and diseases in citrus farming

### ROOT PEST



### ROOT DISEASE





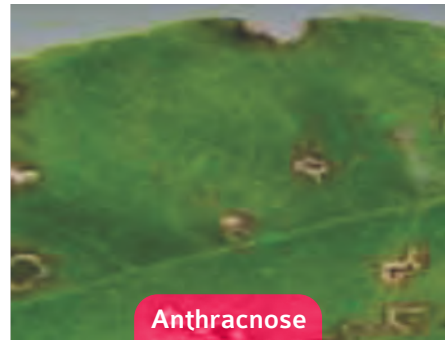
## PC (c) Identify foliar, stem pests and diseases.

Below shows some examples of foliar, stem pests and diseases in citrus farming

### FOLIAR PESTS



### FOLIAR DISEASE



## STEM PESTS

## STEM DISEASE



African citrus psyllid



Gummosis

### PC (d) Identify fruit pests and diseases

Below shows some examples of fruit pests and diseases in citrus farming

## FRUIT PESTS

## FRUIT DISEASE



Citrus fruit fly (Ceratitis)



Common fruit fly (Drosophila)



Citrus Black spot



Scap





## PC (e) Demonstrate how to manage the major pests and diseases

### Procedure for managing pests on a citrus farm:

- i. Identify the type of damage present on the farm
- ii. Identify the plant part affected (roots, stem, leaves, flowers and fruits)
- iii. Identify type of pests associated with the damage
- iv. Determine the extent of damage
- v. Examine options/ intervention methods available and relative cost of implementing them.
- vi. Select most effective combination/methods to contain pest population below Economic Injury Level (EIL)
- vii. Examine appropriate time and period to apply the chosen method
- viii. Monitor pest population to ensure they don't go above EIL.

### Methods of managing major pests and diseases in a citrus farm:

- Farm sanitation
- Monitoring and early warning systems
- The use of recommended rootstock (resistant varieties)
- Chemical control



## Self-assessment

### PC (a), (b) & (c)

Complete the table below

Type of disease	Part of plant affected
Anthracnose	
Gummosis	
Phytophthora	
Scap	

### PC (d)

1. Your school citrus farm has been affected with pests and diseases. Using the procedures discussed in the learning material, select and apply an appropriate method to control the pests and diseases.

2. Research to find out how management of pests and diseases can be done through the following;

a. Farm sanitation

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b. Monitoring and warning systems

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c. The use of recommended rootstock (resistant varieties)

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d. Chemical control

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# Demonstrate understanding of Integrated Pest management (I.P.M) in citrus Production

In this LO, you will learn to identify approaches to IPM, explain its importance, describe intervention methods and apply appropriate intervention methods in IPM.

## PC (a) Identify approaches to Integrated Pest Management

### Integrated Pest Management (IPM)

Pest problems from time to time and pest management can be a real challenge. Insects, plant diseases, weeds and other animals can cause significant plant damage. These concerns can be addressed by implementing integrated pest management (IPM) practices in your citrus farm.

### Meaning of IPM (Integrated Pest Management)

**Integrated:** Is a focus on interactions of pests, crops, the environment and various control methods. This approach considers all available tactics and how these tactics fit with other agricultural practices used.

**Pest:** is an organism with characteristics that people see as damaging or unwanted as it harms agriculture through feeding on crops. The term pest is used to refer specifically to harmful organisms including fungi and viruses.

**Management:** a way to keep pests density within levels above which can cause economic damage. Management does not mean total eradication of pests but finding effective and economic ways of keeping environmental damage to a minimum.

Furthermore, Integrated Pest Management (IPM) is a/an

- strategy to prevent and suppress pests with minimum impact on human health, the environment and non-target organisms or plants.
- preventative, long-term, low toxicity means of controlling pests.
- approach to pest control that focuses on pest prevention by eliminating the root causes of pest problems.



IPM is not a single pest control method but rather a series of pest management evaluations, decisions and controls. For example, when infestations are present and require immediate intervention, IPM presents options where the safest most effective methods available for the situation are chosen.

## PC (b) Explain the importance of Integrated Pest Management.

### Importance of IPM

Below are some benefits and importance of IPM:

- Reduces producer's economic risk by promoting low-cost and effective pest management practices.
- Avoids future pest management crisis through research directed at potential short, medium and long term challenges.
- Reduces health risk to agricultural workers by fostering best management practices.
- Reduces environmental risk associated with pest management by encouraging the adoption of more ecologically non-threatening control methods.
- Protects at-risk ecosystems and non-target species through reduced impact of pest management activities.
- Promotes sustainable bio-based pest management alternatives.

## PC (c) Describe Intervention Methods in IPM

There are four main methods in IPM and these include:

- Biological Control
- Cultural Control
- Mechanical Control
- Chemical Control

**Biological Control** - Biological control generally includes the manipulation of one biological organism to control another organism classified as a pest. In the web of nature the combination of biological control techniques is extensive. Insect pests may be preyed upon or parasitized by other insects. Most insect pests are attacked by bacterial, fungal or viral pathogens. Specific weeds may be controlled by insects with specialized feeding habits. Figure 2 ('a' and 'b') shows the use of insects to feed on mealy bugs.



**Figure 2** a) *Cryptolaemus montrouzieri* b) *Leptomastix dactylopii*

**Cultural Control:** Cultural control is the deliberate alteration of the production system either the cropping system itself or specific crop production practices, to reduce pest populations or avoid pest injury to crops. The goal of cultural control is to alter the environment, the condition of the host, or the behaviour of the pest to prevent or suppress an infestation. It disrupts the normal relationship between the pest and the host and sometimes the immediate environment making the pest less likely to survive grow or reproduce.

**Chemical control:** If all other integrated pest management methods are unable to keep an insect pest population below an economic threshold, then the use of an insecticide to control the pest and prevent economic loss may be justified.

Practitioners should be careful of the choice of chemical used which should depend on the specific insect, feeding habits, time of maturity of fruits, etc.

## PC (d) Apply Approaches to IPM

Prevention, suppression, and eradication are three approaches to maintain pest damage below economic levels.

### Prevention

Prevention is the practice of keeping a pest population from infesting a field or site and should be the first line of defence. The prevention approach may include either chemical or non- chemical methods. It includes such things as;

- i. quarantine or restricting movement of planting material from diseased areas.
- ii. planting weeds and disease free seeds,
- iii. growing varieties of plants resistant to diseases or insects
- iv. Sanitation which includes weed control and removal of sources of infection by burning or burying.



## Suppression

Suppressive approach is used to reduce pest population levels either by chemical means or removal of breeding grounds.

The methods of suppression usually do not eliminate all pests but reduce their populations to a tolerable level or a point below economic injury. Additional suppressive measures may be required if the first attempt does not achieve the management goal.



## Self-assessment

### PC (a)

1. Explain the term Integrated Pest Management (IPM)

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### PC (b)

2. State two (2) the benefits of Integrated Pest Management

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### PC (c)

3. Group the following IPM methods under the headings in the table below. IPM methods: Biological, Chemical, Mechanical and Cultural

PREVENTION	SUPPRESSION

## Demonstrate knowledge of phytosanitary regulations for the market.

In this LO, you will learn about the sanitary and phytosanitary regulations and their importance in international trade, the sanitary and phytosanitary standards and certification and how to identify factors to meet required standards and certification.

### PC (a) Explain sanitary and phytosanitary regulations and their importance in international trade.

Sanitary and Phytosanitary (SPS) regulations are technical regulations designed to prevent a potentially adverse impact of international trade on human, animal or plant life or health.

The purpose of the regulations is to protect the consumer and promote national health and safety. Although World Trade Organization (WTO) members (countries) have the right to establish their own appropriate level of protection, member states should also aim to achieve consistency in the application of this concept.

The SPS agreement defines the Appropriate Level of Protection (ALOP) as "the level of protection deemed appropriate by the member state establishing a sanitary or phytosanitary measure to protect human, animal, plant life or health within its territory.

### IMPORTANCE OF SANITARY and PHYTOSANITARY REGULATIONS

#### The SPS agreement:

- Uses process of scientific risk assessment and risk management to avoid the introduction of diseases.
- Prevents substantial financial losses to individual companies and loss of export markets for citrus fruit.
- Acknowledges the importance of harmonizing standards internationally so as to minimize or eliminate the risk of sanitary and phytosanitary standards becoming barriers to trade.
- Helps countries to have access to a neutral dispute settlement system for resolving disagreements over sanitary and phytosanitary measures.

## PC (b) Explain the sanitary and phytosanitary standards and certification. Standards and Certification



**Pest infestation:** insect pests in stored fruits need certain living conditions to feed, reproduce and survive. Pest infested fruits are deemed unacceptable and will be rejected; i.e. pest infested fruits are subjected to the various stages of risk assessment to establish whether there are unacceptable economic impacts.



**Chemical residue:** As concerns over pesticide and food safety evolve and as analytic and test capabilities improve, new procedures are adopted by importers. Maximum residue levels (MRLs) are monitored at port entry to check if it conforms to the accepted regulations. Maximum Residue Limits (MRLs) for pesticides used in the control of pest and diseases not only to safeguard consumer health but also to minimize the presence of these residues in the environment



**Sun burn:** Sunburn is a form of radiation burn that affects living tissue such as skin that results from an overexposure to ultraviolet (UV) radiation commonly from the sun. Temperature and light intensity greatly impact on the nutritional quality of fruits.

## PC (c) Factors required to meet standards and certification.

To pass standards and gain certification, citrus should be free from pests' infestation, chemical residues and sun burns. The requirements can be classified in the following sectors: Food and feed safety, Animal health, Plant health and Public health as described below:

**Food and feed safety:** EU rules on food safety are designed to protect human life and health while the rules on animal feed aim at protecting human and animal life and health. Importers of fruits and foodstuffs must comply with general conditions, which include:

- General principles and requirements of food law and traceability.
- General rules on hygiene of fruits and foodstuffs and hygiene specifications for food of animal origin and on microbiological criteria for foodstuffs.
- Rules on residues, pesticides, veterinary medicines and contaminants in and on food.
- Special rules on genetically modified food and feed, bio proteins and novel foods.
- Special rules on certain groups of food products (e.g. mineral waters, cocoa, citrus, quick-frozen food) and foodstuffs aimed at specific populations (e.g. foods for infants and young children)

- Specific marketing and labelling requirements for fruits, feed materials, compound feeding stuffs, and feeding stuffs intended for particular nutritional purposes.
- General rules on materials intended to come into contact with fruits and food stuffs.



## Self-assessment

### PC (a)

1. Research to find out the Sanitary and Phyto-Sanitary agreement from three countries including Ghana for class discussions.

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### PC (b)

1. Visit the website below and find out more information on Maximum Residue Levels for citrus

<http://www.mrldatabase.com/>.

Your findings should include factors to meet the required standards and certifications.

