

CHAPTER 10



OBJECTIVES

At the end of this chapter, students be able to:

- â—† state the meaning of pest.
- â—† classify pest into insect and non-insect pests.
- â—† classify insect pest based on their mouthparts.
- â—† discuss important insect pests of major crops.
- â—† recognise and name the important storage insect pests.
- â—† describe the nature of damage to crops.
- â—† state and discuss the general control and preventive measures of some insect pests.
- â—† state and discuss the possible side effects of the various preventive and control methods on man and the environment.
- â—† state the general effects/economic importance of pests.

10.1 Introduction

The menace of pests has constituted a major constraint to agricultural production especially in the tropics where the environmental condition is good for pest development. Crops are damaged by pests on the field and in the store leading to loss of income to the farmer. Everywhere in the world where agriculture is practised, pests abound and their presence necessitates the need to put in place one form of protection or another in order to avoid yield loss.

10.2 Meaning of Pests

A pest can be described as any organism, whether plant or animal, which causes or has the potential to cause economic damage to crops or livestock. It can also be described as any organism capable of causing damage to crop plant and such damage can be qualitative or quantitative. Examples of animal pests of crops are insects, birds, rodents, monkeys and nematodes. When a pest is a plant, it is often called a weed; for example, *Striga* sp. is a weed pest of maize. Some plant parasites such as mistletoe are plant pests.

10.3 Economic Importance of Pests

Pests play a significant role in crop production because of the damage they cause. Some of the economic effects of pest attack on crops are

- i. They destroy crops in the field through their feeding activities. For example, the larvae of insects feed on leaves while rodents feed on yam, cassava and potato tubers. Monkeys eat up fruits such as banana and plantain.
- ii. They reduce the quantity of crop yield both in the field and in the store.
- iii. They reduce the market value or quality of farm produce. For example, insects and their faeces and frass reduce the market value of harvested and stored crop produce.

- iv. Crops may be predisposed to disease attack when pests feed on plants, leaving holes or entrance for pathogens.
- v. There is reduction in the income of farmers.
- vi. Some pests such as aphids and whitefly as well as rodents and nematodes are vectors or carrier of disease pathogens.
- vii. Pest attacks in some cases often result in the total death of crop plants when they are heavily infested.
- viii. Fruits and vegetables are rendered unattractive and unmarketable when attacked by pests such as monkeys and birds.
- ix. Pest infestation causes retarded or stunted growth in crops when attacked heavily.

10.4 Classification of Pests

Pests are classified in different ways. Some of these are described below.

10.4.1 Pest classification based on whether insect or non-insect pests

Generally, pest may be classified into (i) insect pests (ii) non-insect pests

(i) Insect Pests: These are the most serious pests of agricultural importance and the group includes all insects which inflict damage on crops. They are the most numerous group of pests. Examples of insect pests are grasshopper, weevils, beetles, cotton stainer, yam beetle and the whiteflies. These feed on the crop, live inside to obtain shelter or utilise the plant for reproduction purpose.



FIGURE 10.1 Insect pests of tropical crops

(ii) Non-insect pests: They are organisms other than insects which infest crops. Examples in this category are birds like the Quelea birds, rodents, monkeys and nematodes. These also cause a lot of damage to crops. They are not as numerous as insect pests.



FIGURE 10.2 Non-insect pests of typical crops: birds, rodents/monkeys

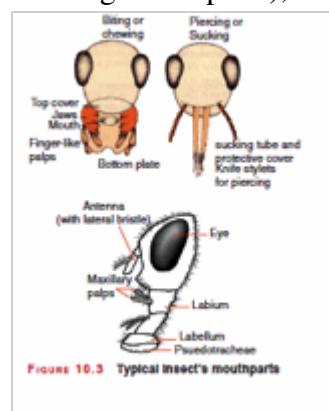
10.4.2 Classification of insect pests based on mouthparts

Insects pest are classified into different groups on the basis of their mouthparts and the mode of

feeding. The groups include: (a) biting and chewing insects (b) piercing and sucking insects and (c) boring insects.

10.4.2.1 Biting and chewing insects

This group of insects has their mouthparts adapted for biting and chewing. They possess strong mandible and maxillae which they use for biting and chewing plant parts. Other parts of the mouth are labium and labrum. Examples of insects with biting and chewing mouthparts are grasshopper, leaf worms, yam beetles (beetles), army worms (larvae of this lepidopteran pest have biting and chewing mouthparts), locusts, mantids and termites.

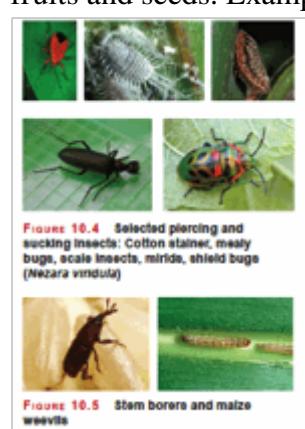


10.4.2.2 Piercing and sucking insects

The mouthparts of these insects have been modified to pierce the tissues and suck the contents of the cells of the host plants. They have strong mouthparts called proboscis. This enables them to pierce through plants and suck liquid materials from the plant tissues. Examples of insects in this group include cotton stainers, mealy bugs, scale insects, capsids or mirids, and shield insects (*Nezara viridula*).

10.4.2.3 Boring insects

The insects in this group (both adults and larvae) are capable of boring into plant parts and produce, thereby destroying them. They have mouthparts that are modified for boring into stems, fruits and seeds. Examples include stem borers, maize weevils and the rice weevils



10.5 Preventive and Control Measures of Pests

In order to reduce the damage done to crops by pests, there is need for prevention and control of pests. The following are common pest control methods: (1) physical control (2) cultural control (3) biological control (4) chemical control (5) quarantine.

1. Physical method: This method involves the removal of pests by physical means. This can be picking of insects by hand, setting traps for rodents, shooting rodents with gun, fencing around the

farm with wire netting.

2. Cultural method: This involves the application of correct farm operations aimed at enabling crops to escape pest attack. Some farm practices are used to control pests especially on the field. These are practising crop rotation, appropriate tillage operation, adequate spacing and correct seed rate, timing of planting, good farm sanitation, timely harvesting, close season practices especially in cotton, burning crop residues.

3. Biological control: This is a control measure which involves the introduction of natural enemies of pests to control or keep the pest population at a minimum level that will not cause damage. The natural enemies can be predators or parasites.

It is a control measure where living organisms are used to control pests.

4. Chemical control: This is the use of chemical called pesticide on the farm to control or prevent pest on the farm. Pesticides refer to any chemical that kills pests. Pesticides can be classified according to the organism they kill;

insecticides for killing insects.

Nematicides – nematodes

Avicides – aves/birds

Rodenticides – rodents, for example, rats

5. Quarantine method: When new crop varieties are introduced into the country they are quarantined at the port of entry and screened for pests and diseases. Through this process foreign pest are prevented from being introduced into the country.

10.6 Side Effects of the Various Preventive and Control Methods

Methods used in controlling pests have advantages as well as side effects. Their shortcomings are highlighted below.

10.6.1 Physical control

- â Time consuming.
- â All pests cannot be picked by hand.

TABLE 10.1 Nature of damage and economic importance of selected insect pests

Pests	Crops Attacked	Nature of Damage	Preventive and Control Measures
Insect Pests			
Stem borers: <i>Busseola fusca</i> , <i>Sesamia calamistis</i>	Cereals: rice, maize guinea corn	<ul style="list-style-type: none"> • Larvae bore holes • Eat up the tissues • Reduce growth and yield • Weaken the plant 	<ul style="list-style-type: none"> • Use of insecticides • Crop rotation • Timely planning
Army worms: <i>Spodoptera</i> sp.	Cereals, cowpea	<ul style="list-style-type: none"> • Larvae invade and eat up leaves • Feed on leaves thereby reducing photosynthesis • Feeding activities cause reduced growth and yield 	<ul style="list-style-type: none"> • Spraying with insecticides • Hand picking
Pod borers: <i>Maruca vitrata</i>	Legumes: cowpea, groundnut, soya bean	<ul style="list-style-type: none"> • Young ones (larvae) bore into the pod and eat up the seeds • Reduction of yield • Introduce disease • Webbing of pods together 	<ul style="list-style-type: none"> • Use insecticides like cypermethrin • Crop rotation • Timely harvesting
Aphids: <i>Aphis craccivora</i>	Legumes: cowpea	<ul style="list-style-type: none"> • Causes stunted growth • Vectors of disease: rosette, mosaic disease of cowpea 	<ul style="list-style-type: none"> • Insecticides • Uproot and burn infected plants
Leaf-eating beetles: <i>Ootheca mutabilis</i> , <i>Empoasca dolichi</i>	Legumes: cowpea	<ul style="list-style-type: none"> • Defoliate crops • Reduce photosynthesis • Reduced yield 	<ul style="list-style-type: none"> • Insecticides • Planting of resistant varieties
Cocoa mirids: <i>Distantiella theobroma</i> , <i>Sahlbergella singularis</i>	Beverages: cocoa	<ul style="list-style-type: none"> • Attack young shoot and inject toxic saliva into plant • Transmit fungal diseases • Reduce yield • Stunted growth 	<ul style="list-style-type: none"> • Spray with insecticide • Regular weeding • Farm hygiene

Pests	Crops Attacked	Nature of Damage	Preventive and Control Measures
Scale insects: <i>Planococcus citri</i>	Beverages: cocoa, kola, coffee	<ul style="list-style-type: none"> Feed on cell contents Premature fruit fall Transmit viral diseases 	<ul style="list-style-type: none"> Spray with insecticides.
Yam beetles: <i>Heteroligus meles</i>	Tubers: yam	<ul style="list-style-type: none"> Bore into heaps and feed on the tubers Reduce the quality and market value Reduction in yield 	<ul style="list-style-type: none"> Treatment of yam set with aldrin dust before planting Practise crop rotation
Variegated grass-hopper: <i>Zonocerus variegatus</i>	Tubers: yam, cassava, vegetables	<ul style="list-style-type: none"> Adults and larvae defoliate leaves Reduce the rate of photosynthesis Reduction in yield 	<ul style="list-style-type: none"> Insecticide, e.g., Aldrex 40 Hand picking
Cassava mealy bug: <i>Phenacoccus manihoti</i>	Tubers: cassava	<ul style="list-style-type: none"> Swelling of shoots Twisting of stem and reduce internode 	<ul style="list-style-type: none"> Spray with insecticide Early/timely planting Treatment of stem cuttings before planting
Green spider mite: <i>Mononychellus tanajoae</i>	Cassava	<ul style="list-style-type: none"> Feed on leaves thereby reducing rate of photosynthesis Reduction in yield 	<ul style="list-style-type: none"> Spray with insecticide Biological control
Cotton stainer: <i>Dysdercus superstitionis</i>	Cotton, okra, tomato	<ul style="list-style-type: none"> Distortion of leaves Transmit viral diseases Reduce quality of boll and lint Suck sap from plant 	<ul style="list-style-type: none"> Spray with insecticides
Cotton boll worm: <i>Helicoverpa armigera</i>	Cotton, tomato	<ul style="list-style-type: none"> Larvae feed on the boll They destroy lint and reduce its quality Premature fall of boll 	<ul style="list-style-type: none"> Spray with insecticides Burn cotton plant debris after harvesting
Thrips	Vegetables: onion, tomato	<ul style="list-style-type: none"> Browning of leaves Wilting of plant Reduced yield 	<ul style="list-style-type: none"> Use of insecticides

Pests	Crops Attacked	Nature of Damage	Preventive and Control Measures
Leaf rotters	Vegetables	<ul style="list-style-type: none"> • Rolling and twisting of leaves • Reduced photosynthesis • Yield reduction 	<ul style="list-style-type: none"> • Control with insecticides, e.g., vetox 85
Leaf beetles	Vegetables: okra, tomato; pepper	<ul style="list-style-type: none"> • Eat up leaves and stems • Reduce quality and market value • Reduce photosynthesis • Yield reduction 	<ul style="list-style-type: none"> • Use of appropriate insecticides, e.g., vetox 85
Beetles: <i>Callosobruchus maculatus</i> , <i>Sitophilus zeamais</i>	Stored produce: cowpea maize, rice sorghum, groundnut	<ul style="list-style-type: none"> • Larvae bore into and feed on seed reducing it to powder • Reduce quality • Reduce quantity • Reduce viability of seeds 	<ul style="list-style-type: none"> • Proper storage of produce • Timely harvesting • Storage hygiene • Fumigation of store
Non-Insect Pests			
Birds: weaver birds	Rice, maize, millets, sorghum	<ul style="list-style-type: none"> • Feed on grains in the field • Reduction in farmers income • Reduce quality and yield 	<ul style="list-style-type: none"> • Use of cage traps with bait • Bird scarer or scare crow • Fencing or screening farms in green house • Drumming or noise making on the farm • Shooting with catapult • Use of avicides
Rodents: rats, squirrels, bush rabbits, grass cutters	Rice, yam, cassava, maize, fruits	<ul style="list-style-type: none"> • They destroy whole plant • Feed on crops • Reduction in yield • Increase cost of production 	<ul style="list-style-type: none"> • Use of rodenticides • Trapping with bait • Use of predators: dogs and cats • Farm hygiene, i.e., cleaning, weeding • Shooting and fencing
Monkeys	Banana, mango, maize, orange, cocoa	<ul style="list-style-type: none"> • They eat up the fruits • Reduce the quality • Spoilage of fruits • Losses to the farmer 	<ul style="list-style-type: none"> • Shooting with gun where possible • Use of traps

10.6.2 Biological control

- â The newly introduced natural enemy may have its population shoot up. It may start attacking crops when all pests have been killed.
- â They may feed on other beneficial organisms.
- â They cause imbalance in the ecosystem.

10.6.3 Cultural control

- â Burning may destroy both harmful and beneficial organisms.
- â Fire may spread to other farms.
- â Fire leads to destruction and loss of organic matter from the soil.
- â Resistant variety may become adapted to the environment.

10.6.4 Chemical control

- â Beneficial organisms are destroyed by chemicals.
- â Toxicity of chemicals to man and animals.
- â Chemicals leave undesirable residue in produce.
- â Chemicals, when applied, are washed out of soil to rivers and streams, causing pollution and death of aquatic organisms.
- â Continuous use of chemical pesticides leads to development of resistance to the chemical.

Activity Collection and identification of field insects

Materials: Kilner jars, cotton wool, ethyl acetate, sweep net, aspirator

Procedure: Soak cotton wool in ethyl acetate and place inside the Kilner jar. Cover it tightly to prevent the fume from escaping. Go into the field and use the hand net to sweep flying insects. Use the aspirator to suck in crawling insects such as the beetles. Collect as many insects as possible and bring to the laboratory. Sort the insects on the basis of their mouthparts into those that have biting and chewing (mandibulate) and piercing and sucking (haustellate) mouthparts. Mount your collects on a board. Report your finding.

SUMMARY

â—† A pest is any organism (plant or animal) which causes or has the potential to cause economic damage to crops or livestock.

â—† Examples of animal pests of crops are insects, birds, rodents, monkeys and nematodes.

â—† Pest can be classified based on insect or non-insect pest and mouthparts.

â—† In order to reduce the damage done to crops by pests, there is need for prevention and control of pests. The common pest control methods are physical control, cultural control, biological control, chemical control and quarantine.

REVISION QUESTIONS

Essay Questions

1. (a) State three major classifications of insects based on their mouthparts.
(b) Describe briefly five major importance of a pest.
2. (a) Give two examples of a biting and chewing insects.
(b) Mention one host crop of each of the two insects mentioned in 2a.
3. (a) Mention three examples of non insect pests of farm crops.
(b) In tabular form, state one host crop, nature of damage and the control of the non-insect pests of farm crops named above.

Objective Questions

1. Any organism, whether plant or animal, which causes or has the potential to cause economic damage to crops or livestock is called
 - (a) pest.
 - (b) disease.
 - (c) pester.
 - (d) paste.
2. All the following are examples of vertebrate pests of crops except
 - (a) nematodes.
 - (b) rodents.
 - (c) birds.
 - (d) monkeys.
3. The general name for a plant that is considered to be a pest is
 - (a) ree.
 - (b) shrub.
 - (c) weed.
 - (d) herb.
4. Pest can reduce or destroy
 - (a) the quality and quantity of crop yield both in the field and in the store.

- (b) the quality and quantity of crop yield only in the field.
- (c) the quality and quantity of crop yield only in the store.
- (d) the quality and quantity of crop yield both in the field and not in the store.

5. The following are insect pests except

- (a) variegated grasshoppers.
- (b) white flies.
- (c) yam beetles.
- (d) nematodes.

Answers

1. a 2. b 3. c 4. a 5. d