MODULE 06

Pests and Diseases

FACILITATOR GUIDE 1

Identifying Pests and Diseases

OVERVIEW

LEARNING OBJECTIVE

Participants will be able to identify common pests and diseases in their home gardens.

DURATION

MATERIALS NEEDED

- Flipchart
- Many colors of markers, especially yellows, browns, greens, for drawing insects
- Paper for participants
- Tape
- Insect pests collected by gardeners (optional)
- Insect-damaged leaves and other plant parts (optional)

KEY CONCEPTS

- When plants are sick or in distress, they express symptoms that help gardeners understand what is wrong.
- Different kinds of pests create different kinds of damage. Learn which pests are affecting your garden!
- Through early control of pests and diseases, gardeners can promote good garden health and prevent future attacks.

TRAINING AGENDA

1	Introduction and warm-up	DISCUSSION	10 min
2	What is wrong with my plants?	DISCUSSION	30 min
3	Understanding insect pests	DISCUSSION	45 min
4	Beneficial insects and plants that attract them	DISCUSSION	30 min
5	Insect pest life cycles	DISCUSSION	30 min
6	Understanding and managing plant diseases	DISCUSSION	45 min
7	Closing discussion	DISCUSSION	15 min

10 min

1. Introduction and warm-up

Welcome gardeners to the training. Do a brief introduction to today's topic and review the training agenda. You may want to outline the training agenda on your flipchart or board so gardeners can see it when they arrive.

Conduct a warm-up exercise or ice-breaker to make sure all gardeners feel welcome and are ready to fully participate. Suggested warm-up and ice-breaker activities can be found in the Facilitator's Guide: Encouraging Learning through Participant Engagement.

Participant Engagement Guide

30 min

2. What is wrong with my plants?

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will learn how to observe plant "symptoms" to determine if plants are suffering from nutrient deficiencies, water stress, insect damage, or a disease.

MATERIALS NEEDED: Flipchart and markers

1. Explain to gardeners that when something is wrong with plants, they will start to show "symptoms," or signs of a problem. Have gardeners list symptoms they commonly observe in plants. Start with the most common symptoms and move to the rarer ones.
2. Divide your flipchart paper or board up into four sections for nutrient deficiency, water stress, insect damage, and diseases. Discuss with gardeners which symptoms are most commonly associated with what problem.

KEY MESSAGES

Although it is not always easy to determine exactly what is wrong with a plant, gardeners can look for these common symptoms to better understand how to fix a problem.

When plants remain untreated, a small problem may cause other more serious problems to develop. For example, a plant that has just a few whiteflies on it will appear fine at first, but, if left untreated, the whiteflies will reproduce very rapidly until they cover the plant's leaves. When whiteflies suck on plant tissue, they can transmit certain viral diseases that cause leaves to become yellowish and distorted. In addition, whiteflies excrete a sugary substance known as honeydew, which serves as food for a fungus called "sooty mold." Sooty mold creates a black film over leaves and prevents plants from photosynthesizing. If a gardener finds a plant after it has developed symptoms from the whiteflies, viral diseases, and sooty mold, it will be hard for them to figure out how to treat this plant. Encourage gardeners to frequently check their gardens to catch pest problems before they progress. Keep in mind that some insects like to hide on the underside of leaves, such as whiteflies, but others prefer to sit around the veins and new/unfurled leaves, such as aphids.

Water stress

Symptoms: leaves wilting, plant limp.

Nutrient deficiencies

Symptoms: The most common symptom of lack of nutrients is yellow leaves, but plants can also turn reddish or purplish hues if they do not have enough nutrients. Ask yourself if your plant is a different color than it should be.

Insect infestation

Symptoms: Look for "bites" taken out of leaves, skeletonized leaves, holes in stems and fruits. Also look for the insects themselves, webbing created by insects, their droppings, and chewed up plant parts.

Plant disease

Symptoms: Diseases make plants do "funny" things: wilt even if they are well watered, develop sooty black spots or a white fungus, or grow distorted leaves. Plant diseases tend to affect the whole plant, while insect pests attack individual fruit or leaves.

45 min

3. Understanding insect pests

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will learn about three categories of insect pests frequently seen in home gardens and connect the pest category to the type of damage they do.

FACILITATOR PREPARATION: Consider asking gardeners to come to the session with a collection of leaves or other plant parts that have insect damage. Gardeners can also collect the insect pests themselves and bring them to the session.

MATERIALS NEEDED:

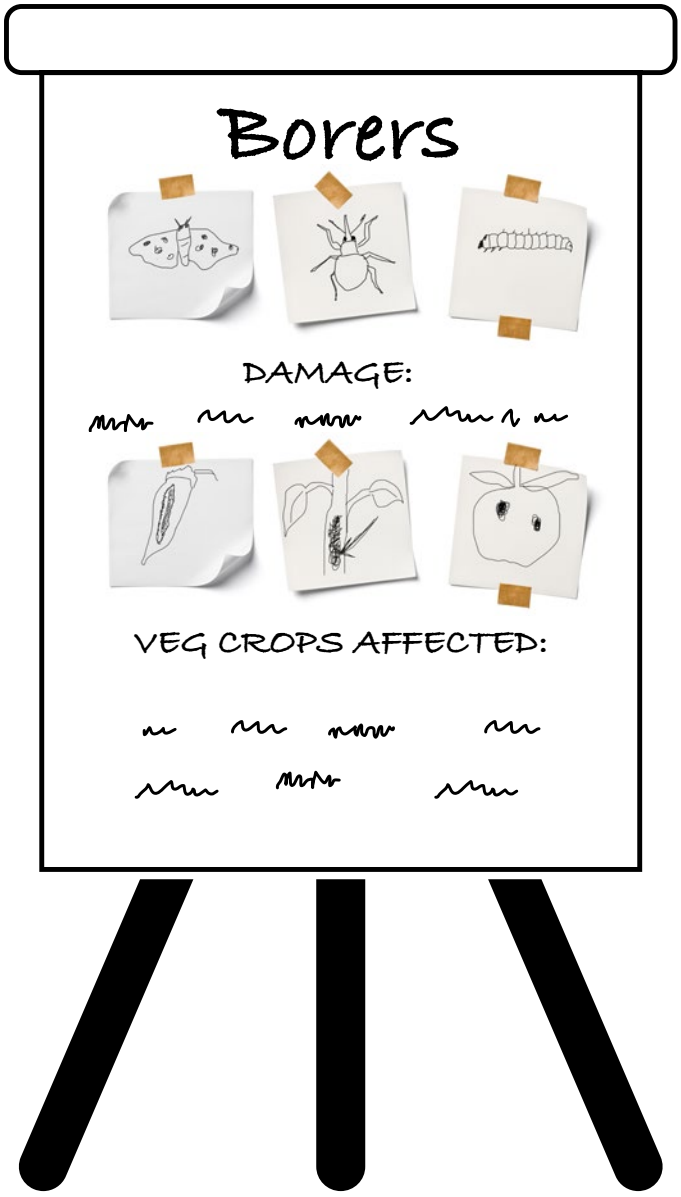
- Flipchart
- Paper for participants
- Many colors of markers, especially yellows, browns, greens, for drawing insects
- Tape
- Insect pests collected by gardeners (optional)
- Insect-damaged leaves and other plant parts (optional)

1. Ask gardeners to name insect pests they have seen in their gardens. Write these names on your flipchart. Be sure to include all local names in your list and note when there are duplicate names to describe the same pest or when a local name describes a broad group of pests rather than a single kind. If gardeners have collected insect pests from their gardens, review these as a group and write down their names as well.

2. Pass around the paper and markers you have brought and assign each participant some insects to draw. Participants should draw one insect per piece of paper. Encourage them to use correct color combinations and focus on the insects' mouthpieces to the best of their ability. If a gardener knows what the insect looks like at different life stages, they should draw these life stages together on the same paper.

3. Write 'piercing/sucking pests', 'defoliators/chewing pests,' and 'borers' as titles on three different flipchart papers or areas of the board. Put the flipchart papers up on the wall or on the ground if needed. Explain to gardeners that these categories describe how different kinds of insects feed on plants.

4. Pick one picture to represent each insect category and stick this picture on the appropriate paper or area of the board. Then:
    a. Ask participants to describe the damage caused by this insect. Write down the descriptive words they use and draw pictures of the damage it creates.
    b. If gardeners have brought samples of leaves or other plant parts with insect damage, tape these in the appropriate space.
    c. List the vegetable crops that are most commonly affected by this pest.
5. Ask gardeners to continue placing the pictures of the insects they drew in the appropriate category, adding descriptive words and drawings as needed. If there is disagreement among gardeners about what insects cause what damage, ask them to make a mental note of the disagreement and bring it up later in the garden monitoring session.
6. When the pictures are all categorized, ask one volunteer per category to summarize the results for the rest of the participants.



KEY MESSAGES

Piercing and sucking insects/sap feeders




Sucking insects have a mouthpiece that can pierce and suck leaves and other plant tissues. These insects do not take a "bite" of the fruit or leaves, but instead suck juices from plant tissues or, in some cases, inject a toxin. This will deform the leaves and make them brown or yellow. If there are many insects, then the whole plant can wilt or die. Sucking insects can be common during early growth stages when plant tissues are full of sap. Sucking insects are important to control because they can transmit viruses that cannot be treated. These viruses cause distorted leaves and fruit and uneven ripening.

CONTROL MEASURES: Hand remove insects with a tissue or blast insects off plants with a hose, remove broadleaf weeds and waste piles that harbor sucking insects, remove highly infected plants early and bury in a deep pit or burn.

COMMON EXAMPLES: Aphids, leafhoppers, whiteflies, thrips, scale insects, mealybugs, true bugs, spider mites (not technically an insect, but still an important crop pest).

Defoliators/chewing insects




Defoliators are leaf eaters and make visible "bites" in the leaves or consume entire leaves off a stem. Leaf eaters can consume leaves at different rates, with some, like the tobacco hornworm, capable of consuming enough leaves in a day that it will profoundly harm the plant.

CONTROL MEASURES: Remove defoliators by hand. Look at every angle of the plant to find defoliators that are hiding. Some defoliators will hide in the soil during the day and feed at night. Look in the soil around the base of the plant to find any insects hiding there.

COMMON EXAMPLES: Caterpillars (army worms), cutworms, grasshoppers, maggots, spotted beetles, flea beetles, hornworms, leafminers, and other beetles.

Borers




Borers drill and tunnel into fruit, bean pods and shoots of plants as they eat. They mostly attack during the flowering, fruiting and ripening stages and leave their eggs and larvae inside the hole they have created. Look for evidence of small holes in fruits or pods. Shoots will look weak and droop due to internal damage from these feeding pests. Fruits, pods and shoots can be discolored or grow abnormally, e.g. be small and irregularly shaped.

CONTROL MEASURES: It is very important to control borers early in their life cycle. Larvae of borers may be found briefly on the outside of plants and can be removed by hand before they begin boring. Remove infected fruit, stems, pods from the garden and bury or burn them in a place away from the garden.

COMMON EXAMPLES: Weevils, cutworms, pod borers, fruit and shoot borers, stem/bean flies, moths.

30 min

4. Beneficial insects and plants that attract them

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners learn to identify the insects that are beneficial to their garden, how they are beneficial, and which plants attract them.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners if there any insects that can be beneficial to our gardens. How do these insects help us?
2. Divide your flipchart or board into two columns. Write "Pollinators" in one column and "Natural Enemies" in the other column. Ask gardeners for examples of each. Prompt them if needed.
3. Split gardeners up into small groups and ask them to discuss which plants can be planted in a garden to attract beneficial insects and where in their gardens they would put these plants. Why is it important that these plants be flowering for them to have a "pest control" effect?
4. Bring gardeners back together and ask each group to share their ideas with the larger group.

KEY MESSAGES

Not all insects do damage to our plants. Lots of insects are actually beneficial!

Natural enemies




Some insects eat other insects or lay their eggs inside of them (killing them when the young hatch and start to feed) and can therefore help control their populations.

EXAMPLES OF NATURAL ENEMIES: ladybugs, praying mantises, centipedes, small wasps, spiders, lacewings, hoverflies, dragon flies, assassin bugs, earthworms, and pirate bugs.

Pollinators




Other insects help spread pollen from flower to flower as they fly. You will often see pollinators "busy" around flowers as they collect food for themselves – they are simultaneously helping your flowers develop into fruits.

EXAMPLES OF POLLINATORS: bees, bumble bees, flies, hover flies, butterflies, and moths

Attracting beneficial insects with flowering plants




One way to attract the beneficial insects to our garden is to plant flowering plants around the margins of our gardens. Not only does this look good, the insects also come to feed on these flowers and stay to feed on the insect pests in your garden.

Some good flowering plants include:

- Herbs like parsley, dill, lavender, lemon balm, coriander, basil, celery, fennel, chives, mint
- Flowers like marigolds, sunflowers, corn flowers, calendula.
- Stinging nettles and wild mustards
- Brassicas (kale, cauliflower, broccoli) that you are leaving to develop seed

30 min

5. Insect pest life cycles

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will learn about insect life cycles and how this information can help them better identify insect pests and beneficial insects.

FACILITATOR PREPARATION: Facilitator should familiarize themselves with common and/or most destructive local insects and their life cycles if these life cycles are missing from the material provided in this module.

MATERIALS NEEDED:

- Flipchart
- Paper for participants
- Many colors of markers, especially yellows, browns, greens, for drawing insects
- Tape

1. Use the **Insect Life Cycles Training Aid** to review the different life stages of insects.
2. Split participants up into 'piercing and sucking,' 'defoliators/chewing,' 'borers,' and 'beneficials' small groups. Have each group pick one insect from their category and draw a picture of its life cycle. Rotate the groups so every group draws a picture from each category. Provide some guidance into what are the common life cycle phases for each insect category to help guide gardeners.

KEY MESSAGES

Understanding an insect's life cycle can help gardeners search for and eliminate insect pests before they become a problem. Eggs can be removed before they turn into leaf-eating larvae and winged insects can be prevented from laying eggs on crops with a net. Additionally, gardeners may be able to more easily identify their main pest problem if they see the same insect at various life stages on their crops rather than mistakenly thinking they have two or three different pests damaging their crops.

45 min

6. Understanding and managing plant diseases

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will learn what plant diseases are and how to manage them in a home garden.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners how plant diseases can affect their gardens.
2. Give participants five minutes to quickly discuss with their neighbors *the symptoms plants have when they are sick*. After five minutes, ask participants to share and write their ideas on your flipchart or board. Encourage them to be as specific as possible. If gardeners mention symptoms that could be due to other reasons, such as water stress, nutrient deficiencies or insects, note this by reviewing the list from the earlier discussion on 'What is wrong with my plants.'
3. Give gardeners another five minutes to quickly discuss with their neighbors *how diseases in humans spread* (for example, bacteria in water or food or viruses by sneezing, coughing and physical contact). After five minutes, ask participants to share with the larger group and write their ideas on your flipchart or board.
4. Now ask gardeners to discuss with their neighbors *how plant diseases spread*. After five minutes, have the participants share their thoughts with the larger group. Elicit the main ways plant diseases spread (insects, soil, seeds, water, wind, and physical contact with other infected plants).
5. Draw three columns on a flipchart and write the main ways plant diseases can spread in the column to the left. On top of the middle column write "What NOT to do" (or just an ✗) and on top of the right column write "What TO DO" (or just a tick ✓).
6. Work through each category, asking gardeners what NOT to do and what TO DO to manage diseases.
7. Finish the session by asking gardeners to develop one sentence with their neighbors that summarizes how to keep a garden free of disease (for example, "Keep your soil, plants and seeds healthy and your water clean"). Give participants two minutes to come up with their summary sentence.

KEY MESSAGES

- Plants can get sick just like people! A plant infection can be very mild—and the plant will still yield produce that can be eaten—or an infection can kill the plant. Plant diseases cannot harm humans, but they can dramatically lower yields and make produce unsuitable for eating.
- Plant diseases express themselves differently depending on the crop and how badly the plant is infected. This makes it difficult for gardeners to know for certain what disease is affecting their crops. Nonetheless, gardeners should always work to stop the disease from spreading within their gardens and their neighbors' gardens. It is very hard to manage plant diseases once they are present, so the best strategy is to prevent them from occurring or from getting out of control.
- Some disease symptoms can be similar to the symptoms plants have when they lack water or nutrients. Taking good care of the plants will therefore make it easier to diagnose a diseased plant since you know it is not underfed or under watered. If the garden on a whole is healthy, but an individual plant or part of a plant is showing signs of being sick, this is an indication that the plant is suffering from a disease and should be removed from the garden.

What symptoms do plants have when they are sick?

Some common signs and symptoms of plant diseases include:

- White, brown, or black fungal growth
- Angular brown leaf spots where plant tissue may have died with a yellow "halo" around it
- Leaf spots that have a "bull's eye" appearance
- Concentric yellow ring spots
- Reddish or orange fuzzy "rust" on leaves
- Yellowing leaves
- Galls on plant roots
- Entire plant or branches wilting
- Water-soaked lesions on plants
- Fruits that have soft, rotting spots and potentially mold
- Fruits that are abnormally colored
- Mosaic leaf patterns or irregular patchworks of green and yellow areas over the surface of a leaf
- Yellow bands along the main veins of leaves
- Crinkled or distorted leaves
- Plants remain small and stunted despite good bed preparation
- A thick, gummy substance emerging from an infected stem or canker.

Diseases can spread through...	What NOT to do?	What to do?
Insects	x Do not let insect pests get out of control.	✓ Monitor crops regularly for insects and practice prevention and control measures.
Soil	x Do not put infected plants in compost piles and then spread this compost in your fields.	✓ Practice crop rotation. ✓ Pull up infected plants and burn them right away. ✓ Add disease-free organic material to your garden beds to build up soil fertility and "healthy" microorganisms.
Seeds	x Do not harvest seeds from infected plants. x Do not plant seeds that are moldy.	✓ Know the source of your seeds as much as possible. Harvest seeds from healthy and productive plants. ✓ Keep seeds dry and clean in an airtight container.
Water	x Avoid splashing water as much as possible if diseases are a major problem in your garden.	✓ Intercrop to reduce the spread of diseases from an infected plant to its neighbors and to reduce rain or irrigation water from splashing soil on plants. ✓ Stake plants to improve air circulation between leaves and help plants get dry.
Wind		✓ Plant a windbreak to protect plants.
Infected plant tissue	x Do not put infected plants in the compost pile.	✓ Prune away any infected plant leaves, stems, and fruits and burn them. ✓ Pull up any very infected plants completely and burn them.

15 min

7. Closing discussion

Ask participants to share with the group:

- Something they learned in the session
- How they could support each other in helping identify pests and diseases

NEXT GUIDE: Managing Pests and Diseases