MODULE 06

Pests and Diseases

FACILITATOR GUIDE 2

Managing Pests and Diseases

OVERVIEW

LEARNING OBJECTIVE

Participants will learn techniques for preventing and controlling pests and diseases.

DURATION

MATERIALS NEEDED

- Flipchart and markers
- Paper and pencils to distribute to participants
- Yellow, blue or both colored cards or objects that contain these colors
- Oil, grease, or another sticky substance
- String, poles, or another material to fix the colored cards to in the garden
- Water bottles or other plastic containers to place as pit traps
- Knife to cut water bottle tops
- Water and vinegar or salt to place in pit traps

KEY CONCEPTS

- A strong, healthy garden is more capable of resisting an attack from pests and diseases than an unhealthy garden. Our goal is to shift our energy away from fighting pests and diseases to actions that will prevent them from happening in the first place.

TRAINING AGENDA

1	Introduction and warm-up	DISCUSSION	10 min
2	Preventing insect pests and diseases	DISCUSSION	40 min
3	Rotating crops to prevent disease	DISCUSSION	30 min
4	Managing pests and diseases	DISCUSSION	40 min
5	Monitoring our gardens for pests and diseases	PRACTICAL ACTIVITY	30 min
6	Closing discussion	DISCUSSION	10 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

40 min

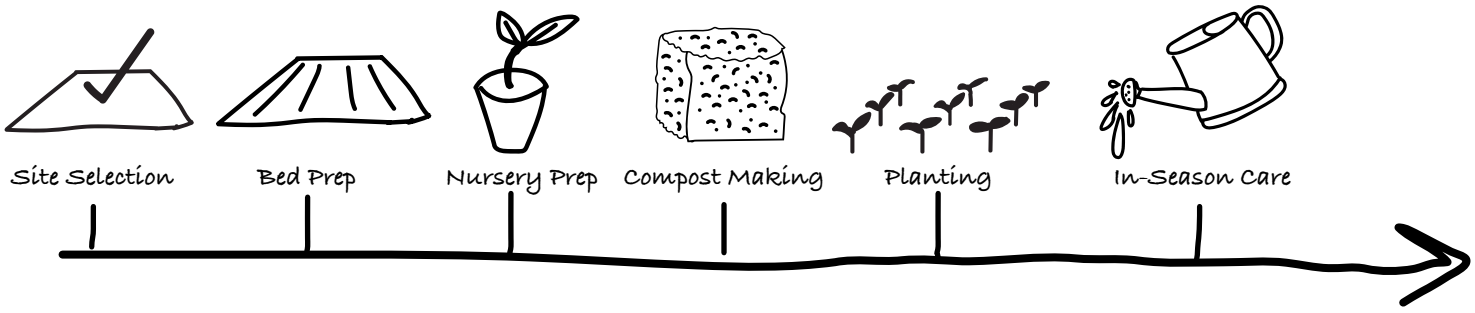
2. Preventing insect pests and diseases

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners see how pest and disease management can start even before pests and diseases are present.

MATERIALS NEEDED: Flipchart and markers

1. Ask gardeners when is the best time in the season to start pest and disease management. Have gardeners give their answers and explanations.
2. Explain to gardeners that we can start to manage pests and diseases even before we plant our first seed.
3. Draw a horizontal line on your flipchart to represent a timeline of the season. Have gardeners list the steps they take from preparing to plant a crop up until pests and diseases appear in their gardens. Include steps that take place outside of the garden too, like building a nursery or compost pile. Use pictures and words to depict these steps on the timeline.
4. Starting at the beginning of the timeline, ask gardeners to list all the actions they can take to prevent pests and diseases from entering and spreading in their gardens. Write these preventative actions below each gardening step and add others that gardeners may have missed.
5. Emphasize to gardeners that all the actions they have listed are considered pest and disease control, even though they have done them before they saw a single pest.



KEY MESSAGES

Pest and disease management does not start when we see the symptoms! It starts even before we plant our first seed. Gardeners can reduce the amount of insect pests and diseases in their gardens by carefully preparing their garden space, practicing crop rotation, and cleaning their equipment and tools prior to use.

Gardening steps	Preventative Action
Site selection	• Pick a site where crops have done well in the past. If you see, for example, that tomatoes continuously seem to have a disease in certain sites, do not plant tomatoes there, but plant a different crop in its place (crop rotation).
Bed preparation	• Enrich garden bed soil with disease-free compost or rotted manure to build healthy soil capable of fighting diseases. • Be aware that mulch can also provide habitat for slugs and other pests. Reduce level of mulch if necessary. • Trim away overhanging branches so that sunlight can dry moisture in the garden during the day. • Plant flowering plants around garden perimeter to attract beneficial insects to the garden. Parsley, sunflowers, marigolds, and holy basil are plants that attract beneficial insects. • Clean tools and boots before preparing beds. Diseases can spread from an infected bed to an uninfected one through soil on tools and boots.
Nursery preparation	• Plan for a diversity of vegetables in your garden. • Use clean equipment, containers, and hands for planting. • Check seeds for mold before planting. Do not plant moldy seeds. • Place seeds in a hot water bath for 20 minutes. Place seeds in a water-permeable cloth and tie securely. Boil water and then let cool for 10 minutes. Pour water in a bowl and submerge seeds for 20 minutes. Place seeds in a bowl of not-hot water afterwards to stop treatment. Dry seeds before planting so they can be evenly spread in the soil. • Observe if seedlings are experiencing "damping off." Symptoms can include: seedlings fail to emerge; first leaves are water soaked, mushy or discolored; stems are water soaked and very thin; young leaves wilt and turn brown; roots are absent or stunted; or fluffy white growth appears. "Damping off" diseases spread in cool, wet conditions. In the future, allow more sun to reach seedlings, improve water drainage, and use clean soil, tools, and containers. • Plant disease-resistant varieties of vegetables if available.
Compost preparation	• Use only disease- and insect-free material in compost piles. • Clean tools regularly.
Direct seeding and transplanting	• Check seeds for mold before planting. Do not plant moldy seeds. • Place seeds in a hot water bath for 20 minutes. Place seeds in a water-permeable cloth and tie securely. Boil water and then let cool for 10 minutes. Pour water in a bowl and submerge seeds for 20 minutes. Place seeds in a bowl of not-hot water afterwards to stop treatment. Dry seeds before planting so they can be evenly spread in the soil. • Practice crop rotation. • Use netting to protect young seedlings. • Plant disease-resistant varieties of vegetables if available. • Intercrop beds or plant a diversity of species within the garden to "confuse" pests and reduce the amount of food available for each species of insect pest. Insects are often specialists; if gardeners plant a diversity of crops, then that species has less to eat and has to look harder to find it.
In season care	• Monitor crops daily for pests and diseases. • Use colored sticky traps (yellow, blue) for pest monitoring. • Manage weeds that may harbor pests. • Use a "pest prevention spray" on crops (see below). • Use netting to protect plants from insect pests. • Sprinkle wood ash around garden. • Stake or trellis plants to improve air flow between leaves. • Prevent waterlogging of soil, which creates damp conditions favored by many pests and diseases.

A strong, healthy garden is more capable of resisting an attack from pests and diseases than an unhealthy garden. Our goal is to gradually shift our energy away from fighting pests and diseases to actions that will prevent them from happening in the first place.

What is a pest prevention spray?

A pest prevention spray is a spray that coats a crop's leaves and stems with a substance that is unattractive to insects that come to feed on it, such as aphids, mealybugs, or white flies. Garlic bulbs, onion leaves and onion bulbs, chilies, neem leaves, and many herbs (mint, basil, rosemary, dill, cilantro) have substances in them that make them unattractive to certain pests. These ingredients can be crushed or finely chopped and then soaked in water overnight. One or more ingredients can be used together in the same spray. Small amounts of soap can be added to help the liquid spray cling to the plant. Only add enough soap to cause small bubbles to form when the liquid is shaken or vigorously stirred; too much soap will "burn" the crops. Test the spray on one plant first before applying it on a broader scale. The liquid is sprayed on crops using a sprayer or dabbed on plants using a small branch with dried leaves. Special attention should be paid to the underside of leaves where pests like to hide. The spray should be applied late in the day to avoid burning leaves in the hot sun and can be applied a few times a week if needed.

Ingredients for making pest pervention spray

How can we use wood ash to repel pests?

Sprinkle wood ash from a fire around the base of plants to repel surface-feeding insects such as slugs and snails. Wood ash dehydrates soft-bodied insects. When dusted on crops, it will deter chewing insects that do not like the gritty texture. However, wood ash loses its deterring properties when it gets wet and must be reapplied. It therefore needs to be applied regularly. Wood ash should be used selectively since continuous use may increase the soil pH or accumulate salts to levels harmful to plants.

How does a colored sticky trap help gardeners monitor their insect pests?

Whiteflies, leafminers, fungus gnats, and aphids are attracted to the color yellow. Thrips are attracted to both yellow and bright blue color. Since these insects can be very small and hard for gardeners to see, colored sticky traps can be used to "trap" them so that gardeners can monitor their presence.

Purchase yellow or blue colored cards, or look around your environment to find objects that have large blocks of these colors in them. You can also use yellow or blue paint to coat metal, plastic, or another reusable item in this color. Make the traps sticky by applying oil or grease over the yellow or blue color. Fasten the traps to posts or use string to hang the traps within the garden. The traps should be placed on or between the crops at crop level where pests can be a problem – if the traps are too far away from the pests' food source (your crop!) or too high above crops, then pests may not encounter the traps. Try laying traps both vertically and horizontally to see which direction is best at capturing pests and adjust your traps as needed. The traps themselves may not control the pests, but will help to reveal what insect pests are present and to what extent. Traps that fill up quickly indicate a serious pest problem that should be controlled through another management strategy as soon as possible.

Homemade yellow cup sticky trap

Hanging sticky trap

30 min

3. Rotating crops to prevent disease

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners learn the benefits of crop rotation for pest and disease control, as well as other aspects of a healthy garden.

MATERIALS NEEDED: Paper and pencils to distribute to participants

1. Distribute pieces of paper torn into palm-sized squares to the gardeners. Working in small groups, ask them to quickly draw locally available vegetables that they like to eat and put the names of the vegetables below the picture. Give gardeners a few minutes to complete their drawings.
2. Draw four columns on your board or flipchart and write "Seeds/Seed Pods – Leaves – Fruits – Roots" in that order at the top of the columns. Ask each group to come to the flipchart or board and tape their drawings in the column that best describes the part of the plant that is best to eat.
3. Draw a square on your flipchart or board to represent a garden bed. Move one drawing from the Seeds/Seed Pods column to the square and explain to gardeners that they can pick one crop from this group to plant in the garden bed first. Move this drawing back to the Seeds/Seed Pods column and select one from the Leaves column, followed by a drawing from the Fruits and then the Roots column. Explain that a new season is starting each time you move a drawing to the square. Show the **Crop Rotation Training Aid** to gardeners to help explain this idea.
4. Explain to gardeners that switching what type of crop is planted in a garden bed season after season helps control pests and diseases by removing their food source for multiple seasons. Have gardeners share additional thoughts on how practicing crop rotation can reduce pests and diseases.
5. Explain that rotating crops also benefits the soil as each crop uses different combinations of nutrients pulled from different parts of the soil. Draw examples of typical root structures for each crop type at the bottom of each column and discuss how following the sequence of Seeds/Seed Pods → Leaves → Fruits → Roots can help build healthy soils.
6. Emphasize that rotating crops seasonally helps build a healthy garden, but is also important for their and their families' health. Eating a diversity of vegetables helps your body get all the nutrients it needs to stay strong.

KEY MESSAGES

Crop rotation is the practice of moving crops from one bed to another, or from one place in a bed to another place in the same bed, from season to season.

Why do we rotate crops?

Lower pest and disease impact: Insects and diseases specialize in attacking vegetables that are within the same plant family. To keep insects and diseases from making a big impact on your garden, alternate between plant families to make it more difficult for insects and diseases to spread throughout the garden. When you remove crops from a particular plant family from the garden, the insect pests that live and feed on it will no longer be able to reproduce in the garden.

Healthy soils: By having a diversity of crops in your garden, you will be encouraging plants to use different nutrients from different parts of the soil. Some plants can also help the health of soil. Legumes, for example, add nitrogen to the soil that can later on be used by plants that require a lot of nitrogen, such as brassicas.

Better yields: With better soil health and fewer pests, you will have more vegetables. Having a diversity of crops within your garden will also limit the yield losses you have from any one pest or disease.

By rotating from Seeds/Seed Pods → Leaves → Fruits → Roots, we will rotate what plant families we are planting in the same garden bed season after season.

Plants grown for their **seeds or seed pods** include beans, groundnuts, and peas.

- Seed crops help rebuild soil fertility by adding back nutrients.
- Even though some vegetables, like cowpeas, are grown for their edible leaves, they should be classified as a 'seed' vegetable for crop rotation purposes.

Plants grown for **leaves** include amaranth, lettuce, and cabbage.

- Leaf plants require a lot of soil nutrients, so can be planted in a freshly prepared, well-fertilized garden bed or directly after a seed plant.

Plants grown for their **fruits** include cucumber, eggplant, gourd, Irish potato, melon, pepper, pumpkin, squash, and tomato.

- Fruit crops can manage more nutrient stress than leaf plants, but still require well-fertilized soil. Many fruit crops are also highly susceptible to soil-borne diseases, such as blights and wilts, so it is especially important to follow fruit crops with crops from different categories in a garden bed to break the cycle of disease. Some diseases can be very persistent in soil, even lasting twenty or thirty years in the soil, but planting other crops in between fruit crops can reduce the level of disease in the soil and allow fruit crops to survive.
- Even though some fruit vegetables, like pumpkins, are grown for their edible leaves, they should be classified as a 'fruit' vegetable for crop rotation purposes.

Plants grown for their **roots** include beets, carrots, garlic, onions, radishes, sweet potatoes, turnips, and radishes.

- Root crops can help break the cycle of disease while accessing nutrients from different places in the soil profile than leaf or fruit vegetables.

40 min

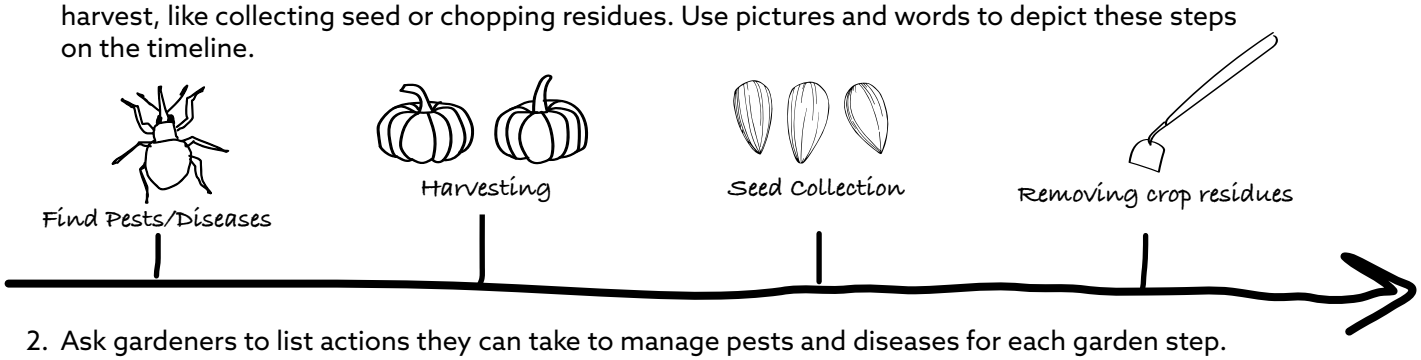
4. Managing pests and diseases

INTERACTIVE DISCUSSION

GOAL OF DISCUSSION: Gardeners will learn how to manage pests and disease outbreaks.

MATERIALS NEEDED: Flipchart and markers

1. Draw another horizontal line on your flipchart to represent a timeline of the season. Now have gardeners list the steps they take from observing pests and diseases in their garden up until the end of the season. Include steps that take place outside of the garden and steps that occur after harvest, like collecting seed or chopping residues. Use pictures and words to depict these steps on the timeline.



2. Ask gardeners to list actions they can take to manage pests and diseases for each garden step. Write these management actions below each gardening step and add others that gardeners may have missed.

3. Emphasize to gardeners that managing pests and diseases appropriately now is also helping reduce the severity of future outbreaks.

KEY MESSAGES

Timely pest and disease management can prevent outbreaks that are more serious if diseases are controlled and insect pests cannot reproduce. Timely management can also help reduce the severity of future attacks.

Gardening step	Management actions
In season care	• Monitor crops daily for pests and diseases. • Hand remove small infestations of insects. • Use colored sticky traps (yellow, blue) for pest monitoring. • Manage weeds that may harbor pests. • Use a "pest prevention spray" on crops. • Use netting to protect plants from insect pests. • Sprinkle wood ash around garden. • Stake or trellis plants to improve air flow between leaves. • Allow chickens to search for insects in nearby shrubs or woody areas to eat insects before they enter the garden. If insects that are favored by chickens are observed in the garden, allow chickens to enter to consume these insects. Observe carefully to make sure chickens are not damaging plants in the process and wash any produce thoroughly before consuming to remove chicken poop. • Prune away disease-infected leaves, branches, or entire plants and bury them in a deep pit away from the garden or burn them if possible. • Reduce mulch levels if insects are hiding there. • Avoid overwatering and creating a moist environment where diseases can grow. • Prevent waterlogging of soil, which creates damp conditions favored by many pests and diseases. • Avoid overhead watering that allows water to splash from plant to plant and potentially spread disease. Water plants at the base instead.
Harvesting	• Remove inedible, old fruits that might be harboring insects. If fruits are found to contain insects, bury them in a deep pit away from the garden or burn them rather than compost them.
Seed collection	• Only collect seeds from healthy, disease-free plants. • Make sure seeds are mature and properly dried before harvesting.
Removing crop residue	• Bury every insect and disease-infested residue in a deep pit away from the garden or burn it rather than compost it.

How can we use pit traps in our garden?

Pit traps are used to catch crawling insects, such as slugs and snails, as they approach crops. Cut the top off a water bottle or other plastic container. Bury it in the garden so that the top of the plastic is level with the soil. Fill the container with a few centimeters of water and add something toxic to the pests, such as vinegar or salt. The water should be deep enough that the insects cannot crawl out again. Place as many pit traps as desired around crops.

Photo Credit: EatTheSeason.com

30 min

5. Monitoring for pests and diseases

PRACTICAL ACTIVITY

GOAL OF ACTIVITY: Gardeners will spend time looking for evidence of insects and diseases in a garden and discuss what actions they would take to manage those pests. Gardeners will also place colored sticky traps and pit traps for pest monitoring.

FACILITATOR PREPARATION: Identify a garden, or gardens, in advance where participants can observe symptoms of pest and disease damage.

MATERIALS NEEDED:

- Yellow, blue or both colored cards or objects that contain these colors
- Oil, grease, or another sticky substance
- String, poles, or another material to fix the colored cards to in the garden
- Water bottles or other plastic containers to place as pit traps
- Knife to cut water bottle tops
- Water and vinegar or salt to place in pit traps

STEP 1. Bring gardeners to a garden where they can look for evidence of pests and diseases.

STEP 2. Explain to gardeners the importance of monitoring for pests and diseases early and often. Also explain the importance of visiting the garden at different times of day and night to catch pests when they are active.

STEP 3. Let gardeners find plants expressing symptoms of pest and disease damage, as well as the pests themselves.

STEP 4. Discuss the symptoms found by gardeners, what could be the cause of these symptoms, and what could be done to control any pest and disease outbreaks found in the garden. Ask gardeners what steps could be taken next season to prevent these pests and diseases from entering the garden again.

STEP 5. Build sticky traps and pit traps with gardeners and place them in the garden.

KEY MESSAGES

Why should we monitor our gardens for insect pests?

By regularly checking our gardens for insect pests, we can quickly identify if there are any problem insects and stop them before they spread to other plants or crops. It is much easier to control a small pest outbreak than it is to try and save a crop from failing because of a severe outbreak.

How do we monitor our gardens?

Insects are generally good at hiding. This means we have to be very thorough and creative when we look for them.

- Get down on your hands and knees when observing the crop and soil
- Examine the undersides of leaves, nodes of plants, and inside flowers
- Dig in the soil or mulch looking for insects
- Leave a plastic bag in the soil near plants overnight and check it in the morning to see if any insects are hiding under it.
- Place pit traps on the ground to catch slugs and snails
- Take a plant and shake it while catching the insects that fall with a white piece of paper
- Use colored sticky traps to observe small flying insects like whiteflies or thrips
- If you need to pull up any individual plant, shake it in a bucket to observe the insects that were on it.
- Come to the garden at different times of day and night to observe if insects are feeding.

When monitoring pests, it is important to take note of the type of insects you find, the number of plants affected, the severity of damage to individual crop plants, and area of crop affected by the pest. It is also important to keep monitoring your garden even when you are treating the pest problem to see if what you are doing is successful.

10 min

6. 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 MODULE: 08-Managing Water