

Keeping Plant Diseases in Check



LESSON TEN

What's Ahead

In this lesson, you'll learn about:

- the types of pathogens;
- mechanical sources of disease;
- environmental disorders;
- what diseases need to grow;
- disease symptoms; and
- how to prevent diseases.

The garden is an area of activity. Even when you're not in the garden, things are happening. During the day, plants make food from the sun's energy and mine nutrients and moisture from the soil. Bees and other insects pollinate flower blossoms, and soil micro-organisms are busy underground. When you think about it, your garden is an amazing place!

A garden is not a natural ecosystem. The environment of a garden is quite different than what would occur in the "wild," where a balance of plants, animals, pests and predators exists. People food would be scarce.

The convenience of a garden, with all the plants in one area, outweighs the headaches of possible garden diseases. However, simply knowing what to look for and how to set up the garden will help keep disease problems in check.

Classifying Plant Diseases

Diseases can be caused by pathogens, mechanical sources or environmental factors. Let's look at each of these causes more closely.

Pathogens: A pathogen is a tiny disease-causing agent. Plant pathogens include: fungi (fun-ji), bacteria, viruses and nematodes.

Fungi are microscopic organisms that

take their food from plant tissue. The tissue could be living or dead. Fungal diseases spread rather slowly, but they may damage plants before you can effectively control them.

Some common fungal diseases include: powdery mildew, downy mildew, rusts, early blight, late blight, molds, scabs, smut and rots. In fact, fungi are the only pathogen that can be controlled easily.

You can control fungal diseases with natural or synthetic fungicides. In fact, fungi are the only pathogen that can be controlled easily. You can prevent them with good cultural practices, as we will see later.

Bacteria are single-celled organisms that reproduce quickly. If the conditions are right, they will multiply at an amazing rate. Bacterial diseases are difficult to control. Common bacterial diseases in the vegetable garden include: bacterial blight of beans, cucumber wilt and potato blackleg.

Viruses are organisms that cannot be seen with the naked eye. You must use a high-powered microscope to see them. Viruses rob the host plant of its proteins.

Viral diseases are usually spread by insects with sucking mouthparts, such as aphids and leafhoppers. The insects infect neighboring plants by "injecting" plants with a virus. One viral disease, tobacco mosaic, is spread by people who smoke and have the virus on their hands. Tobacco mosaic affects peppers. If you're a smoker, wash your hands before entering the garden to prevent this disease.

Viral diseases are systemic, which means once they are inside a plant, they can move

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▶ KEY POINT 1:

A pathogen is a disease-causing agent. Fungi, bacteria, viruses and nematodes are all pathogens.

about and infect the entire plant system. The same disease could affect the plant's roots, stem, leaves and fruits.

Viral diseases cannot be cured. Remove all infected plants from the garden and destroy them.

Nematodes are tiny parasitic soil worms. They live inside a plant or cling to a plant part using their head or mouthparts. Nematode damage is difficult to diagnose because symptoms are similar to those of common plant pathogens. Plants infected with nematodes become weak and unproductive.

Mechanical Sources of Disease

Mechanical injury to plants is a "people-related" problem. Plants can be injured by a gardener's hoe, spade, fork, boot, rototiller or other tool. Once a plant is injured, it's much more vulnerable to disease. Be careful when you work in the garden.

Environmental Disorders

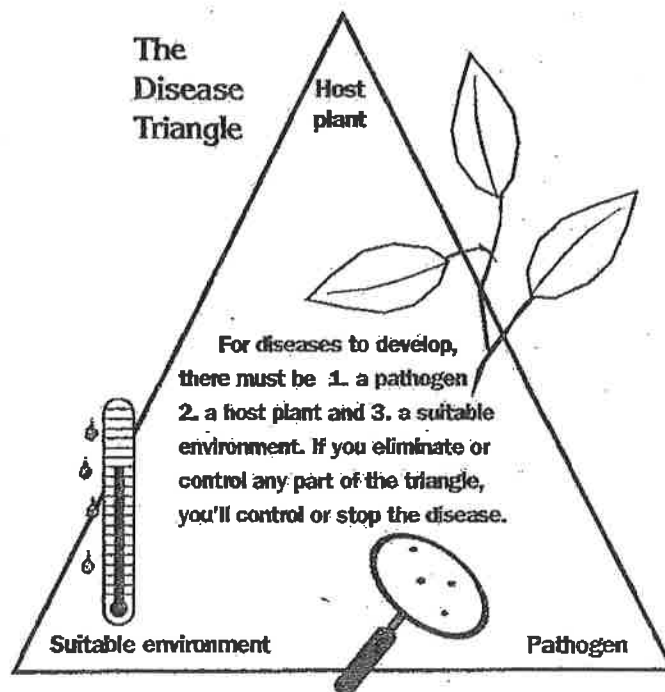
The weather plays an important role in the growth of plants. Freezing, frosts, drought, excess water, wind, hail, sun and heat can damage plants. Check out possible environmental causes for a disease before you blame it on a pathogen.

Here are some examples of environmental disorders: sunscald on tomatoes or peppers; leaf scorch on bean leaves; cold weather damage to leaves of vine crops, hollow heart in potatoes, growth cracks on radishes, cabbage and tomato.

The Disease Triangle

Diseases are part of our environment. It would be impossible to eliminate the millions of pathogens that exist. Pathogens are everywhere — in the air, in water, the soil, in plants and in animals. Generally, their populations are held in check by the balance of nature. However, sometimes pathogens flourish. For a disease organism to flourish, three factors need to exist. These three factors form what is called "The Disease Triangle."

All three factors must be present for the pathogen population to increase. The pathogen must be present. A host plant (or animal) must be present, and a suitable environment must exist. Pathogens multiply if temperature, moisture and sometimes light are right for their reproduction or growth. By eliminating or controlling any part of the triangle, you can stop the disease.



▶ **KEY POINT 2:**
 Pathogens, mechanical sources and environmental conditions all cause disease.



Symptoms of Plant Disease

Diseases typically occur in the home garden at a slow rate. You may not notice them at first. Diseases show themselves in different ways, depending on the type of disease and the plants it infects. Here is a list of plant disease symptoms to watch for:

Chlorosis: Chlorosis is a technical word for yellowing of a plant's tissues. Chlorosis may affect young leaves, old leaves, or leaf edges in spots, dots and splotches.

Dead Plant Parts: Plant parts die and turn brown. These parts may or may not drop off the plant.

Water-Soaked Appearance: Some plant diseases show themselves within plant tissue as dark green in color or greasy in appearance.

Leaf Drop: When leaves drop off, the plant can't make food.

Plant Wilt: A wilted plant looks like it needs water. However, watering will not correct this disorder.

Common Plant Diseases

Disease \ Disorder	Common Crops Affected	Remarks
Blossom End Rot	tomato, pepper, eggplant	Bottom of fruit is blackened and soft. Avoid situation by mulching and water regularly.
Cat Face/Cracking	tomato	Caused by irregular watering
Early Blight	tomato	Irregular spots on lower leaves; cankers can infect stems, fruit. Clean area and use mulch.
Late Blight	potato	Dark areas develop on leaves and stems, lower leaves affected first.
Club Root	broccoli, brussels sprouts, cabbage, cauliflower	Adjust pH of soil up to 7.0 (use limestone). Rotate crop.
Scab	cucumber, melons, squash, pumpkin	Choose a resistant variety. Rotate crop.
Powdery Mildew	squash, pumpkin, cucumber	Choose resistant variety. This is a dry weather fungus.
White Mold	beans	Allow for good air circulation.
Potato Scab	potato	Lower the pH of the soil to 5.3 or less (use sulfur).
Damping Off	seedlings	Seedlings die quickly. A thin rotted stem appears at ground level.



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Slow Plant Growth: Plant growth is stunted when stressed by living organisms or poor environmental conditions.

Rotten Plant Parts: Fruits and roots are typically affected by rots. Fungi and bacteria are the causes of most rots.

Disease Prevention Steps

Use this checklist to note what practices you use.

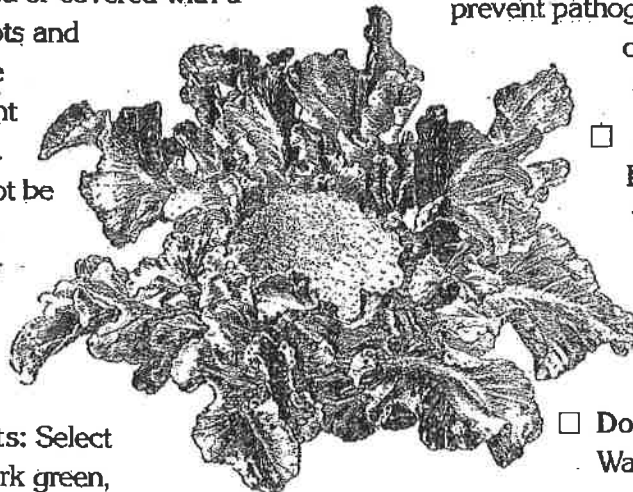
- Build a fertile soil:** Pay attention and measure soil nutrient levels, soil pH and soil organic matter.
- Select resistant varieties:** When selecting vegetables for your garden, read the seed catalog, seed packet or transplant marker to see what diseases the variety is resistant to.
- Buy disease-free seed:** Make sure that the seed you purchase is from a reputable seed business. Discount seeds are not a good buy. Seeds don't need to be treated to be disease-free. Disease-free seeds are from clean sources.

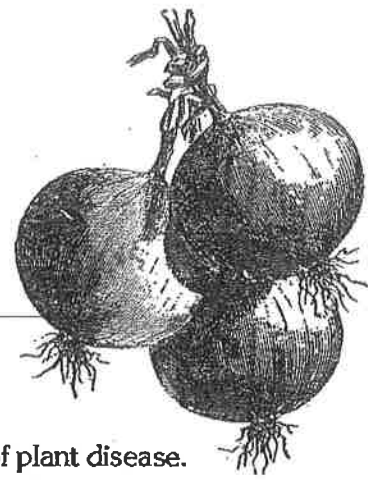
Some seeds are treated or covered with a fungicide to prevent rots and fungal diseases. These seeds are usually bright purple or pink in color. These seeds should not be eaten or used as feed. Wash your hands after handling treated seeds to remove the fungicide dust.

- Buy healthy transplants:** Select transplants that are dark green,

stout and healthy in appearance. Avoid yellow, lanky or spotted plants.

- Rotate crops:** Rotate vegetable families from garden section to section. Some gardeners have four garden plots that they rotate every year. One of the four gardens is left fallow or is sown with a green manure crop so that the fertility of the soil can be improved. Garden rotation breaks that cycle of disease by removing the host plant. A simple record keeping system will help you remember what crops grew where in previous years.
- Use mulch:** It will keep weed populations down, prevent splashing of soil particles onto plants and fungal spore spread. Spores are the reproductive bodies of fungi. They are "shot" into the air at temperatures of 70 degrees F or more.
- Eliminate weeds or alternate hosts:** Some disease pathogens need more than one host to complete their life cycle.
- Keep garden tools and footwear clean:** Wash garden tools and boots with a bleach solution (one part bleach to nine parts water) to prevent pathogens from spreading. Apply oil to metal tools after air drying.
- Allow air to move:** Pathogens grow under warm, moist conditions. Avoid crowding plants, and don't plant wind-break hedges close to the garden.
- Don't over-water your garden:** Water thoroughly, but not too





often. Most vegetables need about one inch of water per week. Watch the weather report and water only when needed. Water the soil, not the leaves.

- Control insects:** Remember, insects can spread disease by “injecting” each plant.
- Keep the garden area clean:** Remove the weeds and brush from the garden area. Clip or mow weeds around the garden so they aren’t a haven for pests. Keep your compost pile or compost bin outside the garden. Use only finished compost as a soil amendment. Unfinished compost may infect or re-infect your plants. Remove debris from the garden when crops are finished. Bury or destroy plant parts to kill possible pathogens.

Summary

Now that you know more about plant diseases, try to answer the **Study Questions** and do a **Study Activity**. In the next lesson, we’ll learn about composting.

Study Questions

1. List three causes of plant disease.
2. What is a pathogen? What are the types of pathogens which cause disease?
3. Draw the disease triangle and label the parts.
4. Which disease pathogen is easiest to control?
5. List at least five practices that will help prevent plant disease in your garden.
6. List at least five common symptoms of plant disease.

(See bottom of page 60 for answers.)

Study Activities

Plan a Rotation

Make a plan to rotate your garden crops for the next two years. (See Lesson #7 for list of plant families). Draw your plan below.

Year 1	Year 2

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Read and Learn

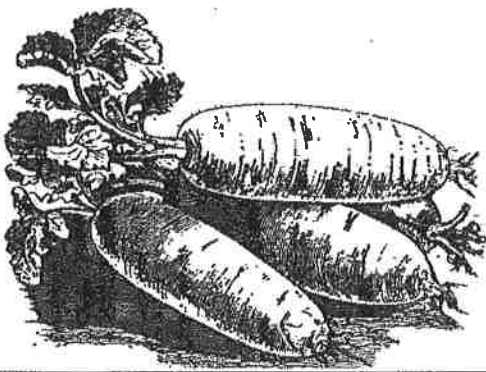
Learn more about common vegetable disease by reading about them. Check at your county Extension office or local library for more information.

Disease I.D.

Send a diseased leaf sample to the University of Maine Cooperative Extension Plant Diagnostic Lab for identification. Call 1-800-287-0279 for more information or bring the samples to your county Extension Office for shipment. The service is free.

Other Resources

For more information on plant diseases, contact your county Extension office or write or call the Plant Diagnostic Lab (University of Maine Cooperative Extension, 491 College Ave., Orono, ME 04473-1295, 1-800-287-0279).



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- Study Question Answers
1. pathogens, mechanical sources, environmental factors
 2. A tiny disease-causing agent. Fungi, bacteria, viruses and nematodes.
 3. host
 4. Fungus
 5. See checklist on page 58.
 6. Chlorosis; dead plant parts; water-soaked appearance; leaf drop; plant wilt; slow plant growth; rotten plant parts.