

# DISEASE MANAGEMENT *in* Home Vegetable Gardens



## Introduction

Nothing is probably more frustrating for home gardeners than to see the fruits of their labors lost to diseases and pests.

Diseases occur when environmental conditions are suitable for pathogens to develop on susceptible hosts. Some pathogens attack a wide variety of plants, whereas others attack only specific plants. Additionally, some pathogens can attack all plant parts, whereas others attack only selected tissues.

Many types of organisms cause infectious diseases of plants, but the five major groups of plant pathogens are fungi, water molds, bacteria, viruses and nematodes. Adverse environmental conditions also can cause non-infectious diseases of plants, which are referred to as disorders. Adverse conditions include improper soil pH, nutrient deficiencies and toxicities, soil compaction, excess water, herbicide damage and more. Plants weakened by adverse conditions may be further predisposed to attack by pathogens.

Successful disease management begins with accurate identification of the cause of the problem. Knowing the common diseases of individual crops aids greatly in disease identification and management. Many diseases are readily identified based on characteristic signs (observation of the pathogen itself) and their symptoms. The identification of other diseases requires microscopic examination of diseased tissues or even more sophisticated laboratory techniques, which are available through the LSU AgCenter Plant Diagnostic Center.

Other vegetable disease management resources available through the LSU AgCenter are:

- Louisiana Plant Disease Management Guide (Pub.1802).
- Louisiana Vegetable Planting Guide (Pub. 1980).
- Vegetable Gardening Tips Series
- Louisiana Home Vegetable Gardening (Pub. 3000).

## Disease Management

Prevention is the key to disease management in the home garden. Although many foliar diseases, such as leaf spots and mildews, are generally manageable once they are observed, root diseases generally are not.

Several disease management options are available for the home gardener that have minimal impact on the growing environment yet help to maintain a healthy crop. Creating an optimal growing environment in the vegetable garden will minimize plant stress, which in turn will reduce plant disease susceptibility and ultimately improve crop yield and garden aesthetics.

Several synthetic chemicals and natural products (also called biopesticides) are available to aid in the management of plant diseases, but they should always be used in conjunction with cultural practices intended to modify the environment to make it less conducive to disease development.

**Site selection and preparation.** Choose a sunny, well-drained location to plant a vegetable garden. Most vegetables require 8 hours or more of full sun and do not like to have “wet feet.” Raised beds with good drainage will help to keep the roots from sitting in water for prolonged periods of time. Choose a location that will provide enough space for selected plants to grow and spread their roots. Overcrowded plants are more likely to be stressed than plants that are adequately spaced.

**Soil tests.** Soil is the foundation for healthy and productive plants. Soil temperature, moisture, pH and fertility all influence soil pathogens ability to survive and colonize plants. Have your soil tested annually to determine the pH, salts, nutrients and organic matter levels and water-holding capacity. For more information on how to sample, test and assess the quality of your soil contact the LSU AgCenter Soil Testing & Plant Analysis Laboratory.

**Resistant varieties.** Many varieties of vegetables are resistant or tolerant to specific diseases. This does not mean that they are immune to these diseases, but when a disease does develop, it will be less severe on them than on varieties without resistance. Every effort should be made to buy resistant varieties when they are available. Contact your parish extension agent for information on resistant varieties of specific crops.

**Disease-free seed and transplants.** Many vegetable disease problems originate with the seed or transplants. Seed should be purchased from reliable commercial seed companies. Purchase fungicide-treated seed to prevent damping-off diseases. If you like to save seed from your favorite varieties, only select seed from healthy plants. Before purchasing transplants inspect them for disease symptoms. If a plant is diseased at an early age it is very difficult to manage.

**Fallowing and crop rotation.** Fallowing (letting the land lay idle without a crop for 2-3 years) and crop rotations interrupt the life cycle of soil pathogens by placing the pathogens in

a non-host environment. Through this interruption, the pathogens are unable to accumulate to levels that could cause significant levels of disease and crop losses. Following is achieved by moving the location of the garden every few years. Crop rotation is the practice of planting different plant families in a new area in the garden every season for 3-4 seasons.

**Solarization.** Soil solarization is a practice that utilizes the sun's energy to heat the soil and reduce populations of soil pathogens, insects and weed seeds. To be effective, soil should be heated to a depth of 4-6 inches and to at least 100 degrees for at least 4-6 weeks. In Louisiana, the best time to do this is during the heat of the summer (July and August). Prepare the soil as you would for planting, making sure that it is free of clods and is moist but not overly wet. Cover the soil with a clear plastic or polyethylene tarp (1 to 6 mils thick) that is free of holes. Stretch the plastic so that it is in contact with the soil and bury the edges to prevent heat loss. Be careful when removing the plastic to prevent recontamination of the soil.

**Organic mulches and amendments.** The addition of organic matter and other soil amendments can help reduce diseases caused by pathogens living in the soil. Adding organic matter to the soil enhances soil and plant health by improving soil structure and moisture retention, providing plant nutrients and sustaining beneficial soil microorganisms. Mulch also serves as a barrier between the soil and plant tissue and reduces the amount of pathogen that can be splashed onto leaves, stems and fruit.

**Sanitation.** Sanitation includes various physical practices intended to reduce pathogen populations and prevent their spread. Many pathogens survive between crops in or on the residue from diseased plants and fruit, so it is important to remove as much of the old plant debris as possible. Do not compost plant residue from diseased plants or fruit. Similarly, eliminate weeds because they may harbor pathogens or serve as a host for insects that may transmit viruses and other pathogens. Frequent cleaning with soap and water followed by disinfestation with a sanitizer such as diluted chlorine or rubbing alcohol of tools also will help prevent the spread of pathogens.

**Synthetic chemicals.** The home gardener has several chemical control products to choose from, including fungicides and bactericides. Most of the available products for home gardeners work on contact and must be applied before the disease occurs or as soon as disease symptoms are observed. The most common fungicidal products for home garden use contain chlorothalonil, sulfur or mancozeb. Products containing copper can be used as fungicides or bactericides. Organic gardeners can use sulfur or copper to manage vegetable diseases. A list of available fungicides and bactericides is provided in Table 1.

**Biopesticides.** Many home gardeners prefer to grow their vegetables organically or using products that are more "environmentally or earth friendly" than traditional synthetic chemicals. Biopesticides are derived from natural materials such as plants, animals, minerals and fungi or bacteria, and are most effective when used in conjunction with cultural methods. A list of biopesticides available to home gardeners is provided in Table 2.

## Diseases Affecting Vegetables

**Damping-off.** Fungi and water molds can attack newly planted seed (preemergence damping-off) and young seedlings (postemergence damping-off). Prepare the beds to ensure good drainage, and do not overwater during germination. Sow seeds when soil temperatures are favorable for rapid germination and growth, and do not sow them too deeply. The use of fungicide-treated seeds will help to prevent damping-off.

**Leaf spots, blights and fruit rots.** Buy disease-free transplants. Choose resistant varieties if available. Plant in sunny locations with good air circulation to reduce the length of time the leaves remain wet. Avoid the use of overhead irrigation. Fungicide sprays applied prior to the onset of rainy periods will provide some protection against fungal spots and blights. Copper-containing products and biopesticides are somewhat effective against bacterial diseases.

**Mildews.** Two types of mildews affect vegetables – downy and powdery. Powdery mildews predominate during dry and warm-to-hot temperatures, whereas downy mildews thrive during cool and wet periods. Both types can be managed successfully by planting resistant varieties in areas of the garden with full sun and good air movement. Plants can be protected with synthetic chemicals or biopesticides.

**Southern blight.** This disease affects a wide range of vegetables. Management can be very difficult once the pathogen is established in the soil. Do not plant susceptible crops for 2-3 years in areas known to be infested with the pathogen. Turn the soil to bury the sclerotia (mustard seed-like survival structures) as deeply as possible (at least 8-10 inches). For small plantings, aluminum foil wrapped around the lower part of the stem (from just below the soil line to approximately 2 inches above the soil) provides a physical barrier that prevents the pathogen from reaching the plant.

**Viruses.** Viruses can cause a multitude of symptoms, including mosaic patterns, leaf yellowing, leaf twisting or malformation and plant stunting. Choose resistant varieties when possible. Do not introduce virus-infected plants into the garden. Prevent the spread of viruses by controlling insects and weeds and by regularly disinfecting tools used to work with the plants. Remove diseased plants. Using reflective mulches aids in disrupting insect transmission of some viruses, like the thrips-transmitted tomato spotted wilt virus.

**Wilts.** Wilt diseases are commonly caused by soilborne fungal and bacterial pathogens or nematodes. Wilting will often begin at the top of the plant, and eventually the entire plant will wilt and die. Selecting resistant varieties best prevents disease. If the area is known to be infested with a wilt pathogen, do not plant susceptible varieties in the infested area for 2-3 years.

## Common Diseases of Vegetables in Louisiana

**Basil:** downy mildew and Fusarium wilt.

**Beans and peas (southern):** anthracnose, bacterial blights, gray mold, leaf spots and blights (fungal), powdery mildew, root-knot nematode, rust, viruses and white mold.

**Bulb vegetables (garlic, onion, etc.):** Botrytis blight, downy mildew, leaf blights (fungal), purple blotch and white rot.

**Cole crops (broccoli, Brussels sprouts, cabbage, cauliflower, etc.):** Alternaria leaf spot, black rot and downy mildew.

**Corn (sweet):** leaf blights (fungal) and rust.

**Cucurbits (cucumbers, melons, squash, watermelons, etc.):** angular leaf spot, downy mildew, gummy stem blight, Phytophthora blight and fruit rot, powdery mildew, root-knot nematode, southern blight and viruses.

**Eggplant:** leaf blights (fungal), Phomopsis fruit rot, and southern blight.

**Leafy greens (collards, lettuce, mustard, turnip, etc.):** Alternaria leaf spot and blight, downy and powdery mildew.

**Lettuce:** anthracnose, bacterial spot, downy and powdery mildew.

**Okra:** Fusarium wilt, powdery mildew and root-knot nematode.

**Peas (English):** anthracnose, powdery mildew and rust.

**Root vegetables (beets, carrots, parsnips, turnips, etc.):** leaf spots and blights (fungal) and root-knot nematode.

**Peppers:** anthracnose fruit rot, bacterial spot, Phytophthora blight, southern blight, tomato spotted wilt and other viruses.

**Spinach:** downy mildew and white rust.

**Tomatoes:** Alternaria stem canker, bacterial speck, bacterial spot, bacterial wilt, early blight and other leaf spots and blights, leaf mold, pith necrosis, root-knot nematode, southern blight, tomato spotted wilt and other viruses.

## Fungicides for Use in the Home Vegetable Garden

Fungicide	Trade Names	Disease(s) Controlled	Crops
<b>captan</b>	<i>Hi-Yield Captan 50W</i> Fungicide	Damping-off	<b>Seed treatment only</b> Beans, beets, cabbage, corn, melons, peas, spinach, squash & Swiss chard
<b>chlorothalonil</b>	<i>Bonide</i> Fung-onil Multi-purpose Fungicide <i>Ferti-lome</i> Broad Spectrum Landscape & Garden Fungicide <i>GardenTech</i> Daconil® Fungicide <i>Hi-Yield</i> Vegetable, Flower, Fruit and Ornamental Fungicide <i>Scotts Ortho</i> ® MAX® Garden Disease Control	Anthracnose, Botrytis gray mold, downy mildew, early blight, fruit rots, fungal leaf spots & blights, gummy stem blight, late blight, powdery mildew, rust	Most vegetables
<b>copper</b>	<i>Bonide</i> Copper Dust <i>Bonide</i> Garden Dust <i>Bonide</i> Liquid Copper Fungicide <i>Bonide</i> Dragoon Dust with Copper <i>Concern</i> Copper Soap Fungicide <i>Liqui-Cop</i> Copper Fungicide Garden Spray <i>Natural Guard</i> Copper Soap Fungicide <i>SA-50 Southern Ag</i> Liquid Copper	Anthracnose, bacterial leaf spots & blights, early blight, fungal leaf spots & blights, gummy stem blight, powdery mildew, scab, white rust	Most vegetables
<b>mancozeb</b>	<i>Bonide</i> Mancozeb Flowable with Zinc <i>Southern Ag</i> Dithane M-45	Anthracnose, early blight, fungal leaf spots & blights, gummy stem blight, rust	Asparagus, corn, cucurbits, onions, potatoes, tomatoes
<b>myclobutanil</b>	<i>Spectricide</i> Multi-purpose Fungicide	Pod tip rot, powdery mildew, rust	Asparagus, cucurbits, snap bean, tomatoes
<b>phosphorous acid (mono- &amp; di-potassium salts)</b>	<i>Monterey</i> Agri-Fos Systemic Fungicide	Root, crown & fruit rots caused by <i>Phytophthora</i> & <i>Pythium</i> , downy mildew & late blight	Most vegetables
<b>sulfur</b>	<i>Bonide</i> Garden Dust <i>Bonide</i> Sulfur Plant Fungicide <i>Bonide</i> Tomato & Vegetable 3 in 1 <i>Ferti-lome</i> Dusting Sulfur <i>Hi-Yield</i> Dusting Wettable Sulfur <i>Safer Brand</i> Garden Fungicide II <i>Southern Ag</i> Wettable or Dusting Sulfur	<i>Botrytis</i> , downy mildew, powdery mildew & rust	<b>Do not use on cucurbits</b> <b>May cause injury on some bean varieties</b>  Brassicas (cole crops), onions & peas
<b>sulfur + potassium salts of fatty acids</b>	<i>Safer Brand</i> 3-in-1 Garden Spray	Powdery mildew	Beans, cucumbers, peas, potatoes & squash

# Biopesticides

Biopesticide	Disease(s) Controlled	Crops
<b>Bayer Advanced Serenade Garden Disease Control</b>	Botrytis blights, Alternaria spots and blight, gummy stem blight, onion purple blotch, powdery mildew	Most vegetables
<b>GreenCure Foliar Fungicide</b>	Leaf spots and blights, powdery mildew	Most vegetables
<b>BioSafe Disease Control</b>	Leaf spots and blights, powdery mildew	All vegetables
<b>Novozyme Actinovate Lawn and Garden</b>	Damping-off, Botrytis gray mold, leaf spots and rust	Most vegetables and herbs
<b>Novozyme Actino-Iron Lawn and Garden</b>	Damping-off, root rots	Most vegetables and herbs
<b>BioWorks RootShield Home &amp; Garden</b>	Damping-off, root rots	<b>Apply to seed, plant roots and soil only</b> Most vegetables
<b>SaferGro Mildew Cure</b>	Powdery mildew	All vegetables
<b>BioWorks MilStop</b>	Powdery mildew	Most vegetables
<b>Neem Oils (many brands)</b>	Powdery mildew, rust	Most vegetables
<b>Dr. Earth Final Stop Disease Control Fungicide</b>	Botrytis gray mold, leaf spots and blights, powdery mildew	<b>May cause leaf burn on some plants</b> Most vegetables
<b>Simple Success Companion Biological Fungicide</b>	Damping-off, root rots	Most vegetables and herbs



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