

Tomato Diseases

Tomatoes (*Lycopersicon esculentum*) can be grown on almost any moderately well-drained soil type. A good supply of organic matter can increase yield and reduce production problems. Tomatoes and related vegetables, such as potatoes, peppers and eggplants, should not be planted on the same land more than once in three years. Ideally, any cover crop or crop preceding tomatoes should be members of the grass family. Corn, an excellent rotation crop with tomatoes, supplies large amounts of organic matter and does not promote the growth of disease organisms that attack tomatoes. Certified seeds and plants are recommended and should be used whenever possible.

Bacterial Wilt

Bacterial wilt or Southern bacterial blight is a serious disease caused by *Ralstonia solanacearum* (formerly *Pseudomonas solanacearum*). This bacterium survives in the soil for extended periods and enters the roots through wounds made by transplanting, cultivation or insects and through natural wounds where secondary roots emerge. Disease development is favored by high temperatures and high moisture. The bacteria multiply rapidly inside the water-conducting tissue of the plant, filling it with slime. This results in a rapid wilt of the plant, while the leaves stay green. If an infected stem is cut crosswise, it will look brown and tiny drops of yellowish ooze may be visible.

Prevention & Treatment: Control of bacterial wilt of plants grown in infested soil is difficult. Rotation with nonsusceptible plants, such as corn, beans and cabbage, for at least three years provides some control. Do not use pepper, eggplant, potato, sunflower or cosmos in this rotation. Remove and destroy all infected plant material. Plant only

certified disease-free plants. The varieties Neptune, Tropic Bay and Kewalo are partially resistant to bacterial wilt, but are uncommon varieties. Chemical control is not available against this disease.

Early Blight

This disease is caused by the fungus *Alternaria solani* and is first observed on the plants as small, black lesions mostly on the older foliage. Spots enlarge and concentric rings in a bull's eye pattern can be seen in the center of the diseased area. Tissue surrounding the spots may turn yellow. If high temperature and humidity occur at this time, much of the foliage is killed. Lesions on the stems are similar to those on leaves, sometimes girdling the plant if they occur near the soil line (collar rot). On the fruits, lesions attain considerable size, usually involving nearly the entire fruit. Concentric rings are also present on the fruit. Infected fruit frequently drops.

The fungus survives on infected debris in the soil, on seed, on volunteer tomato plants and other solanaceous hosts, such as Irish potato, eggplant, and black nightshade.

Prevention & Treatment: Use resistant or tolerant cultivars. Use pathogen-free seed and do not set diseased plants in the field. Use crop rotations, eradicate weeds and volunteer tomato plants, fertilize properly, and keep the plants growing vigorously.

If disease is severe enough to warrant chemical control, select one of the following fungicides: maneb, mancozeb, chlorothalonil, or fixed copper. Follow the directions on the label.

Late Blight

Late blight is a potentially serious disease of potato and tomato, caused by the fungus *Phytophthora infestans*. Late blight is especially damaging during cool, wet weather. The fungus can affect all plant parts. Young leaf lesions are small and appear as dark, water-soaked spots. These leaf spots will quickly enlarge and a white mold will appear at the margins of the affected area on the lower surface of leaves. Complete defoliation (browning and shriveling of leaves and stems) can occur within 14 days from the first symptoms. Infected tomato fruits develop shiny, dark or olive-colored lesions, which may cover large areas. Fungal spores are spread between plants and gardens by rain and wind. A combination of daytime temperatures in the upper 70s °F with high humidity is ideal for infection.

Prevention & Treatment: The following guidelines should be followed to minimize late blight problems:

- Keep foliage dry: Locate your garden where it will receive morning sun.
- Allow extra room between the plants, and avoid overhead watering, especially late in the day.
- Purchase certified disease-free seeds and plants. There are no late blight-resistant tomato cultivars.
- Destroy volunteer tomato and potato plants and nightshade family weeds, which may harbor the fungus.
- Do not compost rotten, store-bought potatoes.
- Pull out and destroy diseased plants.
- If disease is severe enough to warrant chemical control, select one of the following fungicides: chlorothalonil, fixed copper, maneb or mancozeb. Follow the directions on the label.

Septoria Leaf Spot

This destructive disease of tomato foliage (fruit is rarely infected) is caused by the fungus *Septoria lycopersici*. Infection usually occurs on the lower leaves near the ground, after plants begin to set fruit. Numerous small, water-soaked spots with dark borders surrounding a light gray center appear on the older leaves. Black specks, which are spore-producing bodies, can be seen in the center of the

spots. Severely spotted leaves turn yellow, die and fall off the plant. The fungus is most active when temperatures range from 60 to 80° F and humidity is high. Defoliation weakens the plant, reduces the size and quality of the fruit, and exposes the fruit to sunscald (see below). The fungus can overwinter on crop residue from previous crops, decaying vegetation and some wild hosts related to tomato.

Prevention & Treatment: Currently grown tomato cultivars are susceptible to Septoria leaf spot. Crop rotation and sanitation will reduce the amount of inoculum. Repeated fungicide applications (see late blight) will keep the disease in check.

Leaf Mold

The fungus *Cladosporium fulvum* causes leaf mold. It is first observed on older leaves near the soil where air movement is poor and humidity is high. The initial symptoms are pale green or yellowish spots on the upper leaf surface, which enlarge and turn a distinctive yellow. Under humid conditions the spots on the lower leaf surfaces become covered with a gray, velvety growth of the spores produced by the fungus. When infection is severe, the spots coalesce, and the foliage is killed. Occasionally, the fungus attacks stems, blossoms and fruits. Green and mature fruit can have a black, leathery rot on the stem end.

The fungus survives on crop residue and in the soil. Spores are spread by rain, wind or tools. Seeds can be contaminated. The fungus is dependent on high relative humidity and high temperature for disease development.

Prevention & Treatment: Crop residue should be removed from the field. Staking and pruning to increase air circulation helps to control the disease. Avoid wetting leaves when watering. Rotate with vegetables other than tomatoes. Using a preventative fungicide program, the same as used for early blight control, can control the disease.

Bacterial Spot

This disease is caused by the bacterium *Xanthomonas vesicatoria*, which attacks green but not red tomatoes. Peppers are also attacked. The disease is more prevalent during wet seasons. Damage to the plants includes leaf and fruit spots, which result in reduced yields, defoliation and sun-

scalded fruit. The symptoms consist of numerous small, angular to irregular, water-soaked spots on the leaves and slightly raised to scabby spots on the fruits. The leaf spots may have a yellow halo. The centers dry out and frequently tear.

The bacteria survive the winter on volunteer tomato plants and on infected plant debris. Moist weather and splattering rains are conducive to disease development. Most outbreaks of the disease can be traced back to heavy rainstorms that occurred in the area. Infection of leaves occurs through natural openings. Infection of fruits must occur through insect punctures or other mechanical injury.

Bacterial spot is difficult to control once it appears in the field. Any water movement from one leaf or plant to another, such as splashing rain drops, overhead irrigation, and touching or handling wet plants, may spread the bacteria from diseased to healthy plants.

Prevention & Treatment: Only use certified disease-free seed and plants. Avoid areas that were planted with peppers or tomatoes during the previous year. Avoid overhead watering by using drip or furrow irrigation. Remove all diseased plant material. Prune plants to promote air circulation. Spraying with fixed copper will control the disease. Follow the instructions on the label.

Buckeye Rot

Buckeye rot is a disease of the fruit caused by the fungus *Phytophthora parasitica*. The first fruit symptoms appear as brownish spots, often at the point of contact between the fruit and the soil. As the spots enlarge, dark, concentric rings can be seen. Lesions of buckeye rot resemble those of late blight, except that the former remain firm and smooth, whereas late blight lesions become rough and are slightly sunken at the margins. Under moist conditions, a white, cottony fungal growth appears on the buckeye rot lesions. With time, the entire fruit will rot. The fungus does not affect the foliage. The disease is most common during periods of prolonged warm, wet weather and in poorly drained soils. The fungus survives in the soil and is spread by surface water and rain. Peppers are also susceptible to this disease.

Prevention & Treatment: Avoid compacted, poorly drained soils (grow plants in raised beds). Rotation, sanitation, staking and mulching will help reduce the disease. Fungicides applied for late blight control will also control buckeye rot.

Fusarium Wilt

This is a warm-weather disease caused by the fungus *Fusarium oxysporum*. The first indication of disease in small plants is a drooping and wilting of lower leaves with a loss of green color followed by wilting and death of the plant. Often leaves on only one side of the stem turn golden yellow at first. The stem of wilted plants shows no soft decay, but when cut lengthwise, the woody part shows a dark brown discoloration of the water-conducting vessels. The fungus is soilborne and passes upward from the roots into the water-conducting system of the stem. Blocking of the water-conducting vessels is the main reason for wilting. Invasion occurs through wounds in roots growing through infested soil. Long-distance spread is through seed and transplants.

Prevention & Treatment: Control can be obtained by growing plants in pathogen-free soil, using disease-free transplants and growing only varieties resistant to races 1 and 2 of Fusarium wilt (indicated by FF following the tomato variety name), such as: Celebrity, Solar Set, Park's Whopper, Goliath, Dona, Big Beef, Health Kick, Viva Italia, and Classica. Raising the soil pH to 6.5-7.0 and using nitrate nitrogen rather than ammoniacal nitrogen will retard disease development. No chemical control is available.

Southern Blight

The fungus *Sclerotium rolfsii* causes this disease. The first symptom is drooping of leaves suggestive of other wilts. On the stems, a brown, dry rot develops near the soil line. White fungal growth with brown mustard seed-sized sclerotia may be visible. The stem lesion develops rapidly, girdling the stem and resulting in a sudden and permanent wilt of all aboveground parts. Frequently, a white fungal mat covers the lesions. The fungus can also attack fruits where they touch the soil.

The fungus can survive for years in soil and plant debris. It is favored by moist conditions and high temperatures.

Prevention & Treatment: Crop rotation with nonsusceptible grass crops and removal of plant debris immediately after harvest will help to control the disease. Do not plant tomatoes after beans, pepper or eggplant. Calcium nitrate may be applied at transplanting.

Seedling Disease (Damping-off)

The fungi *Pythium* and *Rhizoctonia* cause damping-off of tomato seedlings. Seedlings fail to emerge in the greenhouse or small seedlings wilt and die soon after emergence or transplanting. Surviving plants have water-soaked areas on the stem close to the soil line.

Prevention & Treatment: Damping-off is often a problem in plants that are planted too early in the spring. The fungi are more active in cool, wet, rich soils. To prevent damping-off, take these precautions:

- Start seeds indoors in sterilized potting mix.
- Do not start seeds in soil that has a high nitrogen level. Add Nitrogen fertilizer after the seedlings have produced their first true leaves.
- Allow the surface of the soil to dry between waterings.

Viruses

Different viruses cause different symptoms on tomato. Symptoms of virus infection may appear as light and dark green mottling of the leaves. With tomato spotted wilt virus (TSWV), plants are stunted, bronzed or spotted, or have prominent purple veins. Fruits may have yellow spots. Tobacco mosaic virus (TMV) causes mottling of older leaves and may cause malformation of leaflets, which may become shoestring-like in shape. Viruses are highly infectious and readily transmitted by any means that introduces even a minute amount of sap from infected into healthy plants.

Prevention & Treatment: There are no chemical controls for viruses. Destroy infected plants promptly. Wash hands thoroughly after smoking (the tobacco mosaic virus may be present in certain types of tobacco) and before working in the garden. Eliminate perennial weeds near the garden. Control insects (thrips and whiteflies) that carry viruses (see [HGIC 2218, Tomato Insect Pests](#)). Rotate tomatoes

with crucifers (such as cabbage, broccoli and turnips). Plant TSWV resistant varieties, such as BHN 444 Hybrid, Health Kick and Kewalo. Many varieties have TMV resistance, such as: Bush Celebrity, Bush Early Girl, Jetsetter, Big Beef, Dona, Celebrity, Keepsake, Sweet Cluster, Sweet Million (cherry), and Super Marzano (paste).

Root-knot Nematodes

Root-knot nematodes are microscopic worms that live in the soil and in plant roots. Affected plants are usually stunted, discolored and may die. Knots or galls develop on the roots.

Prevention & Treatment: When nematodes are not yet present, move the garden location every year, purchase disease-free plants, pull up roots immediately after harvest and use resistant varieties (indicated by N following tomato variety): Better Boy, Celebrity, Sweet Cluster, Keepsake, Big Beef, Dona, Small Fry, Sugar Snack, Classica, and Super Marzano.

When root-knot nematodes are present, relocate the garden to a nematode-free area. Use nematode resistant varieties. Establish a rotation system with marigolds (varieties Tangerine, Petite Gold and Petite Harmony) which reduce root-knot nematode populations in soils.

For more information see [HGIC 2216, Root-Knot Nematodes in the Vegetable Garden](#).

Disorders

Blossom End Rot: Blossom end rot is a physiological disorder of tomato. Symptoms are water-soaked spots on the blossom end of the fruit. These spots enlarge and become black. Secondary infection by decay-causing organisms usually follows.

The cause of this disorder is a calcium deficiency in the developing fruit. Extreme fluctuations in moisture, insufficient soil calcium, root pruning from nearby cultivation, and excessive ammoniacal (NH_4^+) nitrogen, potassium, or magnesium fertilization can also increase the chances of blossom end rot, especially early in the season.

Prevention & Treatment: Late spring planting of tomatoes should be at the recommended date for

your area. The soil should be limed according to recommendations of a soil analysis report to bring the soil pH to 6.5, and to provide adequate calcium levels in the soil. Limestone is best applied 3 to 6 months in advance and tilled into the garden soil. Follow the soil report for recommendations for pre-plant nutrient (fertilizer) applications. If calcium levels are not sufficient but the soil pH is correct, then gypsum (calcium sulfate) is best tilled into the soil before planting at 1 to 2 pounds per 100 square feet.

Avoid excessive potassium or magnesium fertilization as these nutrients will compete with calcium for uptake by the plants. Epsom salts is an example of a magnesium source, so do not apply to soil unless a recent soil report indicates a magnesium deficiency. Avoid ammoniacal nitrogen fertilizers for side dress applications (beside or around the plants), as ammoniacal nitrogen also will compete with calcium for uptake. Examples of fertilizers with ammoniacal nitrogen are ammonium sulfate, ammonium nitrate and most complete fertilizers, such as 10-10-10. A calcium nitrate (15.5-0-0) sidedress fertilizer is usually the best choice, and is applied monthly at 2 pounds per 100 feet of row.

Maintain a uniform supply of moisture through irrigation and adequate soil mulches. Mulches will not only keep the soil cooler and more evenly moist, but will suppress weeds, thus reducing the need for nearby cultivation that may damage tomato roots. Remove fruit with blossom end rot symptoms from the plants.

However, if the soil was not tested lime or gypsum was not applied pre-plant, and blossom end rot occurs, then applying gypsum at 1 to 2 pounds per 100 square feet as a side dress supplement has proven beneficial.

Growth Cracks: Tomatoes crack when environmental conditions (drought followed by heavy rain or watering) encourage rapid growth during ripening. Some cracks may be deep, allowing decay organisms to enter the fruit and cause fruit rot.

Prevention: Maintain even soil moisture with regular watering. Some varieties are crack-tolerant,

such as: Early Girl, Roma, Heinz 1439, First Lady, Ball's Beefsteak and Rutgers.

Sunscald: Sunscald occurs when tomatoes are exposed to the direct rays of the sun during hot weather. It is most common on green fruit. Decay causing fungi frequently invade the damaged tissue.

Prevention: Cover exposed fruits. Control leaf diseases.

Poor Fruit Set: Poor fruit set occurs for several reasons:

- Extreme temperatures: The blossoms drop off without setting fruit when temperatures are below 55 °F or above 90 °F for extended periods. Try Sunmaster Hybrid for heat-tolerance.
- Dry soil: Blossoms dry and fall when the plants do not receive enough water.
- Shading: Few blossoms are produced when the plants receive less than six hours of sun a day.
- Excessive nitrogen: high nitrogen levels in the soil promote leaf growth at the expense of blossom and fruit formation. Correct the nitrogen imbalance with superphosphate or 0-10-10 fertilizer.

Catfacing: This is a disorder caused by cold temperatures during fruit set. The fruit is extremely malformed and scarred, usually at the blossom end. Fruits that develop later in the season will not be affected.

Leaf Roll: Leaf roll of tomatoes may be caused by high temperatures, prolonged periods of wet soil conditions, and drought. It may also occur when tomatoes are pruned severely. The symptom is mostly on older leaves, with an upward curling of the leaflets, but may progress to affect up to 75 percent of the foliage. The rolled leaves may feel leathery and stiff. Often the condition of leaf roll occurs once the plants are under the stress of a heavy fruit set. Some varieties are more prone to leaf roll than others.

Prevention & Treatment: The symptom of leaf roll does not significantly damage the crop. To help prevent this disorder, tomatoes should be planted on well-drained soil and be irrigated during periods of drought.

This information is supplied with the understanding that no discrimination is intended and no endorsement by the Clemson University Cooperative Extension Service is implied. All recommendations are for South Carolina conditions and may not apply to other areas. Use pesticides only according to the directions on the label. All recommendations for pesticide use are for South Carolina only and were legal at the time of publication, but the status of registration and use patterns are subject to change by action of state and federal regulatory agencies. Follow all directions, precautions and restrictions that are listed.