



Bacterial Spot of Pepper & Tomato

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IMPORTANCE

Bacterial spot affects tomato and pepper crops in both commercial fields and residential gardens. This disease results in poor fruit set, fruit blemishes, and defoliation. Once introduced into a planting, bacterial spot is difficult to control and can result in major fruit losses.

SYMPTOMS

Leaves

Leaf spots begin as small, water-soaked areas for both crops (FIGURE 1). Spots are slightly raised on leaf undersides and depressed on topsides of leaves. These spots are typically located along leaf margins.

In spite of these similarities, appearance of spots and symptom progression are different for pepper and tomato.

On **tomato**, a yellow halo develops around spots (FIGURE 2) and foliage quickly becomes bright yellow, even if only a few spots are present. Size and shape of leaf spots may vary under different conditions, but they are often angular when limited by leaf veins. Centers of spots drop out leaving holes (shot-hole appearance). Diseased tomato leaves tend to remain on plants as they turn brown (FIGURE 3).

On **pepper**, irregular spots enlarge, become reddish-brown or tan with dark margins (FIGURE 4), but centers do not fall out. Leaves become ragged as symptoms advance. Spotted leaves on pepper plants do not turn yellow. Leaves drop, defoliating plants and exposing fruit to sunscald injury.



FIGURE 1. BACTERIAL LEAF SPOT ON PEPPER IS CHARACTERIZED BY WATER SOAKED LESIONS AND RAGGED LEAVES.

FIGURE 2. BACTERIAL SPOT LESIONS ON TOMATO DEVELOP A YELLOW HALO AND LEAVES QUICKLY TURN BRIGHT YELLOW.



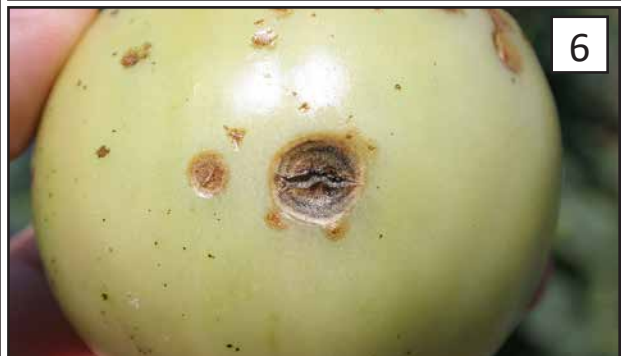
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FIGURE 3. BACTERIAL SPOT-INFECTED TOMATO FOLIAGE EVENTUALLY TURNS BROWN, BUT REMAINS ON PLANTS.

FIGURE 4. BACTERIAL SPOT LESIONS ON PEPPER FOLIAGE MAY BE DARK-COLORED OR HAVE TAN CENTERS WITH DARK MARGINS; MARGINS OF LEAVES BECOME RAGGED.

FIGURE 5. BLISTER-LIKE, WARTY SPOTS APPEAR ON INFECTED PEPPER FRUIT

FIGURE 6. BACTERIAL SPOT LESIONS CAN SERVE AS ENTRY POINTS FOR SECONDARY DECAY ORGANISMS (LARGER LESION).

Fruit

Fruit lesions on both pepper and tomato are initially water-soaked spots that become blister-like, rough, and tan to brown in color (FIGURE 5). Lesions seldom exceed $\frac{1}{4}$ inch in diameter. When infections extend into the locules (seed cavity), seed can become infected or contaminated. Secondary decay organisms may invade bacterial spot lesions (FIGURE 6), resulting in fruit decay. Sunscald is common in pepper as defoliation occurs.

CAUSE & DISEASE DEVELOPMENT

Bacterial spot is caused by one or more species of *Xanthomonas*. Infections are often introduced into plantings from contaminated seed (bacteria within the seed or on the seed coat) or, more commonly, from infected transplants.

The pathogen overwinters in plant debris remaining in fields or gardens from the previous crop, as well as in nearby solanaceous weeds (e.g. horsenettle, jimsonweed, and nightshade). However, *Xanthomonas* spp. can only survive in the soil for short periods in the absence of infected debris, volunteers, or diseased plants.

Infections are favored by warm (75°F to 86°F), wet weather. During these conditions, the pathogen can colonize leaf surfaces and then enter through wounds or leaf stomates to infect susceptible tissues. Disease spread is aided by driving rain, as well as wind-blown debris and soil that cause physical injury to leaves and fruit. Fruit infected in the field can develop symptoms in storage and shorten shelf-life.

DISEASE MANAGEMENT

Disease management must focus on preventing the introduction of the bacterium into plantings and on slowing its spread, rather than eradicating the disease after it occurs.

Transplant Production

- Use commercially produced certified disease-free seed.
- Treat seed prior to planting, if it has not already been treated (see *Vegetable Production Guide for Commercial Growers*, Appendix J).
- Grow resistant cultivars whenever possible. Commercial growers may refer to *Vegetable Production Guide for Commercial Growers* for a list of suggested cultivars.
- Maintain relative humidity below 85%.
- Space plants for rapid drying.
- Remove and destroy diseased plants, including those in close proximity, as soon as symptoms are detected.
- Sanitize tools, work areas, and production benches after use and between crops. Wash hands frequently while working with transplants.
- Treat transplants weekly with a preventative bactericide beginning approximately 2 weeks after emergence.

Fields & Gardens

- Practice crop rotation. Do not grow related crops (tobacco, eggplants, potatoes) for 2 to 3 years after a pepper or tomato crop.
- Plow under cover crops early in spring to minimize carryover.
- Purchase certified disease-free transplants.
- Select resistant cultivars whenever possible. Commercial growers may refer to *Vegetable Production Guide for Commercial Growers* for a list of suggested cultivars.
- Avoid the use of overhead irrigation.

- Space plants for increased air circulation and rapid drying.
- Do not work in fields or gardens when plants are wet.
- Control broadleaf weeds in the tomato/pepper crop, around field borders, and during crop rotations.
- Plow under crop residues promptly after harvest to encourage more rapid decay.
- Home gardeners: If site has a history of disease, apply a copper-based product as a preventative measure beginning at transplant and continue at 7-day intervals as long as conditions are wet or rainy.
- Commercial growers: Preventative sprays should be used beginning immediately after transplanting. Use shorter intervals when weather is conducive for disease. Once plants are infected, bacterial leaf spot spreads rapidly and is difficult to control, so preventative applications are critical for commercial production.

ADDITIONAL RESOURCES

- Cleaning & Disinfecting Home Garden Tools & Equipment (PPFS-GEN-17)
<https://plantpathology.ca.uky.edu/files/ppfs-gen-17.pdf>
- Cleaning & Sanitizing Commercial Greenhouse Surfaces (PPFS-GH-07)
<https://plantpathology.ca.uky.edu/files/ppfs-gh-07.pdf>
- Greenhouse Sanitation (PPFS-GH-04)
<https://plantpathology.ca.uky.edu/files/ppfs-gh-04.pdf>
- Home Vegetable Gardening in Kentucky (ID-128)
<http://www.ca.uky.edu/agc/pubs/id/id128/id128.pdf>
- Post-harvest Disease Losses in Fruit & Vegetable Crops (PPFS-GEN-24)
<https://plantpathology.ca.uky.edu/files/ppfs-gen-24.pdf>
- Vegetable Production Guide for Commercial Growers (ID-36)
<http://www2.ca.uky.edu/agcomm/pubs/id/id36/id36.pdf>

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