

# Bacterial Spot of Pepper and Tomato

**B**acterial spot, caused by the bacterium *Xanthomonas campestris* subsp. *vesicatoria*, is the most common disease of peppers in Alabama. It is also a recurring disease of tomatoes grown in the state. The disease causes distinct symptoms on pepper and tomato leaves and fruit and reduces both yield and fruit quality (Figure 1).

## Symptoms

On peppers, all aboveground plant parts are susceptible to bacterial spot. Initially, small, yellowish green, water-soaked spots occur on the lower surface of young leaves. Spots may be slightly raised on the lower leaf surface with a corresponding slight depression on the upper side of the leaf. On older leaves, spots are first dark green and water-soaked, but not noticeably raised. Spots enlarge up to a ½ inch in diameter and become tan to purplish gray, often with dark brown margins (Figures 2 and 3). Spots may be bordered by a narrow yellow halo. The center of the lesion often dies, dries up, and collapses, leaving holes in the



Figure 2. Dark, water-soaked spots on pepper leaves.

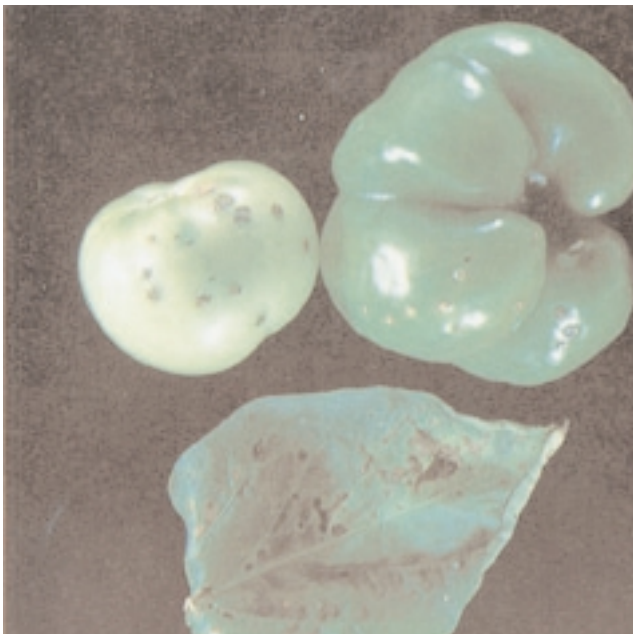


Figure 1. Bacterial spot on pepper leaves and pepper and tomato fruit.



Figure 3. Tan spots with dark margins on pepper leaves.

leaf or ragged leaf margins (Figure 4). Affected leaves may turn yellow and fall at any time during the season. When spots are numerous, entire leaves drop off while still green, exposing fruit to direct sunlight, resulting in sunscald.

Spots on pepper fruit begin as dark, circular, water-soaked lesions up to  $\frac{1}{4}$  inch in diameter. Eventually the spots become raised and cracked and have a warty appearance (Figure 5). The spots are initially pale green but soon turn brown. During moist weather, various secondary, decay producing bacteria and fungi enter through these lesions, causing the fruit to rot before or after harvest.

Small, raised lesions up to  $\frac{1}{4}$  inch long may also occur on the stem. Older cankers become roughened and light brown.

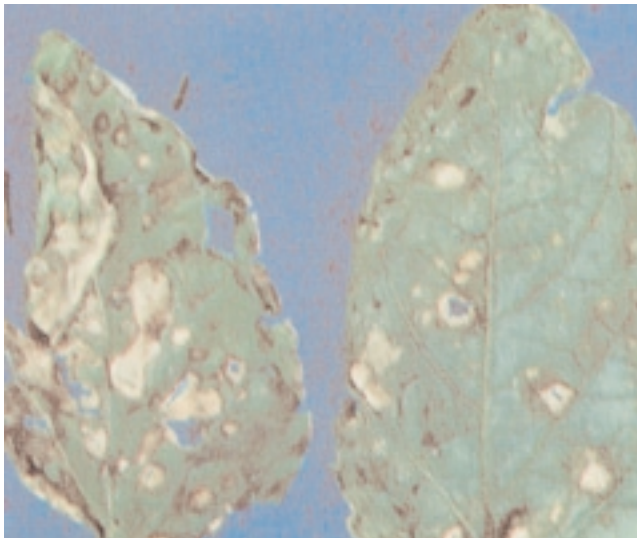


Figure 4. Ragged appearance of pepper leaves with bacterial spot.

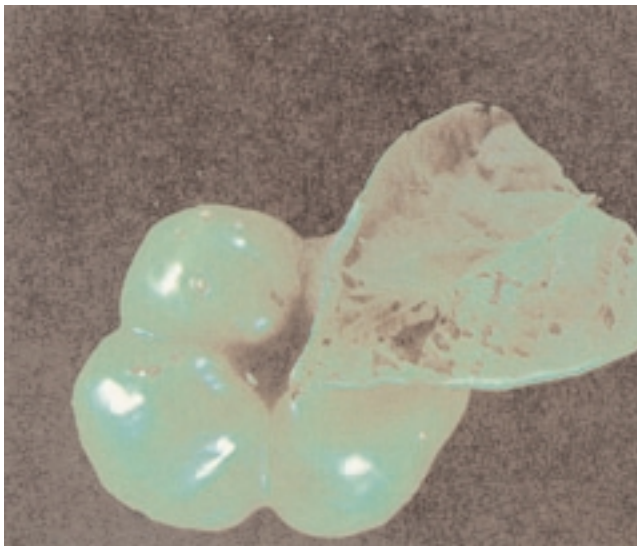


Figure 5. Bacterial spot on pepper.

On tomatoes, bacterial spot symptoms can appear on the leaves, fruit, and stems. Leaf lesions are dark and water-soaked initially and eventually turn brownish black. They may exhibit a narrow, yellow halo that resembles symptoms of the fungal disease early blight (Figures 6 and 7). Lesions appear sunken and “greasy” on the upper leaf surface with a translucent center and a black margin. Spots are somewhat rounded but may be angular if restricted by leaf veins. The center of the spots dry out and frequently tear. Although initially about  $\frac{1}{8}$  inch in diameter, spots become poorly defined after a period of heavy moisture and coalesce, particularly along leaf margins (Figure 8). Only a few spots may cause a leaflet to turn yellow and drop prematurely. Lesions on the flower stems also cause the blossoms to die suddenly and drop.

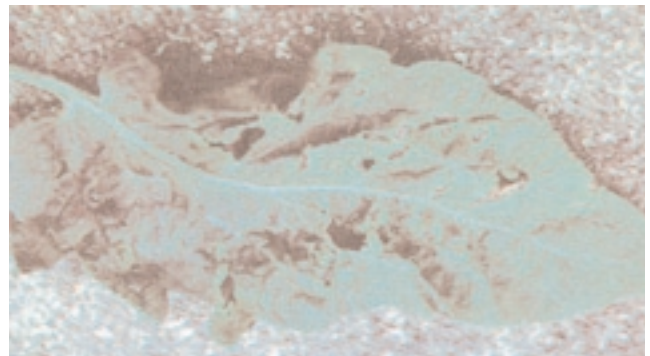


Figure 6. Bacterial spot with yellow halo on tomato.

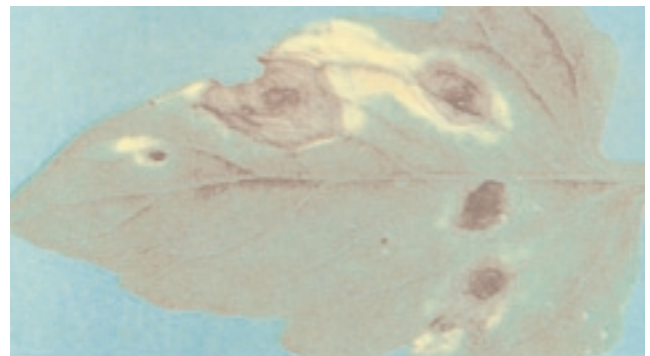


Figure 7. Early blight on tomato.

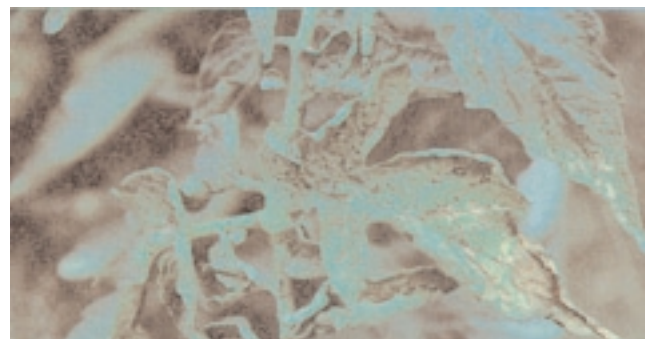


Figure 8. Bacterial spot on tomato.

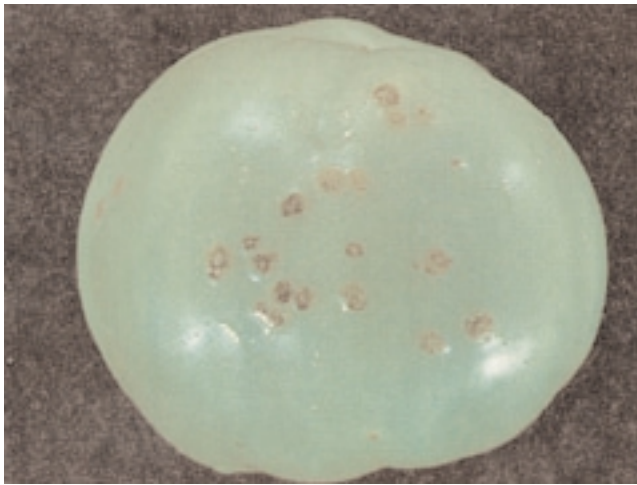


Figure 9. Bacterial spot on tomato fruit.

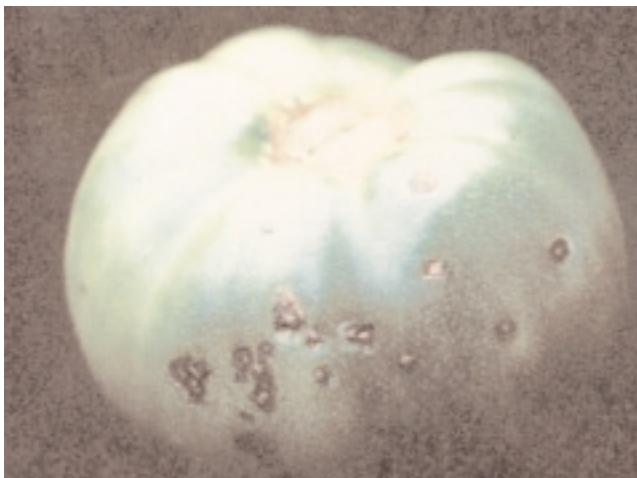


Figure 10. Raised pimples of bacterial spot on tomato.

Spots on green fruit first appear as small, black, raised “pimples” surrounded by a narrow, water-soaked or greenish white halo (Figures 9 and 10). Older spots are black, slightly raised, and up to  $\frac{1}{3}$  inch in diameter. In time, the raised centers develop into scabby, tan to brownish black, sunken craters (Figure 11). Although spots remain small and do not penetrate very deep into the fruit, large numbers will reduce fruit quality. Ripe fruit are immune to bacterial spot because of their high acidity.

Bacterial spot can easily be confused with bacterial speck, caused by the bacterium *Pseudomonas syringae* pv. *tomato*. Bacterial speck only occurs on tomatoes and may infect any part of the plant, but symptoms are most obvious on fruit and foliage. Bacterial speck and spot can usually be differentiated by the large white halo that develops around the fruit lesions produced by bacterial speck (Figure 12). The halo is much more extensive than that produced by bacterial spot. Control measures

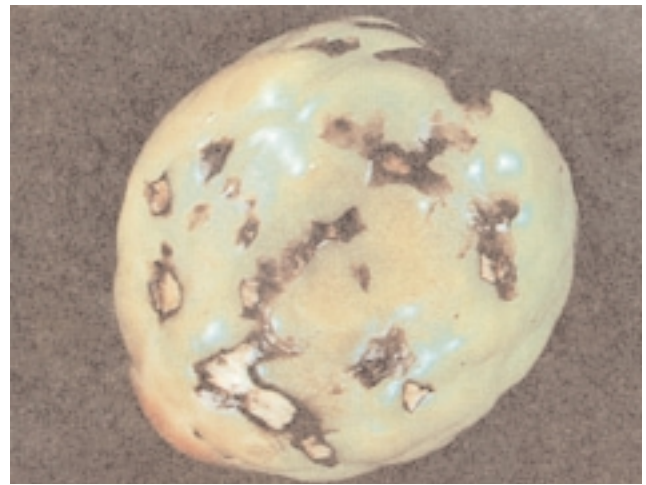


Figure 11. Scabby sunken lesions of bacterial spot on tomato.



Figure 12. Bacterial speck on tomato showing halo's around lesions.

outlined in this circular for bacterial spot also apply for bacterial speck.

### Disease Cycle

Bacterial spot cannot survive on its own in soil; however, it can survive for a year or more on or within seed. Seedlings and adjacent transplants become contaminated from bacteria spread by wind or splashing water from nearby infected plants. Infected transplants carried to the field can act as the initial source of the disease. In Alabama, the bacterium may also overwinter on pepper and tomato debris left on the soil surface from the previous growing season. Bacterial spot also survives in solanaceous weeds, such as black nightshade and groundcherry. Reports also indicate that the bacterium can persist in association with wheat roots through a mild winter.

Overhead irrigation, frequent, warm, driving rains, and long dew periods favor severe outbreaks

of bacterial spot. Wind, splashing rain, irrigation water, the movement of equipment, high-pressure sprays, and the handling of wet plants all aid in the spread of bacteria through a field. Spread within a field can often be correlated with the direction of prevailing winds.

Infection occurs through natural openings (hydathodes, stomates) or through wounds on the leaves and stems such as those caused by insects or by abrasions caused by blowing sand. Disease development is favored by prolonged periods of high relative humidity and temperatures that fluctuate between 68°F and 95°F. Night temperatures of 75°F to 82°F favor disease development while low night temperatures (61°F) suppress development regardless of daytime temperatures. High nitrogen levels favor the development of bacterial spot.

Various strains of the bacterium can be determined based on host range and symptoms. Some bacterial strains favor peppers, some favor tomatoes, while others attack both.

## Control

Bacterial spot is extremely difficult to control once established in a tomato or pepper field. This is why preventing the introduction of the pathogen on transplants is critical. When purchasing transplants, be certain they come from fields inspected and certified as disease-free.

Always rotate tomatoes or peppers with unrelated crops for a minimum of 2- and preferably a 3-year period. Never grow tomatoes or peppers in the same field in successive years. There is some evidence that the bacterium can be transmitted on pepper seed; volunteer tomato and pepper plants should be destroyed well before the next cropping season. Avoid small grains such as wheat in the rotation, because the bacterium may survive near the surface of wheat roots during the winter. Control weeds in and around production fields, especially those in the solanaceous family, that may harbor the disease (for example, black nightshade, groundcherry). At the end of the growing season, remove, destroy, or bury tomato and pepper plants to eliminate plant debris that could act as overwintering sites for the pathogen.

Establish and maintain a balanced soil fertility program. Tomato and pepper crops growing under low fertility conditions are more susceptible to severe outbreaks of bacterial spot. Also, avoid excessive fertility levels, especially prior to fruit set, as this can result in excessive foliage, low fruit set, and an increase in disease severity.

Overhead irrigation should be avoided whenever possible. Workers and field equipment should be kept out of wet fields. Bacterial spot is readily spread through fields when contact is made with wet foliage. Planting peppers in narrow strips between early planted corn may help reduce spread of bacterial spot during severe storms.

After transplanting peppers or tomatoes into a field, begin applications of a fixed-copper compound prior to the appearance of the disease. Continue spraying on a 7- to 10-day schedule. Sprays applied to the plants before rain or irrigation are most beneficial. Always follow the manufacturer's directions and restrictions when using any pesticide.

Strains of the bacterium differ in their sensitivity to copper. Bacterial spot control for pepper is improved by adding a maneb-type fungicide to the copper sprays. The addition of maneb increases the amount of copper in solution. The same is true for tomatoes when a mancozeb or maneb-type fungicide is added to the copper sprays. Mancozeb is not labeled for use on peppers.



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Use pesticides **only** according to the directions on the label. Follow all directions, precautions, and restrictions that are listed. Do not use pesticides on plants that are not listed on the label.

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The pesticide rates in this publication are recommended **only** if they are registered with the Environmental Protection Agency and the Alabama Department of Agriculture and Industries. If a registration is changed or cancelled, the rate listed here is no longer recommended. Before you apply any pesticide, check with your county Extension agent for the latest information.

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