



AVRDC - The World Vegetable Center

Fact Sheet

Pepper Diseases

Bacterial Spot

Xanthomonas campestris pv. *vesicatoria*

Found worldwide

Symptoms

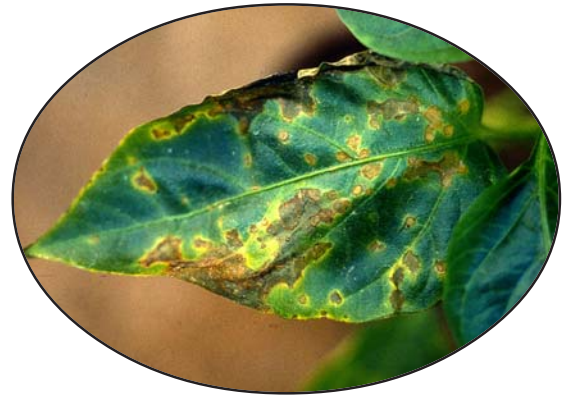
All stages of growth are susceptible and all portions of the plant may show symptoms.

On leaves, the lesions are sunken on the top surface and slightly raised on the lower surface. The lesions are brown, circular to irregular, water-soaked, and usually smaller than 3 mm in diameter (sometimes larger in hot, humid conditions). When numerous lesions occur, they coalesce causing necrotic areas, and give the plants a blighted appearance (see photo at top right). Affected leaves may turn yellow and drop off or become dry and remain on the plant. Severe infections can result

in defoliation of the plant. Affected seedlings develop yellow spotting and may defoliate when infection is severe.

Diseased stems and petioles have elliptical, raised lesions. Flower infection results in severe blossom drop.

On young fruit, lesions are small, circular, green spots reaching a diameter of 2–3 mm. They become brown and have a raised, coarse, wart-like surface. Ripe fruit are rarely infected.



How to Identify Bacterial Spot



Lesions begin as small spots, which are raised on the lower surface



Severe infection leads to defoliation



Raised, brown, wart-like lesions on fruit

Conditions for Disease Development

Young leaves and fruit are more susceptible to infection than older tissue. The pathogen is seed borne and can infect new seedlings from infected crop debris left in the soil after harvest or on pepper volunteers. The pathogen cannot live long in the soil without crop debris to live on. Weeds such as black nightshade can also harbor the pathogen and transmit it to new plants.

The bacterium is more common on tomato seed than on pepper seed. Seed infection serves as a means of dissemination. The bacterium is also disseminated short distances by wind-driven rain, overhead irrigation, and surface-drainage of water that contains the bacteria. Long distance dispersal is by infected seed, and by mechanical means such as the handling of infected transplants, on equipment, and by workers on hands or clothing. The bacterium can enter the plant through stomata and wounds created by wind-driven sand, insect punctures or mechanical means. Fruit infection occurs through wounds due to abrasions, insect feeding, and growth cracks.

Temperatures between 24 and 30°C and leaf wetness periods of 24 hrs or longer arising from dew, fog, rain or overhead irrigation are favorable for disease development. Night temperatures of 25–28°C favor disease development. Symptoms appear within 6 days after inoculation under favorable environmental conditions.

Control

Control is centered about *preventing* introduction of the bacterium rather than eradication of it once present.

Sanitation – Use pathogen-free seed. If transplants are purchased from off the farm, obtain only certified disease-free transplants. Use sanitation to prevent or reduce the initial inoculum in production of transplants. Avoid cull piles near seedbeds or production fields. Remove pepper debris, burn it, or chop it and bury it immediately after harvest, and incorporate into the soil to assist in rapid decomposition of diseased pepper debris. Decontaminate tools after working in infested areas.

Cultural – Set transplants into soil with recommended rates of N and K, but at the high end of the scale. Losses from bacterial spot are greatest when peppers become deficient in N or K, and the disease can be minimized by maintaining high fertility, being careful not to get the plants into an overly vegetative state or fruit set will be seriously reduced.

Use strict water management practices by avoiding overhead watering in local transplant production to

reduce spread of the disease. Use flood or furrow irrigation if possible. If overhead irrigation is necessary, it should begin early in the day so that the foliage can dry before the evening. Rain shelters to reduce water splash may reduce disease severity during periods of high rainfall.

Use crop rotations of 2 to 3 years, excluding eggplant, tomatoes and tobacco from the total rotation. Control broadleaf weeds during the rotation and around the field borders, and volunteer pepper in affected fields. Disk all crop residues into the soil promptly after harvest to encourage more rapid decomposition of tissue infected with the bacterium, and plow cover crops very early in the spring to minimize carry-over.

Avoidance – Once infected transplants are introduced into the field, effective control of bacterial spot is difficult to achieve, therefore, plant in a pathogen-free plant bed and production field. Avoid clipping or damage to the seedlings to minimize secondary spread of bacteria. Work in affected field areas last, after working in the healthy portions of a field. Avoid working in affected areas when the foliage is wet. Avoid spraying plants while wet with a high pressure sprayer. This may encourage spread by blowing bacteria about the field.

Resistance – Use varieties of pepper resistant to bacterial spot where possible. Follow other control options diligently to avoid bacterial spot from susceptible pepper varieties which will continue to be released as well as to manage strains of the bacterium that may not be controlled by resistant varieties.

Chemical – Fixed-copper or fixed-copper + maneb sprays applied on dry seedlings before transplanting to production fields may be effective. The material will kill only those bacteria on the surface of the leaf and not within the leaf tissue. Therefore, the sprays should be started a few days after emergence, continued at 5-day intervals, applied with equipment that ensures good coverage, and applied on dry plants. Avoid overhead irrigation or rain for 24 hr after application. Frequent application of fixed-copper may result in the development of resistance in the bacteria to the material. Check with your local extension agent for varieties, and chemical sprays, if any, that may be used effectively in your region.

Seed – Use hot water treatment with pepper seed that is less than one year old. Soak seed at exactly 50°C for 25 minutes then cool and dry.

For more information on the production of pepper and other vegetables, go to <www.avrdc.org>.