

Disease Information

Bacterial Spot of Pepper and Tomato

Bacterial spot, caused by *Xanthomonas vesicatoria* and *X. euvesicatoria*, is a disease that is commonly found in warm, moist regions that grow these crops, so it is unusual to have it occur in Utah. We saw an eruption of bacterial spot symptoms at the end of the summer last year when we had heavy rain fall in August creating prime conditions for the bacteria to spread. The heavy rains that many places in Utah have received over the past several weeks could potentially lead to another outbreak of bacterial spot as warmer weather arrives.

The primary spread of bacterial spot is via seeds infected with the bacteria, while secondary spread can occur from one infected plant to another, or from infected debris left in a field. Transplants grown from infected seed may not show symptoms if they are grown in cool, dry conditions. The bacteria will remain latent until the plants are exposed to high temperatures and moisture through rain or overhead irrigation.

Tomatoes and peppers are the main crops affected by bacterial spot. Initial symptoms are small brown spots on leaves. Under warm and humid conditions, spots often enlarge forming large blighted areas and may be either dark brown or have tan-colored centers with dark margins and a yellow halo. Leaves with too many spots turn yellow and drop prematurely, resulting in defoliation and a greater chance of sun scald on the fruit. Leaves turning yellow and dropping prematurely is a predominant problem with greenhouse-grown transplants.



Paul Bachi, University of Kentucky Research and Education Center, Bugwood.org

Bacterial leaf spot symptoms on a sweet pepper leaf

Fruits on the plants are also susceptible to infection. Fruit blemishes begin as small, black, water-soaked spots which enlarge, becoming blister-like, rough, and warty. The spots are brown and seldom exceed 1/4 inch in diameter, but can make fruits unmarketable. Once symptoms develop, splashing irrigation water or wind and rain can quickly spread the bacteria through the greenhouse or across a field.



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Bacterial spot symptoms on sweet pepper

Management

Management of bacterial spot is difficult. There are cultural practices that can help to minimize this disease.

Use disease-free seed and transplants. This is the best management option. There is one pepper variety from Seminis Vegetable Seeds (PS 09942815 (with X10R™)) that has resistance to all ten races of the bacteria that are known to occur. Other pepper varieties are resistant to races 1, 2 and 3 (click [here](#) for more information).

Avoid overhead irrigation. This will slow the spread of the bacteria.

Remove cull piles from adjoining pepper or tomato fields.

Rotate crops. Crop rotation, especially after an outbreak, is important because the bacteria can survive in infected plant debris. Peppers should not be rotated with tomatoes that are also susceptible to the pathogen. For best results, rotate with non-related crops for a minimum of one year.

Chemical Treatment Options

The only chemical option is copper, which helps to stop the spread of the disease from plant to plant. Fixed coppers

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(Champ, Cuprofix, NuCop, Kocide, Kop-RSpray) can be used at 5 to 10 day intervals during wet weather. Sonata is a biological control that works as a bacterial antagonist. In many parts of the country, *X. vesicatoria* has become resistant to copper and treatments are ineffective. In Utah, resistant isolates of the bacteria to copper have not yet been found. It is not recommended to use sprays as a preventative measure as this will encourage resistance by the bacteria. It is currently not known which race(s) of the bacteria we have in Utah.

Root Rots

Root rot is a general term that describes any disease where a pathogen (causal organism) attacks and leads to the deterioration of a plant's root system. Most plants are susceptible to root rots. Root rots can be chronic diseases or, more commonly, are acute and can lead to the death of the plant. A large number of soil-borne pathogens can cause root rots. *Phytophthora spp.*, *Pythium spp.*, *Rhizoctonia solani*, and *Fusarium spp.* are the more common sources of root rot. These pathogens have wide host ranges, and thus can cause root rots on a wide variety of plants. Most root rot pathogens prefer wet soil conditions.



Root rot causes drought-stressed symptoms such as seen on the above bean plants.

Root rot is often noticed when above ground symptoms are seen. Plants with root rot appear drought stressed, are often stunted, have wilted leaves, or leaves that are yellow or red. When roots of these plants are examined, they have soft brown tissue in central core of the root.

When tomatoes and eggplants are affected by *Phytophthora* root rot, roots of all sizes develop water-soaked spots that dry out and turn a chocolate brown as the disease becomes advanced. Early infections, caused by *Phytophthora* kill seedlings. Later infections reduce plant vigor and may cause collapse and death of the plant.



Root rot causes roots to become a dark brown

Management

Provide good water management. This is the most important factor in reducing the threat of root rot. Provide enough water to fulfill a plant's growth needs and prevent drought stress, but DO NOT over-water.

Provide good soil drainage. Drainage should be plentiful to the rooting depth of the plants, generally 1 to 2 feet for bedding plants. Add organic material (e.g., leaf litter or compost) to heavy soils to increase soil drainage. Good soil drainage is best provided before planting.

Remove excess mulch. Excess mulch can lead to overly wet soils.

Buy root rot-free plants. Plants from a reputable source are more likely to be disease free, but always double check plants prior to purchase. Also look for varieties that are less susceptible to root rots.

Minimize contamination. Avoid movement of soil or plants from areas with root rot problems. Refrain from watering plants with soil contaminated water (soil could potentially have a root rot pathogen). After working with plants with root rot problems, disinfest tools and footwear with a 10% bleach or detergent solution, or alcohol.

Rotate crops. If tomatoes have been affected by root rot, avoid planting tomatoes or other susceptible plants such as eggplant or peppers in the same soil for at least one or two seasons. Plant a resistant crop such as corn instead, or leave the soil unplanted and do not irrigate, but keep it well worked to allow the soil to dry as deeply as possible. Different species of *Phytophthora* attack beans and cole crops, so these plants can be substituted as well.

Chemical Treatment Options

The most effective way of preventing rot diseases is to provide good drainage and to practice good water management. Along with the appropriate cultural controls, chemical fungicides (PCNB, mefenoxam, metalaxyl, continued on next page

Insect Information

etridiazole, thiophanate-methyl and propiconazole) and biological control agents (Gliocladium, Streptomyces, and Trichoderma) that are labeled for root rot control may help. Be cautious when using these products and make sure you know exactly which root rot pathogen is affecting your plants. Contact your local Extension agent or send in a sample to the Utah Plant Pest Diagnostic Lab (<http://utahpests.usu.edu/uppd/htm/forms>) for an accurate diagnosis.

Insect Information

Aphids:

Aphids are a cool season insect, so the cooler weather we've had lately has encouraged aphid populations to increase. As aphid populations continue to increase, they will migrate to summer hosts as these hosts become available.

Aphid adults are small insects, with soft, pear-shaped bodies. They have two appendages on the rear end of their bodies called cornicles. Aphids vary in color both within a species and from species to species depending on environmental conditions and which plants they are feeding on. Most aphids are wingless, but adults with wings may also be seen. Aphids overwinter as eggs in protected areas and as the weather warms in the spring, eggs hatch and a new generation of winged aphids begin feeding, migrating to new host plants, and reproducing.



Adult female winged aphids give birth to live young called nymphs

Although damage caused by aphid feeding often will vary depending on the type and maturity of the plant being attacked, aphids often cause leaf tissue to become stunted, yellowed, distorted, and curled.

Management

The best way to manage aphids is by encouraging and allowing for populations to be controlled by natural predators. If populations increase to a point where some control measure are needed, there are several methods that can be used. Use row covers to protect from aphid infestation until plants are mature enough to withstand their attacks. Since the majority of aphids found on plants are the less mobile wingless form of aphids, a stiff spray of water can physically remove aphids from your desired plantings. Keep nitrogen levels low since high levels encourage aphid reproduction. Several low level applications of nitrogen throughout the season are recommended rather than a single heavy one.

Chemical Treatment Options

Because aphids can become resistant to chemicals used to control their populations, insecticides should only be used after cultural and physical measures have been taken and additional control is needed. Insecticidal soaps and oil sprays are the best options for most situations. These products will kill aphids and beneficial insects they come in contact with but because they have no residual activity, beneficial insects coming in after will not be affected. Insecticidal soaps and oils kill by contacting insects so to be effective, complete coverage is necessary.

Precautionary Statement: Utah State University Extension and its employees are not responsible for the use, misuse, or damage caused by application or misapplication of products or information mentioned in this document. All pesticides are labeled with ingredients, instructions, and risks. The pesticide applicator is legally responsible for proper use. USU makes no endorsement of the products listed herein.

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