IPM Integrated Pest Management

DISEASES OF BEANS

Bacterial Diseases
Fact Sheet
Page: 729.50
Date: 10-1991

VEGETABLE/ HORTICULTURAL CROPS

CORNELL COOPERATIVE EXTENSION

Bacterial Diseases of Beans

Helene R. Dillard and Daniel E. Legard

Department of Plant Pathology, NYS Agricultural Experiment Station at Geneva, Cornell University

There are three distinct bacterial diseases found on snap and dry beans in New York State: **Bacterial brown spot,** caused by *Pseudomonas syringae* pv. *syringae*, **common bacterial blight,** caused by *Xanthomonas campestris* pv. *phaseoli*, and **halo blight,** caused by *Pseudomonas syringae* pv. *phaseolicola*.

Brown spot was not considered an economic problem in New York until the early 1980s. It is a recurring problem that can cause serious losses in snap beans. Common blight is often seen in dry-bean fields, but usually does not pose a significant threat to the crop. Halo blight has caused serious losses in both dry and snap beans in New York in some years, but because of the increased use of certified seed, it now occurs only sporadically. All three bacterial diseases can cause serious yield losses in heavily infected snap- and dry-bean fields.

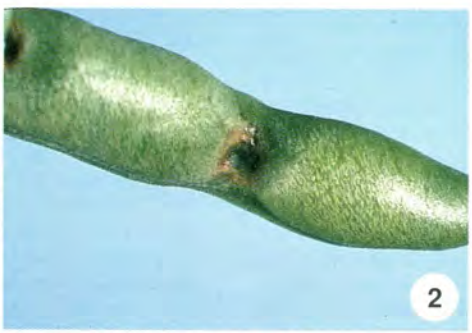
Symptoms and Signs

• *Bacterial brown spot.* The initial foliar symptom of bacterial brown spot is small water-soaked spots that develop into distinctive necrotic brown spots about 3-8mm in diameter, often with a narrow, diffuse yellow margin (fig. 1). These lesions may enlarge, coalesce, and fall out giving the leaves a tattered appearance. Sunken brown spots can form on the pods (fig. 2). If infection occurs early in pod development, the pod may become bent or twisted at the infection site (fig. 3).

• *Common bacterial blight.* Leaf symptoms initially appear as water-soaked spots that become necrotic, light brown lesions of irregular shape with distinct, bright yellow margins (fig. 4). These lesions enlarge to 10mm or greater (fig. 5) and may kill the leaflet. Similar water-soaked spots form on the pods and enlarge into reddish brown lesions (fig. 6). In humid weather, a yellow bacterial exudate may be present on the pod lesions. Infected developing seeds may abort or shrivel and discolor as they mature (fig. 6).

• *Halo blight.* Symptoms of halo blight initially appear as small water-soaked spots on the underside of the leaflets, eventually developing into numerous small, reddish-brown lesions on the leaves (fig. 7). Greenish-yellow halos, highly variable in size, subsequently develop around these spots (figs. 7 and 8). During severe infections


1


2


3

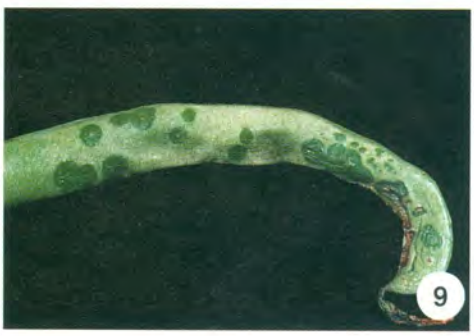

4


5


6


7


8


9

the disease may become systemic and cause yellowing and death of new foliage. At temperatures above 80°F halos are very small or absent. Pod symptoms first appear as small water-soaked spots and streaks on the pod surface (fig. 9). The water-soaked areas enlarge and are sometimes surrounded by a narrow reddish zone. Light, cream-colored bacterial exudate may be present on the lesions under moist conditions.

Pod symptoms of common and halo blight are very similar; therefore, these diseases should be identified by leaf symptoms or the bacterium. Leaf symptoms of halo blight may be confused with those of brown spot because of the variability in margin and halo size with temperature.

Disease Cycle

• *Bacterial brown spot.* The bacterium *Pseudomonas syringae* pv. *syringae* can cause diseases on several kinds of plants, but only a unique form of this bacterium causes that known as bacterial brown spot. These bacteria can grow on the surface of some plants, including snap and dry beans, without causing disease. Bacteria that exist this way are called epiphytes. Bacterial brown spot on beans often occurs after large epiphytic populations of the bacteria develop. Since severe infection may not develop until after a major rainstorm, an absence of symptoms does not mean that the bacteria are not present.

Hairy vetch and other weeds have been reported as overwintering sources of the pathogen in Wisconsin. Recent research in New York, however, suggests that weeds are not an important source of the pathogen but that bean crop residues may be a significant source of inoculum. The pathogen spreads from overwintered bean stem and pod pieces to the current bean crop by rain and overhead irrigation. The bacteria may also be spread by equipment used in contaminated fields, and by people or animals walking through the field.

Brown spot bacteria can survive on bean seed, but recent assays of certified snap bean seedlots used in New York indicated that the pathogen either was not present or was below the detectable level. Noncertified seedlots of snap or dry beans may carry infections that can introduce the bacteria to new locations. In New York, seedborne bacterial brown spot most likely serves to introduce the disease into an area, whereas infested crop residues are the source of bacteria for continuing epidemics.

• *Common bacterial blight* can survive on or in the seed, and contaminated seed is the primary source of the pathogen. Bean plant residues can also be a source of the bacterium. The pathogen survives better in residues on the soil surface than residues that have been worked into the soil. In Michigan, the common blight bacterium was found as an epiphyte on several weeds, including lambsquarters and pigweed. Common bacterial blight is introduced to new regions via contaminated bean seed. Once introduced, secondary spread can occur by wind-blown rain, overhead irrigation, contaminated equipment, or people and animals. Common bacterial blight epidemics are favored by high temperature and humidity. Yield is affected most if blight develops before the pod-fill stage.

• *Halo blight.* Infected bean seed is the most important source of the halo blight bacterium. The pathogen can survive more than 4 years in bean seed, and a single contaminated seed in 16,000 is sufficient to cause a severe epidemic under favorable weather conditions. The pathogen can also survive in bean residues from previous seasons. Halo blight can be spread by wind-driven rain, overhead irrigation, equipment, or people and animals. Severe outbreaks of halo blight often occur after heavy rainstorms. Although disease can develop rapidly from 60° to 80°F, temperatures above 80°F inhibit development of the characteristic yellow halos and systemic chlorosis.

Cultural Control

The best control of bacterial bean diseases is prevention. Only certified, western-grown, disease-free seeds should be planted. The chance of acquiring seedborne bacteria is significantly reduced by using certified bean seed produced in the arid climates of the western United States. Since moisture is required by these pathogens for reproduction and spread, seeds are more likely to become contaminated with bacteria when seed production fields have been exposed to summer thunderstorms, cool autumn temperatures and rains, and overhead irrigation.

Growers should never save their own seed, and should avoid using noncertified seed. If noncertified seed must be used, those fields should be isolated from fields planted with certified seed to reduce disease spread from contaminated fields. Because minor pod lesions on snap beans can result in rejection by processors and fresh-market buyers, snap bean fields in particular should be isolated from noncertified-seed dry beans.

Choose bean varieties with tolerance or resistance to the bacterial diseases that occur frequently in the growing area. Varieties differ greatly in their susceptibility to different bacterial diseases. In some varieties, the leaves are very susceptible to one or more of the pathogens, but pods may be resistant. In other varieties, the pods may be very susceptible but few lesions develop on leaves. Seed companies continue to develop and release varieties with resistance to bacterial pathogens.

All three bacterial pathogens survive best in crop residues on the soil surface. Infested bean residues should therefore be incorporated into the soil shortly after harvest and thoroughly covered to promote decomposition. These bacteria are unable to survive in soil without bean residues. Bean residues left on the soil surface do not decay quickly, allowing the bacteria to survive longer.

Tractors and other equipment used in fields with bacterial diseases should be thoroughly cleaned and disinfected before moving to disease-free fields. To prevent spread of the bacteria on equipment or in spray water, avoid making pesticide applications or cultivating when the leaves are wet.

Fields where bacterial diseases are a problem should not be used for beans again until the crop residues are completely decomposed. To achieve this, follow a minimum 2-year rotation out of beans. Good rotation will also help reduce buildup of root-rotting organisms, white and gray molds, and anthracnose.

Chemical Control

Seed treatment with the antibiotic streptomycin can help reduce contamination of the surface of the seed coat. Streptomycin seed treatment will not provide 100 percent control, but it has been very effective against surface contamination. Streptomycin seed treatment will not control systemic infections of bacterial diseases. Antibiotics may not be applied to seed by growers, but must be commercially applied by licensed seed treaters.

Copper-based bactericides will reduce epiphytic populations of bacterial pathogens on bean foliage, and also reduce disease severity when applied as a preventative. These compounds, however, cannot eradicate the pathogens once the plants are infected. If wet weather is persistent, bacterial populations can increase very quickly and are difficult to arrest unless several applications of copper-based bactericides are made. For these reasons, copper-based bactericides are not highly recommended.

Refer to the current *Cornell Pest Management Recommendations for Commercial Vegetable Production* for an updated list of available bactericides and their proper use.

Acknowledgments

Appreciation is extended to Jim Hunter, John Ludwig, and Jim Steadman for suggestions and assistance, to Joe Ogrodnick for photographic assistance, and to Howard Schwartz for the photograph of common bacterial blight (fig. 6). Portions of the research leading to these results were funded by the New York State Snap Bean Research Association.

Produced by Media Services at Cornell University for the New York State Integrated Pest Management Program.

Quantity discount available.

153VCFS729.50 81/110 10/91 5M ML E10527G