Angular Leaf Spot of Strawberry
(Bacterial Blight)

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Angular leaf spot is the only bacterial disease of strawberry in the Midwest. Though not usually a major problem in the Midwest, once introduced into a planting it can become very serious. After the disease becomes established in a planting, not much can be done to manage it. Losses result from (1) decreased productivity from diseased or dead leaves and (2) reduced yields due to unmarketable fruit with calyx infections (figure 4).

Symptoms

Symptoms first appear as tiny water-soaked lesions on the undersides of leaves (figure 1). As these lesions enlarge, they become delineated by small veins and appear angular (figure 2). When held to the light these dark green lesions appear translucent on the upper leaf surface (figure 2). When moist, lesions on leaf undersides may secrete a viscous ooze of bacteria that becomes scaly and white when dry. As infected leaves age, lesions on the upper side of leaves may appear as reddish brown necrotic spots that may or may not possess a yellow (chlorotic) halo (figure 3). Symptoms at this stage may be easily confused with leaf scorch, a disease caused by a fungus. Entire leaves may die if major veins become infected. Calyxes can also become infected and turn brown or black and dry up, resulting in unmarketable fruit when severe (figure 4).

Figure 1. Water-soaked lesions on the underside of an infected leaf. Photo by Michael A. Ellis.

Figure 2. Translucent appearance of lesions on the upper leaf surface when held up to light. Photo by Michael A. Ellis.

Figure 3. Appearance of older lesions on the upper leaf surface. At this stage the symptoms may resemble leaf scorch, a disease caused by a fungus. Photo by Michael A. Ellis.
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Causal Organism and Disease Cycle

Angular leaf spot is caused by the bacterium *Xanthomonas fragariae*. This bacterium does not survive freely in the soil but instead survives on previously infected dead leaves on or in the soil. Crowns of systemically infected (live) plants are another source for overwintering inoculum. Plants that are systemically infected have the bacteria present in their vascular system. The bacterium that causes angular leaf spot is generally introduced into a planting on symptomless, systemically infected nursery plants. In spring, the bacteria become active in systemically infected plants and disease symptoms develop. The bacteria ooze out of lesions on the underside of infected leaves, and rain splashes these bacteria onto other strawberry plants. The bacteria enter the plant through wounds or natural openings. Free water on plant surfaces, high relative humidity, moderate daytime temperatures (~68°F), and nighttime temperatures near freezing are conducive to development of angular leaf spot. Prolonged periods of wetness favor disease development, including the use of overhead irrigation to prevent frost damage. Under high-moisture conditions, bacteria may ooze from lesions on the undersides of leaves and get splashed to other tissues to cause new infections. Succulent leaves and calyx tissue are most susceptible to infection.

Control

1. The use of disease-free transplants is extremely important in preventing the introduction of the disease. Always use certified planting materials. However, it is important to remember that nursery stock is certified to be free of viruses. There are no certification programs for bacterial or fungal diseases of strawberry.
2. To minimize spread of angular leaf spot within infected fields, avoid moving equipment or harvesting when plants are wet. This also reduces wounding of plants when the bacteria are more likely to spread.
3. While completely resistant cultivars are currently unavailable, use of less susceptible cultivars will be helpful in managing this disease. Highly susceptible cultivars include Allstar, Annapolis, Cavendish, Honeoye, and Kent.
4. Once the disease is established in the planting, the use of chemicals to control it is generally not highly effective. There are several fixed copper fungicide/bactericides that are registered for use on strawberry. Protectant applications of fixed copper fungicides have been utilized with varying success. When used, low rates of copper are recommended since repeated applications can result in phytotoxicity. Applications of copper past the initiation of bloom may result in more damage than the disease, especially under cool, slow drying conditions. Oxidate (hydrogen dioxide 27%) is also registered for control of angular leaf spot on strawberry and has also been used with varying success.

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