

Bacterial Blight of Cotton

Xanthomonas citri subsp. *malvacearum*

Host: Cotton and relatives of *Gossypium* spp., *Gossypium barbadense*, *Gossypium herbaceum*, and *Gossypium hirsutum*; wild cotton (*Gossypium populifolium*), a few weed hosts (*Hibiscus vitifolius* and *Lochnera pusilla*), and the kapok tree (*Ceiba pentandra*).

Disease common name: Bacterial blight; other names: angular leaf spot, black arm, boll rot, and gummosis.

Pathogen: *Xanthomonas citri* subsp. *malvacearum*; syn.: *Xanthomonas axonopodis* pv. *malvacearum* and *Xanthomonas campestris* pv. *malvacearum*; older name: *Xanthomonas malvacearum*.

Disease Cycle

Inoculum: The primary inoculum source is contaminated seed. The pathogen survives and multiplies on the surface of the host, providing more inoculum. Inoculum may be found on insects, plant debris, and field equipment.

Transmission: The bacterium is spread by equipment, insects, and movement of infected plant debris, contaminated soil, and seed. Wind, rain, and overhead irrigation help to disseminate the bacterium.

Infection: Bacteria colonize seedlings when infested/infected seed germinate. In subsequent plant-to-plant spread, bacteria invade through stomata or wounds. Injured tissues are very susceptible to infection. Hail-damaged crops often are severely infected. Infection is favored by temperatures above 25°C and when relative humidity exceeds 85%.

Symptoms and signs: There are four distinct disease symptoms. The first symptom type may appear at the seedling stage as minute, water-soaked spots on the cotyledons. The second symptom type occurs on leaves and appears as tiny, water-soaked lesions, usually first seen on the undersides of mature leaves (Fig. 1). These spots expand and dry to form larger, dark, angular-shaped lesions several millimeters in size. It is common for the disease to spread along the veins (Figs. 2 and 3). The third symptom type, known as black arm, appears as lesions on veins, petioles, and stems. This symptom occurs when bacteria spread from infected leaves to vascular tissues. Excess polysaccharide production along with the host response causes veins, petioles, and stems to have a darkened appearance. At this stage, the plants may be severely diseased and dying (Fig. 4). The fourth symptom type is boll rot (Figs. 5 and 6). Boll rot is characterized by blackening of the bolls, lint discoloration, and infection of the seeds within the boll. Infected areas initially become water-soaked, gradually darken, and form depressed lesions. Stems develop long, sunken, black lesions and frequently shrivel and die.

Survival: The pathogen survives on the seed coat and in the embryo for at least 22 months and on seed lint for at least 4 months. The pathogen also can be isolated from dry, undecomposed plant debris after at least 5 months in the field.

Disease Management

Treatment of delinted seed with acid provides good control of seedborne bacteria. Prompt cultivation of crops after harvest helps to promote decomposition of residue, which decreases bacterial survival.

References

Bradbury, J. F. 1986. Guide to Plant Pathogenic Bacteria. CAB International, Slough, U.K.

Kirkpatrick, T. L., and Rothrock, C. S., eds. 2001. Compendium of Cotton Diseases, 2nd ed. American Phytopathological Society, St. Paul, MN.



Figure 1. Early stage of disease on a cotton leaf with water-soaked leaf spots and water-soaking along the veins. (Courtesy A. Hayward)



Figure 2. Angular leaf spots and blackening along midribs. (Courtesy APS)



Figure 3. Late stage of angular leaf spot. (Courtesy M. Shurtleff)



Figure 4. Cotton field exhibiting black arm stage of the disease of susceptible (left) and resistant (right) varieties. (Courtesy APS)



Figure 5. Late infection of cotton bolls with sunken, brown to black lesions. (Courtesy A. Hayward)



Figure 6. Infection of cotton bolls causes premature opening, resulting in discoloration of cotton from entry of secondary saprophytic microorganisms. (Courtesy APS)