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Cotton Stem Blight and Boll Rot

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What is cotton stem blight and boll rot?

Cotton stem blight and boll rot is caused by the necrotrophic fungus *Sclerotinia sclerotiorum* (Hu et al. 2018). This pathogen can attack hundreds of plant species including many important agricultural crops such as vegetables, legumes, sunflowers, canola, many flowering bedding plants, and stone fruits (Kohn 1979). The disease caused by *Sclerotinia spp*. is commonly referred to as white mold. The disease is favored by cool temperature (between 59 and 75 degrees Fahrenheit) and moist conditions under a closed plant canopy. *S. sclerotiorum* is a soil-borne fungus that usually infects the lower stem and other foliage tissues near the soil surface and can attack roots of some plant species. However, the primary impact of white mold on cotton is manifested in yield losses, although cotton stand establishment and seed quality could be affected by this disease. Due to wet and cool weather conditions during the "monsoon" season in the southeast Arizona, fields with a history of bean production will have an increased risk of cotton boll rot and stem blight.

What does it look like?

Limbs in proximity to the soil surface die first and the infection progresses rapidly towards the upper part of the plant. Tips of infected limbs remain green and healthy for several days before wilting becomes evident. When the canopy is pulled back, bleached stems and white cottony growth of the fungus are easily observed. Infections can be found on stems, branches, bolls, and leaves (Figures 1-4). Diseased bolls appear soft and rotten, covered with white mycelium and large, black, irregularly shaped sclerotia (Figure 4).

Figure 1. Bleached limbs with white cottony mycelium observed under the canopy

Figure 2. Infected leaves with white cottony mycelium

Figure 3. Water-soaked cotton bolls with white cottony mycelium and sclerotia

Figure 4. Irregular shaped black sclerotia

Which other disease can it be confused with?

Verticillium wilt and Fusarium wilt are other diseases that can be confused with Sclerotinia infection. While crop canopies exhibiting wilt symptoms are evident with all three diseases, both Verticillium wilt and Fusarium wilt exhibit vascular discoloration in main stems of affected cotton plants. In contrast, Sclerotinia stem blight does not cause vascular discoloration. Cotton boll rot has been associated with several fungal species including *Fusarium*, *Diplodia*, *Alternaria*, and *Phytophthora* (Guthrie et al. 1994; Pinckard and Guidroz 1973). These pathogens infect the bracts and enter the boll at cracking or through injuries by boll feeding insects such as bollworm (*Helicoverpa zea*) and budworm (*Heliothus virescens*) (Guthrie et al. 1994). Cottony mycelium or black sclerotia are unique signs that can be used to distinguish Sclerotinia boll rot from boll rot caused by other fungi.

What should I look for?

Cotton stem blight and boll rot often occurs in patches in a field, and signs of infection may include a white, cottony mycelium growth and sclerotia on infected tissues (Figures 1-4). These fungal growths may occur inside or on the exterior of the stems and bolls. The disease thrives in cool, wet conditions and is often severe in varieties that are selected for high-yield environments or when cultural practices result in a dense, early-closing canopy (e.g. high plant population and/or narrow rows). A canopy with wilt symptoms should be pulled back and examined for the presence of bleached stems, white cottony molds, and irregularly shaped black sclerotia. The dimension of sclerotia ranged from 3 mm to 5.8 mm in length, 2.3 mm to 10.7 mm in width (Figure 4).

How can I detect the disease on my farm?

The fungus persists in a field by formation of survival structures called sclerotia, which function much like seeds, surviving for years in the soil and eventually germinating when condition become favorable. Sclerotia germinate by producing apothecia (a mushroom-like fruiting body), which in turn produce millions of spores. Spores must colonize dead plant tissues before moving into a living host. Therefore, senescing leaves and flowers provide a ready source of dead tissue for colonization. Infection results in water-soaked stem lesions that develop into white mold under humid conditions. Sclerotia are formed within the infected tissues outside and inside the stems and bolls to complete the disease cycle.

How does it spread?

Locally, the disease can spread directly to other plants by contact with moldy infected tissue. However, it does not spread readily from one field to another or from one location to another. Long-distance spread often occurs through the movement of soil, debris of infected plants or sclerotia-contaminated seeds.

Where is it now?

Cotton stem blight and boll rot has been found in the Willcox area of Arizona (Hu et al. 2018). In general, *S. sclerotiorum* is often found in fields with a production history of beans, lettuce, legumes, and sunflowers. Historically, the fungus is found in Yuma, Maricopa, and Cochise counties.

How can I protect my farm from stem blight and boll rot?

Growers should take precautions, especially those who have a history of white mold in their fields. You should scout your fields for the presence of new pests and unusual disease symptoms that may help you find an issue before it becomes a major problem. Make sure you are familiar with common cotton disease symptoms, so that you can tell if you spot something different.

Disease control measures include variety selection, crop rotation, weed control, biocontrol and chemical control. There is no immunity available, but differences in tolerance may exist between cotton varieties. Since sclerotia can be transferred between fields through harvest equipment or contaminated seeds, it is important to harvest infected fields last and clean the harvest equipment thoroughly to prevent spreading sclerotia to other fields. Weed control is necessary because ragweed, pigweed and other weeds are alternate hosts for this fungus and weeds can also increase canopy density and trap moisture that accelerates disease spread. Five year or more rotations with non-host crops such as small grains, cereals, and corn reduce the number of sclerotia in the soil by loss of viability over time, but one to three year rotations may not have a significant impact on incidence of disease because the sclerotia can survive in the soil for up to 10 years. Soil treatment with *Coniothyrium minitans* (Contans) can be useful when combined with other components of an integrated disease management program. Early applications of foliar fungicides are most effective in disease suppression because this allows fungicides to penetrate deep into the canopy for adequate foliage cover. Effective chemical compounds include triazole fungicides (tebuconazole, tetraconazole, prothioconazole, and flutriafol), thiophanate methyl, succinate dehydrogenase inhibitor (boscalid), and strobilurin fungicide (picoxystrobin).

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