W 370

Target Spot and Its Potential Impact on Tennessee Cotton

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Target spot has been noted in several cotton producing counties in Tennessee over the past few years. Although much concerning the disease remains unknown, research at the University of Tennessee and other Mid-South/Southeastern institutions has begun to answer several key questions.

What is target spot?

"Target spot," or Corynespora leaf spot, is a new disease that has been moving through the Southeastern states over the past several years. Caused by the fungus *Corynespora cassiicola*, the disease was originally described in Mississippi as early as 1961 (Jones, 1961) but reports of the disease have been uncommon until roughly 10 years ago when Dr. Kemerait at the University of Georgia began noting the disease along the Gulf Coast (Kemerait et al., 2011). Since then, the Corynespora leaf spots have been reported in almost every cotton-producing state in the Southeast and Mid-South.

What does it look like?

Corynespora leaf spots are typically found on mature mainstem and subtending leaves close to the base of the plant. In severe infestations, lesions may be noted in the upper canopy and on bracts and bolls. Corynespora leaf spots are commonly referred to as "target spots" due to the irregular concentric rings contained within the dark brown to light brown lesions. Although lesion size and number per leaf can vary substantially, lesions are commonly larger than 1/4-inch in diameter, and often multiple lesions occur on each infected leaf. Affected leaves will typically retain their dark green color, although some will occasionally turn yellow. Affected plants may also prematurely shed mature leaves starting from the base of the plant as the disease progresses.

What causes target spot?

Little is known about the development of the disease in cotton but several factors appear to contribute to increased incidence. In contrast to Alternaria, Cercospora and Stemphylium leaf spots, which are typically associated with a nutrient (frequently potassium) deficiency, Corynespora leaf spot generally is found after canopy closure in high-yielding environments (two-plus bale) which undergo prolonged periods of excessive canopy humidity. These periods may be caused by frequent rainfall events, irrigation and/or cloudy weather. An excessive amount of available nitrogen promotes rank growth and thus may also support the development of the disease. Due to the ability of the fungus to survive on cotton debris, no-till or strip-tilled fields that are cropped with continuous cotton tend to be more affected.

Variety susceptibility to the disease appears to vary slightly, with earlier-maturing varieties occasionally displaying reduced disease incidence and percent defoliation. At this point, it is not clear whether earlier maturity causes a variety to be less susceptible or if later maturity simply correlates with a larger canopy creating a micro-climate that better supports the spread of the disease. Some differences in susceptibility have been noted between varieties of the same maturity, with leaf morphological features and plant growth characteristics suspected to play a role; however, it is unclear whether these factors cause or correlate with a reduction in susceptibility.

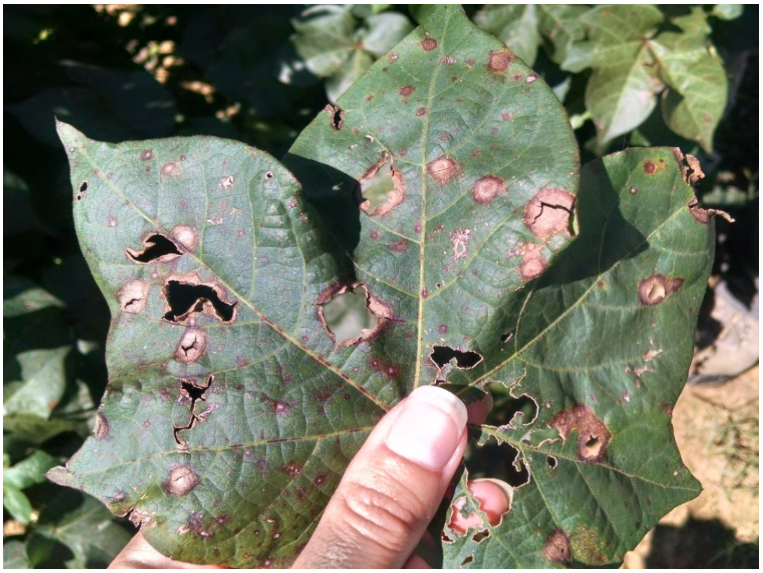

Figure 1: Left and Top Right: *Lesions typically appear first on lower leaves and slowly progress up the plant, but size and number of the lesions can vary substantially from leaf to leaf.*
Bottom Right: *Corynespora leaf spots are commonly referred to as "target spots" due to the irregular concentric rings contained within the dark brown to light brown lesions commonly larger than a quarter of an inch in diameter.*

How can Target Spot impact cotton production?

Although the yield-reducing mechanism is not well understood, it is thought that the major concerns with Corynespora leaf spot are damage to photosynthetically active tissues and/or premature defoliation. Subsequent yield reductions attributed to the disease in South Alabama and Georgia have been estimated to exceed 200 lb/ac (Hagan et al. 2013). The premature shedding of mainstem and subtending leaves may impact yield if the disease occurs early during the boll-fill period, but shedding late in the boll-fill period may reduce the incidence of boll-rot and make defoliation easier.

Can yield loss be determined from lesion size/frequency or percent defoliation?

Several scientists studying the disease at the University of Tennessee Institute of Agriculture and other land-grant institutions have noted a disconnect between lesion size/frequency and percent defoliation, especially across locations in the South. Furthermore, recent studies in Alabama by Hagan et al., 2013 have noted an additional disconnect between yield and target spot intensity. Specifically, Hagan has noted the highest-yielding varieties occasionally display the highest lesion density and percent defoliation. As with most diseases, the effect target spot has on yield seems to be influenced by disease onset, when and at what growth stage infection first occurs, and weather conditions influencing disease development.

What are the potential impacts to Tennessee cotton?

Tennessee cotton has initially been predicted to be at low risk to target spot since Tennessee's environment is not conducive for early onset of the disease, rapid disease development and subsequent substantial yield loss. Studies conducted at the West Tennessee AgResearch and Education Center over the past few years have noted numerically lower yields in plots impacted by the disease, but these reductions are often not statistically significant. These studies also indicate Tennessee cotton currently falls within a low-risk category for yield-impacting infections of target spot. Still, since the first report of target spot in Tennessee during 2013, the onset of the disease has been occurring earlier within each year, disease incidence has been increasing, and increased rates of defoliation have been observed. This suggests the pathogen is still becoming established in Tennessee and yearly increases may be due to increasing inoculum. Therefore, it is not certain what impact target spot may have on Tennessee cotton in the future.

Figure 2: *Severe infestations of target spot can lead to the premature shedding of mature leaves starting from the base of the plant. Mainstem and subtending leaves at all lower positions had been shed in this plot in Tennessee during 2014.*

What steps can be taken to reduce the impact of target spot?

Rotate to a non-host such as corn if possible. Recent work in Brazil, past work in Mississippi and preliminary results from Georgia have indicated pathogen isolates from soybean also cause disease on cotton (Sumabat et al., 2016; Galbieri et al., 2014; Jones et al., 1961). Therefore, rotation with soybean may not reduce disease incidence.

Plant multiple, high-yielding, stable-performing varieties adapted to the field environment. Although differences in variety susceptibility have been noted, the highest yielding varieties in a given trial have also occasionally been characterized by the highest disease ratings and greatest percent defoliation.

Properly apply nitrogen and plant growth regulators to produce sufficient vegetative growth to support fruiting bodies without allowing the plant to become rank. Avoid excessive applications of N and account for residual N whenever possible. Begin monitoring plant growth at the pinhead square stage and consider applying a pre-bloom plant growth regulator application to rapidly growing, later maturing varieties.

Considerations for fungicide applications: While two applications of fungicide have consistently reduced disease and defoliation due to target spot, yield responses have been variable in Tennessee small plot research. Fungicides labeled for cotton include Headline, TwinLine, Topguard, Priaxor and Quadris (including generic azoxystrobin products). Factors that increase the potential benefits of a fungicide application to address target spot include fields that have been cropped in continuous cotton, no-till or strip-till management in which plant residue remains on the soil surface, high nitrogen levels, high yielding varieties characterized by excessive vegetative growth, and prolonged periods of high humidity within the canopy due to irrigation or frequent rainfall. Ongoing research conducted at the University of Tennessee Institute of Agriculture and at several other Mid-South and Southeastern Universities will help to better understand target spot and management needs in Tennessee.

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