WHAT ARE THE COSTS OF CHRONIC SEEDLING DISEASE?

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Abstract

Seedling diseases are a limiting factor in stand establishment of cotton, even with cottonseed being universally treated with a number of fungicides. Symptoms include seed rot, preemergence damping-off of seedlings prior to emergence, and postemergence damping-off of seedlings within the first few weeks after emergence. All of these symptoms result in reduced stands and skips in the planting row often greater than can be compensated for by neighboring plants and may lead to reduced lint yields. In addition to reduced plant stands, many researchers have suggested reductions in growth and development, vigor, of surviving seedlings is an important symptom of seedling diseases which also may reduce yields. The importance of chronic seedling disease was examined using the pathogen *Thielaviopsis basicola*. This pathogen causes black root rot on cotton, a cortical root rot that rarely kills the plant but under favorable conditions can reduce seedling vigor. Data to examine the effects of *T. basicola* on seedling growth and development were extracted from larger studies examining the impact of *T. basicola* and *Meloidogyne incognita*, the root-knot nematode, on cotton. Numerous studies have demonstrated the importance of *T. basicola* on seedling growth. More recently, using root scanning and the WinRhizo software for analysis of root architecture, controlled environmental studies examined the effect of this cortical root rot on root architecture. Black root rot caused a 50% reduction in root length, a 45% reduction in root tips or terminal links, and a 64% reduction in overall path length, the total number of links in all pathways to the tap root, suggesting that diseased seedlings are exploring less soil for water and minerals limiting the ability of the root system to support the developing plant later in the season. Microplot studies over a range of soil textures were able to examine the consequences of chronic seedling disease on later growth. Seedling disease caused by *T. basicola* reduced mid-season plant height in each year of the three-year study. In addition, *T. basicola* resulted in significant yield losses in two of three years. Yield reductions in these years were 9% and 21%. In the other year, yield reduction was not significant but numerically was similar to the yield losses found in the other two years. In these studies, root colonization of seedlings was about 80% for *T. basicola* to cause these season-long effects. These levels of colonization would be associated with years of extended cool wet weather the first few weeks after planting. Research results using the black root rot pathogen demonstrated the impact of reduced seedling vigor on yield. This research emphasizes the importance of seedling diseases on the season-long growth and yield of cotton for surviving seedlings, in addition to losses associated with reduced plant stands.