

IMPACT OF SEEDLING PATHOGENS ON COTTON GROWTH AND DEVELOPMENT

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The seedling disease complex of cotton is the number one disease problem of cotton in the United States, causing an estimated 2.8% loss over the last 10 years (Cotton Disease Council Loss Estimates). We often estimate the importance of seedling diseases by quantifying factors such as plant emergence or stand. Where stand reductions are great and replanting is required, costs associated with seedling diseases can more clearly be estimated. However, the measurement of reductions in seedling growth and development from the chronic phases of disease are more difficult to quantify. Problems we associate with reductions in stand and vigor from seedling diseases are additional pest management problems, such as weed problems from skips or poor development of the crop and late season insect problems. In addition, maturity of the crop may be delayed and yield and fiber quality may be reduced. Despite estimates of disease losses, there is very little data in the literature to support the extent of the losses from individual pathogens or how seedling diseases affect plant growth and development. When factors such as seedling weight and plant populations are used to estimate losses from seedling diseases, estimates rarely correlate well with lint yields. This is due in part to the ability of the cotton plant to compensate for the absence of plants or unthrifty plants in the field. In addition, even though seedling diseases may play a large role in determining the yield potential of a crop many other factors during the growing season can affect final yield. The importance of seedling diseases can be demonstrated by transplanting chronically diseased plants to the field and looking at differences in yield and development. Alternatively, the soilborne pathogens responsible for seedling diseases can be suppressed or eliminated from soil through soil fumigation or other treatments. Brown and McCarter (1976. *Phytopathology* 66:111-115) transplanted healthy seedlings or seedlings with soreshin symptoms caused by *Rhizoctonia solani* to the field. Controlled environmental studies had documented reductions in shoot and root growth for diseased plants at 19 C, but not 28 C. In the field over two years diseased plants yielded 39% and 13% less than healthy plants. Yield reductions were attributed to a delay in flowering and boll maturity. A similar research approach was used to study the importance of black root rot, caused by *Thielaviopsis basicola*. In controlled environmental studies reductions of 22-31% and 13-19% in seedling weight were found at 20 C and 24 C, respectively (Kinney and Rothrock. 1994. *Phytopathology* 84:1145).

When transplanted to the field, plants grown at 20 C in soil infested with the pathogen yielded significantly less than plants grown in noninfested soil. These techniques demonstrate the importance of seedling diseases on growth and development of the cotton crop, however, they are of limited use for field studies. The increased use and refinement of plant mapping techniques have the potential to quantify changes in cotton growth and development (Bourland and Watson. 1990. *Crop Sci.* 30:224-226). Cotton mapping quantifies the development of the crop throughout the season, including such parameters as nodes, first fruiting node, nodes above white bloom, number of monopodial and sympodial branches, and boll position. By measuring these developmental parameters under different disease pressures we may be able to establish those parameters that are most sensitive to seedling diseases. Utilizing these parameters we have been able to quantify changes in plant development, such as first fruiting node. If we can quantify these changes in plant development we may be better able to predict under what conditions these changes in plant growth will impact yield and help manage the cotton crop after the seedling stage to realize the crop's yield potential.