Estimating yield losses associated with the interaction between *Thielaviopsis basicola* and the root-knot nematode on cotton

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ABSTRACT

Thielaviopsis basicola *(Berk. & Broome) Ferraris (syn.* Chalara elegans *Nag Raj & Kendrick), which causes black root rot, and the root-knot nematode,* Meloidogyne incognita *(Kofoid & White) Chitwood, interact synergistically to cause more damage than either pathogen alone on cotton. Surveys have found that the root-knot nematode (*M. incognita *race 3) and* T. basicola *are widespread throughout the Midsouth. Yield reductions associated with this interaction were estimated using microplot and paired-plot studies. Microplots were established by not infesting or infesting previously fumigated soil with one or both of the pathogens. Paired plots were established in growers fields in Ashley County, Arkansas in 2000 and 2001 by selecting areas of fields where cotton plants were stunted early in the season with adjacent areas that appeared to have normal plant growth. Plots were a minimum of four rows by 15 m in length. Soil from plots was assayed for populations of the root-knot nematode and* T. basicola*, and soil fertility. The severity of black root rot was assessed as root discoloration and isolation of the pathogen and nematode damage as root galling (0=no galls and 5>50 galls/root system). Plant growth was monitored throughout the growing season and plants were harvested by hand to estimate yield. In microplot studies, the interaction between the pathogens resulted in increased seedling death and delayed seedling development. The presence of both pathogens delayed the days to first cracked boll and reduced yields 23% and 44% in the two years of the microplot study. Soil population differences for paired plots were small between the affected and non-affected plots, with populations of* T. basicola *and* M. incognita *being significantly lower in non-affected areas of the field compared to affected areas in one year. A lesser area of the root system had* T. basicola *associated with it for non-affected plots compared to affected plots, however these differences were small. Large differences were found for galling between non-affected and affected areas at midseason, 1.9 and 5.0 in 2000 and 1.9 and 4.1 in 2001, respectively. These differences in galling also were evident at harvest. Few differences were found in soil fertility analyses between affected and non-affected areas. Affected areas had shorter plants throughout the growing season in both years. In addition, crop development was delayed as indicated by a higher first fruiting node and number of green bolls at harvest in affected than non-affected plots. Seed cotton yield was reduced 33% in 2000 and 21% in 2001 for affected plots compared to non-affected plots. These results from microplot and paired-plot studies indicate the importance of these pathogens on yield in fields where both pathogens occur. Yield losses in growers' fields are being evaluated currently using a global positioning system (GPS) to monitor pathogen populations, soil properties, and yield, and by using the fumigants Telone (1,3-dichloropropene) and Vapam (metam sodium).*