EFFECTS OF CULTURAL PRACTICES AND TWO SOILBORNE PATHOGENS ON ROOT MORPHOLOGY OF COTTON IN THE FIELD

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Abstract

In many Arkansas cotton fields, factors including traffic across the field, shallow tillage, dry weather and soil type, may result in a compacted soil layer, sometimes called a plow pan or hardpan. This layer can affect water infiltration, and the penetration and exploration of the soil by cotton roots. Physical inhibition of roots to penetrate and explore soil could be exacerbated by root damage caused by soilborne pathogens, including the root-knot nematode, *Meloidogyne incognita,* and black root rot pathogen, *Thielaviopsis basicola*. An evaluation of the topological changes in root systems resulting from these pathogens in the presence of a compaction layer may be useful in describing changes in aboveground plant growth, development, and yield. Field studies were conducted near Leachville, Mississippi County, in Northeast Arkansas in 2009 and 2010. Before planting, four field-length strips were selectively subsoiled using a parabolic plow (paratill) to a depth of 12-15 inches. Strips of equivalent size that were not subsoiled were left adjacent to each subsoiled strip. Within each strip, sub-plots were fumigated with the nematicide Telone II using a Yetter Avenger. Plant samples were excavated and measured in both June and October and root systems were scanned and analyzed using WinRhizo software (Regent Instruments Inc). The results indicated that: 1) Telone II application increased root architecture parameters such as magnitude, altitude, exterior pathlength, and also increased root growth, resulting in larger surface areas, root volumes and longer root lengths; 2) Telone II significantly reduced galling caused by *M. incognita*; 3) In most cases, subsoiling numerically increased root architecture parameters (magnitude, altitude, exterior pathlength), but the response was not as great as Telone II. These changes in root development from Telone II or subsoiling were more evident early in the season. Studying root architectural changes in soils infested by soilborne pathogens in the field provides a novel perspective for investigating pathogenicity.