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RELATIONSHIP OF COLUMBIA LANCE AND ROOT-KNOT NEMATODES TO SOIL TYPE

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Abstract

Plant-parasitic nematodes cause significant yield losses on cotton in most areas of the U. S. Recently these yield losses have increased in severity as economic conditions have forced many producers to monocrop cotton in a given field. In many cases all fields on a given farm may have been planted to cotton for more than 10 consecutive years. Southern root-knot (*Meloidogyne incognita*) and Columbia lance (*Hoplolaimus columbus*) nematodes are the most important nematodes in South Carolina cotton fields. In South Carolina both species are often found in the same field. A recent survey of the 149 fields that constitute three farms totaling 4,100 acres of cotton found that the damage threshold for one or both nematode species was exceeded in 94 of the 149 fields.

Management options for root-knot and Columbia lance nematodes are limited. No resistant cotton cultivars are available for either nematode species. Peanut is the only economically viable rotation crop, which is a nonhost for either of the two nematode species. Use of nematicides is the primary management tool for cotton nematodes. Nematode distribution in a field is determined largely by soil type. In most fields nematodes occur in clusters or scattered pockets. Uniform nematicide applications therefore result in nematicides being applied in areas with and without nematodes present. Development of programs which predict where high densities of damaging nematodes occur could greatly reduce the area of a field treated with a nematicide thus reducing economic inputs while increasing yields by applying nematicides only where damaging levels of nematodes occur. Combining systems, which utilize soil electrical conductivity meters and yield monitors may provide the needed predictive system, which can optimize economic inputs by the grower while minimizing environmental impacts.

The objectives of this study were to a) Determine whether electrical conductivity could be used to map soil texture on a field-wide basis in a timely and economical manner and b) Determine whether nematode densities and subsequent crop yield losses can be significantly correlated to soil texture.

Tests were conducted in a 7-acre site within a 140-acre field, naturally infested with *H. columbus and M. incognita*. A soil texture map was developed using GPS, GIS, and the Veris 3100 soil electrical conductivity meter. The accuracy of the map was verified by taking soil samples from the grids and analyzing for soil texture using the hydrometer method. This map was used to designate four soil types. Thirteen replications of 4 treatments were established. The four treatments were: 1) 6.0 gal/acre Telone II + 4.0 lbs/acre Temik 15G; 2) 3.0 gal/acre Telone II + 4.0 lbs/acre Temik 15G; 3) 6.0 lbs/acre Temik 15G; and 4) non-treated. Plots were planted to Suregrow 501BR cotton and maintained using conventional production practices. Nematode densities were determined for each plot at planting and harvest.

Soil electrical conductivity (EC) was very effective in measuring soil texture. EC had a positive correlation (0.97) with percentage clay and a negative correlation (0.96) with percentage sand and was used to develop an accurate soil type distribution map of the field. This map was also highly correlated to the yield map. At-planting Columbia lance nematode (CLN) densities were highly correlated to soil type. Both Telone II treatments significantly reduced at-planting CLN densities. The three-nematicide treatments significantly reduced at-harvest galling indices: reductions for the Telone II treatments were greater than for the 6.0 lbs/acre Temik 15G treatment. All nematicide treatments significantly increased yields. The high correlation between nematode densities with soil type coupled with our ability to efficiently and economically map soil texture will allow us to predict areas for variable rate application of nematicides.

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