Impact Of Minimum Tillage On Root-Knot Nematode Management In Cotton

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Studies were conducted in 2008 and 2009 to evaluate and quantify the effect of tillage on the management of root-knot nematode in cotton in Leachville, Arkansas. The field was divided into eight - 48 row blocks. Alternating blocks were deep tilled using a Paratill with a disk bedder. Specific control treatments for Nematodes were tested within the tilled and no-till soil environments. Nematode treatments consisted of: 1.) Untreated Check and 2.) Telone II applied at 3 gal/A with a yetter coulter applicator two weeks prior to planting. Efficacy of the nematicide treatments were assessed based on plant height (cm), above-ground dry plant weight (g), rootlength (cm), root dry weight (g), root gall rating (0-5), and yield (lbs lint/acre).

Results showed an increased level of early plant height, plant and root dry weight, and yield in the conventional tilled treatments. Less nematode were observed in plots treated with a nematicide, especially in the conventional tilled plots. Similar results were also observed in cotton lint yields.

Looking At Better Ways To Managing Nematodes In Cotton

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Plant-parasitic nematodes have had a long history of causing serious problems to cotton farmers in the United States. Several nematodes including reniform, Southern root-knot, Columbia lance, and sting nematodes appear to be the most damaging types across the mid-South and Southeast. The losses from reniform alone are well over 100 million dollars each year. Subtle damage from nematodes may be difficult to observe but can still cost producers plenty each year. Serious damage cannot be overlooked but may be blamed on any number of causes besides nematodes.

Identification is one of the most important elements in beginning a management plan against nematodes. If you don't even know which type or types are present in your fields, then some management strategies may only make the situation worse. Generally, in the mid-South either the reniform or Southern root-knot nematodes are the major nematode types that are likely to cause serious damage. Crop rotation is currently widely used and has a great place against nematodes. Corn, grain sorghum, peanuts, or a resistant soybean variety work well against the reniform nematode and dramatically reduce soil populations. When the Southern root-knot nematode is involved, corn will not help out very much but the other three crops will. However, it is very important to know which nematodes types are present in your fields in order to make good recommendations.

Because of the nematode types present or lack of any other options, many producers must plant cotton into a field where nematode types or populations are high enough to cause injury. Seed treatment nematicides are now widely utilized but are not intended to be used against very damaging populations of nematodes. Our research over the past several years has shown that some areas of fields will need the extra protection that you would obtain from a soil fumigant. The problem that quickly arises is determining which areas of the field need extra help.

A number of states are looking at this question of where should you use something other than a standard rate of nematicide such as Temik 15G or use one of the seed treatment nematicides in a field (Davis et al., 2009; Ortiz et al., 2009; Overstreet et al., 2009). One of the primary tools that are currently being investigated is the use the Veris 3100 Soil EC Mapping System to help define soil texture within a field. Nematodes such as the Southern root-knot have been strongly linked to soil texture and particularly sand content in the soil. The sandy areas of a field are where the greatest damage is likely to occur. As the clay content increases in the soil, these soils are not as likely to be damaged as severely by the Southern root-knot nematode. Once the clay content gets high enough, Southern root-knot simply will not occur in these soils. Unfortunately, reniform nematode will occur in the sandy soils but seems to favor the soils with higher contents of silt or clay. Fields that have been mapped with the Veris 3100 Soil EC Mapping System can be divided up into a number of zones based on the readings from the machine (ECa). Low numbers from the Veris machine will correspond well with the lightest areas in a field while higher numbers indicate heavier soils. In some of the alluvial soils that we have in Louisiana, soils can change from a very light, sandy loam on one side of the field and gradually change into heavy clay on the opposite end. Many fields may be more of similar soil type and not change as much from one area to the next within a field. Producers should have a good idea about each of their fields and what these numbers actually mean in individual fields. Areas of a field that have had noticeable damage from nematodes in the past either from visible stunting, plant loss, early plant death, or just low yields are always going to be the most likely soils within a field to show damage again. Although populations of nematodes may go up or down over time, areas of a field which have high levels of nematodes such as the Southern root-knot are where they still seem to be the highest.

One of methods that we have been looking at in Louisiana to find areas within a field that need may require supplemental nematicides is to use the combination of Veris information and verification strips to identify the problem areas (Figure 1). The numbers that are derived from the Veris machine are divided up within the field and become several zones (anywhere from 3-7 depending on how wide a range of readings are experienced). The verification strips are composed of a number of rows of each treatment (usually 12-16) that are either untreated or treated with a fumigant that run through the entire length of the field. We also try to place a series of 3-4 verification strips in a field to make sure that all the soil zones are well represented. By examining yield obtained from a cotton yield monitor, you can fairly easily determine where in the field the nematicide was working and where you need to treat.

Another method that is being used is to develop risk maps of a field (Figure 2). This uses a combination of information from the field such as soil texture (obtained by the Veris rig), yield history (yield maps), and nematode populations obtained from sampling. Fields may need to be broken up into various areas by using texture, yield, or experience and sampled for nematode populations. High risk areas in the field would be those that are very sandy, have had major yield problems in the past, and have high populations of a nematode such as the Southern root-knot. Low risk areas are those which have slightly heavier soil, have yielded well in the past, or have low populations of nematodes. Risk zones would be particularly helpful in fields that may not have a lot of textural differences across the field. The Macon Ridge in Louisiana is an area of soils that were formed from wind-blown soil from the Mississippi River. These soils are silt loams with shallow hardpans. Depth to the hardpan is what will give a higher reading using the Veris machine. Reniform nematode seems to really flourish in these soils and can often build up to very high populations. In these soils, sampling by either a grid pattern or breaking the field into blocks may be more useful than tex-

ture in identifying where to treat.

Nematode management is certainly changing with some of the newer technologies that are currently available to producers. These new technologies give producers a better idea of where nematode problems are in their fields and just how much damage they really are causing. The ideal use of this technology is to treat only the areas of a field that needs it with nematicides. The areas within a field that would require additional treatment could certainly vary from year to year especially if crop rotations are used or nematode populations drastically change.

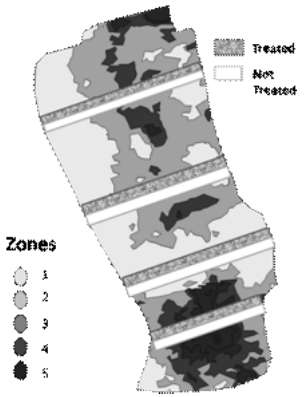
References

Davis, R.F., C.D. Perry, D.G. Sullivan, and G.R. Lee. 2009. Utilization of management zones for reniform nematodes in cotton. P. 177. In: Proceedings Beltwide Cotton Conferences, San Antonio, TX 5-8 January, 2009. National Cotton Council, Cordova, TN

Ortiz, B.V., C. Perry, D. Sullivan, R. Kemerait, A.R. Ziehl, R. Davis, G. Vellidis, and K. Rucher. 2008. Cotton yield response to variable rate nematicides according to risk zones. Pp. 573-582. In: Proceeding of the Beltwide Cotton Conferences, Nashville, TN 8-11 January, 2008. National Cotton Council, Memphis, TN.

Overstreet, C., M. Wolcott, G. Burris, and D. Burns. 2009. Management zones for cotton nematodes. Pp. 167-176. In: Proceedings of the Beltwide Cotton Conferences, Nashville, TN 8-11 January, 2008. National Cotton Council, Memphis, TN.

Figure 1. An example of a field that has been divided into 5 soil zones based on using ECa information obtained by a Veris machine. Zone 1 is the lightest soil and zone 5 is the heaviest soil. Four verification strips (treated and untreated rows) have been placed in the field to find out which soil zones are responding to the use of a soil fumigant.



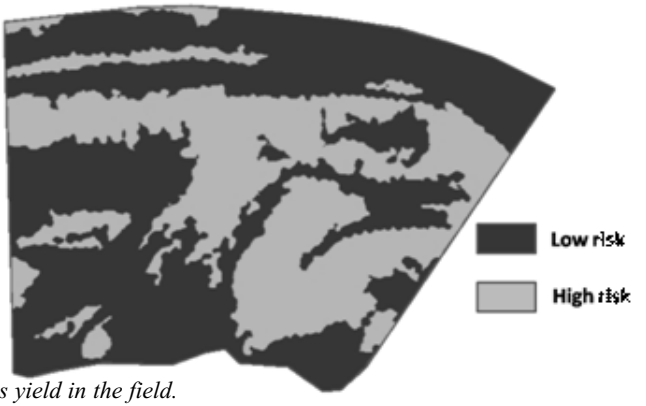


Figure 2. A field that has been divided into two risks zones based on soil texture (ECa) and previous yield in the field.