ALTERNATING COTTON ROW PATTERNS TO REDUCE DAMAGE FROM RENIFORM NEMATODES

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ABSTRACT

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Two field trials were conducted in north Florida, U.S.A., to determine any yield advantages of planting cotton into the previous cotton crop row middle rather than the usual in-row planting. Soil at the sites was a loamy sand infested with reniform nematodes (*Rotylenchulus reniformis*). Initial nematode population densities were less in the row middle than in row stubble from the previous year. As the season progressed, reniform nematode population densities in cotton planted in the row middle and in-row were approximately the same. At seasons end, reniform nematode population densities in the row middle of both trials were lower than in the respective in-row plantings. Cotton lint yields were increased by 30% in one test and 40% in another test by planting in previous cotton row middles. This cultural technique requires no additional cost to growers, and allows yield improvement which would be profitable for growers.

Key words: cotton, cultural practice, *Gossypium hirsutum*, reniform nematode, *Rotylenchulus reniformis*, nematode management.

RESUMEN

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Se realizaron dos ensayos de campo en el Norte de Florida, U.S.A., para determinar si representaba alguna ventaja en cuanto a producción el plantar el algodón en las filas intercaladas respecto a las utilizadas en el cultivo previo, o bien, realizar la plantación habitual que se hace en las mismas filas. El suelo de ambos campos era franco arenoso y estaban infestados con el nematodo reniforme (*Rotylenchulus reniformis*). Las densidades iniciales de población del nematodo eran menores en las filas intercaladas que en las filas que tenían el rastrojo procedente del cultivo del año anterior. Conforme avanzaba el cultivo, las densidades de población del nematodo reniforme eran aproximadamente las mismas en el algodón plantado en las filas intercaladas que en las mismas filas. Las producciones de fibra de algodón incrementaron en un 30% en un ensayo y en un 40% en otro ensayo por el hecho de plantar en las filas intercaladas. Esta práctica cultural no supone ningún coste adicional para los agricultores y permite mejorar la producción, lo cual será ventajoso económicamente para los agricultores.

Palabras clave: algodón, *Gossypium hirsutum*, manejo, nematodo reniforme, practicas culturales, *Rotylenchulus reniformis*.

INTRODUCTION

Reniform nematodes (*Rotylenchulus reniformis*) have become an increasingly important problem in cotton production in the U.S.A. (Beltwide Cotton Committee, 2002). Management of reniform nematodes is by crop rotation, nematicides or a

combination of these practices since resistant cotton cultivars are not available (Kinloch and Rich, 2000). For many growers, rotation is not seen as an option due to low alternative commodity prices, and nematicides are costly. Thus, other practices need to be developed to provide growers more flexibility to manage reniform nematodes. Our research has centered on several cultural practices that could potentially reduce losses to reniform nematodes in cotton at little cost to growers. These have included practices such as planting cotton between previous crop rows, increasing cotton plant populations and destroying cotton roots in a timely manner. In 1998, cotton was strip-till planted between previous cotton rows and showed positive results in a preliminary test. Cotton lint yield was increased 29% by planting between previous rows compared to planting into the cotton stubble. The tests described herein were conducted to further determine if planting cotton between rows of a previous cotton crop could help reduce damage from reniform nematodes.

Field trials were conducted in 2000 and 2001 at the North Florida Research and Education Center near Quincy, FL, U.S.A. on a loamy sand soil (80% sand, 8% silt, 12% clay) infested with reniform nematodes. Cotton was grown on the sites the year before, and the mowed stubble was left undisturbed over the winter. Cotton cultivars DeltaPine 458 BR and Stoneville BXN 47 were planted using strip tillage with chisels placed 30 cm deep on 22 June 2000 and 26 June 2001, respectively. Plot rows were 91-cm-wide, 7.62 m long and four rows wide. The two treatments consisted of planting cotton either directly in-row over the old cotton stubble or planting between the previous cotton rows. Treatments were alternated and replicated six times. Cotton was maintained using standard cultural practices for north Florida. In the 2000 trial, soil samples were collected from cotton rows with the exception of the 136-day sampling date that included samples from the cotton rows and between rows. In 2001, soil samples obtained during the cotton growing season were collected from both cotton rows and between rows. Samples for nematode analysis and plant yield parameters were collected from the two center rows in each plot. When soil samples were taken concurrently in the cotton row and between rows, individual cores were taken across from each other to insure comparable sampling areas. Soil was collected by removing six cores (2.54 cm diam) to 25 cm deep from each plot. A 100 cm^3 soil sub-sample from each plot was extracted by the modified centrifugation-sugar flotation technique (Jenkins, 1964) and reniform nematodes counted. Seed cotton was manually harvested on 6 December 2000 and 5 December 2001, and the weight was multiplied by 0.40 to provide a lint yield estimate.

In the 2000 test, reniform nematode population densities 28 days after planting were significantly lower ($P \leq 0.05$) in cotton planted between previous rows than that planted over the previous stubble (Table 1). As the season progressed, however, reniform nematode population densities in-row in both treatments increased and were roughly equal 76 days after planting. Samples taken at 136 days were collected both in-row and between rows of the two treatments. Reniform nematode population densities were significantly higher in-row in both treatments (mean-1603/100 cm^3 soil) compared to row middle populations (mean-544/100 cm^3 soil). Seed cotton yields mirrored early season nematode population density data. Yield was significantly higher in cotton planted between previous cotton rows compared to in-row planting.

In the 2001 test, initial reniform nematode population densities were lower ($P \leq 0.05$) between previous cotton rows than

Table 1. Comparative reniform nematode population densities in cotton planted in row or between rows of a previous cotton crop, 2000.

Planting method[y]	Days after planting			Lint kg/ha
	28	76	136	
	Nematodes/100 cm^3 soil			
In-Row	431 a	971 a	1500 a	340 b
Row Middle	179 b	793 a	1702 a	442 a

[y]In-row planting indicates that cotton was seeded over the stubble from the previous year; row middle cotton was planted between rows from the previous year.
[z]Column means followed by the same letter are not significantly different ($P \leq 0.05$).

those taken in the cotton stubble (Table 2). At both the 81 and 153-day sampling dates, reniform population densities in the row did not differ between the two planting methods. Additionally, nematode population densities between rows middles of both previous year treatments did not differ from each other but were lower than those found in the planted row of either treatment. Due to the initially lower populations of reniform nematodes in rows middles, however, cotton lint yield was significantly higher than in-row plantings.

Many growers have considered compaction in the row middles from tractor tires as a major concern. However, much of the cotton in Florida is strip till planted with an in-row subsoiler that breaks the

Table 2. Population variation of reniform nematodes and lint yield of cotton planted in-row and in row middles of a previous cotton crop, 2001.

Planting method	At planting	Days after planting		Lint kg/ha
		81	153	
In-Row	Nematodes/100 cm^3 soil			
In-row samples		328 a	378 ab	
	240 a			508 b
Between row samples		81 b	168 b	
Row-middle				
In row samples		330 a	624 a	
	92 b			714 a
Between row samples		205 ab	316 b	

[x]Indicates initial nematode population densities; samples were collected eleven days prior to planting.
[y]In-row planting indicates cotton was seeded over the stubble from the previous year; row middle cotton was planted between rows from the previous year.
[z]Column means followed by the same letter are not significantly different ($P \leq 0.05$).

compaction layer. The present research indicates that nematode management may be more of a concern than increased compaction. Our data supports the hypothesis that planting cotton in previous row middles will help avoid a portion of potential yield loss due to reniform nematodes, since population densities of reniform nematodes are lower between rows compared to in-row populations. However, plant growth and therefore root spread are probably important factors in the success of this technique. More detailed tests are needed to determine advantages of planting between previous cotton rows over a wide range of initial population densities of reniform nematodes, soil types and previous cotton yield. Should these results be applicable under a wide range of conditions, nematicide rates could possibly be reduced, or more likely, row middle plantings could increase nematicide performance. Also, shifting to row middle plantings using strip-till technology does not involve additional grower expense so any yield improvement would be profitable for the cotton farmer.

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