

Response of Ultra-Narrow Row Cotton to Telone II in Root-Knot and Reniform Infested Fields¹

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Introduction

Upland cotton (*Gossypium hirsutum*) is an important agronomic crop in northern Florida and was grown on more than 80,000 acres in 2009. Typical production practices include planting in 36 to 40-inch-wide rows at a seeding rate of 2-3 seed per foot of row. This row spacing allows traditional equipment to be used for weed and insect management. With the advent of transgenic herbicide-resistant cotton cultivars, less reliance has been placed on cultivation for weed control. Similarly, reduced insect pressure has resulted from the success of the boll weevil eradication program in Florida and from the use of transgenic cotton cultivars that contain a toxic protein from *Bacillus thuringiensis* (Bt). These developments have allowed several farms in northern Florida to use higher cotton seeding rates in nonconventional row widths (mainly in 10-inch-wide rows with current recommendations of 60-80,000 plants/acre, termed ultra-narrow row or UNR in this document).

Plant-parasitic nematodes, especially the southern root-knot and the reniform nematodes,

cause widespread yield losses of cotton in Florida. Since resistant cotton cultivars are not available, nematode diseases are managed by crop rotation and nematicides. However, due to the profitability of cotton compared to other row crops such as corn and soybean, many growers plant cotton continuously on the same land, leading to increased use of nematicides. Our research has shown that application of the nematicide, Telone II, has produced the highest yield improvements in conventional cotton compared to other nematicides. Recommended rates of Telone II in conventionally planted cotton are 3-6 gals/acre with the lower rates effective in reniform nematode-infested fields and the higher rates needed in fields heavily infested with root-knot nematodes. Recent research has been conducted to determine the influence of Telone II on root-knot and reniform nematode numbers and cotton yield responses in ultra narrow row cotton production in Florida.

Trials

Two similar studies were conducted during the same year at field sites in northern Florida. One site was in a root-knot nematode-infested field in Santa

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Rosa County and the other was in a reniform nematode-infested one in Gadsden County. Both sites had been planted to cotton the year before.

Management of the trial sites followed Florida Cooperative Extension Service recommendations, and they were not irrigated. Treatments at both sites included applications of Telone II at 1.5, 3.0, 4.5, 6.0, 7.5, and 9.0 gals/acre applied broadcast. These were applied with chisels set 16 inches apart and injected 12 inches deep in mid-May. Non-treated check plots were chiseled without treatment. A Roundup Ready/BT cotton was planted with a grain drill in rows set 10 inches apart about a week after nematicide treatment at both sites. Plant numbers averaged between 2 and 3 per row foot at the sites. Plots at the reniform nematode site were harvested entirely on October 20 with a mechanical cotton stripper, while at the root-knot nematode site, harvesting was done on November 9 by mechanically picking bolls from two 30-inch-wide swaths through each plot. Seed cotton samples were ginned to determine lint yield. Pre-plant and post-harvest nematode soil population densities were determined from each plot.

Root-knot nematode numbers increased over the course of the crop season in non-treated plots and in plots treated with 1.5 gals/acre of Telone II (Table 1). Treatments of Telone II at 3.0 gals/acre and above were sufficient to maintain nematode numbers at the same level as found prior to treatment. A Telone II treatment of 4.5 gals/acre and higher was required to have a significant yield increase over the control. Among treatments at this site, there was a significant positive relationship between lint yield/acre and the amount of Telone II applied.

Application of Telone II increased cotton height at the reniform nematode-infested site (Table 2), and there was a significant positive relationship between plant height and Telone II rates. A minimum rate of 3.0 gals/acre of Telone II was required to increase cotton lint yields above that from the non-treated check. Yields from treatments at this and higher rates could not be distinguished. There was no difference in reniform nematode numbers following non-treated and various Telone II treatments after harvest. Among treatments at the reniform site, there was a

significant positive relationship between lint yield and the amount of Telone II applied.

The negative effect that higher rates of Telone II had on numbers of root-knot nematodes could be a major factor in choosing UNR cotton in root-knot nematode-infested soil and broadcast application of the fumigant for managing this nematode. The rate/nematode relationship predicted that 9.0 gals/acre of Telone II, the highest rate used in this study, was close to that required to reduce post-harvest nematode numbers to nearly undetectable levels. This would have a significant impact on the choice of nematode management in a subsequent crop. Possibly, if these higher rates of Telone II were used in the first year of cotton production, a second year of cotton production would not require fumigation. However, this would not be feasible if the soil was densely infested with reniform nematodes. Our data showed damaging levels of reniform nematodes remained after harvest even with the highest level of Telone II used in this study. Calculations of the rate/nematode relationship indicated that as much as 22 gals/acre of Telone II applied broadcast would have been required to bring the reniform nematode populations down to non-detectable levels following harvest.

The relationship between lint yield and Telone II rate in the root-knot nematode site predicted an average increase of 50 lbs/acre of lint for each gallon of Telone II used. Similarly, UNR cotton yield responses to Telone II application in reniform-infested soil was 35 lbs/acre yield increase for each gallon of Telone II used. These yield responses were equivalent to that found in previous studies using traditional row spacing in root-knot and reniform nematode-infested soil.

Conclusion

Management of Florida's major nematode problems in UNR is feasible by broadcast applications of Telone II and it may be more advantageous to use this production method and treatment practice than traditional spacing for the long-term management of root-knot nematodes. Populations of root-knot nematode are more capably managed than those of reniform nematode by using

broadcast fumigation and the UNR cotton cropping practice. In UNR fields infested with reniform nematodes, the relationship between yield and Telone II dosage indicates that the profitability of fumigant rates greater than 3.0 gals/acre will be greatly dependent on the relative value of the fumigant and cotton lint.

Table 1. Root-knot nematode numbers, juvenile stage (J2) and cotton lint yield when grown in ultra narrow rows in response to treatments of Telone II applied to sandy loam soil in Florida.

Telone II ¹ gals/acre	J2/100 cm ² soil		Lint
	Pre-treatment	Post-harvest	lbs/acre
	18 May 28 April	15 November	9 November
0 chiseled	30 a	177 a	568 c
1.5	28 a	92 a	659 bc
3.0	27 a	33 a	698 bc
4.5	25 a	31 a	806 ab
6.0	25 a	22 a	814 ab
7.5	20 a	13 a	836 ab
9.0	20 a	11 a	942 a

¹ Applied with chisels set 16 inches apart and 12 inches deep, 10 days before planting.

² Paired comparison between pre-treatment and post-harvest nematode numbers.

Data are the averages of six observations. Averages followed by a similar letter within a column are not significantly ($P \leq 0.05$) different according to Duncan's multiple-range test.

Table 2. Plant heights and yields in ultra narrow row cotton, and reniform nematode numbers after harvest in response to treatments of Telone II applied to sandy loam soil in Florida.

Telone II ¹	Plant height	Lint	Nematodes/
gals/acre	cm	lbs/acre	100 cm ² soil
11 May	19 July	20 October	1 November
0	60.1 d	558 c	1500 a
1.5	72.3 c	777 b	1088 a
3.0	78.1 bc	935 ab	868 a
4.5	84.6 ab	955 a	1038 a
6.0	79.5 bc	984 a	669 a
7.5	89.8 a	1085 a	825 a
9.0	87.4 ab	1103 a	954 a

¹ Applied with chisels set 16 inches apart and 12 inches deep, applied 4 days before planting.

² Data are the averages of six observations. Averages followed by a similar letter within a column are not significantly ($P \leq 0.05$) different according to Duncan's multiple-range test.