## EFFICACY AND ECONOMIC ANALYSIS OF NEMATODE CONTROL STRATEGIES IN GEORGIA COTTON W. Don Shurley Tifton, GA Robert C. Kemerait Tifton, GA

# Abstract

Southern Root-Knot nematodes are found in an estimated 60 to 70 percent of Georgia's cotton acreage. Medium to high populations are found in 41 of the state's 78 cotton-producing counties. Strategies to control nematodes and reduce yield loss include crop rotation to a non-host crop, use of nematicides, use of seed treatments, and use of nematode-resistant varieties if available. Studies were conducted a 3 locations in 2003 and 2004 to evaluate nematicide treatments. Yields, costs, and net returns were determined for each treatment at each location for each year. Each year, the untreated check was 3.5 lbs/acre of Temik applied in-furrow at planting. This is a standard practice for Georgia producers to control thrips and provides no nematode control. In 2003, this was compared to (a) a split application of Temik consisting at 5 lbs/acre at planting plus 5 lbs/ac side-dressed and (b) 3 gallons/acre of Telone plus 3.5 lbs/ac of Temik at planting. In 2004, the 3.5 lbs/acre Temik check was compared to (a) 5 lbs/acre of Temik at planting, (b) a split application of Temik consisting at 5 lbs/acre at planting plus 5 lbs/ac side-dressed and (c) 3 gallons/acre of Telone plus 3.5 lbs/ac of Temik at planting. In 2004, each treatment resulted in lowering average nematode populations compared to the check in 2 of 3 locations. Although not necessarily resulting in the lowest nematode populations, the split Temik treatment and Telone+Temik treatment resulted in the highest yield per acre at each location in 2004. Net returns were highest with the split Temik or Telone+Temik treatments at all 3 locations in 2004. In 2003, the differences in net returns were not as pronounced. The Telone+Temik treatment resulted in the highest net return at 1 location while there were no treatment effects at the other 2 locations.

### **Introduction**

There are 4 nematode species commonly found in Georgia. These are southern root-knot nematode, reniform nematode, columbia lance nematode, and sting nematode. It is estimated that at least one species of nematode is found in 60 to 70 percent of Georgia's cotton acreage (Kemerait, 2003). The most prevalent species in cotton is the southern root-knot nematode. High populations are found in 23 of the state's 78 cotton-producing counties. Medium populations are found in 28 counties.

The most severe problems are in fields that are not properly rotated to non-host crops. To control nematodes and reduce yield losses, cotton producers have 4 choices– rotation with a non-host crop, use of nematicides, use of seed treatments or seed treatments plus nematicides, or planting of a nematode-resistant variety if available. The lack of profitable rotation crops, however, has been a constraint in managing the nematode problem. A corn-cotton rotation can be a profitable alternative to continuous cotton if corn yield is high but soybeans are not a profitable rotation (Davis, et. al., 2003 and Shurley, et. al., 2003). With the exception of peanuts, few if any other crops offer a solution for many Georgia producers (and peanuts have only become feasible for some producers since quota was eliminated and loan rates increased under the 2002 farm bill).

#### **Methodology**

The objective of this study was to determine the benefit of alternative nematicide treatments compared to no treatment on cotton yield and net returns. Tests were conducted at three locations in 2003 and three locations in 2004. These tests were large, on-farm randomized replicated plots in fields that had been planted annually to cotton and had a history of severe nematode losses. Each plot was replicated 4 times.

In 2003, variety DP 555BR was planted at 2 locations and DP 458BR at the third location. In 2004, DP 555BR was planted at all 3 locations.

 rip/bed plus 3.5 lbs/ac of Temik AP. In Georgia, 3.5 lbs/ac of Temik AP is considered a standard regime for thrips control only and for purposes of these tests was considered the check on non-treated plot. In 2004, 4 treatments at 3 locations consisted of 3.5 lbs/ac of Temik AP, 5 lbs/ac of Temik AP, split applications of Temik-- 5 lbs/ac of Temik AP plus 5 lbs/ac of Temik SD, and 3 galllons/ac of Telone at rip/bed plus 3.5 lbs/ac Temik AP.

Soil sample tests for nematode population counts were taken prior to application of any nematicide/prior to planting and prior to harvest at each location each year. At some locations, sampling was also done mid-summer.

All plots were machine picked and each replication's seedcotton weighed separately. Actual lint yield and fiber quality were not determined. Lint yield was assumed to be 42% of seedcotton weight for DP 555BR and 38% for DP 458BR. All lint was assumed to be Color 41-Leaf 4, Staple 34, and base quality for strength, uniformity, and micronaire.

Net return was calculated as yield per acre times price per pound minus treatment costs. Treatment costs were nematicide plus application costs. Application costs include tractor fuel and repairs, equipment repairs, and labor. Application costs were not considered if the nematicide was applied simultaneously with another input without a separate trip over the field (Temik AP and Telone, for example). If investment in additional machinery or equipment would be required to apply the nematicide, application cost also included annual depreciation, interest, and insurance (Telone injection and Temik SD, for example).

Cotton was valued at the November average Georgia spot cash price for 41-4/34 (USDA-AMS, 2003 and 2004) plus the November average Loan Deficiency Payment (LDP) if applicable (USDA-FSA, 2004).

#### **Results**

#### Yield

At 3 locations in 2004, the 5-lb rate of Temik AP did not result in higher yields compared to the check in 2 of the 3 locations. Numerically, yields were highest with the Telone+Temik treatment at 2 of 3 locations. Statistically, yields were highest with the split 5+5 application of Temik or the Telone+Temik treatment at each location (Table 1). At 3 locations in 2003, yields were numerically higher with each nematicide treatment compared to the 3.5 lb Temik check. The Telone+Temik treatment produced the highest yields at each location but was statistically different from the split 5+5 Temik treatment at only 1 location.

	2003			2004			
Treatment	Colquitt Co. DP 555BR	Mitchell CoW DP 555BR	Mitchell CoC DP 458BR	Coffee Co. DP 555BR	Colquitt Co. DP 555BR	Mitchell Co. DP 555BR	
3.5 Lbs Temik AP	646 b	1,034 b	686 ab	1,015 b	690 c	826 bc	
5.0 lbs Temik AP				999 b	749 bc	782 c	
5.0 lbs Temik AP + 5.0 lbs Temik SD	732 b	1,084 ab	692 ab	1,067 ab	869 a	856 b	
3 gal Telone PPI + 3.5 lbs Temik AP	902 a	1,090 a	699 a	1,177 a	867 a	922 a	

Table 1.	<b>Yield Per Acre</b>	(Lbs of Lint) B	y Location, Y	ear, and Treatment.
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Treatments followed by the same letter are not statistically different, probability 95%

## Nematode Populations, Treatments, and Yields

One of the challenges in nematicide control recommendations is the relationship between yield and nematode population. Among treatments within location, there were very often no statistical differences in nematode population. This observation may be the result of the sampling procedure and the dynamic nature of nematode populations and how they change during the season.

In 2004 at Coffee County, average nematode populations ranged between 50 and 150 per 100 cubic centimeters of soil (Figure 1). Populations were generally less with each treatment compared to the 3.5 lbs Temik check. At Coffee County and Mitchell County, the nematicide treatments generally resulted in lower nematode populations.

At all 3 locations, the 5+5 split Temik treatment and the Telone+Temik treatment resulted in the highest yields but not necessarily the lowest average nematode populations.



Figure 1. Average Nematode Populations and Yield By Location And Treatment, 2004

**Costs** 

Treatment costs in 2004 ranged from \$10.85 per acre for the 3.5 lbs Temik check to \$48.41 per acre for the Telone+Temik treatment (Table 2). Application costs were minor compared to nematicide cost. Treatment costs in 2003 were \$10.68 per acre for the 3.5 lbs Temik check, \$35.89 per acre for the split 5+5 Temik treatment, and \$45.10 per acre for the Telone+Temik treatment.

	2003			2004		
Treatment	Nematicides	Application	Total	Nematicides	Application	Total
3.5 Lbs Temik AP	\$10.68	N/A	\$10.68	\$10.85	N/A	\$10.85
5.0 lbs Temik AP				\$15.50	N/A	\$15.50
5.0 lbs Temik AP + 5.0 lbs Temik SD	\$30.50	\$5.39	\$35.89	\$31.00	\$5.83	\$36.83
3 gal Telone PPI + 3.5 lbs Temik AP	\$43.68	\$1.42	\$45.10	\$46.85	\$1.56	\$48.41

Table 2. Treatment Costs Per Acre, By Year.

# Net Returns

For 2004, net returns were highest for the Telone+Temik treatment at 2 of 3 locations (Figure 2). In Coffee County, net return for the Telone+Temik treatment was \$652.06 per acre-- \$53.89 per acre higher than the 5+5 Temik treatment and \$59.15 higher than the 3.5 lbs Temik check. In Colquitt County, net return was highest for the 5+5 Temik treatment at \$480.21 per acre. This was \$12.83 higher than the Telone+Temik treatment and \$80.22 per acre higher than the 3.5 lbs Temik check. In Mitchell County, the Telone+Temik treatment resulted in net return of \$500.18 per acre-- \$19.46 per acre higher than the check. The 5+5 Temik treatment was slightly less than the check.

In 2003, differences in net returns were generally less pronounced than in 2004 (Figure 3). In the Colquitt County test, highest net returns were from the Telone+Temik treatment. Net return was \$143. 60 per acre higher than the

3.5 lbs Temik check and \$109.48 higher than the 5+5 split Temik treatment. At the Mitchell County-W location, the 5+5 split Temik application gave the highest new return but there was little difference between the treatments and check. At the Mitchell County-C location, the check produced the highest net return.



Figure 2. Net Return Per Acre, Treatment and Location, 2004



Figure 3. Net Return Per Acre, Treatment and Location, 2003

### **Conclusions**

Use of Temik in a split application of 5 lbs/acre at planting plus 5 lbs/acre sidedressed or Telone (3 gallons/acre at rip/bed) plus Temik (3.5 lbs/ac at planting) resulted in statistically highest yield at all 3 locations in 2004. Temik split applications resulted in highest net return at 1 location and Telone plus Temik resulted in highest net return at 2 locations.

Compared to the check of 3.5 lbs/acre, increased rate of Temik in split applications resulted in numerically higher yields at all locations in 2003 but yields were not statistically different. Use of Telone at rip/bed plus 3.5 lbs of Temik at planting resulted in numerically highest yields at all 3 locations in 2003 but was not statistically different from the split application of Temik at 2 of 3 locations. Averaged across all 3 locations, Telone + Temik resulted in the highest net returns in 2003.

Compared to the 3.5 lbs/acre Temik "thrips rate", Temik in split application or Telone + Temik can improve yield and increase net returns.

## **References**

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