ASSESSMENT OF EFFICACY AND ECONOMIC RETURNS FOR NEMATICIDES APPLIED IN GEORGIA

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Abstract

Results from 24 cotton studies conducted from 2002 to 2007 are reported here. Field sites were naturally infested with the southern root-knot nematodes (Meloidogyne incognita). Efficacy (mean yield) and value (mean dollars/acre) of various nematicide treatments to include AVICTA Complete Cotton (formerly known as AVICTA Complete Pak), AERIS Seed-Applied System, Temik 15G (aldicarb), Vydate C-LV (oxamyl) and Telone II (1,3-dichloropropene) were compared to seed treated only with insecticides thiomethoxam (Cruiser) or imidacloprid (Gaucho or Gaucho Grande). Temik 15G, 5 lb/A, was assessed in each of the 24 trials; other nematicides were compared to Temik 15G, 5 lb/A, and Cruiser or Gaucho in subsets of the trials. Yield and value data were grouped and analyzed according to final root-knot nematode populations. Root gall ratings assessed approximately 30 days after planting were typically significantly lower on plants treated with Temik 15G than on plants from seed treated with AVICTA Complete Cotton, AERIS Seed-Applied System, Cruiser, or Gaucho Grande. Due to the tremendous variability in data across numerous large, replicated, on-farm trials, it was usually not possible to determine strict, statistical differences between treatments. However, accepting the limitations of a grower-oriented study such as this, Temik 15G, 5 lb/A provided better relative yields and value to the grower than did AVICTA Complete Cotton or AERIS Seed-Applied System. In limited trials, the use of Vydate C-LV did not add value to the use of Temik 15G, 5 lb/A, for management of nematodes. Side-dressed applications of Temik 15G, 5 lb/A, added yield but not value to use of an at-plant application of Temik 15G alone. Finally, use of Telone II, 3 gal/A, added yield and value to the cotton crop beyond that realized with Temik 15G, 5 lb/A.

Introduction

Parasitic nematodes are one of the most important pest problems for cotton growers in Georgia today. In a recent random survey conducted by members of the University of Georgia's Cooperative Extension, it was found that nearly 70% of the commercial cotton fields included in the survey was infested with some level of plant parasitic nematodes. The southern root-knot nematode (Meloidogyne incognita) is the most important and widespread parasitic nematode on cotton in Georgia; however some growers are severely affected by reniform (Rotylenchulus reniformis), Columbia lance (Hoplolaimus columbus), and sting nematodes as well.

For the 2006 growing season, it was estimated that nematodes cost growers in Georgia approximately $88.5 million in terms of lost yields and cost of nematicides to manage the problem. Cotton growers in Georgia typically manage nematodes with a combination of crop rotation and use of nematicides such as 1,3-dichlropropene (Telone II), aldicarb (Temik 15G), and oxamyl (Vydate C-LV). Since 2006 and 2007, growers have been using abamectin (a component of AVICTA Complete Cotton) and thiodicarb (component of AERIS Seed-Applied System), respectively, to manage nematodes on cotton.

Since 2002, Extension specialists, researchers, county agents, cotton growers, and personnel from the agrichemical industry have collaborated in Georgia to assess the efficacy of nematicides for control of nematodes affecting cotton. Nematicide treatments were randomized and replicated in each study and plot-size was often more than an acre per treatment. It was not possible to include each nematicide treatment in every study; however Temik 15G, 5 lb/A, and seed treated with either thiomethoxam (Cruiser) or imidocloprid (Gaucho and Gaucho Grande) was included in each study included in this report.

Since 2002, there have been more than 40 studies assessing the efficacy of nematicides on cotton in Georgia. Many of these were conducted as replicated studies in commercial fields where, as one would expect, there was tremendous variability in nematode populations, environmental conditions, irrigation, and nematicides included in the trials. Only 24 of the total studies have been included in this report. The trials included in this report were conducted in fields infested with the southern root-knot nematode (M. incognita) and all included control treatments of Cruiser or Gaucho/Gaucho Grande. This report is compilation of the data collected since 2002.

The objectives of the current study were to evaluate the efficacy and value of nematicides available to cotton growers in Georgia. Because yield losses that occur in a cotton field from plant parasitic nematodes are a function of nematode populations, environmental stresses, and cultivar, yield responses and values in this study were standardized to the insecticide seed treatments, which do not control nematodes, in each trial.

Materials and Methods

All nematicide trials included in this study were conducted in fields or research plots known to be naturally infested with the southern root-knot nematode, Meloidogyne incognita. Specifics of these field sites are presented in Tables 1 and 2. Nematicide treatments were applied to plots on research stations under the supervision of researchers and Extension specialists. In commercial fields, treatments were applied by the grower under the direct supervision of the Extension specialist or the county agent. The cotton crops were managed according to guidelines from the University of Georgia's Cooperative Extension.

Treatments included in one or more of the trials analyzed in this study were:

1. Seed treated with Gaucho or Gaucho Grande from Bayer CropScience (currently priced locally at $51.25/bag of seed).
2. Seed treated with Cruiser (0.34 mg/seed) from Syngenta (currently priced locally at $49.90/bag of seed).
3. Seed treated with AVICTA Compete Cotton (currently priced locally at $122.00/bag of seed). AVICTA Complete Pak is a combination of the fungicide seed treatment Dynasty CST (azoxystrobin, fludioxonil, and mefenoxam), Cruiser (0.34 mg/seed) and abamectin (0.15 mg/seed).
4. Seed treated with AERIS Seed-Applied System + Trilex (currently priced locally at $105.36/bag of seed). AERIS Seed-Applied System included thiodicarb, imidacloprid, and the Trilex Advanced Seed Applied System (trifloxystrobin, triadimenol, and metalaxyl).
5. Temik 15G (rates of 3.5, 5, and 7 lb/A) currently priced locally at approximately $3.00/lb. Temik 15G was applied to the open furrow at planting and also as a side-dress application prior to pin-head square in some situations. (Note: an additional cost for labor, fuel, and equipment was factored into economic returns when the side-dress application of Temik 15G was analyzed.)
6. Vydate C-LV (17.0 fl oz/A) was assessed according to local price and the cost of application when cotton was between the 2nd and 5th true-leaf stage.
7. Telone II (3 gal/A) was priced locally at $12.00/gal. It was assumed that the application of Telone II was made during normal field preparation; additional costs only included cost to purchase a fumigation kit. Telone II was applied with a single chisel in-row 12-inches deep to appropriate plots at least seven days prior to planting. Temik 15G, 3.5 lb/A, or seed treated with imidacloprid or thiomethoxam was used to control early season thrips.

Note: It was estimated that the average cotton grower in Georgia plants 3 seed per foot of row. Therefore, it was estimated that a bag of cottonseed, 250,000 count, would plant approximately six acres with a single bag of seed.

The experimental design in each study was a randomized complete block design with a minimum of three replications. Pre-plant and post-harvest soil samples were collected from every trial to determine nematode populations; mid-season soil samples were often collected as well. Root samples were carefully dug from some trials approximately 30 days after planting to assess for root galling. Root galling was rated on a scale from 0 (no galls present) to 10 (100% of the root system affected). Each increment, e.g. 1,2,3,4,…, represented a 10% increase in root area covered with galls. Yields were taken from each plot; lint yield was estimated from each plot by multiplying seed cotton by 38%. For this study, it was estimated that cotton lint was valued at $0.60/lb.

To compensate for differences in yield and economic value that resulted from environmental stresses that varied from field to field, results from each trial were standardized against the Cruiser or Gaucho-Gaucho Grande seed treatments using the formula:

Standardized yield for treatment "A" (%) =
(yield for treatment "A"/yield insecticide treatment) X 100%

Standardized economic return for treatment "A" ($/A) =
[(lint yield for treatment "A" lb/A X $0.60/lb) – (cost of treatment "A")] –
[(lint yield for insecticide seed treatment lb/A X $0.60/lb) - (cost of insecticide seed treatment)]

Treatment means for nematicide (% yield of the control and dollar return over the insecticide seed treatment) were calculated across all trials regardless of final nematode counts. These values were also calculated specifically for

trials where final nematode counts were described as "low" (less than 200 root-knot nematode juveniles/100cc of soil), "moderate" (200-500 root-knot nematode juveniles/100cc of soil), "high" (500-750 root-knot nematode juveniles/100cc of soil) and "very high" (greater than 750 root-knot nematode juveniles/100cc of soil). Standard deviation was calculated for each mean and treatment means were only compared for trials where each treatment was included. For example, Temik 15G was present in 24 of 24 trials described here; however it was only compared to AVICTA Complete Cotton in 19 of 24 Trials.

Results and Discussion

The efficacy of a nematicide to manage root-knot nematodes was assessed in three ways in this study. Efficacy was assessed as the ability to reduce early season galling on the developing root system, the ability to increase yield relative to Cruiser or Gaucho Grande, and the ability to provide greater economic return to the grower.

The results from trials where roots were rated for gall damage are presented in Table 3. Use of Temik 15G, 5 lb/A, typically resulted in less root galling on the roots than did AVICTA Complete Cotton or AERIS Seed-Applied System. Telone II, only assessed in one trial, provided the greatest relative reduction in root galling. Based upon these data, Temik 15G provided better early-season control of the southern root-knot nematode than did AVICTA Complete Cotton or AERIS Seed-Applied System.

Relative yield (% lint yield of control) and relative value measured as $/A return to the grower (value of lint yield – cost of nematicide treatment) compared to the control are presented in Tables 4-8. Results from Table 4 were calculated across all trials without consideration for final nematode count. Results from Tables 5-8 were calculated for populations of root-knot nematodes arbitrarily designated as "low", "moderate", "high", and "very high", respectively.

The first observations from Tables 4-8 are that there was tremendous variability in the data from these field trials. For example, differences between a nematicide treatment and the control (100% of relative yield and 0 $/A for value) is often within the measure of standard deviation. Also, though numerical differences between treatments, e.g. Temik 15G, 5 lb/A, and AVICTA Complete Cotton, are common across categories, these differences typically are within one standard deviation of each other. Such variability makes it impossible to accept that observed differences are statistically significant at the 95% or even 90% confidence interval. However, we believe that the results presented here have true importance to the cotton grower because a) the data was collected over a number of years in many studies, b) because most of the data was collected in large commercial fields, and c) the numeric trends in yield and value are dramatic and consistent.

From the results presented in Table 4 across nematode populations, it appears that Telone II, 3 gal/A, and Temik 15G, 5 lb/A, consistently provided the best value to the grower. The economic value of Telone II and Temik 15G to the growers may be offset to some degree by the convenience of a seed treatment such as AVICTA Complete Cotton or AERIS Seed-Applied System (the magnitude of perceived value will vary from grower to grower). However, the cotton grower should consider the potential economic gain in use of Telone II or Temik 15G and contrast it with the convenient use of a seed treatment nematicide or perhaps Temik 15G alone rather than Telone II. From Table 4, it also appeared that there was little to be gained for the grower by applying Temik 15G at any rate other than 5 lb/A, or by the additional application of Vydate C-LV or a side-dress application of Temik 15G.

Somewhat surprisingly, the basic trends observed for analysis across all final nematode counts continued when populations were described as "low", "moderate", "high", and "very high". Telone II typically provided the best yields and return to the grower; Temik 15G, 5 lb/A, provided better yields and better economic returns than did the seed treatments or different rates of Temik or use of Vydate or a side-dressed Temik application.

It is important to note that the nematode populations in this study were arbitrarily described as "low" to "very high" based upon final nematode counts from soil collected at harvest. Nematode counts from soil samples are a function of the true nematode population, the skill of the nematologist who processes the sample, the care in which the soil sample is collected and transported, and the soil conditions at time of sampling. There is risk that populations that are described as "low" because of low counts may actually have higher populations than were described. For this

reason, it will remain critical in studies such as this to continue to compare efficacy of Temik 15G to AVICTA Complete Cotton and AERIS Seed-Applied System in fields with lower pressure from nematodes where would expect the best performance from a seed treatment.

Because there were fewer trials where AERIS Seed-Applied System, Temik 15G, 7 lb/A, and Vydate C-LV were included, it is more difficult draw conclusions about these treatments. As similar nematicide studies are conducted in the future, additional data will be accumulated for these treatments.

Conclusion

From the data presented in this study, better early season control of the southern root-knot nematode, as measured by level of root galling, occurs when a grower uses Temik 15G rather than AVICTA Complete Cotton or AERIS Seed-Applied System. Growers in this study were likely to see the best economic returns when using either Telone II, 3 gal/A, or Temik 15G, 5 lb/A. However, there was such variability in the data that it is not possible to make the previous statement with statistical confidence at the 90% or 95% level. In individual trials included in this report, it was possible that any treatment could out yield any other treatment. Unfortunately, this is the "curse" of nematicide trials, especially in a commercial setting. However, the true importance of this study is that it demonstrates dramatic benefits for the grower from the use of Temik 15G, 5 lb/A, and Telone II across a number of trials, nematode populations, and environmental conditions.

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Table 1. Characteristics of fields sites used in study of nematicides and cotton.

County	Site	Year	Soil type	Reps[z]	Irrigation	Nematode	Fall Count[y]
Colquitt*	Perryman	2002	Loamy sand	4	No	*M. incognita*	219
Mitchell*	Windhausen	2003	Loamy sand	4	Yes	*M. incognita*	579
Colquitt*	Perryman	2003	Loamy sand	4	Yes	*M. incognita*	476
Colquitt*	Perryman	2004	Loamy sand	4	No	*M. incognita*	189
Coffee-1*	Nugent	2004	Loamy sand	4	Yes	*M. incognita*	167
Tift**	Gibbs Farm	2004	Loamy sand	6	Yes	*M. incognita*	735
Coffee-2*	Nugent	2004	Loamy sand	3	Yes	*M. incognita*	119
Mitchell*	Grogan	2004	Loamy sand	4	---	*M. incognita*	148
Coffee-1*	Nugent	2005	Loamy sand	3	Yes	*M. incognita*	500
Coffee-2*	Nugent	2005	Loamy sand	3	Yes	*M. incognita*	208
Colquitt*	Perryman	2005	Loamy sand	4	No	*M. incognita*	855
Mitchell*	Windhausen	2005	Loamy sand	4	Yes	*M. incognita*	506
Tift**	Gibbs Farm	2005	Loamy sand	6	Yes	*M. incognita*	456
Floyd*	Jordan	2005	Loamy sand	4	No	*M. incognita*	234
Elbert*	Evanson	2005	Loamy sand	4	Yes	*M. incognita*	207
Colquitt*	Perryman	2006	Loamy sand	4	No	*M. incognita*	258
Mitchell*	Windhausen	2006	Loamy sand	4	Yes	*M. incognita*	659
Mitchell**	Rohm & Haas	2006	Loamy sand	4	Yes	*M. incognita*	656
Coffee-1*	Nugent-1	2006	Loamy sand	3	Yes	*M. incognita*	489
Coffee-2*	Nugent-2	2006	Loamy sand	3	Yes	*M. incognita*	391
Colquitt*	Perryman	2007	Loamy sand	4	No	*M. incognita*	253
Mitchell*	Windhausen	2007	Loamy sand	4	Yes	*M. incognita*	396
Evans*	Beasley	2007	Loamy sand	4	Yes	*M. incognita*	816
Tift**	Gibbs	2007	Loamy sand	6	Yes	*M. incognita*	530

*On-farm trials. Plots were 4-10 rows wide by length of field.

**Small-plot trials. Plots were 2-4 rows wide by 25-40 ft in length.

[z]Number of replications in the trial.

[y]Average number of juveniles of *M. incognita*/100 cm^3 soil across treatments in sample collected at harvest.

Table 2. Listing of nematicide treatments included in each trial*.

Site	Variety	Cruiser	Gaucho/ Gaucho Grande	Temik 15G	Temik 15G	Temik 15G	Temik 15G	AVICTA Complete Cotton[z]	AERIS Seed Trt + Trilex[y]	Telone II[x]
		0.34 mg/seed		3.5 lb/A	5.0 lb/A	7.0 lb/A	5 lb/A + 5 lb/A			3 gal/A
Perryman 02	DP 555		X	X	X	X	X			
Perryman 03	DP 555		X	X	X	X	X			X
Perryman 04	DP 555	X		X	X			X		X
Perryman 05	DP 555	X		X	X		X	X		X
Perryman 06	DP 555	X			X		X	X		X
Perryman 07	DP 555	X			X		X	X	X	X
Windhausen 03	DP 555		X	X	X	X	X			X
Windhausen 05	DP 555	X		X	X		X	X		X
Windhausen 06	DP 555	X			X			X	X	X
Windhausen 07	DP 555	X			X		X	X	X	
Grogan 04	DP 555		X		X	X	X			X
Rohm & Haas 06	DP 555	X			X		X	X		
Nugent 04-1	DP 555		X	X	X		X	X		X
Nugent 04-2	DP 555	X			X					
Nugent 05-1	DP 555	X		X	X		X	X		X
Nugent 05-2	DP 555	X			X			X		
Nugent 06-1	DP 555	X			X		X	X		X
Nugent 06-2	DP 555	X			X			X	X	
Gibbs Farm 04	DP 555	X		X	X			X		
Gibbs Farm 05	DP 555		X		X			X		
Gibbs Farm 07	DP 555		X		X			X	X	
Jordan 05	DP 444	X		X	X			X		
Evanson 05	ST 5599	X		X	X		X	X		
Evans 07	DP 555	X			X		X	X	X	X

*Temik 15G, 5 lb/A, + Vydate C-LV, 17 fl oz/A was included at Perryman 02, Windhausen 03, Perryman 03, and Perryman 05.

[z]AVICTA Complete Cotton is composed of Dynasty CST, Cruiser (0.34 mg/seed) and STAN (abamectin, 0.15 mg/seed).

[y]AERIS Seed-Applied System + Trilex contains thiodicarb, imidacloprid, and the Trilex Advanced fungicide treatment (trifloxystrobin, triademinol, and metalaxyl).

[x]Telone II is applied with Cruiser, Gaucho Grande, or Temik 15G, 3.5 lb/A, for control of thrips.

Table 3. Gall ratings* from fields infested with the southern root-knot nematode.

Site	Cruiser	Gaucho Grande	Temik 15G	Temik 15G	AVICTA Comp. Cotton*	Temik 15G	AERIS Seed Treatment	Telone II
	0.34 mg/seed		3.5 lb/A	5.0 lb/A		5 lb/A + 5 lb/A		3 gal/A
Gibbs Farm 2004-2005*	3.9 a		1.6 c	2.15 bc	3.05 ab			
Nugent-2 06	4.0 a			1.3 c	3.3 ab		4.0 a	
Rohm & Haas 06		2.5 abc		2.0 bc	3.5 a			
Coarsey 06	2.5 a			2.0 a	2.0 a		2.25 a	
Gibbs Farm 07	3.0			0.8	3.5		2.5	
Rohm & Haas 07	2.4			1.0	2.2			
Evans County 07	6.5			4.8	6.4	2.8	5.0	1.4
Tift Co. 07				3.4	3.9			

*Galls in 2004-2005 and 2007 rated on a 1-10 scale where 0 = no observed galling, 1 = 10% galling, 2 = 20% galling, etc. Galls in 2006 rated on scale 1-5 based upon 1= no galling and 5= most severe. Gall ratings from Coarsey 06 and Evans 07 were collected mid-season.

** Data from 2004 and 2005 Gibbs Farm trials combined across years as the interaction between years was not significant.

***Means followed by the same letter are not different at $p \leq 0.05$ (Fisher's Protected LSD) at the Gibbs Farm, $p \leq 0.1$ at the Nugent Farm and $p \leq 0.15$ at the Rohm & Haas Farm. Statistics not applied to data from 2007.

Table 4. Results from trials across all final nematode counts (juveniles/100cc of soil).

Treatment	Total Trials[z]			
	Relative yield vs. control[y] (%)	Std Dev	Value above Cruiser or Gaucho[x] ($/A)	Std Dev
24 trials, 417 juveniles/100cc soil[w]				
Temik, 5 lb/A	111.4	14.1	47.90	62.90
11 trials, 410 juveniles/100cc soil				
Temik, 3.5 lb/A	109.4	11.7	22.26	99.65
Temik 5 lb/A	111.1	14.7	39.30	50.04
4 trials, 356 juveniles/100cc soil				
Temik,5 lb/A	107.5	8.7	18.34	20.67
Temik, 7 lb/A	108.7	12.1	12.04	34.82
Temik, 5+5 lb/A	113.3	11.0	18.93	20.72
4 trials, 532 juveniles/100cc soil				
Temik, 5 lb/A	118.2	22.3	50.59	70.52
Temik, 5 lb/A + Vydate C-LV, 17 fl oz/A	108.0	7.6	8.71	16.86
5 trials, 476 juveniles/100cc soil				
Temik, 5 lb/A	109.3	9.6	28.43	24.21
Temik, 5 lb/A+5 lb/A	115.2	14.0	30.73	43.35
Telone II, 3 gal/A, + seed treatment	124.8	12.4	69.16	58.53
10 trials, 458 juveniles/100cc soil				
Temik, 5 lb/A	111.1	14.8	44.67	55.34
Telone II, 3 gla/A, + Temik, 3.5 lb/A	122.6	18.6	75.26	113.23
19 trials, 446 juveniles/100cc soil				
AVICTA Complete Cotton	100.6	6.9	-11.42	36.90
Temik, 5 lb/A	112.4	15.4	54.86	68.76
6 trials, 521 juveniles/100cc soil				
AERIS Seed-Applied System	102.5	11.7	8.86	66.07
AVICTA Complete Cotton	99.0	6.3	-16.80	40.24
Temik, 5 lb/A	116.9	19.5	89.01	95.01
15 trials, 436 juveniles/100cc soil				
Temik, 5 lb/A	111.0	13.5	38.71	48.94
Temik, 5 lb/A+5 lb/A	113.3	12.7	28.84	49.78

[z]In this table, relative percent yields and value above the Cruiser/Gaucho control are calculated across all trials in which specific treatments were evaluated without differentiation based upon final counts of root-knot nematodes.
[y]Relative yield versus control is defined as average of (lint yield of treatment/lint yield of control) x 100%.
[x]Value above Cruiser or Gaucho control is defined as average of (value of lint yield of treatment – value of lint for Cruiser or Gaucho control in same study).
[w]Number of field trials included in analysis and average final nematode count for these trials.

Table 5. Results from field trials where average final nematode counts were below 200 juveniles per 100cc of soil.

Treatment	Low Nematode Count			
	Relative yield vs. control[y] (%)	Std Dev	Value above Cruiser or Gaucho[x] ($/A)	Std Dev
4 trials, 156 juveniles/100cc soil				
Temik, 5 lb/A	109.1	4.8	34.94	23.56
2 trials, 178 juveniles/100cc soil				
Temik, 3.5 lb/A	108.1	13.7	36.42	63.29
Temik 5 lb/A	110.8	7.3	41.42	37.83
1 trials, 148 juveniles/100cc soil				
Temik,5 lb/A	106.0	NA	22.82	NA
Temik, 7 lb/A	104.4	NA	9.38	NA
Temik, 5+5 lb/A	105.9	NA	2.72	NA
0 trials				
Temik, 5 lb/A				
Temik, 5 lb/A + Vydate C-LV, 17 fl oz/A				
0 trials				
Temik, 5 lb/A				
Temik, 5+5 lb/A				
Telone II, 3 gal/A, + seed treatment				
3 trials, 168 juveniles/100cc soil				
Temik, 5 lb/A	109.2	5.9	35.28	28.84
Telone II, 3 gal/A, + Temik, 3.5 lb/A	123.0	13.1	64.46	62.00
2 trials, 178 juveniles/100cc soil				
AVICTA Complete Cotton	103.9	13.2	0.78	53.81
Temik, 5 lb/A	110.8	7.3	41.52	37.83
0 trials				
AERIS Seed-Applied System				
AVICTA Complete Cotton				
Temik, 5 lb/A				
2 trials, 158 juveniles/100cc soil				
Temik, 5 lb/A	111.0	7.1	44.54	32.15
Temik, 5+5 lb/A	114.9	12.7	44.01	58.39

[z]In this table, relative percent yields and value above the Cruiser/Gaucho control are calculated across all trials in which specific treatments were evaluated where final counts of root-knot nematodes were less than 200 juveniles/100cc of soil.

[y]Relative yield versus control is defined as average of (lint yield of treatment/lint yield of control) x 100%.

[x]Value above Cruiser or Gaucho control is defined as average of (value of lint yield of treatment – value of lint for Cruiser or Gaucho control in same study).

[w]Number of field trials included in analysis and average final nematode count for these trials.

Table 6. Results from field trials where final nematode counts were between 200 and 500 juveniles per 100cc of soil.

Treat	Moderate Nematode Count			
	Relative yield vs. control[y] (%)	Std Dev	Value above Cruiser or Gaucho[x] ($/A)	Std Dev
11 trials, 323 juveniles/100cc soil[w]				
Temik, 5 lb/A	108.8	9.3	39.25	48.71
4 trials, 284 juveniles/100cc soil				
Temik, 3.5 lb/A	106.2	7.9	26.23	33.58
Temik 5 lb/A	106.1	9.8	21.39	30.07
2 trials, 347 juveniles/100cc soil				
Temik,5 lb/A	110.8	13.2	22.11	32.99
Temik, 7 lb/A	116.9	11.6	35.53	23.69
Temik, 5+5 lb/A	120.4	12.6	31.86	24.47
2 trials, 347 juveniles/100cc soil				
Temik, 5 lb/A	110.8	13.2	22.11	32.99
Temik, 5 lb/A + Vydate C-LV, 17 fl oz	112.0	10.3	17.42	23.32
3 trials, 329 juveniles/100cc soil				
Temik, 5 lb/A	112.0	12.2	32.50	29.21
Temik, 5+5 lb/A	122.7	13.2	54.32	38.42
Telone II, 3 gal/A + seed treatment	132.9	3.6	92.09	58.00
2 trials, 487 juveniles/100cc soil				
Temik, 5 lb/A	107.5	8.5	45.17	106.54
Telone II, 3 gal/A + Temik, 3.5 lb/A	129.4	11.3	65.61	15.73
9 trials, 318 juveniles/100cc soil				
AVICTA Complete Cotton	99.6	4.5	-17.05	33.52
Temik, 5 lb/A	108.4	9.2	43.06	52.34
2 trials, 301 juveniles/100cc soil				
AERIS Seed-Applied System	100.4	3.6	-0.96	0.81
AVICTA Complete Cotton	100.5	1.4	-3.67	10.90
Temik, 5 lb/A	112.9	12.6	74.15	33.95
7 trials, 330 juveniles/100cc soil				
Temik, 5 lb/A	109.7	10.5	30.04	39.56
Temik, 5+5 lb/A	115.4	14.0	29.60	43.33

[z]In this table, relative percent yields and value above the Cruiser/Gaucho control are calculated across all trials in which specific treatments were evaluated where final counts of root-knot nematodes were between 200 and 500 juveniles/100cc of soil.

[y]Relative yield versus control is defined as average of (lint yield of treatment/lint yield of control) x 100%.

[x]Value above Cruiser or Gaucho control is defined as average of (value of lint yield of treatment – value of lint for Cruiser or Gaucho control in same study).

[w]Number of field trials included in analysis and average final nematode count for these trials.

Table 7. Results from field trials where final nematode counts were between 500 and 750 juveniles per 100cc of soil.

Treatment	High Nematode Count			
	Relative yield vs. control[y] (%)	Std Dev	Value above Cruiser or Gaucho[x] ($/A)	Std Dev
6 trials, 572 juveniles/100cc soil[w]				
Temik, 5 lb/A	112.1	20.6	57.92	102.54
3 trials, 528 juveniles/100cc soil				
Temik, 3.5 lb/A	110.1	20.3	63.65	134.97
Temik 5 lb/A	105.6	9.4	29.79	63.01
1 trials, 579 juveniles/100cc soil				
Temik,5 lb/A	102.3	NA	6.31	NA
Temik, 7 lb/A	96.4	NA	-32.29	NA
Temik, 5+5 lb/A	106.4	NA	9.31	NA
1 trial, 579 juveniles/100cc soil				
Temik, 5 lb/A	102.3	NA	6.31	NA
Temik, 5 lb/A + Vydate C-LV, 17 fl oz/A	102.5	NA	-1.81	NA
1 trial, 579 juveniles/100cc soil				
Temik, 5 lb/A	102.3	NA	6.31	NA
Temik, 5+5 lb/A	106.4	NA	9.31	NA
Telone II, 3 gal/ + Seed treatment	105.7	NA	-4.16	NA
3 trials, 561 juveniles/100cc soil				
Temik, 5 lb/A	104.8	7.9	24.68	52.45
Telone II, 3 gal/A, + Temik, 3.5 lb/A	117.0	28.1	72.11	186.9
5 trials, 570 juveniles/100cc soil				
AVICTA Complete Cotton	103.0	2.6	7.61	17.58
Temik, 5 lb/A	114.0	22.4	68.24	111.10
2 trials, 594 juveniles/100cc soil				
AERIS Seed-Applied System	114.0	10.5	66.00	42.14
AVICTA Complete Cotton	102.9	0.3	5.39	5.72
Temik, 5 lb/A	127.3	35.2	129.19	169.46
4 trials, 560 juveniles/100cc soil				
Temik, 5 lb/A	104.5	8.0	22.28	53.59
Temik, 5 lb/A+5 lb/A	107.5	10.7	21.29	71.45

[z]In this table, relative percent yields and value above the Cruiser/Gaucho control are calculated across all trials in which specific treatments were evaluated final counts of root-knot nematodes averaged between 500 and 750 juveniles/100cc of soil.

[y]Relative yield versus control is defined as average of (lint yield of treatment/lint yield of control) x 100%.

[x]Value above Cruiser or Gaucho control is defined as average of (value of lint yield of treatment – value of lint for Cruiser or Gaucho control in same study).

[w]Number of field trials included in analysis and average final nematode count for these trials.

Table 8. Results from field trials where final nematode counts were above 750 juveniles per 100cc of soil.

Treatment	Very High Nematode Count			
	Relative yield vs. control[y] (%)	Std Dev	Value above Cruiser or Gaucho[x] ($/A)	Std Dev
3 trials, 802 juveniles/100cc soil[w]				
Temik, 5 lb/A	122.5	23.03	76.86	64.93
2 trials, 795 juveniles/100cc soil				
Temik, 3.5 lb/A	116.0	5.7	57.67	6.84
Temik 5 lb/A	129.7	27.4	96.12	78.79
0 trials				
Temik,5 lb/A				
Temik, 7 lb/A				
Temik, 5 lb/A +5 lb/A				
1 trial, 855 juveniles/100cc soil				
Temik, 5 lb/A	149.1	13.2	151.83	NA
Temik, 5 lb/A + Vydate C-LV, 17 fl oz/A	105.5	10.3	1.83	23.32
1 trial, 816 juveniles/100cc soil				
Temik, 5 lb/A	108.2	NA	38.36	NA
Temik, 5+5 lb/A	101.4	NA	-18.63	NA
Telone II, 3 gal/A + seed treatment	119.8	NA	73.68	NA
1 trial, 855 juveniles/100cc soil				
Temik, 5 lb/A	149.1	NA	151.83	NA
Telone II, 3 gal/A, + Temik, 3.5 lb/A	129.7	NA	57.63	NA
3 trials 802 juveniles/100cc soil				
AVICTA Complete Cotton	97.4	14.4	-34.37	60.86
Temik, 5 lb/A	122.5	23.0	76.86	64.93
1 trial, 816 juveniles/100cc soil				
AERIS Seed-Applied System	86.2	NA	-85.80	NA
AVICTA Complete Cotton	86.4	NA	-87.47	NA
Temik, 5 lb/A	108.2	NA	38.35	NA
2 trials, 836 juveniles/100cc soil				
Temik, 5 lb/A	128.6	28.9	95.09	80.23
Temik, 5 lb/A +5 lb/A	115.8	20.3	26.07	63.21

[z]In this table, relative percent yields and value above the Cruiser/Gaucho control are calculated across all trials in which specific treatments were evaluated where final counts of root-knot nematodes were greater than 750 juveniles/100cc of soil.

[y]Relative yield versus control is defined as average of (lint yield of treatment/lint yield of control) x 100%.

[x]Value above Cruiser or Gaucho control is defined as average of (value of lint yield of treatment – value of lint for Cruiser or Gaucho control in same study).

[w]Number of field trials included in analysis and average final nematode count for these trials.