ROOT-KNOT AND RENIFORM NEMATODE SUPPRESSION WITH SELECTED NEMATICIDES IN ARKANSAS

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Abstract

Small plot studies were conducted on two fields on typical grower farms, one with root-knot and one with reniform nematode. One treatment, Temik (aldicarb) applied at a rate of 5.0 lb product per acre with an additional 5.0 lb applied at either 4 weeks after planting or at the pinhead square stage was the highest yielding treatment in both studies. The same results were found the previous year on similar studies. Also, eight large block studies comparing Temik sidedress at 5.0 lb per acre compared to no treatment were conducted. Results indicated a significant yield increase for sidedressed plots compared to the untreated plots.

Introduction

Nematode severity in Arkansas, although not as great as 1998, proved to be increasing throughout the state. Root-Knot nematode (RKN), *Meloidogyne incognita*, and reniform nematode, *Rotylenchulus reniformis*, were diagnosed on many grower fields for the first time in 1999. Cotton yields were reduced through much of the state due to environmental stress and nematodes made a bad situation worse for many growers. Also, this was a year that experienced one of the most severe thrips infestations on cotton in many years. The objectives of these studies were to evaluate various rates and timings of selected nematicides for suppression of root-knot and reniform nematode in typical grower fields, and to evaluate the efficacy of these compounds for control of thrips.

Materials and Methods

RKN and Reniform Studies

The studies were conducted on typical grower fields in Jefferson County, AR (RKN), and Monroe County, AR (reniform). The test design for both studies was a randomized complete block design with four replications. Plot size was four rows, 50 ft long on 38 in spacing. The cultivar PM 1560 BG was planted May 10 (RKN) and May 12 (reniform). In-furrow (IF) liquid formulations were applied through a single nozzle spray nozzle positioned to spray into the open seed furrow delivering 13.25 gpa. Granular IF treatments were applied with insecticide boxes on the planter. Sidedress granular applications were made with a coulter rig at pinhead to match head square stage. Sidedress liquid applications were made via nitrogen applications with a "knifing" rig. Nematode samples were collected at planting, mid-season, and at harvest. Thrips quantifications were determined by cutting 10 plants at the soil line, washing plants in soapy water, and vacuum filtering the solution to collect thrips. Visual damage ratings for thrips were made June 1 (RKN) and June 3 (reniform) using a scale of 1 to 5, with 1 being no damage and 5 being defoliation. Plots were machine harvested on October 5 (RKN) and October 26 (reniform).

Large Block Study

Eight large block studies were conducted in five counties to evaluate the effect of Temik (aldicarb) sidedressed to cotton. Of the eight locations the Cornerstone #1 (Jefferson Co.), Crittenden, Jefferson, and Mississipi Co. fields were known to have root-knot nematode infestations. The Cornerstone #2 field (Jefferson Co.) represented the only field with a reniform infestation. Desha #1 and Desha #2 as well as the Poinsett Co. fields had no nematode infestation. Fields designated as non-nematode fields all had in-furrow applications of Temik at 3.5 lb of product per acre. All nematode infested fields had an in-furrow application application of Temik at 5.0 lb of product per acre. At pinhead to match head square stage plots were set out in a simple paired comparison design with treated plots receiving 7.5 lb of product per acre on non-nematode fields and 5.0 lb of product per acre on nematode fields. Each location had four replications of treated and untreated plots. Each plot was sampled for nematodes prior to application, 2-4 weeks post application and at harvest. Each plot was machine harvested for yield comparisons. Yields were subjected to analysis and mean separation for each location. All locations were then pooled and analyzed.

Results

RKN Study

All treatments significantly reduced the number of thrips compared to the untreated check (Table 1). Damage ratings were variable across treatments but were significantly better than the untreated check. Root-knot nematodes were present in all plots at planting. Nematode numbers were not different among treatments at mid-season. Nematode numbers increased greatly by harvest and although some differences were observed nematode counts were high for all treatments. All treatments with the exception of Temik at 5.0 lb/ A IF resulted in significantly higher yields than the untreated check. The highest yielding treatment was Temik applied at 5.0 lb/ A IF followed by 5.0 lb sidedressed at pinhead square and was significantly better than Gaucho (imidicloprid) alone, Temik at 5.0 lb/ A, Gaucho IF plus 5.0 lb Temik at pinhead square, and the untreated control. The treatment of Admire 2F (imidicloprid) at 3.2 oz/A IF at planting resulted in cotton yields that were higher than application of Gaucho alone or Temik at 5.0 lb/A IF at planting.

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Reniform Study

All treatments significantly reduced the number of thrips compared to the untreated check except for the foliar application of Orthene (acephate) at 0.25 lb/ A (Table 2). Thrips damage ratings were significantly lower than the untreated check or foliar orthene treatment. Nematode population densities varied among plots and treatments at planting, however all plots had detectable levels of reniform nematode. Reniform nematode numbers increased or declined very little in most plots at mid-season. However, nematode numbers increased greatly at crop harvest. No significant differences in nematode numbers among treatments were detected at mid-season or harvest. All treatments resulted in significantly higher yields compared to the untreated check. Temik at 5.0 lb/A IF followed by 5.0lb sidedressed at pinhead square, Admire at 3.2 oz/A IF, and Temik at 3.5 lb/A IF had significantly higher yields than the foliar Orthene at 0.25 lb/A.

Large Block Study

Of the eight locations, Cornerstone #2 (reniform), Crittenden (RKN), Desha #2, Mississippi (RKN), and Poinsett (no nematodes) showed significant yield increases at various confidence intervals with a sidedress application of Temik (Table 3). The Cornerstone #1 (RKN), Desha #2 (no nematodes), and the Jefferson (RKN) locations indicated no significant yield difference between the treated and untreated plots. When all locations were pooled the treated plots averaged 911.5 lb of lint cotton per acre compared to the untreated plots which averaged 869.6 lb of lint cotton per acre, resulting in a significant yield increase of 41.9 lb of lint per acre for the sidedress treatment.

Table 1. Control of thrips and suppression of root-knot nematodewith selected pesticides and impact on yield. Jefferson Co., AR. 1999.

	Thrips		Root-knot / 500 cc soil			
Trt. and rate/A	No./10 plant	Damage rating[1]	4 May	28 June	21 Sept.	SC (lb/A)
Temik 5.0 lb IF[2] + 5.0 lb SD[3]	4	1.1	255	312	5341	3516
Admire 3.2 oz IF	16	0.9	511	256	5341	3356
Temik 5.0 lb IF + 5.0 lb SD[4]	5	1.5	284	426	2983	3274
Gaucho 8 oz cwt[5] + Nemacur 3 1 Qt SD[4]	29	1.6	596	426	10398	3169
Di-Syston 6.5 lb IF	6	2.0	710	113	5256	3147
Admire 2.4 oz + Nemacur 3 1 Qt IF	10	2.0	823	284	5341	3111
Temik 3.5 lb IF	9	1.6	738	454	5028	2975
Gaucho 8 oz cwt[5]+ Temik 5.0 lb SD	24	2.2	710	483	5227	2921
Gaucho 8 oz cwt[5]	17	1.6	625	340	4829	2750
Temik 5.0 lb IF	4	1.2	1335	255	5653	2380
Control	321	4.6	568	454	6761	1868
LSD (P=0.05)	41	0.7	964	ns	3692	546

[1]Damage rating scale 1-5 where 1=no foliar damage, 5= defoliation.
[2] IF=in-furrow application at planting.
[3]SD=sidedress application at 4 weeks after planting.
[4]SD=sidedress application at pinhead square.
[5]Gaucho 480 applied at 8 oz/ 100 lb of seed.

Table 2. Control of thrips and suppression of reniform nematode with selected pesticides and impact on yield. Monroe Co., AR. 1999.

	Thrips		Root-knot / 500 cc soil			
Trt. and rate/A	No./10 plant	Damager ating[1]	12 May	29 June	21 Sept.	SC (lb/A)
Temik 5.0 lb IF[2] + 5.0 lb SD[3]	6.8	1.6	1392	1279	18977	2312
Admire 3.2 oz IF	39.8	2.5	1534	1250	16818	2183
Temik 3.5 lb IF	8.0	1.9	1818	1193	22216	2181
Temik 7.0 lb IF	8.5	1.6	6023	2046	19204	2159
Gaucho 8 oz cwt[5]	53.5	3.2	1222	2841	27329	2118
Gaucho 8 oz cwt[5]+ Temik 5.0 lb SD[4]	45.5	2.9	4375	3352	25852	2016
Temik 5.0 lb IF	23.8	1.5	2841	3296	13181	1993
Admire 2.4 oz + Nemacur 3 1 Qt IF	19.5	2.4	1620	1705	19261	1978
Di-Syston 6.5 lb IF	20.5	3.1	2955	2671	18182	1871
Orthene .25 lb[6]	172.0	4.2	1051	2131	13977	1686
Control	180.5	4.7	1903	2955	19886	1121
LSD (P=0.05)	48.2	0.7	2690	2672	14931	441

[1]Damage rating scale 1-5 where 1=no foliar damage, 5= defoliation.
[2] IF=in-furrow application at planting.
[3]SD=sidedress application at 4 weeks after planting.
[4]SD=sidedress application at pinhead square.
[5]Gaucho 480 applied at 8 oz/ 100 lb of seed.
[6]Foliar application

Table 3. Large block study of Temik sidedressed at pinhead to match head square. AR. 1999.

Location/ Nematode[1]		Treatment[2]	Lint Yield[3]	LSD	∝ level
Cornerstone #1	(RKN)	Treated	927.8 a	110.45	ns[4]
		Untreated	899.8 a		
Cornerstone #2	(RNF)	Treated	1011.5 a	13.36	0.20
		Untreated	993.5 b		
Crittenden	(RKN)	Treated	577.2 a	86.86	0.10
		Untreated	487.9 b		
Desha #1	(None)	Treated	1142.8 a	71.67	0.20
		Untreated	1069.2 b		
Desha #2	(None)	Treated	1228.8 a	97.49	ns[4]
		Untreated	1234.9 a		
Jefferson	(RKN)	Treated	1064.9 a	37.81	ns[4]
		Untreated	1079.2 a		
Mississippi	(RKN)	Treated	846.9 a	84.53	0.20
		Untreated	751.9 b		
Poinsett	(None)	Treated	492.3 a	28.70	0.05
		Untreated	440.3 b		
Mean for all locations		Treated	911.5 a	23.61	0.05
		Untreated	869.6 b		

[1]RKN=root-knot nematode; RNF=reniform nematode; none=no nematodes.
[2]All fields with nematodes received 5.0 lb of Temik in-furrow at planting and treated plots received a sidedress application of an additional 5.0 lb of Temik at pinhead to match head square stage. Fields with no nematodes were treated with Temik at 3.5 lb/ A in-furrow at planting and an additional application of 6.5 lb/A at pinhead to match head square stage.

[3]Means within a location and column followed by the same letter are not significantly different at ∝ levels of 0.05, 0.1, and 0.2.
[4]ns=means not significantly different at all alpha (∝) levels tested.