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

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RESEARCH PROBLEM

In recent years, surveys have indicated that an increasing percentage of fields are infested with either the root-knot nematode or reniform nematode. A survey of Jefferson County indicated over one-half of all fields are infested with these plant parasitic nematodes.

BACKGROUND INFORMATION

Nematode severity in Arkansas in 1999, although not as great as in 1998, proved to be increasing throughout the state. Root-knot nematode (RKN), *Meloidogyne incognita*, and reniform nematode, *Rotylenchulus reniformis*, were diagnosed in 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, one of the most severe thrips infestations occurred on cotton in 1999 compared to previous years. The objectives of these studies were to evaluate various rates and timings of selected nematicides for suppression of RKN and reniform nematode in typical grower fields and to evaluate the efficacy of these compounds for control of thrips.

RESEARCH DESCRIPTION

RKN and Reniform Studies

The studies were conducted on typical grower fields in Jefferson County (RKN), and Monroe County (reniform). The test design for both studies was a randomized complete block with four replications. Plot size was four rows spaced 38 inches apart and 50 ft in length. The cultivar PM 1560 BG was planted 10 May (RKN) and 12 May (reniform). In-furrow (IF) liquid formulations were applied through a single nozzle positioned to spray into the open seed furrow and deliver 13.25 gal/acre. Granular IF

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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 were quantified by collecting the whole above-ground portion of 10 plants, washing the plants in soapy water, and vacuum-filtering the solution to collect thrips. Thrips damage was visually rated on 1 June (RKN) and 3 June (reniform) on the basis of a 1 to 5 scale, with 1 = no damage and 5 = defoliation. Plots were machine-harvested on 5 October (RKN) and 26 October (reniform) 1999.

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 County), Crittenden, Jefferson, and Mississipi county fields were known to have RKN infestations. The Cornerstone #2 field (Jefferson County) was the only field with a reniform infestation. Desha #1 and Desha #2 as well as the Poinsett County fields had no nematode infestation. Fields designated as non-nematode fields all had IF applications of Temik at 3.5 lb/acre. All nematode-infested fields had an IF application application of Temik at 5.0 lb/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/acre on non-nematode fields and 5.0 lb/acre on nematode fields. Each location had four replications of treated and untreated plots. Each plot was sampled for nematodes prior to Temik application, 2-4 wk after Temik 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/acre IF resulted in significantly higher yields than the untreated check. The highest yielding treatment was Temik applied at 5.0 lb/acre IF followed by 5.0 lb sidedressed at pinhead square, and this was significantly better than Gaucho (imidicloprid) alone, Temik at 5.0 lb/acre, Gaucho IF plus 5.0 lb Temik at pinhead square, and the untreated control. The treatment of Admire 2F (imidicloprid) at 3.2 oz/acre IF at planting resulted in cotton yields that were higher than application of Gaucho alone or Temik at 5.0 lb/acre IF at planting.

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/acre (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/acre IF followed by 5.0 lb sidedressed at pinhead square, Admire at 3.2 oz/acre IF, and Temik at 3.5 lb/acre IF had significantly higher yields than the foliar Orthene at 0.25 lb/acre.

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 Jefferson County (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 lint cotton/acre compared to the untreated plots, which averaged 869.6 lb lint cotton/acre, resulting in a significant yield increase of 41.9 lb lint/acre for the sidedress treatment.

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

	Thrips		Root-knot			Seed-cotton
Trt. and Rate	No.	Damage rating[z]	4 May	28 June	21 Sept	yield
rate/acre	No./10 plt		----------	No./500 cc soil	----------	lb/acre
Temik 5.0 lb IF[y] + 5.0 lb SD[x]	4.0	1.1	255	312	5341	3516
Admire 3.2 oz IF	16.0	0.9	511	256	5341	3356
Temik 5.0 lb IF + 5.0 lb SD[w]	5.0	1.5	284	426	2983	3274
Gaucho 8 oz cwt[v] + Nemacur 3 1 Qt SD[w]	29.0	1.6	596	426	10398	3169
Di-Syston 6.5 lb IF	6.0	2.0	710	113	5256	3147
Admire 2.4 oz + Nemacur 3 1 Qt IF	10.0	2.0	823	284	5341	3111
Temik 3.5 lb IF	9.0	1.6	738	454	5028	2975
Gaucho 8 oz cwt[v] + Temik 5.0 lb SD	24.0	2.2	710	483	5227	2921
Gaucho 8 oz cwt[v]	17.0	1.6	625	340	4829	2750
Temik 5.0 lb IF	4.0	1.2	1335	255	5653	2380
Control	321.0	4.6	568	454	6761	1868
LSD (0.05)	41.0	0.7	964	NS	3692	546

[z] Damage rating scale 1-5 where 1=no foliar damage, 5= defoliation.
[y] IF = in-furrow application at planting.
[x] SD = sidedress application at 4 weeks after planting.
[w] SD = sidedress application at pinhead square.
[v] 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			Seed-cotton
Trt. and Rate	No.	Damage rating[z]	12 May	29 June	21 Sept	yield
rate/acre	No./10 plt		----------	No./500 cc soil	----------	lb/acre
Temik 5.0 lb IF[y] + 5.0 lb SD[x]	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[w]	53.5	3.2	1222	2841	27329	2118
Gaucho 8 oz cwt[w] + Temik 5.0 lb SD[v]	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[u]	172.0	4.2	1051	2131	13977	1686
Control	180.5	4.7	1903	2955	19886	1121
LSD (0.05)	48.2	0.7	2690	2672	14931	441

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

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

Location/ Nematode[z]	Treatment[y]	Lint Yield[x]	LSD	α level
Cornerstone #1 (RKN)	Treated	927.8 a	110.45	ns[w]
	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[w]
	Untreated	1234.9 a		
Jefferson (RKN)	Treated	1064.9 a	37.81	ns[w]
	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		

[z] RKN = root-knot nematode; RNF = reniform nematode; none=no nematodes.

[y] 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/acre in-furrow at planting and an additional application of 6.5 lb/acre at pinhead to match head square stage.

[x] 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.

[w] ns = means not significantly different at all alpha (α) levels tested.