2010 EVALUATION OF CULTIVAR TOLERANCE AND CHEMICAL MANAGEMENT OF SOUTHERN ROOT-KNOT NEMATODES

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Abstract

The southern root-knot nematode, *Meloidogyne incognita*, is an economically important parasite of cotton in Gaines County, Texas. The objectives of this research were to evaluate the performance of Stoneville (ST) 5458B2RF and Fibermax (FM) 9180 B2F planted in conjunction with Aeris, Temik 15G at 5.5 lbs/ac, Temik 15G at 7.5lbs/ac, or Temik 15G at 5.5lbs/ac plus a foliar application of Vydate C-LV at the third grown square. Adult and immature thrips whole plant counts, *M. incognita* gall counts, and nematode counts per 500cm^3 soil provided further information on the impact of root-knot nematodes. Plots were machine harvested and yield, gin turnout, fiber quality, and economics of treatments were determined. Root galls caused by *M. incognita,* were decreased with the use of 5.5 lbs and 7.5 lbs per acre of Temik 15G (22 and 27 galls/root system), but not by Aeris (40 galls/root) or the untreated check (36 galls/plant). Root-knot nematode population density was affected by cultivar. FM 9180B2F had 3083 and ST 5458B2RF had 1176 root-knot/500 cm^3 soil), but was not affected by chemical treatments. Net value was $219/acre higher when ST 5458B2RF was planted rather than FM 9180B2F, and was not affected by chemical treatments. Based on these results, planting tolerant varieties was the most economical and effective method in the management of root-knot nematodes.

Introduction

The southern root-knot nematode, *Meloidogyne incognita*, is an economically important parasite of cotton in Gaines County, Texas. Higher populations of this pest tend to occur in sandier fields that have had consecutive cotton crops and very little rotation to a non-host, such as peanuts (Kirkpatrick, 2001). Management decisions are dependent on the level of nematode infestation and the estimated nematode-induced yield loss (Kirkpatrick, 2001). Planting partially resistant cultivars is one of the most effective tools in managing this pest (Zhou et al., 2003). Temik 15G applied in-furrow at planting followed by a foliar application of Vydate C-LV has increased cotton lint yields (Siders, 2008). Seed treatments are another option for the management of nematodes. Therefore, cotton production may be optimized by planting partially resistant cotton cultivars in conjunction with the use of seed treatments or Temik 15G. The objectives of this study were to evaluate the impact of two cotton cultivars planted in conjunction with chemical treatments on southern root-knot nematode populations, and to compare net returns between cultivars, chemicals, and their interaction.

Materials and Methods

The on-farm trial was conducted in Gaines County, TX in 2010 in a field with the 6 year crop history of cotton followed by peanuts, followed by four years of cotton. The field's soil was 93% sand, 3% silt, and 4% clay. The trial was planted on 4 May. Plots had 40-inch row spacing and were center-pivot irrigated. Plots were 8-rows wide by 400 ft. in length and were arranged in a randomized complete block design with 3 replications. See *Table 1* for a complete list of treatments. The number of adult and immature thrips were counted by visually inspecting 10 whole plants per plot on 3 June and 9 June. The number of galls caused by *M. incognita* were counted by visually inspecting 10 plant roots per plot on 9 June. Soil samples were taken on 6 August and assayed for *M. incognita*. The trial was harvested on 11 October. All plots were weighed separately using a Lee weigh wagon. Burr cotton grab samples were taken from each plot. All grab samples were weighed and ginned using a sample gin with a lint cleaner, burr extractor and stick machine. Ginned lint was weighed and lint and seed turnouts were calculated. Lint and seed yields were determined by multiplying the respective turn-out by field plot weights. Lint samples were collected for fiber quality analysis. Fiber analysis was conducted by the Texas Tech University Fiber & Biopolymer

Research Institute, and CCC lint loan values were determined for each plot. Total value was calculated by multiplying lint loan value by lint yield. Net value was determined by subtracting chemical cost from the total value. Statistical analysis of data was conducted using the MIXED procedure in SAS version 9.1 (SAS Institute, Cary, NC) with the Satterthwaite option for determining degrees of freedom, and the PDIFF option for comparing treatment mean estimates..

Table 1. Treatments

ST 5458B2RF[1] Untreated
ST 5458B2RF[1] & Aeris seed treatment (insecticide & nematicide)
ST 5458B2RF[1] & 5.5 lbs/acre of Temik 15G[2]
ST 5458B2RF[1] & 7.5 lbs/acre of Temik 15G[2]
ST 5458B2RF[1] & 5.5 lbs/acre of Temik 15G[2] & Vydate C-LV[3]
FM 9180B2F[1] Untreated
FM 9180B2F[1] & Aeris seed treatment (insecticide & nematicide)
FM 9180B2F[1] & 5.5 lbs/acre of Temik 15G[2]
FM 9180B2F[1] & 7.5 lbs/acre of Temik 15G[2]
FM 9180B2F[1] & 5.5 lbs/acre of Temik 15G[2] & Vydate C-LV[3]

[1] Trilex Advance (fungicide) seed treatment was applied to all seed
[2] Temik 15G was applied in-furrow at planting. Temik boxes were calibrated prior to planting the trial.
[3] Vydate C-LV was applied in a band at a rate of 17 oz per acre on 4 June

Results and Discussion

Root galls caused by *M. incognita,* were decreased with the use of 5.5 lbs and 7.5 lbs per acre of Temik 15G, but not by Aeris as compared with the untreated check (*Table 3*). Cultivar did not affect gall number (*Table 2*). Root-knot nematode population density was affected by cultivar (*Table 2*), but was not affected by chemical treatments (*Table 3*). Thrips was not a limiting factor since treatments never reached the thrips threshold of 1 per true leaf (*Table 3*).

Table 2. Average number of root galls caused by *Meloidogyne incognita* on 9 June and average number of *M. incognita* per 500 cm^3 soil on 6 August by cultivar

Cultivar	Average No. of Galls	Average No. of root-knot nematodes
FM 9180B2F	32.4	3083
ST 5458B2RF	27.4	1176
	$P = 0.146$	$P = 0.0081$

Table 3. Average number of root galls caused by *Meloidogyne incognita* on 9 June, average number of *M. incognita* per 500 cm^3 soil on 6 August by chemical, Average number of Thrips by date and chemical

Cultivar	Average No. of Galls	Average No. of root-knot nematodes	Average No. of Thrips 3 June (4 True Leaves)	Average No. of Thrips 9 June (5-6 True Leaves)
Untreated	35.9 ab	2527	0.30 ab	0.07 ab
Aeris	40.2 a	2444	0.07 b	0.00 b
5.5 lbs of Temik 15G	21.7 c	2610	0.64 a	0.12 a
5.5 lbs of Temik 15G + 17 oz Vydate C-LV	26.7 bc	1337	0.60 a	0.13 a
7.5 lbs of Temik 15G	24.8 c	1730	0.37 ab	0.07 ab
	P =0.0097	$P = 0.6264$	$P = 0.0538$	$P = 0.6053$

Means within the same column with the same letter are not significantly different

Yield was primarily affected by cultivar, with ST5458B2RF greatly out yielding FM 9180B2F (*Table 4*). Yield was affected to a smaller degree by chemical treatments that included Temik 15G (*Table 5*). Net value was $219/acre higher when ST 5458B2RF was planted rather than FM 9180B2F (*Table 4*), and was not affected by chemical treatments (*Table 5*). There was no significant interaction between cultivar and chemical, indicating that the response was consistent with both cultivars.

Table 4. Harvest results by cultivar

Cultivar	Lint turnout	Seed turnout	Lint yield	Seed yield	Total value	Net Value
	---------%---------		----------lb/acre---------		--------$/acre-------	
FM 9180B2F	32.6	52.03	648	1033	365	270
ST 5458B2RF	34.2	48.6	1069	1518	585	489
	$P = 0.0097$	$P = 0.0001$	$P = 0.0001$	$P = 0.0001$	$P = 0.0001$	$P = 0.0001$

Table 5. Harvest results by chemical

Cultivar	Lint turnout	Seed turnout	Lint yield	Seed yield	Total value	Net Value
	---------%---------		----------lb/acre---------		--------$/acre-------	
Untreated	34.0	50.6	783 b	1162 b	434 b	355
Aeris	32.7	50.5	824 ab	1226 ab	457 ab	369
5.5 lbs of Temik 15G	33.0	50.3	882 a	1311 a	489 a	390
5.5 lbs of Temik 15G + 17 oz Vydate C-LV	33.2	50.2	904 a	1344 a	501 a	393
7.5 lbs of Temik 15G	34.5	50.0	898 a	1335 a	497 a	392
	$P = 0.43$	$P = 0.89$	$P = 0.04$	$P = 0.055$	$P = 0.04$	$P = 0.41$

Means within the same column with the same letter are not significantly different

Summary

Meloidogyne incognita is one factor that can significantly impact cultivar performance. Based on this trial, planting tolerant cultivars is the most economical and effective method in the management of nematodes. Chemical management also showed some increased control of nematodes. However, there was no additional value over the untreated plots when chemical costs were subtracted from the total value per acre.

Acknowledgements

Special thanks to Raymond McPherson for planting and harvesting this trial. Bayer CropScience funded this project.

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