AN ECONOMIC ANALYSIS OF TELONE II (1,3-D) AND TEMIK 15G (ALDICARB) TO MANAGE *MELOIDOGYNE INCOGNITA* IN COTTON

Zimet, D. J., R. A. Kinloch and J. R. Rich
North Florida Research and Education Center
University of Florida
Quincy, FL

Abstract

Two cotton trials were conducted in northwest Florida in 1995 and one in 1997 in fields infested with the southern root-knot nematode. Treatments in each trial consisted of 4 rates of Telone II and Temik 15G, and a control. The Telone II treatments were applied with a single chisel in the row 2 or 3 weeks prior to planting. Temik 15G treatments were applied in the furrow at planting. The control and Telone II treatments also were treated with an in the furrow Thimet 15G at planting to control thrips. Plot rows were 36 inches wide and 4 rows x 25 feet long. Treatments were replicated 6 times in a randomized complete block design. Six postharvest soil cores (1-inch-diam) were taken from each plot to 10 inches deep and composited. Nematodes were extracted from a 100 cm^3 subsample from each plot by the centrifugation-sugar flotation technique. Lint yield was determined by harvesting the center 2 rows of each plot. Costs were estimated as the sum of material and application costs per acre. Because of method of application, Temik was not assigned application costs, only material costs. Telone II application costs included the cost of Thimet plus an additional $0.74 per acre (prorated Telone II equipment costs). Yields of the Telone II treatments were consistently and significantly greater than those of the control. Almost all Telone II treatments outperformed the Temik treatments, but not all differences were statistically significant. Analagously, Telone II treatments accounted for the greatest partial net returns.

Materials and Methods

Three field trials were conducted in northwest Florida, U.S.A., to evaluate rates of Telone II and Temik 15G to manage the southern root-knot nematode, *Meloidogyne incognita*, on cotton (*Gossipum hirsutum*). Tests #1 and 3 were placed in a loamy sand soil in 1995 and 1997, respectively, while test #3 was conducted in a fine sand soil in 1995. Treatments in the tests consisted of 4 rates each of Telone II and Temik 15G, and a control. The Telone II was applied with a single chisel in the row to 12 inches deep two-three weeks prior to planting. Temik 15G treatments were applied in the furrow at planting in late April in all tests. Phorate (Thimet) 15G was applied in the furrow at planting (6.7 lbs. a.i./acre) to the control and Telone II treatments to reduce thrip (*Frankliniella fusca*) levels, since Temik 15G has activity on this insect pest. Plot rows were 36 inches wide and 4 rows x 25 feet long. Treatments were replicated 6 times in a randomized complete block design. Cotton was maintained utilizing standard grower practices and was not irrigated. Six postharvest soil cores (1 inch diameter) were collected from each plot to 10 inches deep and composited. Nematodes were extracted from a 100 cm^3 subsample from each plot by the centrifugation-sugar flotation technique. Cotton was harvested from the center 2 rows of each plot in late November in all tests. Lint yield was calculated by multiplying by a factor of 0.40. Cotton was valued at $0.70 per pound of lint, a cost of $2.85/lb was charged for Temik and $11.00/gallon for Telone. Charges for Thimet and equipment used in Telone application of $4.00 and $0.74, respectively, also were made.

Results

Telone II treatments in the three tests generally showed greater yields than those treated with Temik 15G, and all Telone II treatments significantly ($P \leq 0.05$) improved cotton yields compared to the control. Temik treatments improved yield over control plots but yield was lower and more variable than when Telone II was applied.

In test #1, no significant yield differences were found among Telone II or among Temik 15G treatment rates (Table 1). All Telone treatments, however, significantly improved lint yield over control plots. When only Temik 15G was applied, cotton yield was not significantly increased over control. All Telone II, but not Temik 15G, treatment rates significantly reduced post harvest populations of *M. incognita* juveniles. In test # 2, none of the Temik treatments significantly increased cotton yield over the control. All Telone II treatments, however, significantly increased cotton yield. Similarly, postharvest number of nematodes were lowest in the Telone treatments. In test #3, all nematicide treatments and rates significantly ($P \leq 0.05$) improved yield of cotton compared to the control. The Telone II at 6 and 3 gallons/acre significantly improved cotton yield compared to the Temik 15G treatments. Yields from all Telone II treatments were numerically greater than the Temik 15G yields. No statistically significant yield differences were found among rates of Telone II although the high and low rates produced the highest and lowest lint yield, respectively.

The economic results (Tables 2 - 4) mirror the production results because of the relatively low and consistent treatment costs and because of the effectiveness of the Telone II treatments. Partial net return per acre equals the estimated additional revenues per acre (based $0.70 per pound of lint) less the estimated additional costs per acre for each treatment in all the economic summary tables. Cost per pound of lint increase equals the additional cost of treatment (over the control) divided by the increase of lint production from that treatment. Increasing cost per pound of increase indicates the influence of diminishing marginal

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 1:169-171 (1998)
National Cotton Council, Memphis TN

returns (Diminishing or decreasing marginal returns means that yield increases caused each additional application or use of a specific input increase at a decreasing rate. According to economic theory, an input may be applied until the marginal cost of the input equals the value of the additional output or yield. In this case, in an economic sense, treatments could be made until the cost per pound of lint increase is $0.70.). In tests 1 and 2 only one Telone II treatment (6.0 gallons) cost more per pound of increase than one of the Temik 15G treatments (12.0 pounds). Temik 15G performed relatively better in test 3. In terms of cost per pound of increase, the most expensive treatments ($0.498 per pound) were for 6.0 and 4.5 pounds of Telone II per acre and the least costly was for 3.0 pounds per acre of Temik 15G.

Discussion

Few differences in cotton yield were found among Telone II rates and all treatments generally improved yield over the control. Yield in Temik 15G treatments was less than those of Telone II. Partial net returns were higher for Telone II treatments. As regards Telone II when applied with Thimet 15G, the decline in partial net return from applying 6 gallons/acre of Telone II as compared to 4.5 gallons indicates that the most efficient economic point is between those two application rates. Although data from only one test for the combined Telone II and Temik 15G are available, it was the most economically efficient (greatest partial net return and next to lowest cost per pound of increase of all treatments) treatment.

In tests #1 and 3, Temik 15G data may be confounded somewhat because of early season stunting was observed at the 9 and 12 lb/acre rates. As a result, the test was repeated using a modified infurrow application and lower rates of Temik 15G in 1997 to help avoid stunting. The cost per pound of increase indicates the break-even cost for a given treatment for a given yield and treatment cost. Until the break-even costs per unit of increase exceeds the price per unit ($0.70 in this experiment), it is profitable. Thus, for Telone II applied at 4.5 gallons/acre, for example, the difference between the commodity price ($0.70/lb of lint) and the cost per pound of increase ($0.195), indicates that the application rate is very remunerative. The three sets of trials indicate that under some conditions, the cost in terms of lost income opportunity of not treating are much less than they are under other conditions. Chemicals must be efficient and must be effective. When in doubt, the producer would be wise to discover and analyze the situation rather than just applying a chemical as a matter of course. However, in fields where nematodes are problematic, such as in these tests, economic benefits of treatment warrants chemical application.

Table 1. Yield of cotton cv. Chembrand 47 and number of southern root-knot nematode juveniles in three Florida field trials.

Chemical & rate/acre	Test 1		Test 2		Test 3	
	Yield[y]	No.[z]	Yield	No.	Yield	No.
Telone II						
6.0 gallons	736	147	819	168	717	67
4.5 gallons	725	143	920	90	644	59
3.0 gallons	729	172	662	75	696	38
1.5 gallons	722	302	632	180	595	105
Temik 15G						
12.0 pounds	703	393	--	--	558	53
9.0 pounds	689	523	554	750	548	82
7.0 pounds	--	--	442	101	--	--
6.0 pounds	667	418	--	--	549	29
5.0 pounds	--	--	362	116	--	--
3.0 pounds	670	615	360	146	550	55
Telone II, 3 gallons +Temik 15G, 3 pounds	--	--	704	107	--	--
Control	638	613	410	112	404	61
L.S.D.	76	264	116	423	124	23

[y]Represents lint yield in lbs./A
[z]Number of southern root-knot nematodes in 100 cm^3 soil.

Table 2. Economic analysis of rates of Telone II and Temik 15G applied to cotton in two southern root-knot nematode infested Florida fields, 1995 (tests 1 & 2).[x,y].

Chemical & rate/acre	Cost per lb. lint increase	Partial net return/acre
Telone II		
6.0 gallons	0.279	107
4.5 gallons	0.182	155
3.0 gallons	0.220	82
1.5 gallons	0.139	86
Temik 15 G		
12.0 pounds	0.526	11
9.0 pounds	0.264	42
7.0 pounds	0.639	2
6.0 pounds	0.590	3
5.0 pounds[x]	--[z]	-14
3.0 pounds	--	-9

[x] Based on an average price of $0.70 U.S./lb lint, a price of Telone II of $11.00 /gallon and of $2.85/lb for Temik 15G. The per acre application costs for the Telone II totaled $4.74, including $4.00 for Thimet.
[y]Cost of treatment (material plus cost of application) divided by yield increase over the control = cost per pound increase.
[z] Cost per pound of lint increase is an invalid space when net returns are negative.

Table 3. Economic analysis of rates of Telone II and Temik 15G applied to cotton in a southern root-knot nematode-infested Florida field, 1995 (test 3).

Chemical & rate/acre	Cost per lb. lint increase[y]	Partial net return/acre
Telone II		
6.0 gallons	0.498	148
4.5 gallons	0.498	114
3.0 gallons	0.284	167
1.5 gallons	0.245	112
Temik 15 G		
12.0 pounds	0.489	74
9.0 pounds	0.393	75
6.0 pounds	0.260	84
3.0 pounds	0.129	94

[y]Based on average price of $0.70/lb lint, $11.00/gallon and $4.74/acre (Thimet and equipment costs) for Telone II application, and $2.85/lb for Temik.

[z]Cost of treatment (material plus cost of application) divided by yield increase over the control.

Table 4. Economic analysis of rates of Telone II and Temik 15G applied to cotton for control of southern root-knot nematode in the field trials (only treatments that were applied in at least two tests).

Chemical & rate/acre	Cost per lb. lint increase[y]	Partial net return/acre[z]
Telone II		
6.0 gallons	0.259	120
4.5 gallons	0.195	140
3.0 gallons	0.178	110
1.5 gallons	0.125	95
Temik 15 G		
12.0 pounds	0.312	42
9.0 pounds	0.227	53
6.0 pounds	0.197	32
3.0 pounds	0.200	21

[y]Based on average price of $0.70/lb lint, $11.00/gallon and $4.74/acre (Thimet and equipment costs) for Telone II application, and $2.85/lb for Temik.

[z]Cost of treatment (material plus cost of application) divided by yield increase over the control.