Telone II® and Temik® Efficacy on Root-knot Nematodes in Cotton

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Abstract

A field plot in western Maricopa county was established in 1995 to determine the ability of Temik® brand aldicarb pesticide to suppress root-knot nematode when Temik 15G was applied as a seedling side-dress and moved into the root zone by irrigation. Telone II® was used for comparative purposes and Gaucho®-treated seed, following a preplant application of Telone, was included to determine if additional benefits could be realized by systemic control of insects during early stages of plant growth. Plans to include foliar applications of Orthene® were abandon when early season thrips populations failed to develop. Temik 15G, applied as a side-dress at 10 lbs. did not suppress nematodes or increase lint yield. Telone, alone and in combination with Gaucho-treated seed, reduced nematode populations and increased lint yield, but differences between the two Telone treatments were not significant. Insect pressure was not a contributing factor. Greenhouse studies showed that both timing of the application and its placement in the row will be of critical importance when Temik is applied for nematode control in furrow irrigated cotton.

Introduction

Since 1992, field trials have been conducted in Arizona to explore alternatives to Telone II for the management of root-knot nematodes in cotton. Previous studies were described in the 1995 Cotton Report. In brief, inconsistent results were obtained when Temik was applied either in the seed row, as side-dress at pin-head square, or a combination of the two. Earlier studies in Australia showed that Temik is more nematistatic than nematicidal. Concentrations of up to 32 ppm failed to kill infective juveniles of root-knot nematodes but concentrations as low as 2 ppm reduced larval migration. Little effect of egg hatch was noted at concentrations below 8 ppm (1). Our preliminary greenhouse studies suggested that Temik moved freely with irrigation water in soil and that placement of Temik 10G, therefore, might be critical for effective nematode control. Therefore, we initiated studies in 1995 to determine if Temik side-dressed at the third true-leaf stage and moved into the root zone during irrigation could improve the performance of this material. Complementary green house studies were conducted to determine the effect of application timing on nematode control, and cotton plants with split root systems were used to determine if the systemic activity of Temik would control nematodes in untreated portions of the roots.

Materials and Methods

A field test with Delta Pine 5415 was conducted in Maricopa County at a commercial cite known to contain a high population of the root-knot nematode, *Meloidogyne incognita*. Preplant sampling established the density of infective juveniles at 0.92 per cubic centimeter of soil. The test plot consisted of five treatments, each replicated

six times. The treatments were: (1) 5 gal./acre Telone II, (2) 5 gal./acre Telone II and Gaucho-treated seed, (3) 5 gal./acre Telone II and Orthene applied as needed to suppress early season insects, (4) 10 lbs./acre Temik 15G applied 2 inches to the side of the seed row and 3 inches deep, (5) Untreated check. Each plot was 6 rows wide and approximately 1400 feet long.

Twenty foot lengths of the two center rows of each plot were marked-out at mid-field and these were sampled for nematodes at intervals after planting. An Oakfield core sampler was used to remove 10 cores (0.75 x 10 inches) per 20 feet of row and the nematodes were extracted under an intermittent mist.

Sampling of thrips and lygus bugs was begun shortly after the cotyledon stage of growth. Thrips were counted on ten whole plants by placing the plants in a tight container saturated with chloroform. Samples were collected at weekly intervals after the cotton seedlings were at the four-leaf stage, Table 1. The early June sample was not taken due to field irrigation. Thrip counts were analyzed by the Chi Square method. No significant differences were found among the treatments.

Sweep samples, 50 sweeps per treatment were collected when the cotton was roughly 18 inches tall. There were no significant populations of lygus bug on any of the treatments. Therefore, a planned application of Orthene was not required to control this insect pest. Lygus bug in previous seasons had accounted for heavy losses of pinhead square and fruit.

Plots were mechanically harvested by picking a round on the outside four rows of each six row plot to avoid straddling the guess rows. Seed cotton yield was measured from each plot using portable electronic field scales placed under the boll buggy tires. Lint yield was estimated based on a gin turn-out of 35%.

The effect of application timing was tested in the greenhouse on tomato seedlings sown at 3 day intervals in 4-inch pots containing a 2:1 mixture of 30 mesh silica sand and sandy-loam soil. The seedlings were treated with Temik 15G (20 lb./acre equivalent) at 3, 6, and 9 days before or after inoculation with *M. incognita* and simultaneously with inoculation. Five thousand, freshly hatched infective juveniles per pot were used for inoculum. The pots were hand-watered and only enough water was applied to wet the soil with out drainage. Sixty days after inoculation, the plants were harvested and the nematode eggs were extracted from the roots and counted.

Systemic nematode-suppressive activity of Temik 15G was investigated in a split-root system using Delta Pine 5415. Seedlings, approximately 6 weeks old, were removed from the soil and their stems split with a razor blade about an inch above the soil line and downward into the tap root so that the root system was separated into two equal portions, both still attached to the plant. Each portion was planted into an individual 4 inch pot and the two pots were taped together to prevent separation. Three weeks later, each half of the root system was inoculated with 5000 infective juveniles. Immediately after inoculation, one pot of each pair was treated with Temik 15G (20 lb./acre equivalent). The pots were hand watered and only enough water was applied to wet the soil without drainage. Seventy days after inoculation, the plants were harvested and the numbers of eggs developing on each half of the root system was determined.

Results and Discussion

Lint yields, while lower than those in our 1994 trials, were markedly increased by preplant fumigation with Telone II. The difference between Temik treated plots and the control was not significant (Table 2). Telone effectively suppressed nematode populations compared to Temik and the controls (Table 3).

Greenhouse tests showed that Temik applied more than three days before or after nematodes penetrate the roots has little effect on nematode development and reproduction (Table 4). And, nematodes were not controlled on portions of the root system that did not receive Temik (Table 5). Hence, the timing and placement of Temik 15G may be of critical importance when this material is used for nematode control. Furthermore, because of its solubility in water and a mobility in soil comparable to that of chloride ion (Dr. James Supak, personal

communication), the distribution of Temik in soil will be greatly influenced by its placement in the seed bed and subsequent irrigation practices. Distribution of Temik in the soil would be particularly difficult to regulate during alternate row irrigation, regardless of its initial placement and roots of plants that develop in soil lacking a nematistatic concentration of Temik will not be protected by systemic activity of the material. A transitory nematistatic concentration of Temik in the soil may not be adequate for sustained prophylaxis.

Based on these results and those of our 1994 field trials at four different locations in Western Maricopa County, the use of Temik 15G for nematode control on furrow-irrigated cotton is not recommended.

Literature Cited

1. McLeod, R. W., and G.T. Khair. 1975. Effects of oximecarbamate, organophosphate and benzimidazole nematicides on life cycle stages of root-knot nematodes, *Meloidogyne* spp. Annals of Applied Biology, 79:329-341.

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Table 1. Effect of treatment on numbers of Thrips.

Treatment	May 4, 1995	May 11, 1995	May 18, 1995
Telone II and Gaucho-treated seed	20	5	3
Temik 15G, 10 lbs./acre, side dressed	12	4	1
Control (Untreated)	15	7	1

Differences between means were not significant. Chi Square.

Table 2. Effect of treatment on cotton lint yield, Buckeye, AZ. 1995.

Treatment	Lint (Pounds/Acre)
Telone II, 5 gal./Acre preplant	993a*
Telone II and Gaucho-treated seed	1110a
Temik 15G, 10 lbs./acre, side dressed	315b
Control (Untreated)	325b

*Means followed by the same letter are not significantly different (P=<0.001), Tukey Test.

Table 3. Effect of treatment on root-knot nematode soil populations. Number of infective juveniles per 100 cc of soil.

Treatment	5/24/95	7/6/95	6/16/95	6/29/95
Telone II, 5 gal./Acre preplant	5a*	15a	39a	4a
Telone II and Gaucho-treated seed	3a	15a	4b	0a
Temik 15G, 10 lbs./acre, side dressed	31b	65b	177c	140b
Control (Untreated)	10b	171b	182c	8a

*Means in the same column followed by the same letter are not significantly different (P=<0.05), Tukey Test.

Table 4. Effect of Temik 15G on root-knot nematodes of tomato when applied before and after inoculation.

Application of Temik relative to inoculation with *M. incognita* (Days).	Mean number of eggs recovered 60 days after inoculation (x1000).
-9	155a
-6	324b
-3	43c
0	0c
+3	2c
+6	415b
+9	340b

*Means in followed by the same letter are not significantly different (P=<0.01), Tukey Test.

Table 5. Effect of Temik 15G on root-knot nematodes on split-root cotton. plants.

Mean number of eggs on treated half	Mean number of eggs on untreated half
31.6	95.7*

*The difference between the two treatments is highly significant (P=0.003), T-test.