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# ROOT KNOT NEMATODE ( *Meloidogyne incognita*) CONTROL AND CARRYOVER EFFECTS OF TELONE II (1,3- dichloropropene) IN COTTON IN ASHLEY COUNTY, ARKANSAS

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## Abstract

Root knot nematode (*Meloidogyne incognita*) surveys conducted over several years show over 50 % of cotton fields in Ashley County, Arkansas are infested. Control with Telone II is new to the area with questions on rates, and carryover among others. Telone II applied at 3 gallons/acre in replicated plots in 2000, showed an increase in lint cotton yield of 191 pounds over the check. In 2001 Telone II applied at 1.5, 3.0 and 4.5 gallons per acre showed significant increases in yield over the check at 1.5 gallons and then again 3.0 gallons, but did not significantly increase yields at 4.5 gallons/acre over the 3.0 gallon rate. Results of the carryover effect of Telone II conducted on the location of the 2000 plots showed that the effects of Telone II did not carryover into 2001.

## Introduction

Ashley County is located in southeast Arkansas with the cotton producing area of the county located in the eastern one-third. From 40,000 –55,000 acres of cotton are grown annually in the Mississippi River alluvial part of the county.

The presence of root knot nematodes (*Meloidogyne incognita*) in the county has been documented for many years and has been recognized as a growing problem. Field surveys in 2000 showed that 56% of the cotton fields in the county were infested with root knot and 47% were above the established treatment threshold. (Table 1) Estimates of yield losses in various years have ranged from 0 – 500 pounds of lint per acre. Rotations with various crops such as root knot resistance soybeans and grain sorghum have met with limited success due to market prices and low income for the rotation crop. Producers began looking for alternatives such as soil fumigants so they could continue to grow cotton, while at the same time increase and stabilize yields. Telone II, a known soil fumigant, is being looked at very seriously by producers for control of root knot nematodes. Many questions are being asked, such as: 1) Will the use of Telone II give significant yields increase in cotton? 2) What rates of Telone II are the most effective? 3) Does Telone II need to be applied every year?

Replicated tests were set up on the Bruce Bond farm near Portland, AR to begin answering these questions. Three test were conducted in 2000 and 2001: 1) In 2000, a test was established to determine if significant yield increases would result from the use of Telone II in a known root knot infested field. 2) In 2001, the 2000 test was replicated to verify the 2000 results, and to also look at various rates. 3) In 2001, the carryover effect of the application of Telone II in 2000 was examined.

## Materials and Methods

2000 Telone II Test: Telone II was applied at the rate of 3 gallons/acre on April 27. The material was injected using ripper-hipper equipment outfitted with soil injection equipment at a depth of 12". Check plots were established by using the ripper-hipper equipment through the plots with no Telone II applied. Each plot was eight rows wide, approximately ½ mile long and planted with Stoneville 4691B cotton. Three pounds of Temik (aldicarb) was applied planting to the Telone II plots as well as the check plots. Nematode samples were taken from the center two rows at 0-6" and 6-12" depth at planting, at first bloom, and at crop maturity. Yields were taken harvesting the entire plot. There were three replications.

2001 Telone II Test: The 2000 test was repeated with the addition of 1.5 and 4.5 gallons per acre rates. Also Gaucho (imidacloprid) seed treatment was used instead of Temik to avoid the possibility of the Temik masking some of the Telone II effects. Telone II was applied at 1.5, 3.0 and 4.5 gallons per acre on March 29 using the ripper-hipper equipment and the attached Telone II injection equipment at a dept of 12". The check plots also had the ripper-hipper equipment run through them. The plots were planted on April 26 with Stoneville 4691B cotton. Each plot was eight rows wide and approximately

1/3 mile long. There were four replications. Nematode samples were taken from the center two rows at planting and at first bloom. Yields were taken harvesting the entire plots.

2001 Telone II carryover effect test: Stoneville 4691B was planted on April 25 in the exact row location of the 2000 Telone II plots. Prior to planting a ripper-hipper with no Telone II was run through all the 2000 plots. In addition new 2001 Telone II plots were established applying 3 gallons/acre for comparison and served as the check. This resulted in three treatments: 1) No Telone II in 2000, No Telone 2001. 2) Telone II – 3 gallons/acre in 2000, no Telone II in 2001. 3) No Telone II in 2000, Telone II at 3 gallons/acre applied in 2001. Nematode samples were taken from the middle two rows at 0-6" and 6-12" depth at planting, at first bloom, and at crop maturity. Yields were taken by harvesting the entire plots.

## Results

2000 Telone II Test: Root knot nematode sampling showed low numbers for all plots at planting. Samples taken at first bloom continued to show near zero nematodes in the samples for the Telone II plots. The non-treated plots had increased to an average of 6,561 juveniles and eggs per pint of soil. Samples taken at crop maturity showed a large increase in root knot numbers in both the Telone II treated plots as well as the untreated check. The Telone II treated plots averaged 3,836/pint with the check averaging 1,6051/pint. (Table 2) Both of these numbers are well above the 250/pint established as the treatment threshold. The increase in nematode numbers was consistent across reps as well as on average. Yields showed an average increase of 191 pounds lint cotton per acre in the Telone II treated plots with a range from 63-430 pounds per lint in the three reps. (Table 3)

2001 Telone II Test: Results of the nematode samples were similar to those in 2000. The at planting samples did show a much larger initial nematode population in the untreated check plots (1,307/pint) as compared to the 3 gallon per acre rate, (300/pint). The number of nematodes per pint at planting was inversely proportional to the Telone II rate applied, with the 1.5 gallon rate having 660/pint, 3 gallon rate having 300/pint and the 4.5 gallon rate having 151/pints. At bloom, the nematode samples showed a small numerical decrease in numbers in all the Telone II treated plots and a small numerical increase in the untreated checks. (Table 4) Yields showed a significant increase over the check at 1.5 and again at the 3.5 gallon/acre rate, with a small but statistically non-significant increased yield with the 4.5 gallon rate over the 3.0 gallon rate. (Table 5)

2001 Telone II Carry Over Effect Test: Nematode samples taken at planting from the location of the 2000 plots showed much higher numbers as compared to the same time the previous year with all numbers well above the 250 nematode/pint treatment level. By first bloom nematode numbers were very high as well as were the numbers at crop maturity. (Table 6) Samples from the 2001 Telone II treated check plots showed 0 nematodes in the samples at planting with a significant increase by first bloom, but significantly less than the 2000 plots. All plots had high numbers by crop maturity. Yields showed no significant difference between the 2000 Telone II treated plots and the 2000 untreated check with only a slight (25 pounds lint/acre) difference in favor of the Telone II plots. Both the 2000 Telone II treated and the 2000 check yielded significantly less than the 2001 Telone II treated plots by 120 and 145 pounds/acre respectfully. (Table 7)

## Summary, Conclusions and Discussion

In 2000, Telone II at the 3 gallon rate significantly increased yields over the untreated check. In 2001, very similar results were obtained. Telone II significantly increased yields over the check at the 1.5 and again at the 3.0 gallon/acre rate in the plots. The 4.5 gallon/acre rate significantly increased the yields over the check and the 1.5 gallon/acre rate, but not over the 3.0 gallon/acre rate. The effect of the 2000 Telone II application did not carry over from the previous year on the plots, which was indicated by yield.

These results revel other questions that are currently being investigated such as: 1) At what root knot nematode population and under what circumstances should different rates of Telone II be applied in cotton? 2) Can fall applications of Telone II be as effective as spring applications?

Table 1. Fall 2000 Root Knot Nematode Survey.

| | **Total Fields – 907**<br>**Acreage Represented – Approximately 36,000** | |
|---|---|---|
| | **# of fields** | **% of fields** |
| Total Root Knot (RK) infested | 508 | 56 |
| RK infested (below 250/pint) | 76 | 8 |
| RK infested (above 250/pint) | 432 | 47 |
| | (25,227 = high sample) | |

Table 2. 2000 Results – Nematodes/Pint 0-12".

| | Juveniles & Eggs/pint of soil | | |
|---|---|---|---|
| **Treatment** | **At Planting** | **!st Bloom** | **Maturity** |
| Rep 1Telone II | 0 | 227 | 7273 |
| Rep 1 Check | 0 | 9136 | 22,362 |
| Rep 2Telone II | 0 | 0 | 1591 |
| Rep 2 Check | 0 | 8137 | 9881 |
| Rep 3Telone II | 0 | 0 | 2645 |
| Rep 3 Check | 227 | 2409 | 15,909 |

| Averages (Juveniles + Eggs/pint) | | | | | |
|---|---|---|---|---|---|
| Telone II At Planting | Check At Planting | Telone II 1st Bloom | Check 1st Bloom | Telone II At Crop Maturity | Check At Crop Maturity |
| 0 | 76 | 76 | 6561 | 3836 | 16,051 |

Table 3. 2000 Results – Yields.

| | **Lint/acre** | **#Differences from Check** |
|---|---|---|
| Rep 1 Telone II | 1410 | + 81 |
| Rep 1 Check | 1329 | |
| Rep II Telone II | 1398 | +430 |
| Rep II Check | 968 | |
| Rep III Telone II | 1399 | +63 |
| Rep III Check | 1336 | |
| | **Averages** | |
| Telone II | 1402 | +191 |
| Check | 1211 | |

Table 4. 2001 Results–Nematodes/Pint 0-12".

| | **Average of 4 Reps. (Juveniles + Eggs/pint)** | |
|---|---|---|
| **Treatment** | **At Planting** | **1st Bloom** |
| Check | 1,307 a | 1,623 a |
| Telone II (1.5 gal) | 660 b | 582 b |
| Telone II (3 gal) | 300c | 136 b |
| Telone II (4.5 gal) | 151 c | 94 b |

Table 5. Results 2000 & 2001 Yields

| | **Average of 4 Reps** | | |
|---|---|---|---|
| | **2001 Lint/acre** | **2001 # Difference from Check** | **2000 # Difference from Check** |
| Telone II (1.5 gal/acre) | 948 B | + 94 | - |
| Telone II (3.0 gal/acre) | 1016 A | + 162 | + 191 |
| Telone II (4.5 gal/acre) | 1048 A | + 194 | - |
| Check | 854 C | - | - |

Table 6. 2001 Carryover Effect Nematodes/acre (eggs + juveniles)

| | **0 – 12" sample depth** | | | |
|---|---|---|---|---|
| **Treatment** | **At Emergence** | **1st Bloom** | **Maturity** | **Yields** |
| Telone II Rep I | 1818 | 19,091 | 12,046 | 869 |
| Check | 3182 | 20,414 | 6,137 | 859 |
| Telone II Rep II | 454 | 18,864 | 10,228 | 938 |
| Check | 227 | 17,272 | 8,409 | 923 |
| Telone II Rep III | 227 | 9,546 | 8,182 | 968 |
| Check | 455 | 15,227 | 4,091 | 899 |

Table 7. 2001 Carryover Effect Yield Lint/Acre

| | Average of all Reps. | | | |
|---|---|---|---|---|
| **Treatment** | **Yield 2000** | **Difference from Check** | **Yield 2001** | **# Difference from 2001** |
| Telone II2000 | 1402 | 191 | 918 | - 120 |
| Check 2000 | 1211 | - | 893 | - 145 |
| Telone II 2001 | - | - | 1038 | - |