**Wheat and Feed Grain Project Report, 2007**

**TITLE:** Root-knot management for corn in Alabama

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**OBJECTIVES:**
1. To evaluate potential nematicides for management of southern root-knot nematode (*Meloidogyne incognita* race 3) on corn hybrids.

Efficacy evaluations of experimental nematicides were conducted at the Plant Breeding Unit (PBU) of the E. V. Smith Research and Education Center and at the Brewton Experimental Field. Both locations are naturally infested with *Meloidogyne incognita* race 3.

In Brewton, three nematicide tests: 1) Telone II, 2) Avicta, and 3) Aeris were established. All tests were planted on a Benndale Fine Sandy Loam. Test plots consisted of 4 rows, 25 ft long, with a 3 ft row spacing and were planted in a randomized complete block design with five replications. Blocks were separated by a 20 ft wide alley. Telone II was applied at 3.0 or 5.0 gal/A and utilizing a modified ripper hipper with a $CO_2$ system to inject the fumigant through flow regulators mounted on delivery tubes attached to the back edge of forward-swept chisels. The fumigant was placed 12 in. deep 21 days prior to planting. Rows were immediately hipped to seal and prevent rapid loss of the fumigant. All remaining rows were subsoiled 12 in. deep and hipped without applying the fumigant. Avicta and Aeris were applied to the seed by the manufacturers. Counter 15G and Mocap 15G in-furrow granule applications were applied at 8.7 lb/A at planting. All plots were maintained throughout the season with standard herbicide, insecticide, and fertility production practices as recommended by the Alabama Cooperative Extension System. Population densities of the root-knot nematode in the soil and on the root system were determined at 49 days after planting or 7 weeks after planting and at harvest. Ten soil cores, 1-in diameter and 6-inches deep were collected from the two rows of each plot in a systematic sampling pattern. Nematodes were extracted from the soil using the gravity sieving and sucrose centrifugation technique. Five root systems were dug from each plot and nematode eggs were removed using sodium chloride dilutions. Plots were harvested on 11 Sep. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

Rainfall was the limiting factor in the 2007 season thus root-knot nematode pressure was low to moderate under these conditions at both locations. Just over 17 inches of rainfall were recorded for the entire growing season at Brewton and PBU. In Brewton, at planting, root-knot nematode numbers averaged 107 second stage juveniles per 150 $cm^3$ of soil over all plots. In the Telone II trial, corn plant height and fresh root weights were increased ($P \leq 0.10$) by Telone II at 7 weeks after planting (21 May) as compared to the granular insecticides and the control (Table 1). Numbers of root-knot eggs per gm of root were very low and did not appear to be affected by nematicide treatment at 7 WAP or at harvest. Yields averaged 122 bu/A over all nematicide

treatments. No nematicide tested increased yield ($P \leq 0.10$) over the control under these severe drought conditions. However, Telone II and Counter 15 G, numerically increased yields by 2.8% and 8.2% respectively.

Table 1. Effect of Telone II, Counter and Mocap on plant growth, *Meloidogyne incognita* numbers and corn yield, on SS 804 RR2.

| Treatment and rate/A | Plant height cm[z] 21 May | | Root fresh weight 21 May | | *Meloidogyne incognita* eggs/gm root 21 May | | *Meloidogyne incognita* eggs/gm root 11 Sep | | Yield bu/A 11 Sep | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Untreated control… | 96.2 | b | 103.6 | b | 7.2 | a | 5.0 | a | 118.1 | a |
| 2. Telone II 3 gal[y]…… | 106.2 | a | 173.5 | a | 6.0 | a | 2.8 | a | 121.2 | a |
| 3. Telone II 5 gal…… | 104.5 | a | 160.4 | a | 7.0 | a | 3.6 | a | 121.7 | a |
| 4. Counter 15 G 8.7 lb | 94.9 | b | 96.5 | b | 9.5 | a | 7.7 | a | 128.6 | a |
| 5. Mocap 15G …… | 97.5 | b | 106.6 | b | 11.0 | a | 7.8 | a | 119.5 | a |
| FLSD ($P \leq 0.01$) | 4.1 | | 21.7 | | 6.0 | | 3.6 | | 13.3 | |

[z] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.
[Y] Rates calculated are based on 36-in row spacing.

In the Avicta test, corn plant height and fresh root weights were not affected by the nematicide seed treatment Avicta at 7 WAP (Table 2). Numbers of root-knot eggs per gm of root were low and were not significantly ($P \leq 0.10$) reduced by the nematicides at 7 WAP or at harvest. No nematicide tested increased yield over the control under these drought conditions; however, Avicta did increase yield numerically by 6%.

Table 2. Effect of Avicta and Counter on plant growth, *Meloidogyne incognita* numbers and corn yield, on Garst 8302 CRW/RR.

| Treatment and rate/ha | Plant height cm[z] 21 May | | Root fresh weight gm 21 May | | *Meloidogyne incognita* eggs/gm root 21 May | | *Meloidogyne incognita* eggs/gm root 11 Sep | | Yield bu/A 11 Sep | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Untreated control…….. | 80.8 | a | 66.1 | a | 5.6 | a | 171 | a | 46.8 | a |
| 2. Avicta 500.4 mgai/seed … | 79.5 | a | 67.3 | a | 15.1 | a | 170 | a | 50.0 | a |
| 3. Counter 15 G 9.4 kg[Y] ….. | 81.7 | a | 62.9 | a | 8.8 | a | 128 | a | 46.2 | a |
| FLSD ($P \leq 0.01$) | 3.6 | | 15.2 | | 12.3 | | 125 | | 18.2 | |

[z] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.
[Y] Rates calculated are based on 36-in row spacing.

In the Aeris test, corn plant height was increased ($P \leq 0.10$) by Counter 15 G at 7 WAP as compared to the seed treatment Aeris and the control (Table 3). Root fresh weights were not increase by either nematicide. Numbers of root-knot eggs per gm of root were not significantly ($P \leq 0.10$) reduced by the nematicides; however, the numbers of root-knot eggs per gm of root were numerically greater in the Counter 15 G treatment as compared to the Aeris seed treatment at both 7 WAP and harvest. Aeris did increase yield numerically by 20% as compared to the control.

Table 3. Effect of Aeris and Counter on plant growth, *Meloidogyne incognita* numbers and corn yield, on SS 804 RR2.

| | Plant | Root fresh | *Meloidogyne incognita* | Yield |
|---|---|---|---|---|

| Treatment and rate/ha | height cm [z] 21 May | | weight gm 21 May | | eggs/gm root 21 May | | eggs/gm root 11 Sep | | bu/A 11 Sep | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. Untreated control…….. | 80.0 | b | 53.6 | a | 6.71 | a | 366.9 | a | 122.6 | a |
| 2. Aeris 0.750 mg ai/seed … | 83.3 | b | 65.1 | a | 4.63 | a | 309.0 | a | 154.8 | a |
| 3. Counter 15 G 9.4 kg…..... | 87.8 | a | 64.3 | a | 17.60 | a | 984.9 | a | 124.5 | a |
| FLSD (P≤ 0.01) | 4.4 | | 17.9 | | 18.0 | | 898 | | 26.6 | |

[z] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.
[Y] Rates calculated are based on 36-in row spacing.

At the Plant Breeding Unit of the E. V. Smith Research and Education Center, two seed treatment nematicide tests were established. The field had a long history of root-knot nematode infestation, and the soil type was classified as a Kalmia loamy sand. Plots were planted on 26 March and consisted of 2 rows, 25 feet long, with a 36 inch row spacing and were planted in a randomized complete block design with five replications. Avicta, Aeris, Vydate CLV, and Lanate 90 SP were applied to the seed by the manufacturers while N-Hibit was added to the seed as a slurry immediately before planting. Counter 15 G (8.7 lb/A) was applied in the seed furrow with chemical granular applicators attached to the planter at planting. NemOut was applied as a soil drench (1 gal/50 ft row) immediately after planting. All plots were maintained throughout the season as previously stated. Population densities of the root-knot nematodes were determined at 30 DAP and at harvest. Plots were harvested on 21 August. Data were statistically analyzed by GLM and means compared using Fisher's protected least significant difference test ($P \leq 0.10$).

At planting, root-knot nematode numbers averaged 77 second stage juveniles per 150 cm $^3$ of soil over all plots at the PBU. In the experimental seed treatment test, no phytotoxicity was observed for any of the seed treatments; however, stand was lower ($P \leq 0.10$) in the Aeris and N-Hibit treatments. Corn fresh root weights and plant heights were not affected by nematicide treatments at 30 DAP (Table 4). Numbers of root-knot J2 and eggs extracted from the roots were greater ($P \leq 0.10$) in the control as compared to the Vydate CLV, Lanate 90 SP and Counter 15 G treatments. However, the number of eggs per gm of root was not different between any treatments. Yields varied by 24.1 bu/A with all the nematicide treatments averaging 70 bu/A.

Table 4. Effect of experimental nematicides on plant growth, *Meloidogyne incognita* numbers and corn yield, SS 804 RR2.

| Treatment and rate/A | Plant stand 25' row 25-Apr | Root fresh weight 25-Apr | Plant height in 25-Apr | *Meloidogyne incognita* J2 eggs total 25-Apr | | *Meloidogyne incognita* eggs/gm root 25-Apr | | Yield bu/A 21-Aug | |
|---|---|---|---|---|---|---|---|---|---|
| 1. Captan 30-DD | 85.8 ab | 105.7 | 25.6 | 3152 | a | 28.7 | a | 72.4 | a |
| 2. Vydate CLV 1.0 mgai seed | 85.2 ab | 124.8 | 26.2 | 1097 | a | 9.2 | a | 73.9 | a |
| 3. Lanate 90SP 0.56 mgai seed | 87.0 ab | 100.4 | 24.92 | 973 | a | 8.6 | a | 67.9 | a |
| 4. Aeris 0.375 mg ai seed | 80.0 b | 116.8 | 25.76 | 2217 | a | 19.9 | a | 65.7 | a |
| 5. N-Hibit 0.26 mg/seed | 71.6 c | 118.8 | 25.92 | 2117 | a | 20.8 | a | 65.0 | a |
| 6. NemOut 170 gm/A | 95.6 a | 105.3 | 25.62 | 1669 | a | 16.2 | a | 61.4 | a |
| 7. Counter 15 G 8.7 lb/A | 88.8 ab | 134.5 | 26.34 | 942 | a | 9.2 | a | 85.7 | a |
| 8. Untreated control | 88.8 ab | 110.9 | 25.2 | 1947 | a | 16.4 | a | 61.6 | a |
| FLSD (P≤ 0.01) | 7.2 | 22.6 | 1.714 | 1488 | | 14.7 | | 17.5 | |

[z] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.

The Counter 15 G, Vydate CLV, and Captan 30-DD increased yields numerically by 28.1% and 16.6% over the untreated control under these extreme hot dry conditions.

In the Avicta seed treatment test, corn stand was similar between the treatments (data not shown) and phototoxicity was not observed. Corn plant height and fresh root weights were not affected by nematicide treatments at 30 DAP (Table 5). Numbers of root-knot J2 and eggs extracted from the roots and the number of eggs per gm of root were greater ($P \leq 0.10$) in the control than in the Counter 15 G application. Yield was not affected by Avicta or Counter in this test under these hot dry conditions.

Table 5. Effect of Avicta and Counter on plant growth, *Meloidogyne incognita* numbers and corn yield, on Garst 8302 CRW/RR.

| | Plant height | Root fresh | *Meloidogyne incognita* | | | | Yield | |
|---|---|---|---|---|---|---|---|---|
| | | | J2 +eggs/ | | eggs/ | | | |
| | in [z] | weight gm | total | | gm root | | bu/A | |
| Treatment and rate/ha | 21 May | 21 May | 21 May | | | | 11 Sep | |
| 1. Untreated control…….. | 23.3 | 86.9 | 2194.4 | a | 77.5 | a | 62.6 | a |
| 2. Avicta 500.4 mgai/seed … | 23.4 | 89.7 | 1549.6 | ab | 56.3 | ab | 55.8 | a |
| 3. Counter 15 G 9.4 kg [Y] …..... | 26.1 | 114.1 | 863.2 | b | 22.8 | b | 57.5 | a |
| FLSD ($P \leq 0.01$) | 3.1 | 31.2 | 888.6 | | 6.6 | | 12.2 | |

[z] Numbers in columns followed by the same letter are not significantly different by Fisher's LSD at $P \leq 0.10$.

The Garst hybrid did not yield as well as Southern States. The severe drought was the limiting factor in the 2007 growing season and not the root-knot nematodes. Further testing will be necessary to determine differences in yield response due to the nematicides.