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Cotton Root Knot Nematode (*Meloidogyne incognita* Race 3) Reproduces Surprisingly Well on Field-Grown Commercial Corn Varieties

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Across the Southeast, corn is a common rotation partner with cotton. Corn plantings are expected to greatly increase in 2007, particularly on irrigated land previously cropped to cotton or peanut. Historically, corn has been considered either a non-host or a very poor host for all species of root knot nematode (*Meloidogyne* spp.). Concerns have been raised that the corn rotation partner was actually serving a bridge host for this nematode between cotton crops. Sizable cotton root knot-related yield declines in irrigated cotton have been reported in Southwest Georgia. Results of an ongoing rotation study at the Plant Breeding Unit have clearly demonstrated that corn is an excellent host for the cotton root knot nematode. Here, cotton yields behind one or more years of corn (Pioneer 31G66) were significantly below those recorded for cotton cropped behind one or two years of peanut. In addition, 30 to 40% reductions of corn yield have been associated with high populations of the cotton root knot nematode. Also all of the commercial corn varieties screened in a 2006 greenhouse trial were good hosts for the cotton root knot nematode. The objective of this study is to determine the host status of selected commercial corn varieties to the cotton root knot nematode (*Meloidogyne incognita* race 3) in a field planting and assess the impact of elevated nematode populations on corn yield.

Material and Methods

2005 - This study is located on the Plant Breeding Unit near Tallassee, AL on a site with a history of cotton, sweet corn, and vegetable production. On 21 March, the site was disked. After chiseling on 25 March, 150 lb/A of 13-13-13 fertilizer was broadcast, incorporated with a disk harrow, and leveled with a field cultivator. Later the same day, 15 field corn varieties were planted. Skips in the plots were replanted by hand. An additional 176 lb/A of urea (34-0-0) was broadcast on 25 March and 29 April. On 17 May, 100 lb/A of 0-0-60 analysis fertilizer was broadcast. Weed control was provided by an at-plant application of Atrazine 4L at 2 qt/A and Lasso at 2 qt/A. The plots received 2.0 acre inches of water on 21 June. Plots were harvested on 26 August and yields are

reported at 15.5% moisture. Soil samples for a nematode assay were collected on April 20 and December 5, 2005. Soil samples were processed using the sugar flotation method. Significance of variety effects were tested by analysis of variance and Fisher's protected least significant difference (LSD) test (P=0.05).

2006 - The study site was disked on February 21 and then chiseled on March 8. A 5-10-15 and ammonium nitrate were broadcast at 150 and 176 pounds per acre, respectively, and lightly incorporated with a disk harrow on March 16. The corn varieties were planted on a 30 inch row spacing on March 16. Pre-emergent weed control was provided by a broadcast pre-plant incorporated application of Dual II Magnum at 1 pint per acre. A post-plant application of 250 pounds per acre of ammonium nitrate and 20-20-20 analysis fertilizer were made on April 24 and May 16, respectively. Plots were irrigated with a cable tow system multiple times in April, May and June. The experimental design was a randomized complete block with four replications. Individual plots consisted of two 30-foot rows spaced 0.8 feet (30 inches) apart. Plots were harvested using a plot combine on August 8. Soil samples were collected for a nematode assay on April 13 and on August 29. Samples were processed using the sugar flotation method and the nematode populations are expressed as the number of larvae (J2) of the cotton root knot nematode per 100 cc of soil.

Results: Because soil and air temperatures were unusually low in April and May 2005, crop growth was extremely slow. Temperatures and rainfall totals were above average for June but seasonal in July 2005. The 2006 growing season was unusually dry throughout much of the spring and early summer. Moreover, temperatures in May and June were above normal.

2005 - Populations of the cotton root knot and lance nematode on the fifteen corn cultivars varied at both the mid-season and final post harvest sampling dates (Table 1). The reproduction ratio (Pf/Pi) above 1.0 showed that cotton root knot and lance nematodes reproduced on nearly all corn varieties. When compared with 11 other corn varieties, heaviest cotton root knot reproduction was noted on DeKalb DK697. The lance nematode reproductive index of Pioneer 31N26 exceeded that of Pioneer 31G66.

Significant differences were noted between the 15 hybrid field corn varieties (Table 1). At 127.8 bu/A, Pioneer 31G97 yielded significantly higher than 11 of the 14 corn varieties. Other varieties that had yields similar to those of Pioneer 31G97 were Croplan 830, DK697, and DKC 69-72. Yield for Southern States 859CL was significantly lower than those reported for 10 field corn hybrids.

2006 – The site where this test was conducted in 2006 was treated with Canopy herbicide in 2005. Apparently, the residue carryover of this herbicide was sufficient to heavily damage corn and greatly reduce yields. However, Canopy herbicide residues did not suppress reproduction of the cotton root knot nematode on corn. As indicated by the reproductive (Pf/Pi) ratios, sizable increases in nematode numbers were seen on all corn hybrids between the April and August sampling dates (Table 2). The largest increase in nematode numbers was seen on DKC 69-72. All of the Pioneer corn hybrids as well as

Garst 8200 YG1 had a lower reproductive index for the cotton root knot nematode than DKC 69-72. However, all corn hybrids supported considerable reproduction of the cotton root knot nematode.

Summary: Corn proved to be an excellent host for the cotton root knot nematode as evidenced by the high level of cotton root knot reproduction seen in 2005 and 2006. In addition, lance nematode numbers increased in 2005 on most corn varieties. While DK 697 was the best host for cotton root knot in 2005, Pioneer 31N26 had the highest reproductive index of the lance nematode. The reproduction ratio for the cotton root knot and lance nematode in 2005 would have been higher if the initial soil samples for the nematode population assay had been collected in September instead of early December. In 2006, DKC 69-72 proved to be the best reproductive host of the 15 corn varieties screened.

The impact of elevated nematode numbers on the corn yields was more difficult to determine. High populations of the cotton root knot and lance nematode on Dyna Gro 58K22 and Pioneer 31N26, respectively, may have been partially responsible for the lower yields reported for both corn varieties in 2005. Canopy herbicide damage obscured any effects of the very high cotton root knot populations on the corn yield in 2006.

Table 1. Corn yield and reproduction of the cotton root knot and lance nematodes.

	Cotton Root Knot Nematode			Lance Nematode			Corn Yield
Corn variety	Pi[z]	Pf[y]	Pf/Pi[x]	Pi	Pf	Pf/Pi	bu/A
Agra Tech 755R	30.5	53.5	2.3[w]	13.0	57.5	5.4	93.0
Agra Tech 719RR CRW	48.0	41.0	1.1	23.5	49.8	1.8	94.7
Croplan 830	66.0	64.5	2.9	25.5	66.5	4.4	114.2
DeKalb DK 697	43.0	56.0	8.3	18.0	82.5	5.9	117.4
DKC 67-60	45.0	52.0	1.3	29.0	80.0	5.6	104.3
DKC 69-71	68.5	33.0	0.8	16.5	70.0	5.0	101.8
DKC 69-72	62.0	84.0	2.5	11.0	41.5	4.7	115.1
Dyna Gro 58K22	54.5	142.5	3.6	16.0	49.0	4.8	93.5
Garst 8200 YG1	25.0	47.0	3.5	16.0	45.5	3.1	101.6
Pioneer 31N26	48.0	59.5	2.2	13.5	86.5	8.1	87.9
Pioneer 31G66	35.0	29.5	0.7	22.0	18.5	1.0	104.2
Pioneer 33V15	32.0	98.0	5.2	30.0	111.5	7.2	109.1
Pioneer 34M54	53.5	104.5	1.7	22.0	86.5	6.3	107.8
Pioneer 31G97	95.5	76.0	1.8	22.0	45.5	2.4	127.8
Southern States 859CL	37.0	62.0	1.7	24.0	36.0	3.0	82.2
LSD (P=0.05)	--	--	4.9	--	--	6.8	17.9

[z]Pi = number of nematodes per 100 cc soil from April 20 nematode soil assay.
[y]Pf = number of nematodes per 100 cc soil from December 5 (post-harvest) nematode soil assay.
[x]Pi/Pf = nematode reproduction index or ratio.
[w]Mean separation with columns was according Fisher's least significant difference (LSD) test, P=0.05.

Table 2. Reproduction of the cotton root knot nematode on selected corn varieties at PBU in 2006.

Corn Variety	Cotton Root Knot Nematode		Reproduction Rate	Corn Yield
	Pi (initial)[z]	Pf (final)[y]	Pf/Pi Ratio[x]	bu/A
Pioneer 31N26	62.5	288	11.5[w]	17.4
Pioneer 31G66	46.5	305	14.4	19.9
Pioneer 33V15	28.0	147	10.2	22.9
Pioneer 34M54	56.0	322	12.0	22.2
Pioneer 31G97	85.5	345	11.0	25.7
DeKalb DK697	38.0	143	23.3	20.0
DKC 69-71	82.5	306	9.8	3.1
DKC 69-72	13.0	415	104.5	13.0
DKC 67-60	60.5	803	67.8	8.9
Garst 8200	85.5	585	11.4	21.7
DynaGro 58K22	48.0	586	39.1	15.9
Super Sweet	29.5	443	53.6	19.7
SS 859CL	202	179	3.8	15.5
Croplan 830	21.5	277	15.9	36.3
Silver Queen	49.5	259	22.1	22.8
LSD (P=0.05)	--	--	75.0	16.5

[z]Pi = number of nematodes per 100 cc soil from April 13 nematode soil assay.
[y]Pf = number of nematodes per 100 cc soil from August 29 (post-harvest) nematode soil assay.
[x]Pi/Pf = nematode reproduction index or ratio.
[w]Mean separation with columns was according Fisher's least significant difference (LSD) test, P=0.05.