Nematode Survey of Peanuts and Cotton in Southwest Georgia

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ABSTRACT

A random survey of 467 peanut and cotton fields in 17 counties of Southwest Georgia was conducted to determine the frequency of occurrence and distribution of parasitic nematodes associated with peanuts and cotton. **Meloidogyne** species were present in 9.7% of the peanut field soil samples, **Pratylenchus** spp. (primarily **brachyurus**) in 16.9% and **Criconemoides ornatus** in 97%. Sixty-nine percent of the root-knot associated with peanuts was **M. hapla**, 25% was **M. arenaria** and 6% was a mixture of both. Sting nematodes, **Belonolaimus** spp., were not found in peanut fields in the survey. In cotton soils, 11.8% of the samples contained **Meloidogyne** spp., 5.1% **Hoplolaimus columbus**, and 0.7% **Rotylenchulus reniformis.**

Key Words: random-survey, peanuts, cotton, **Meloidogyne** spp., **Pratylenchus** spp., **Belonolaimus** spp., **Criconemoides ornatus, Rotylenchulus reniformis, Hoplolaimus columbus.**

Peanuts are one of Georgia's major cash income crops, with a value of $302 million. Average yields have increased greatly in recent years to a 1974 state average of 3250 pounds per acre. Producers are looking for ways to increase yields and improve quality to offset the higher production costs by seeking to identify factors limiting production. Many peanut farmers recognize that nematodes could be an important factor restricting the attainment of their production potential.

For several years root-knot nematodes have been estimated to infest 10 percent of the peanut acreage (13). Lesion nematodes were associated with lower peanut yield and quality by Boyle (3) as early as 1950. Root-knot and lesion nematodes have been associated with the increased invasion of peanuts by *Aspergillus flavus* (Link) Fries or other fungi (4, 8, 9).

Machmer (6) reported an association of *Criconemoides* sp. with "peanut yellows" in Georgia. Recent work by Minton (7) has demonstrated parasitism of *Criconemoides ornatus* Raski on peanuts. This nematode is almost ubiquitous on soil samples from Georgia peanut fields.

Lance, reinform, and root-knot nematodes are severe parasites of cotton and occur in fields of Southwest Georgia. However, the frequency of occurrence and distribution of these nematodes has not been known.

Seventeen counties in Southwest Georgia were

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surveyed to determine the frequency of occurrence and distribution of parasitic nematodes associated with peanuts and cotton. This information would give a reliable basis for an educational program on nematode control. It would also point out areas where nematode research is needed for peanuts.

Methods

The procedure followed in this survey was similar to that reported previously by Motsinger et. al. (10). The 17 counties selected represented over 50% of Georgia's peanut acreage. A total of 467 randomly selected fields were sampled; 331 were peanut and 136 were cotton fields. The number of samples taken in each county was determined by the acreage grown. One sample represented 1000 acres of peanuts or cotton. Using county maps, roads were selected for the survey in main production areas and every fifth field of peanuts or cotton was sampled. Each field sampled was observed for stunted growth which might be attributed to nematodes. Such stunted areas were included in the sampling. For each field 25-30 soil cores were taken to a depth of eight inches in the row. Soil cores were mixed in a bucket and one to two pints were put in a plastic bag. Samples collected were immediately placed in styrofoam boxes to prevent heat build-up in the plastic bag. Samples were kept at room temperature from one to two days, then held at 55°F in the laboratory until processed.

A 100 cc subsample was processed by the centrifugation-flotation method (5). The total nematode population was counted under the stereoscopic microscope. Counts were expressed as numbers per 100 cc's of soil.

All soil samples from peanuts were bioassayed on Rutgers tomatoes. Those positive for root-knot were also bioassayed on Charleston Gray watermelon to separate **Meloidogyne hapla** Chitwood and **M. arenaria** (Neal) Chitwood species according to Sasser's proposed method (11). In addition, perinneal patterns were used to confirm the species according to the descriptions of Taylor et al. (12).

The survey was conducted August 5-8, 1974. Soil moisture was near field capacity in most counties during the survey.

Part of each sample was analyzed for pH and major nutrients by the Plant Tissue and Soil Analysis Laboratory.

Results

Root-knot nematodes were found in 9.7% of the peanut fields and 11.8% of the cotton fields (Table 1). Peanut field samples contained 69% *M. hapla*, 25% *M. arenaria*, and 6% mixed populations of both. These nematodes were associated with above-ground symptoms in a few fields.

Lesion nematodes, primarily *Pratylenchus brachyurus* (Godfrey) Filipjev and Schuurmans-Stekhoven, but some *P. zeae* Graham, were present in 16.9% of the peanut fields and 22.8% of the cotton fields. Numbers recovered from the soil were low. No above-ground symptoms of nematode injury were associated with lesion nematodes. A later assay of pods and soil samples from 38 fields indicated that a few lesion nematodes in the soil at harvest could represent a high population in the pods.

Ring nematodes were present in 92% of cotton and 97% of peanut samples. Less than 100 were

Table 1. Results of random sampling survey of peanut & cotton fields for nematodes in 17 Georgia counties.

	Percent Peanut (P) and Cotton (C) Fields Infested											
	No. fields Sampled		Root-knot		Lesion		Lance		Reniform		Ring	
	P	C	P	C	P	C	P	C	P	C	P	C
Decatur	17	---	35.3	---	29.4	---	---	---	---	---	94	---
Mitchell	22	4	---	25.0	27.3	50.0	9.1	---	---	---	100	100
Miller	20	---	10.0	---	20	---	---	---	---	---	100	---
Early	39	---	30.8	---	---	---	---	---	---	---	100	---
Clay	11	3	9.1	---	---	---	---	66.7	---	---	91	67
Calhoun	17	4	5.9	---	5.9	---	---	---	---	---	94	75
Baker	15	---	---	---	33.3	---	---	---	---	---	100	---
Worth	30	9	3.3	44.4	33.3	55.6	---	---	---	---	100	100
Colquitt	11	19	9.1	21.1	27.3	21.1	---	---	---	---	91	100
Terrell	23	10	---	---	13.0	20.0	---	---	---	---	100	96
Lee	16	2	6.3	---	---	---	---	---	---	---	100	100
Sumter	17	9	---	---	29.4	11.1	---	---	---	11.1	100	78
Dooly	21	49	---	4.1	4.8	20.4	4.8	8.2	---	---	81	88
Crisp	14	14	---	35.7	28.6	42.9	7.1	7.1	---	---	100	93
Turner	20	6	15.0	---	25.0	16.7	---	---	---	---	100	100
Randolph	22	4	4.5	---	---	---	---	---	4.5	---	100	100
Irwin	16	3	12.5	---	25.0	---	---	---	---	---	100	100
% of total fields infested			9.7	11.8	16.9	22.8	1.2	5.1	.3	.7	97	92

recovered from 100 cc's of soil in 89.6% of the cotton samples (Table 2). More than 100 were recovered in 60.2% of the peanut samples. Ring nematode numbers above 1000 per 100 cc's were found in 4.3% of the peanut samples. Also, this species often occurred in almost pure populations, especially at the 500 per 100 cc level or above.

Table 2. Percent of Fields in Random Survey with Ring Nematode Counts in Four Population Levels.

	-100	100-500	501-1000	+1000
Peanuts	39.8	47.2	8.7	4.3
Cotton	89.6	8.8	.8	.8

Reinform nematodes were found in one peanut and one cotton field in Sumter County. Sixtyeight reniform nematodes were recovered from the peanut field, and 354 from the cotton field. Visible symptoms and growth problems were evident only in the cotton field. There was also a compacted soil layer at about a three-inch depth in the cotton field.

Lance nematodes, *Hoplolaimus columbus* Sher were found in four peanut fields with two of them having a moderate population. There were no visible nematode symptoms in these fields. *H. columbus* was present in seven cotton fields in Dooly, Crisp, and Clay Counties. Lance nematode populations in cotton were moderate to high.

Other nematodes present in occasional fields included spiral, *Helicotylenchus* sp., *Trichodorus* sp., and dagger, *Xiphenema* sp. All three occurred at very low population levels except for six cotton fields with spiral counts ranging from 200 to 1050. One sting nematode was found in one soil sample

from a peanut field.

Soil fertility analysis of peanut samples indicated below 30 pounds of available phosphorus in 18.4% of the samples and below 400 pounds of available calcium in 22.9% of the samples.

Discussion

Based on this survey about ¼ or 26.6% of the peanut fields have root-knot or lesion nematodes and may respond to a nematicide treatment, depending upon preplant nematode population levels. About 1/6 or 17.6% of the cotton fields have root-knot, lance, or reniform nematodes and may respond to a nematicide treatment, again depending on preplant nematode population levels.

The field population of ring nematodes that will affect peanut yield is not known. However, Minton (7) demonstrated in microplots that *C. ornatus* caused root and pod damage at high population levels. Also, root-knot and lesion have been found to provide entry points for invasion of pods by aflotoxin-producing fungi. Therefore, treatment may be economical due to improved quality alone. The nearly pure ring populations could be due to either a strong competitive ability of ring nematodes or to a lack of associated competitors for feeding sites. Additional research is needed to better correlate ring nematode numbers with expected peanut yields and quality.

The Columbus lance nematode is of no major economic importance to Southwest Georgia due to its limited distribution. It causes severe damage to cotton, but its affect on peanuts is not known. Field observations indicate that this nematode may cause less damage to cotton after peanuts are grown for at least one year.

Sting nematodes pathogenic on peanuts have not been reported in Georgia, nor has this nematode been associated with peanut growth difficulties. Therefore, it is presently considered to be of no economic importance on peanuts in Georgia.

Peanuts have been reported to be a poor host for reniform nematodes in greenhouse tests conducted by Birchfield (2). The low numbers recovered from field soil indicate that peanuts may likewise be a poor host crop for reniform nematodes under field conditions. However, field studies are needed to determine if even low population levels economically affect yield or quality.

The presence of *M. hapla* as the dominant species of root-knot on peanuts in Southwest Georgia explains the success of the peanut-corn and peanut-cotton rotations practiced there in reducing root-knot damage. Cotton and most corn hybrids are resistant to this species. However, corn in a peanut rotation may allow a build up of *M. arenaria* (1). Corn may also promote high *P. brachyurus* and *C. ornatus* populations.

Problems on peanuts or cotton may be attributed to nematodes when soil fertility is responsible. Low phosphorus or low calcium levels were detected in 41.3% of the peanut fields. Correcting nutritional problems could reduce the tendency to arbitrarily treat problem fields with nematicides. This in turn would reduce production costs, introduce fewer chemicals into the environment, and reserve scarce nematicides for use in bona fide nematode problem fields.

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