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Host Specificity of Four Populations of *Pratylenchus brachyurus*[1]

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Abstract: Four populations of the lesion nematode *Pratylenchus brachyurus* were tested in a greenhouse on seven selected plant species to determine host suitability and usefulness in identifying physiological races of the nematode. The differential plants were 'Florida 77' alfalfa, 'Harvester' snap bean, 'Rough Lemon' citrus, 'Pioneer 304C' corn, 'Florunner' peanut, 'Braxton' soybean, and 'Rutgers' tomato. Fresh shoot or root weights of plants inoculated with all populations were similar to each other and to the uninoculated control in both experiments. The numbers recovered from Harvester snap bean were different ($P = 0.05$) between populations in each test and from Braxton soybean in the second test. The differences between populations on snap bean were different in the two tests.
Key words: behavior, host–parasite relationship, host specificity, lesion nematode, *Pratylenchus brachyurus.*

Pratylenchus brachyurus (Godfrey) Filipjev and Schuurmans-Stekhoven causes damage to many tropical and subtropical crops (2,3,10). Taxonomic separation of species of *Pratylenchus* is difficult because they exhibit little morphological diversity. Difficulties often arise from underestimation of intraspecific variability of morphological characters currently used for distinguishing species (8). The validity of some species is questionable.

Populations of phytoparasitic nematodes called biological or physiological races are recognized as morphologically similar, but they have different host preferences (11). Other terms, such as biotypes and pathotypes, have been used to describe these populations (9). Physiological races have been documented in certain species of phytoparasitic nematodes, such as those from the genus *Meloidogyne* (13). The presence or absence of races within *P. brachyurus* has not been documented; their existence has been suggested by variation in numbers of *P. brachyurus* extracted from roots of *Citrus limon* (L.) Burm. f. seedlings when inoculated with different nematode isolates (7). Field observations suggest behavioral differences within *P. brachyurus* populations (D. W. Dickson and R. A. Dunn, pers. comm.). The morphometrics of *P. brachyurus* vary considerably in response to geographical locations, unfavorable hosts, overcrowding, and high temperatures (5,6). Intraspecific morphological variation was demonstrated in populations started from single females (12).

The objectives of this study were to determine the usefulness of host suitability in separating four *P. brachyurus* populations obtained from different geographical regions and to study host responses to each nematode.

Materials and Methods

The designation and sources of the four populations of lesion nematode, *P. brachyurus,* were 101 from corn (*Zea mays* L. cv. Pioneer 304C) in Alachua County, Florida; 102 from peanut (*Arachis hypogaea* L. cv. Florunner) in Alachua County, Florida; 103 from Florunner peanut cultivar in Tift County, Georgia; and 105 from soybean (*Glycine max* (L.) Merr. cv. Forrest) in North Carolina.

Seven plant species representing a wide diversity of plant types and reported as hosts for *P. brachyurus* were evaluated in a greenhouse to determine host suitability and usefulness in separating populations within *P. brachyurus.* The differential plants were alfalfa (*Medicago sativa* L. cv. Florida 77); snap bean (*Phaseolus vulgaris* L. cv.

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Harvester); citrus (*Citrus jambhiri* Lush. cv. Rough Lemon); corn cultivar Pioneer 304C; peanut cultivar Florunner; soybean cultivar Braxton; and tomato (*Lycopersicon esculentum* Mill. cv. Rutgers).

The nematodes used for inoculum were extracted as follows: Washed roots were cut into pieces ca. 1 cm long and blended with 150 ml water for 15–30 seconds. The resulting mixture was washed from the blender onto a sieve with 38 μm openings and rinsed with a gentle stream of tap water. Residues on the sieve were washed onto a nylon screen with 1.5-mm-pore openings and 11.5-cm-d PVC pipe. The sieve was covered with tissue paper to retain the blended roots. The screen was placed in a plastic box (13 × 13 × 4 cm) and tap water was added to cover the nylon with a thin film of water around the root pieces. The nylon plus the tissue paper over the screen retained the root pieces but allowed the nematodes to migrate through the cloth. The blended roots were incubated for 72 hours, and the nematodes that had been collected were quantified.

Germinated seedlings of the different plants with 3-cm-long radicles were transplanted into 900 cm^3 steam-pasteurized sandy loam soil in individual 15-cm-d clay pots. When the seedlings were 1 week old, the soil was infested separately with 300 nematodes (mixed life stages) per pot (about 0.33 nematodes/cm^3 soil). The nematodes in an aqueous suspension were poured into two small holes, each 5 cm deep, near the base of the seedling. The seedlings were placed in a greenhouse where the temperature was maintained at 25 ± 5 C.

The experiment conducted in the summer of 1986 had six replications; it was repeated in the fall of 1987 with five replications. Plants were harvested 64 days after inoculation and shoot fresh weight, root fresh weight, and nematode density levels were determined. Soil densities were determined by processing 100 cm^3 soil by sugar-flotation-centrifugation (4); root densities were determined by processing 10 g of roots as described for inoculum preparations.

A factorial experiment was conducted with a split-plot design. The plants were blocked by replicate using plant type as main plots and population as subplots. The effects by the plant, by the population, and interactions of the two were subjected to statistical analysis.

Results and Discussions

No nematode population affected fresh shoot or root weight when compared to the uninoculated controls in either experiment (Table 1). Final numbers of the nematode populations were different ($P = 0.05$) only on Harvester snap bean in the first experiment and Harvester snap bean and Braxton soybean in the second experiment (Table 2). In the first experiment populations 102 and 103, which were collected from peanut, had significantly higher final population densities on Harvester snap bean than the other two populations. Population densities of the two populations from peanut were not different and the other two populations, which originated from soybean or corn did not have different final population densities. These observations were the same whether the final root or the soil nematode population densities were compared (Table 2). In the second test, population 101 from Florida reached a higher population density in Harvester bean and Braxton soybean than the other three populations. There were no differences in population densities between the other three populations in either of the two hosts (Table 2). Nematodes were extracted from 100 cm^3 soil; since the numbers were very low (5/100 cm^3), however, no data are shown here. No nematode populations were able to reproduce on citrus in either experiment (Table 2).

This first attempt to separate races of *P. brachyurus* failed to discern behavioral differences on seven species of crop plants. The differences observed in the final population densities in the two experiments were not the same, suggesting that none of the populations studied were different from each other. The smaller numbers ob-

TABLE 1. Shoot and root fresh weights of seven plant species 64 days after inoculation with four *Pratylenchus brachyurus* populations† and the uninoculated control.

		Shoot fresh weight (g)					Root fresh weight (g)				
	Year	101	102	103	105	Control	101	102	103	105	Control
Medicago sativa	1986	34 a	33 a	33 a	30 a	39 a	35 a	28 a	27 a	21 a	36 a
	1987	49 a	47 a	43 a	46 a	50 a	43 a	35 a	39 a	42 a	40 a
Phaseolus vulgaris	1986	55 a	47 a	45 a	50 a	60 a	20 a	18 a	13 a	21 a	19 a
	1987	64 a	91 a	70 a	80 a	65 a	36 a	31 a	34 a	42 a	37 a
Citrus limon	1986	46 a	51 a	56 a	50 a	43 a	34 a	48 a	49 a	46 a	42 a
	1987	10 a	9 a	9 a	11 a	10 a	5 a	4 a	5 a	5 a	4 a
Zea mays	1986	172 a	188 a	177 a	169 a	182 a	171 a	149 a	139 a	135 a	142 a
	1987	144 a	128 a	117 a	176 a	149 a	77 ab	60 c	66 bc	84 a	72 abc
Arachis hypogaea	1986	69 a	74 a	70 a	69 a	67 a	24 a	18 a	17 a	19 a	15 a
	1987	63 a	63 a	57 a	53 a	61 a	20 a	18 a	21 a	17 a	21 a
Glycine max	1986	101 a	93 a	93 a	110 a	99 a	82 a	62 a	56 a	61 a	60 a
	1987	23 a	27 a	28 a	22 a	26 a	20 a	26 a	26 a	17 a	22 a
Lycopersicon esculentum	1986	132 a	125 a	131 a	129 a	131 a	32 a	26 a	29 a	26 a	28 a
	1987	101 a	87 a	112 a	102 a	100 a	46 ab	49 ab	59 ab	42 b	40 b

Data are the means of six (1986) and five (1987) replications. Row means within weight groups followed by the same letters are not significantly different ($P = 0.5$) according to a least-significant difference test.

† Origins of the four populations are 101—Pioneer 304C corn, Alachua County, Florida; 102—Florunner peanut, Alachua County, Florida; 103—Florunner peanut, Tift County, Georgia; 105—Forrest soybean, North Carolina.

TABLE 2. Final population densities of four *Pratylenchus brachyurus* populations† on selected plants 64 days after inoculation.

	Year	Nematodes/g root				Nematodes/100 cm^3 soil			
		101	102	103	105	101	102	103	105
Medicago sativa	1986	21 a	48 a	29 a	14 a	24 a	32 a	16 a	8 a
	1987	1 a	3 a	1 a	0 a				
Phaseolus vulgaris	1986	158 b	253 a	266 a	125 b	37 b	192 a	200 a	42 b
	1987	22 a	9 b	9 b	4 b				
Citrus limon	1986	0 a	0 a	0 a	0 a	0 a	0 a	0 a	0 a
	1987	1 a	1 a	0 a	0 a				
Zea mays	1986	23 a	25 a	30 a	18 a	139 a	82 a	84 a	96 a
	1987	12 a	5 a	4 a	4 a				
Arachis hypogaea	1986	6 a	9 a	16 a	7 a	1 a	2 a	1 a	1 a
	1987	6 a	4 a	5 a	3 a				
Glycine max	1986	23 a	19 a	30 a	11 a	5 a	5 a	7 a	2 a
	1987	23 a	8 b	9 b	7 b				
Lycopersicon esculentum	1986	89 a	41 a	44 a	36 a	138 a	73 a	71 a	41 a
	1987	10 a	2 a	2 a	2 a				

Data are the means of six (1986) and five (1987) replications. Row means followed by the same letter are not significantly different ($P = 0.05$) according to a least-significant difference test.

† Origins of the four populations are 101—Pioneer 304C corn, Alachua County, Florida; 102—Florunner peanut, Alachua County, Florida; 103—Florunner peanut, Tift County, Georgia; 105—Forrest soybean, North Carolina.

tained in the second experiment were due, in part, to the time of the year when it was conducted.

Pratylenchus brachyurus is pathogenic to *Citrus aurantium* L., Sour orange (1), and is associated with rough lemon roots (12). Reproduction was not observed on rough lemon under the conditions of our two experiments, indicating a possible nonhost relationship. Future tests should include a citrus population since it may be critical to maximize differences if, in fact, they exist.

Data from these tests cannot be used to postulate the presence of races within *P. brachyurus*, but the tests were not definitive. Only a relatively few host species and nematode populations were tested.

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