

Expression of Resistance in Peanuts to *Pratylenchus brachyurus*: Impact on Screening for Resistance¹

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Pratylenchus brachyurus is an economically important pathogen of peanut (*Arachis hypogaea* L.) in most peanut production regions of the United States (10). The nematode attacks fibrous roots, pegs, and pods of peanut causing necrotic lesions (1,3). Both market quality and yield of infected peanuts are reduced. *Pratylenchus brachyurus* is managed primarily with nematicides. No commercial peanut cultivars possess useful levels of resistance to *P. brachyurus*, although resistance to this nematode in peanuts has been reported (2,3,9). Two plant introduction (PI) lines

were considered resistant based primarily on low nematode populations and lack of necrosis in pods (9). It was not clear if nematode populations developed as poorly in fibrous roots as in the developing pods of resistant lines. Resistance to *P. brachyurus* has been identified in another PI (Smith, pers. comm.), but further progress has been hampered by the lack of a rapid and efficient technique for screening peanuts for resistance to this nematode. The objectives of this study were to examine the expression of resistance in peanuts to *P. brachyurus* and to develop an efficient procedure for screening for resistance.

The population of *Pratylenchus brachyurus* (Godfrey, 1929) Filipjev and Schuurman Stekhoven, 1941 used was maintained monoxenically on alfalfa callus tissue cultures (7). Peanut lines used in this study included the susceptible cultivars 'Starr' and 'Tamnut 74' and resistant lines PI 295233, PI 290606, and PI 365553.

Trial 1: To determine if more nema-

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TABLE 1. *Pratylenchus brachyurus* recovered from roots of susceptible (S) and resistant (R) peanut lines in greenhouse tests, 1 and 6 weeks after inoculation.

Peanut line	Nematodes per gram fresh weight			
	Trial 1, 1 week after inoculation*		6 weeks after inoculation†	
	Test 1	Test 2	Trial 2	Trial 3
Starr (S)		1,059 a	107 a	162 a
Tamnut 74 (S)	488 a	684 ab	114 a	
PI 295233 (R)	210 b	274 c	144 a	45 b
PI 290606 (R)		436 bc	264 a	28 b
PI 365553 (R)	208 b	627 ab	134 a	

* Data are means of four replications for Test 1 and eight replications for Test 2. Values within a column followed by the same letter are not significantly different according to Duncan's multiple-range test ($P = 0.05$).

† Data are means of eight replications; values within a column followed by the same letter are not significantly different according to Duncan's multiple-range test ($P = 0.05$). Plants in Test 1 were inoculated 1 week after seedling emergence; plants in Test 2 were inoculated 7 weeks after emergence.

todes penetrated roots of susceptible than resistant peanuts, seeds were planted, one per pot, in 10-cm-d pots containing a loamy sand-peat soil mix (5:1, v/v). One week after seedling emergence, each plant was inoculated with a suspension of 4,000 *P. brachyurus* by pouring the suspension into three depressions in the soil that were equidistant from the base of the seedling. After another week in the greenhouse, the seedling roots were harvested. The entire root system was placed in a mist chamber for 72 hours at 24 C and the nematodes recovered were counted.

In one test with four replications, significantly more *P. brachyurus* penetrated seedling roots of susceptible peanuts than resistant peanuts (Table 1). In a second test with eight replications, only PI 295233 had significantly fewer nematodes in the roots, compared with roots of the susceptible cultivars. Root necrosis in response to nematode infection was similar in all peanut lines.

Trials 2 and 3: Reproduction of *P. brachyurus* on young (Trial 2) susceptible and resistant peanut plants (up to 7 weeks old) and on older (Trial 3) plants (7-13 weeks old) was studied in the greenhouse. Seeds were planted, one per pot, in 15-cm-d pots filled with the same loamy sand-peat soil mix used in Trial 1. Young plants were inoculated 1 week after emergence while older plants were inoculated 7 weeks after emergence. Both young and older plants were inoculated with 3,000 nematodes per plant. Plants were harvested 6 weeks after inoculation. Nematodes were extracted from roots by incubating 3-gram fresh weight samples in a mist chamber for 72

hours and from 300-cm³ soil samples by the centrifugal-flotation method (5). Trials 2 and 3 had eight replications per treatment.

Six weeks following inoculation of 1-week-old seedlings (Trial 2), no significant differences occurred in root populations of *P. brachyurus* among susceptible and resistant peanuts (Table 1). Soil populations in these tests were < 4 nematodes/300 cm³ and did not differ significantly among peanut lines. Susceptible and resistant peanut lines inoculated 7 weeks after seedling emergence and grown for another 6 weeks (Trial 3) contained significantly different root nematode populations (Table 1). Nematode populations in roots of Starr were 3.7-fold and 5.8-fold greater than populations in roots of PI 295233 and PI 290606, respectively. Again, populations of *P. brachyurus* in the

TABLE 2. *Pratylenchus brachyurus* recovered from susceptible (S) and resistant (R) peanut lines grown in a shadehouse.*

Peanut line	6 weeks after inoculation†	18 weeks after inoculation†		
		Soil	Roots	Pods
Starr (S)	47 a	208 a	67 a	41 a
PI 295233 (R)	20 a	9 b	5 b	12 b
PI 290606 (R)	11 a	34 b	12 b	10 b
PI 365553 (R)	37 a	25 b	6 b	10 b

* Data are means of eight replications. Means within a column followed by the same letter are not significantly different according to Duncan's multiple-range test ($P = 0.05$).

† Soil values are nematodes/300 cm³; root and pod values are nematodes per gram fresh weight.

soil were low ($< 10/300 \text{ cm}^3$) and did not differ among peanut lines.

Trial 4: To determine the influence of a full season of growth of susceptible and resistant peanuts on the population dynamics of *P. brachyurus*, seeds were planted, one per pot, in 25-cm-d pots filled with the previously described loamy sand-peat soil mix. The pots were placed in a shade house 1 June 1983; each plant was inoculated with 3,000 nematodes 1 week after seedling emergence. Nematode populations in each pot were determined at 6 and 18 weeks after inoculation. At 6 weeks, four 2.5-cm-d cores were removed from each pot. Nematodes were extracted from the soil by centrifugal-flotation, and root fragments from each sample were placed in a mist chamber. Nematodes recovered from soil and root fractions were combined and populations expressed as number of nematodes per 300-cm³ soil. At 18 weeks, plants were harvested and the roots and developing pods separated from the soil. Nematode populations in roots and pods were determined separately by placing 3-gram fresh weight samples of each in a mist chamber for 72 hours. Soil populations were measured as described. There were eight replications per treatment.

In this test, no differences occurred in nematode populations among peanut lines 6 weeks after inoculation. By 18 weeks after inoculation, however, significant differences existed between the susceptible Starr and resistant peanut lines in populations of *P. brachyurus* in the roots, pods, and soil (Table 2). Nematode populations in roots of Starr were 6–22-fold greater than in roots of the resistant lines. Nematode populations in pods were 6–13-fold greater in Starr than in the resistant lines. Pods of Starr had substantially more lesions than pods of the resistant lines; roots of all lines showed similar development of necrotic lesions.

These data confirm the earlier report (9) that peanut lines of PI 295233, PI 290606, and PI 365553 are resistant to *P. brachyurus*. Furthermore, resistance was expressed in both pods and fibrous roots of older plants. Although susceptible and resistant peanut lines could not be separated based on nematode population densities in roots 6 weeks after inoculation on young

seedlings, in one of two tests they could be separated 1 week after inoculation. While a difference in initial penetration of roots of susceptible and resistant alfalfa by *Meloidogyne hapla* juveniles has been reported (4), in most cases host resistance and ability of nematodes to penetrate the roots do not appear to be correlated (6,8). Thus, differences in initial penetration of peanut roots by *P. brachyurus* may not be a reliable measure of plant resistance.

The inability to distinguish between peanut genotypes susceptible or resistant to *P. brachyurus* within 6–8 weeks means that large-scale screening efforts in the greenhouse are impractical. Although the shade house test was effective in the present study, it is labor intensive and may lack the efficiency required for large-scale screening efforts. Since identification of resistance to *P. brachyurus* in peanuts seems to require growing plants to maturity, it is likely that screening of peanut germplasm for resistance will be accomplished best in naturally infested fields.

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