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Control of *Pratylenchus brachyurus* with Selected Nonfumigant Nematicides on a Tolerant and a Sensitive Soybean Cultivar[1]

S. R. KOENNING[2] AND D. P. SCHMITT[3]

Abstract: A field study was conducted to evaluate soybean cultivar sensitivity to *Pratylenchus brachyurus* and selected nonfumigant nematicides for control of this nematode. 'Essex', a tolerant cultivar, yielded more than 'Forrest', a sensitive cultivar, in an infested field. Plots treated with aldicarb, carbofuran, and fenamiphos had fewer nematodes 40 days after planting than nontreated plots. Plots planted with Forrest and treated with carbofuran had a greater yield than the untreated controls.

Key words: aldicarb, carbofuran, chemical control, fenamiphos, *Glycine max*, lesion nematode, *Pratylenchus brachyurus*.

Pratylenchus brachyurus (Godfrey) Filipjev and Schuurmans-Stekhoven is pathogenic to soybean *Glycine max* (L.) Merr. (3,4,7,8) and is distributed throughout much of the southern United States (1,6). Soybean yield losses resulting from this pest vary with cultivar, soil type, inoculum density, and environmental conditions (3–5,7,8). The soybean cultivars 'Essex' and 'Forrest' were tolerant and sensitive, respectively, to *P. brachyurus* in microplot experiments (8). Forrest is especially sensitive in early plantings (3), and yield suppression of 19% has been documented with low population densities of this nematode. The purpose of this experiment was to evaluate the tolerance of these two soybean cultivars in a field naturally infested with *P. brachyurus* using selected nonfumigant nematicides.

Materials and Methods

The experiment was conducted near Montrose, North Carolina, in a Fuquay sand (91% sand, 6% silt, 3% clay, < 0.5% organic matter; pH 5.5). The site was naturally infested with *P. brachyurus*, although *Helicotylenchus dihystera* (Cobb) Sher and *Tylenchorhynchus claytoni* Steiner were also present in low numbers (0–500/500 cm^3 soil). The field, previously cropped to soybeans, was limed at a rate of 4,500 kg/ha 1 month before soybean planting.

A 6 × 6 Latin square design experiment was established on 30 April 1982 to evaluate six treatments: Essex planted in fenamiphos-treated and nontreated soil and Forrest planted in nontreated soil and soil treated with carbofuran, aldicarb, or fenamiphos. Nematicides were applied as granules at a rate of 2.24 kg a.i./ha (0.21 g a.i./m of row) in a 30-cm band in front of the planter and incorporated with rolling tines (set to operate at 12–14 cm deep) attached to the front of the planter. The herbicide alachlor (2.24 kg a.i./ha) was applied to all plots. All other weed control was done with a commercial cultivator and by hand. The experiment was conducted under natural moisture conditions. Soil moisture was adequate for good plant growth early in the season but dry during flowering and pod development.

Plots were 15.4 m long and four rows wide with 0.91 m spacing. All data, including yield and soil samples for nematode assay, were taken from the center two rows. Nematode samples were collected 30 April (planting date), 11 June, and 11 August 1982. Samples consisted of 10–12 2.5-cm-d soil cores taken to a depth of 15–20

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[2] Research Analyst, Department of Plant Pathology, North Carolina State University, Raleigh, NC 27695.

3 Associate Professor of Plant Pathology, North Carolina State University, Raleigh, NC 27695.

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TABLE 1. Yields of two soybean cultivars and population density of *Pratylenchus brachyurus* (soil and root fraction) as influenced by selected nonfumigant nematicides.

Cultivar	Treatment†	*Pratylenchus brachyurus*/500 cm³ soil			Yield (kg/ha)	Crop value‡	Net gain or loss§
		30 April	11 June	11 August			
Essex	Control	58	240	4,553	1,309	$235.62	
Essex	Fenamiphos	92	38	2,929	860	$154.80	−$154.34
Forrest	Control	71	200	7,075	394	$ 70.92	
Forrest	Fenamiphos	95	66	565	615	$110.70	−$ 33.74
Forrest	Carbofuran	166	46	710	1,044	$187.92	$ 77.00
Forrest	Aldicarb	37	80	1,844	754	$135.72	−$ 8.72
LSD (0.05)		52	25	3,708	617		

All data are means of six replicates.
† All chemicals were applied at 2.2 kg/ha (0.21 kg a.i./m of row).
‡ Crop value = $0.18/kg seed × seed wt/ha.
§ Gain or loss within cultivar = (crop value from treated plots − treatment cost) − crop value for control plots. Chemical costs: aldicarb and fenamiphos, $36.76 per kg a.i.; carbofuran, $20.00 per kg a.i.

cm. Nematodes were extracted from 500 cm³ soil by elutriation and centrifugation (2) and from roots by Seinhorst mist (2) for 7 days. Plots were harvested with a commercial harvester. Plant and nematode data were subjected to analysis of variance for a Latin square design, and treatment means were compared by the least significant difference.

RESULTS AND DISCUSSION

All nematicide-treated plots had lower nematode numbers when compared with nontreated controls ($P = 0.05$) at the June sampling (Table 1). Carbofuran and fenamiphos maintained the lowest numbers on Forrest at the August sampling.

Although nematodes were reduced in all treated plots, yields were not consistently increased. Yield of Forrest was increased with the nematicides carbofuran, aldicarb, and fenamiphos by 150, 90, and 70%, respectively. Fenamiphos-treated Essex yielded 30% less than the control. Soybean yields were low in all plots because of an acid subsoil and late-season drought stress.

Nontreated Essex yielded more than nontreated Forrest, confirming microplot data (8). This phenomenon was interpreted as tolerance in Essex to this pest. Both cultivars are in maturity group V. Forrest generally has greater yields than Essex in on-farm variety tests in North Carolina (E. J. Dunphy, pers. comm.). Although carbofuran-treated Forrest yielded more ($P = 0.05$) than untreated Forrest, the nearly threefold yield increase is insufficient to justify the cost of applying nematicides because of the low yields obtained in this field. About 2,300 kg/ha seed are required at $0.18/kg to cover production fixed and variable costs. Further field experimentation may show a benefit from nematicide treatments when cultivars sensitive to this nematode are used because of their pest resistance or other desirable qualities. The large yield increases obtained in nematicide-treated plots lend further evidence to support the hypothesis that *P. brachyurus* is pathogenic to soybean under field conditions and warrants the use of management tactics.

LITERATURE CITED

1. Barker, K. R. 1974. Influence of geographic area and previous crop on occurrence and densities of plant parasitic nematodes in North Carolina. Plant Disease Reporter 58:991–995.

2. Barker, K. R. (Chairman). 1978. Determining nematode responses to control agents. Pp. 114–125 *in* E. I. Zehr, ed. Methods for evaluating plant fungicides, nematicides, and bactericides. St. Paul, MN: American Phytopathological Society.

3. Koenning, S. R., D. P. Schmitt, and K. R. Barker. 1985. Influence of planting date on population dynamics and damage potential of *Pratylenchus brachyurus* on soybean. Journal of Nematology 17:428–434.

4. Koenning, S. R., D. P. Schmitt, and K. R. Barker. 1985. Influence of selected cultural practices on

winter survival of *Pratylenchus brachyurus* and subsequent effects on soybean yield. Journal of Nematology 17:464–469.

5. Lindsey, D. W., and E. J. Cairns. 1971. Pathogenicity of the lesion nematode, *Pratylenchus brachyurus*, on six soybean cultivars. Journal of Nematology 3:220–226.

6. Norton, D. C. 1978. Ecology of plant-parasitic nematodes. New York: John Wiley and Sons.

7. Ross, J. P., C. J. Nusbaum, and H. Hirschmann. 1967. Soybean yield reduction by lesion, stunt, and spiral nematodes. Phytopathology 57:463–464 (Abstr.).

8. Schmitt, D. P., and K. R. Barker. 1981. Damage and reproductive potentials of *Pratylenchus brachyurus* and *Pratylenchus penetrans* on soybean. Journal of Nematology 13:327–332.