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Nematode Response to Cool Season Annual Graminaceous Species and Cultivars

J. F. PEDERSEN[1] AND R. RODRÍGUEZ-KÁBANA[2]

Abstract: The response of 29 rye, oat, triticale, and wheat cultivars to selected nematode species was determined in the greenhouse. Variability in nematode root galling and final nematode population densities in root and soil in response to cool season annual graminaceous crops occurred for spiral (*Helicotylenchus dihystera*), stubby root (*Paratrichodorus minor*), and root-knot (*Meloidogyne incognita*) nematodes. Although none of the graminaceous crops supported *M. incognita* at levels as high as the susceptible 'Davis' soybean control, sufficient variation existed among these to warrant field scale studies.

Key words: *Avena sativa, Helicotylenchus dihystera, Meloidogyne incognita,* oat, *Paratrichodorus minor,* rye, *Secale cerale,* triticale, *Triticum aestivum,* wheat.

Cool season annual graminaceous crops are double cropped with soybean (*Glycine max* (L.) Merr.) in much of the southeastern United States to provide ground cover, forage for grazing, or a harvestable grain crop. They are believed to suppress plant-parasitic nematode populations. In North Carolina, overwintering *Pratylenchus brachyurus* (Godfrey) Filipjev and Schuurmans-Stekhoven populations were reduced by wheat (*Tritichum aestivum* L.), compared with a winter fallow treatment (2). Baird and Bernard have also shown reductions in numbers of second-stage juveniles of *Heterodera glycines* Ichinohe in Tennessee (1).

Differential plant-parasitic nematode response to species and cultivars of *Festuca arundinacea* (Schreb.) and *Phalaris aquatica* (L.) has been documented in the southeastern United States (3). The cropping system comparisons discussed above in the North Carolina and Tennessee studies, however, were limited to a single wheat cultivar, Arthur 71 and Arthur, respectively. Cool season annual graminaceous crop effects on plant-parasitic nematodes common to the southeastern United States need to be elucidated because of potential impacts on subsequent summer crops. Our objective was to determine whether plant-parasitic nematodes common to the southeastern United States differed in their response to cool season graminaceous crops.

MATERIALS AND METHODS

Graminaceous crops used in this study were rye (*Secale cerale* L.), cultivars GI-85, Elbon, Forager, and AFC 20-20; oats (*Avena sativa* L.), cultivars Florida 501, Coker 227, Coker 820, and Terral-Norris 81-21; triticale (× *Triticoseale* Wittmack), cultivar Morrison; and wheat, cultivars Hunter, Scotty, Hart, Coker 68-15, Coker 747, Coker 762, Coker 797, Coker 916, Coker 983, Wheeler, Pioneer 2550, Arco A876, Florida 301, Florida 302, Tyler, Georgia 1123, Stacy, Omega 78, Caldwell, and Terral-Norris 81-17. A nematode susceptible soybean, 'Davis', was included with the grasses as a control.

All graminaceous crops were seeded at a rate of 0.5 g per pot in 1-liter 10-cm-d plastic pots in the greenhouse on 15 May 1985. Soybean was seeded at 10 seeds per pot and hand thinned to eight seedlings per pot after emergence. The soil was a Malbis sandy loam (sand 75%, silt 10%, clay 15%; < 1% organic matter; pH 6.2) infested with spiral (*Helicotylenchus dihystera* (Cobb) Sher.), stubby root (*Paratrichodorus minor* (Culbran) Siddiqi), and root-knot (*Meloidogyne incognita* (Kofoid and White) Chitwood) nematodes at levels of 10, 15, and 50 adults or juveniles per 100 cm^3 soil, respectively. The pots were surface watered daily and were well drained. Ambient greenhouse temperature was maintained at 23–28 C during the experiment. On 28

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[1] Associate Professor, Department of Agronomy and Soils, Auburn University, Auburn, AL 36849.
[2] Professor, Department of Plant Pathology, Auburn University, Auburn, AL 36849.

TABLE 1. Spiral (*Helicotylenchus dihystera*), stubby root (*Paratrichodorus minor*), and root-knot nematode (*Meloidogyne incognita*) numbers and nematode galls in soybean and in rye, oat, triticale, and wheat cultivars.

	Spiral		Stubby	Root-knot		
	Root (No./5 g)	Soil (No./100 cm³)	Soil (No./100 cm³)	Root (No./5 g)	Soil (No./100 cm³)	Galls (No./5 g root)
Control (soybean)						
Davis	51	30	16	3,203	203	82
Rye						
Forager	58	38	107	10	29	25
Elbon	115	31	168	10	5	13
GI-85	91	40	193	8	20	12
AFC 20-20	37	15	157	0	12	32
Oat						
Coker 820	92	26	53	970	23	80
Terral-Norris 81-21	79	9	83	155	13	19
Coker 227	61	9	62	41	14	25
Florida 501	103	23	86	2	7	18
Triticale						
Morrison	283	12	64	10	20	26
Wheat						
Coker 747	206	10	183	136	8	23
Florida 301	131	3	99	93	12	17
Coker 916	112	19	99	86	10	19
Coker 983	131	14	105	79	8	16
Georgia 1123	111	13	42	64	12	14
Pioneer 2550	102	7	98	40	7	17
Tyler	69	26	62	39	15	16
Terral-Norris 81-17	109	20	74	39	20	19
Omega 78	266	10	142	35	4	17
Florida 302	134	15	106	31	38	12
Caldwell	105	14	84	31	3	23
Coker 68-15	180	41	179	26	20	19
Coker 797	43	30	84	24	9	17
Coker 762	58	17	67	21	5	23
Stacy	279	26	96	20	5	16
Arco A876	110	14	150	18	7	24
Hunter	136	49	206	15	13	20
Scotty	170	15	404	11	7	12
Wheeler	358	15	142	9	6	20
Hart	116	25	153	0	5	7
SE	23	5	18	75	8	5
LSD (P = 0.05)	76	15	59	250	27	17

June 1985, the plants were removed from the pots and the number of galls in the root system caused by *M. incognita* was determined. Numbers of nematodes per 100 cm³ soil in each pot and in the entire root systems were determined using an incubation method (5).

The treatments were replicated eight times in a completely randomized design. Data were analyzed using analysis of variance. The least significant different (LSD) and the standard error (SE) were calculated for each variable.

RESULTS AND DISCUSSION

Rye cultivars exhibited little galling (Table 1). One oat cultivar, Coker 820, had many more galls associated with it than any other graminaceous species tested.

Equivalent or larger numbers of spiral and stubby root nematodes were associated with the graminaceous species when compared with the soybean control. Morrison triticale, and Wheller, Stacy, and Omega 78 wheat had the largest numbers of *H. dihystera* associated with their roots. These cultivars were not often among those with the largest number of *H. dihystera* associated with soil fraction, which included Forager, GI-85, and Elbon rye and Hunter, Coker 68-15, Tyler, Stacy, and Coker 797 wheat. *Paratrichodorus minor*, predominantly an ectoparasite, was found in the largest number in the soil samples associated with GI-85, Elbon, and AFC 20-20 rye and Hunter, Scotty, Hart, Coker 68-15, Wheeler, Coker 747, Arco A876, and Omega 78 wheat. *P. minor* counts on Scotty were approximately twice those of the next highest cultivar.

Of the nematodes detected in this study, *M. incognita* is the most damaging to soybean in double cropping systems in the southeastern United States (4). No graminaceous cultivar was associated with *M. incognita* numbers approaching those found in the soybean control. Considerable variation in *M. incognita* numbers and root galling was present within graminaceous species, especially in oat roots. Coker 820 oat roots had significantly higher numbers of *M. incognita* than any other grass (⅓ those of the soybean control); Florida 510 oat roots had among the lowest. No large differences in *M. incognita* numbers were found among the graminaceous soil samples.

Variability in plant-parasitic nematode response to cool season annual graminaceous species and cultivars does exist under greenhouse conditions. Although none of the graminaceous crops studied supported *M. incognita* at levels as high as the nematode susceptible control, sufficient variation existed among these crops to warrant field scale studies.

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