Population Changes of *Pratylenchus hexincisus* and *P. scribneri* in Maize Inbred Lines

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ABSTRACT

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Population changes of *Pratylenchus hexincisus* and/or *P. scribneri* in 18 maize inbred lines were studied in the greenhouse or field. Hybrids A619Ht × A632Ht and Mo17Ht × B73Ht, or C123Ht, hosts of these nematodes, served as checks to monitor suitability of the environment for nematode reproduction. Inbreds C123Ht, Mo17Ht, and W64AHt supported significantly more *P. scribneri* per gram of dry root than other entries did. Inbred C123Ht also supported significantly more *P. hexincisus* per gram of dry root than other cultivars did. Inbreds A632Ht, B37Ht, and B68Ht supported significantly fewer *P. scribneri* that other entries did.

Additional key words: lesion nematode, reproduction

The lesion nematode *Pratylenchus hexincisus* Taylor & Jenkins is a damaging nematode of maize (*Zea mays* L.) (6,7,9). Because the nematode has a wide host range (9), including soybean (*Glycine max* L.), control by crop rotation in many areas is limited. Nematicide applications minimize the detrimental effects of *P. hexincisus* in maize (1,6) but cost and environmental hazards associated with pesticides make alternative controls desirable. Use of resistant cultivars is an option worth exploring. Varying degrees of parasitism occur among commercial hybrids (8) and inbred lines (4).

The purposes of this work were to 1) study population changes of *P. hexincisus* in 18 maize inbred lines in the greenhouse, and 2) study population changes of *P. hexincisus* and *P. scribneri* Steiner in the same cultivars in the field.

MATERIALS AND METHODS

Greenhouse experiments. Increase of *P. hexincisus* in 18 maize inbreds used in breeding in the North Central United States was evaluated in the greenhouse. The hybrids Mo17Ht × B73Ht and A619Ht × A632Ht, hosts of *P. hexincisus* (8), served as checks to monitor suitability of the environment for nematode reproduction. *P. hexincisus* was obtained from a maize field in Des Moines County, IA, and increased in tomato (*Lycopersicon esculentum* Mill.).

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Maize seeds were germinated on damp filter paper in petri dishes. Five-day-old seedlings were planted one per pot in a 2:1 mixture of sand and loam (60% sand, 23% silt, 17% clay, 2% organic matter, pH 7.6) contained in a 15-cm-diameter clay pot. A randomized block design with five replicates was used.

P. hexincisus was pipetted in 10 ml of water into a 2-cm hole next to the seedling root system 1 day after planting. Inocula were 550 ± 50 and 1,000 ± 100 *P. hexincisus* in the first and second experiments, respectively. Plants were fertilized monthly with NPK(6-10-4) and watered as required. Light in the greenhouse was supplemented with a 15-hr fluorescent light period (198 $\mu E/m^{-2}/sec^{-1}$). The experiments were terminated 90 days after inoculation. *P. hexincisus* was extracted (2) for 4 days from 2–3 g of randomly selected, well-washed fibrous roots, which were then dried at 90 C and nematode numbers calculated per gram of dry root.

Field experiments. *Test 1.* The same inbreds tested in the greenhouse were also evaluated in a Louisa County field in 1981. The soil was a sandy loam (88% sand, 2% silt, 10% clay, 2% organic matter, pH 6.0) that had been planted to soybean cultivar Williams in 1980. The field was infested with *P. scribneri* and *P. hexincisus* at a ratio of 4:1. Small numbers of *Xiphinema americanum* Cobb, *Paratrichodorus minor* (Golden) Siddiqi, and *Helicotylenchus pseudorobustus* (Steiner) Golden were also present. Rainfall was excellent for plant growth.

A randomized block design with five replicates was used. Two adjacent rows 9.2 m long and 1 m apart constituted an experimental unit. The outermost rows were bordered with A619Ht × A632Ht plants. Seeding was at 42,405/ha.

Soil and root samples were obtained with a 2-cm-diameter soil probe 65, 95, and 125 days after planting. Five cores were taken to a depth of 15.2 cm in the rhizosphere of five randomly chosen plants per row. Thus, a sample was a composite of 10 cores per experimental unit. Nematodes were extracted from fibrous roots (2) and the soil (5).

Test 2. This experiment was conducted at the Iowa State University Hinds Research Farm in Story County in 1982 to evaluate population changes of *P. scribneri* in inbreds A632Ht, B37Ht, Mo17Ht, and W64AHt. These inbreds supported extreme ranges of nematode numbers in one or more of the previous experiments. Inbred C123Ht, an excellent host was used as a check. The field was planted to maize in 1981 and had a sandy loam (81% sand, 12% silt, 7% clay, 2% organic matter, pH 6.6) soil. The field was infested with *P. scribneri* and small numbers of *X. americanum, P. minor, H. pseudorobustus,* and *Paratylenchus* spp.

The experimental design, sampling, and extraction techniques were as

Table 1. Mean numbers[a] of *Pratylenchus hexincisus* in maize roots 3 mo after inoculation in the greenhouse

Cultivar	No. nematodes/g dry root	
	Exp. 1[b]	Exp. 2[c]
C123Ht	3,019	39,991
A619Ht	253	34,560
Mo17Ht	416	15,730
B86	53	15,134
A619Ht × A632Ht	347	14,124
Mo17Ht × B73Ht	98	13,057
Wf9Ht	201	10,267
B14AHt	265	9,518
B73Ht	65	9,297
B76	499	7,232
H100	171	6,944
H99	264	4,570
Va26Ht	219	4,299
A632Ht	380	3,578
B68Ht	196	2,693
N7A	48	2,693
B37Ht	123	2,380
B77	139	1,835
B84Ht	106	1,834
W64AHt	245	699
LSD ($P = 0.05$)	1,341	16,778

[a] Five replicates.
[b] Each plant was inoculated with 550 ± 50 *P. hexincisus*.
[c] Each plant was inoculated with 1,000 ± 100 *P. hexincisus*.

Table 2. Mean numbers[a] of *Pratylenchus scribneri* and *P. hexincisus* in maize roots, Louisa County, IA, 1981

Cultivar	No. nematodes/g dry root		
	8 July	11 August	10 September
C123Ht	10,368	9,710	5,910
W64AHt	9,645	7,553	3,523
A619Ht	2,790	4,653	3,081
B77	9,293	4,641	7,133
A632Ht	9,658	4,499	3,911
B37Ht	3,983	3,435	3,549
H100	3,494	3,185	2,023
B14AHt	7,713	2,928	2,609
Wf9Ht	5,540	2,693	1,333
N7A	6,717	2,268	614
Mo17Ht	3,566	2,598	3,013
A619Ht × A632Ht	7,238	2,494	2,031
Mo17Ht × B73Ht	5,857	1,938	1,466
B86	5,667	1,718	1,762
B84	9,334	1,490	1,067
H99	4,149	1,282	1,744
B73Ht	4,345	1,001	1,543
Va26Ht	2,310	976	1,031
B68Ht	8,306	926	990
B76	2,367	627	3,727
LSD ($P = 0.05$)	6,738	2,953	4,290

[a] Five replicates.

described before, except sampling dates were 65 and 95 days after planting.

RESULTS

Nematode counts from the soil are not presented because numbers were low.

Greenhouse experiments. Inbreds C123Ht and A619Ht supported significantly ($P = 0.05$) more *P. hexincisus* 3 mo after inoculation than other cultivars did in either one or both tests (Table 1). The ranking of the other cultivars was generally inconsistent between the two experiments.

Field experiments. In the Louisa County test, inbred C123Ht supported significantly ($P = 0.05$) more *P. scribneri* and *P. hexincisus* than did most cultivars 95 and 125 days after planting (Table 2). The number of cultivars supporting significantly different numbers of nematodes from C123Ht was smallest 65 days after planting.

Table 3. Mean numbers[a] of *Pratylenchus scribneri* in maize roots, Story County, IA, 1982

Cultivar	No. nematodes/g dry root	
	8 July	19 August
C123Ht	3,511	2,801
W64AHt	2,833	1,595
Mo17Ht	1,665	1,319
B37Ht	950	1,192
A632Ht	829	588
B68Ht	290	197
LSD ($P = 0.01$)	2,031	1,602

[a] Five replicates.

In the Story County test, inbred C123Ht supported more *P. scribneri* on both sampling dates than inbreds A632Ht, B37Ht, and B68Ht did (Table 3).

DISCUSSION

Although many inbreds were inconsistent in response to *Pratylenchus* spp., perhaps because of different inoculum densities and environmental conditions, consistent reactions existed in a few lines. For example, C123Ht ranked first in susceptibility to *Pratylenchus* spp. in all tests. Mo17Ht also was one of the better hosts, which agrees with results of Georgi et al (4). Both C123Ht and Mo17Ht have C103, a derivative of cultivar Lancaster Surecrop, as a parent. Whether this susceptibility to *Pratylenchus* spp. is being carried in C103 genes is a hypothesis that needs to be tested.

Although C103 is used little in breeding now, it was used extensively between 1950 and 1970 (3). Inbreds C123Ht and Mo17Ht are still common parents in maize hybrids. If other attributes are equal to or superior enough to offset the high susceptibility of C123Ht and Mo17Ht to *Pratylenchus* spp., breeders might consider using less susceptible germ plasm to *Pratylenchus* spp. to reduce the possibility of carrying susceptible germ plasm along. It is difficult with current resources to test all inbreds and hybrids for susceptibility to even the important nematodes such as *Pratylenchus* spp. Use of less susceptible inbreds, where possible, would reduce the possibility of unknowingly sustaining susceptible germ plasm in maize population.

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