

## Reproduction of *Pratylenchus hexincisus* and *P. scribneri* in Corn Inbreds<sup>1</sup>

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**Abstract:** Population development of lesion nematodes was measured in 17 inbred lines of South Dakota and A619Ht dent corn. In two greenhouse groundbed tests, lines SD101, SD102, and SD103 supported fewer than 1,000 *Pratylenchus hexincisus* per gram of dry root after 12 weeks. In an irrigated field test, inbred SD101 supported fewer than 1,000 *P. scribneri* per gram of dry root on each of two sampling dates, whereas line A619Ht supplied high populations of *P. scribneri* on both dates. Inbreds SD45, 84742, and 84763 supported high populations of both *P. hexincisus* and *P. scribneri*.

**Key words:** corn, corn breeding, lesion nematode, maize, *Pratylenchus*, reproduction, resistance, *Zea mays*.

Yield losses in corn (*Zea mays* L.) have been associated with *Pratylenchus hexincisus* Taylor and Jenkins and *P. scribneri* Steiner in the north central region of the United States (1,5). Nematicides are currently the principal method of lesion nematode control in corn in this region (6), but the incorporation of lesion nematode resistance in commercial hybrids would provide a useful alternative (7). Previous studies have demonstrated differences in reproduction of lesion nematodes in corn inbreds (4,7,8). The inability of the inbred corn lines B37Ht and B68Ht to support large numbers of *P. scribneri* was one of the factors contributing to their resistant reactions to this nematode (8). The objectives of this study were to measure population development of *P. hexincisus* or *P. scribneri* in inbred lines of South Dakota and A619Ht dent corn.

### MATERIALS AND METHODS

**Greenhouse studies:** Seventeen inbred lines of South Dakota dent corn were evaluated in a greenhouse groundbed that had been infested 4 years earlier with *P. hexincisus* obtained from a corn field in Moody County, South Dakota. The nematode was maintained on corn and had an initial population density of 112/100 cm<sup>3</sup> soil. The soil

was a silt loam (37% sand, 63% silt, 3.2% organic matter; pH 7.7). Nine of the seventeen inbred lines were selected for a second evaluation. The tests were conducted from late spring through early fall during which time groundbed soil temperatures ranged from 22 to 30 C. The soil was thoroughly rototilled between tests. Entries were hand planted in 1-m-wide rows with 30 cm between hills. A slow-release fertilizer (14-14-14 NPK) was applied at 50 g/m<sup>2</sup> at planting, and supplemental lighting was provided when necessary to extend the photoperiod to 15 hours. Entries were replicated four times in the first evaluation and six times in the second. Plants were thinned to two per hill 1 week after emergence. Experiments were arranged in randomized complete block designs. Root systems were removed 12 weeks after planting, and nematodes were extracted by a modified shaker technique (2). Roots were washed and chopped; a 2-g subsample was placed in a 120-ml flask with 60 ml tap water added and placed on a rotary shaker for 48 hours. Contents of flasks were placed on a Baermann funnel overnight. Nematodes were counted and numbers per gram of dry root calculated.

**Field study:** The same nine inbred lines were evaluated plus inbred line A619Ht in a furrow-irrigated corn field located in Fall River County, South Dakota. The field was naturally infested with *P. scribneri* (Pi = 58/100 cm<sup>3</sup> soil). Soil was a sandy loam (65% sand, 18% silt, 17% clay, 1% organic matter; pH 7.4). Single row plots, 3 m long

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TABLE 1. *Pratylenchus hexincisus* in 17 corn inbreds 12 weeks after planting in a greenhouse groundbed.

Inbred	Inbred pedigree	No. of <i>P. hexincisus</i> /g dry root	
		Test 1†	Test 2‡
84742	Pioneer 3965A	12,905	4,970
84763	A635 × SPPS (Co)	7,365	3,946
SD45	SDp232 × H96	4,643	5,601
84711	SDp309 × SD30	3,610	—
84728	Pioneer 3709	3,508	1,423
84664	SDp309 × W64A	2,875	2,071
SD47	Pioneer 3709	2,113	—
84716	A635 × SDPIK1	1,898	—
84681	SDp232 × H96	1,673	—
SD46	Pioneer 3709	1,430	—
84603	SDp232 × H96	1,410	—
84738	387-12 × CM65	1,160	—
84726	SD18 × SD30	1,123	—
84772	SDp232 × H96	600	1,226
SD101	SDPIK1 × CM65	540	598
SD102	Pioneer 3710	488	622
SD103	Pioneer 3710	323	245
FLSD ( $P = 0.05$ )		3,289	2,172

† Mean of four replicates.

‡ Mean of six replicates. — = not evaluated.

with 1 m between rows and 30 cm between hills, were replicated four times. Alachlor was applied at planting (12 May 1986). Four 400-cm<sup>3</sup> soil samples were removed with a shovel to a depth of 20 cm from each block at planting, and the nematodes were extracted (3) and counted. Root systems were removed from three randomly selected hills in each plot 81 and 127 days after planting. The experimental design and nematode root extraction method were similar to those described for the greenhouse studies. The maturity range (72–75 days to silk) of all entries in the field and greenhouse tests was similar. Low populations of *Helicotylenchus pseudorobustus* (Steiner) Golden also occurred in the field and greenhouse, but data are not reported.

## RESULTS AND DISCUSSION

*Greenhouse studies:* Inbreds SD101, SD102, SD103, and 84772 supported significantly ( $P = 0.05$ ) fewer *P. hexincisus* per gram of dry root than did inbreds SD45, 84742, and 84763 (Table 1). These seven inbreds plus two with an intermediate response (84664 and 84728) were further

TABLE 2. *Pratylenchus scribneri* in 10 corn inbreds 81 and 127 days after planting in a South Dakota irrigated field.

Inbred	No. of <i>P. scribneri</i> /g dry root†		
	81 days	127 days	
84763	15,467	4,647	
SD45	9,742	4,732	
84664	8,270	1,949	
A619Ht	7,209	4,741	
84772	5,755	3,140	
84742	4,714	4,938	
84728	3,894	5,883	
SD103	2,180	2,585	
SD102	1,692	1,949	
SD101	799	894	
FLSD ( $P = 0.05$ )		3,206	2,788

† Mean of four replicates.

tested. In the second test, inbreds SD101, SD102, SD103, and 84772 again supported significantly ( $P = 0.05$ ) fewer *P. hexincisus* than did SD45, 84742, and 84763 (Table 1). Reproduction of *P. hexincisus* in 84664 and 84728 was again intermediate. SD101, SD102, and SD103 supported fewer than 1,000 *P. hexincisus* per gram of dry root in both studies. Because midseason *P. hexincisus* numbers below 1,000 per gram of dry root probably do not cause substantial corn yield losses in Iowa (6) or in South Dakota (Smolik, unpubl.), these three inbreds may provide a source of resistance to *P. hexincisus*.

*Field study:* At the first sampling (day 81), inbreds SD101, SD102, and SD103 supported significantly ( $P = 0.05$ ) fewer *P. scribneri* per gram of dry root than did 84763, SD45, 84664, A619Ht, and 84772 (Table 2). Inbred A619Ht has been reported as susceptible to both *P. hexincisus* and *P. scribneri* (7). At the second sampling (day 127), only SD101 supported significantly ( $P = 0.05$ ) fewer *P. scribneri* than did 84763, SD45, A619Ht, 84742, and 84728. Because SD101 supported fewer than 1,000 *P. scribneri* per gram of dry root on both sampling dates, it may provide a source of resistance to both *P. scribneri* and *P. hexincisus*. Numbers of *P. scribneri* declined over the growing season in the five most susceptible inbreds and increased in the five less susceptible inbreds (Table 2). It is

possible the levels of root tissue destruction in the most susceptible inbreds resulted in inadequate amounts of healthy tissue to maintain high populations through the growing season; however, no quantitative measurements of root damage were recorded.

Although inbred SD103 supported the fewest numbers of *P. hexincisus* in both greenhouse tests, it supported moderate numbers of *P. scribneri* in the field. It would be useful to test the response of lines SD101, SD102, and SD103 to other geographical isolates of *P. hexincisus* and *P. scribneri*. Inbreds SD45, 84742, and 84763 supported high populations of both *P. hexincisus* and *P. scribneri*; if they confer this susceptibility to offspring, careful consideration should be given to their inclusion in a breeding program. These six lines were included in a recently completed diallel, and the response of progeny to *P. hexincisus* and *P. scribneri* will be measured in future studies in an attempt to determine mode of inheritance of resistance and susceptibility to lesion nematodes. Many of the lines included in this study had a similar pedigree (Table 1), and the response of sister lines to *P. hexincisus* or *P. scribneri* was often diverse (Tables 1, 2). SD102 and SD103

were also sister lines, however, and while these lines differ in many agronomic characters (Wicks, unpubl.), they apparently have similar mechanisms governing response to *P. hexincisus*.

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