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A Checklist of Iowa Foliose Lichens

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Population Changes of *Pratylenchus hexincisus* on *Zea mays* and Three Perennial Prairie Species[1]

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Pratylenchus hexincisus is a migratory endoparasitic nematode commonly attacking corn and soybeans in Iowa, but infrequently found in native Iowa prairies. This nematode was inoculated on corn *(Zea mays)* and three perennial prairie species *(Helianthus grosseserratus, Sorghastrum nutans,* and *Sporobolus asper),* and the nematode numbers were observed monthly for 6 months. An increase in nematode numbers was observed on corn. Decreases, but never extinction, in nematode numbers were observed on the three prairie species. It is concluded that these prairie species are inefficient hosts and may be contributing factors for the infrequent occurrence of *P. hexincisus* in Iowa prairies.

INDEX DESCRIPTORS: *Pratylenchus hexincisus, Helianthus grosseserratus, Sorghastrum nutans, Sporobolus asper,* nematodes.

The lesion nematodes, *Pratylenchus* spp., commonly parasitize corn and soybeans in the Midwest (2, 3, 5, 8, 9), but are rarely found in native prairies, the forerunners of midwestern cultivated fields. *Pratylenchus penetrans* occurs in native Kansas prairie on *Sorghastrum nutans* and *Sporobolus asper,* but the frequency was not reported (7). In Iowa, *Pratylenchus* spp. have been observed in the Ames High School (Story Co.) and Kalsow (Pocahontas Co.) prairies, but the numbers and frequencies are small (4, 6).

The purpose of this study was to determine if *P. hexincisus* Taylor and Jenkins, one of the most common nematode species in corn in Iowa, could survive and reproduce on selected prairie plant species under controlled conditions. It is part of a long-range study to determine the host range, distribution, and possible origins of this nematode in Iowa.

MATERIALS AND METHODS

Seeds of *Helianthus grosseserratus* Martens, *Sorghastrum nutans* (L.) Nash, and *Sporobolus asper* (Michx.) Kunth were vernalized, germinated, and potted, 1 seed/pot, into 15-cm diameter clay pots containing 1500 cm^3 steam-sterilized loamy sand soil (80% sand, 15% silt, 5% clay, 0.8% organic matter, pH 7.2). After 2 months growth, these plants were fertilized with 3 g N-P-K (6-10-4). At the same time, *Zea mays* L., cv 'Pioneer 3780', was planted as above, but the corn was not fertilized until after the first harvest. A total of 4670 ± 200 *P. hexincisus* contained in 10 ml of water was inoculated onto the roots of each plant in each pot 7 days after emergence of the corn seedlings. The original population of *P. hexincisus* was hand-picked from field corn in Iowa, and maintained on corn in the greenhouse.

The design was a randomized complete block with three replications for each treatment (one pot containing a plant species) to be harvested monthly for 6 months. The experiment was placed on a greenhouse bench under incandescent lights with a 10 hr day length. Corn, which matures in 3 months, was reseeded in the same soil, such that the corn pots for months 1, 2, and 3 became months 4, 5, and 6, respectively. The experiment therefore contained 63 experimental units.

The nematodes were extracted from the roots by the 96 hr shaker method (1), and the numbers of nematodes/g of dry root and /total dry root mass were calculated. Duncan's multiple range tests were performed on a square root transformation of the data by month for all the plant treatments and by plant treatment for all months.

RESULTS AND DISCUSSION

Corn supported significantly ($p = 0.05$) greater reproduction of *P. hexincisus* than did the prairie plants for all months except the second (Fig. 1). The reduction in numbers of *P. hexincisus*/g of dry root (Fig. 1) in month 2 is believed to be due to a root dilution factor: the root system of corn undergoes rapid growth between 30 and 60 days, causing a dilution of *P. hexincisus*/g dry root because of the nematode's

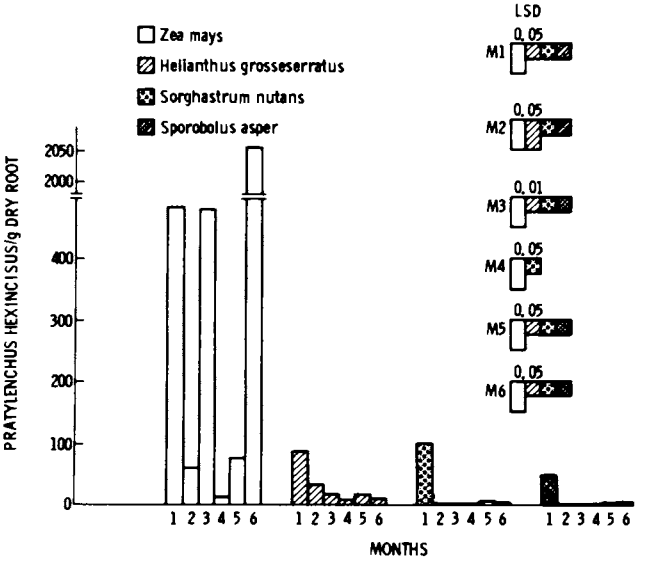

Figure 1. *Numbers of* Pratylenchus hexincisus/*g of dry root in* Zea mays, Helianthus grosseserratus, Sorghastrum nutans, *and* Sporobolus asper *during 6 months. LSD represents least significant difference obtained through Duncan's multiple range test. M represents month.*

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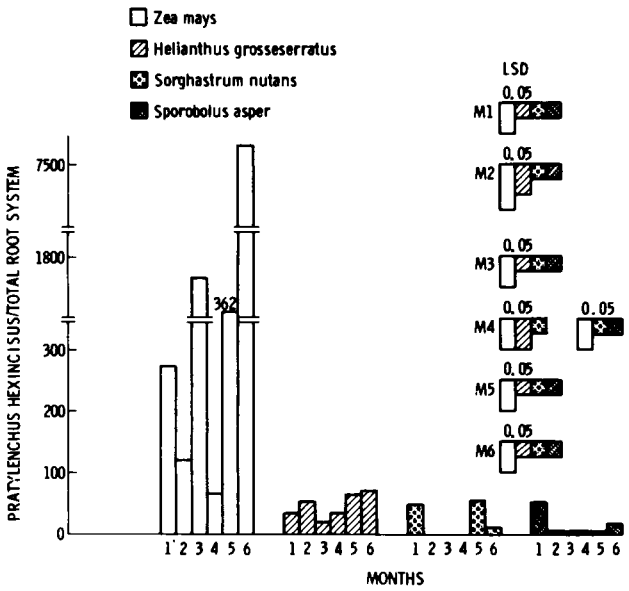

Figure 2. *Numbers of* Pratylenchus hexincisus/*total root system in* Zea mays, Helianthus grosseserratus, Sorghastrum nutans, *and* Sporobolus asper *during 6 months. LSD represents least significant difference obtained through Duncan's multiple range test. M represents month.*

inability to compensate by rapid reproduction. This also influences the number of *P. hexincisus*/total root system (Fig. 2). After 60 days, root growth slows, but the nematode population continues to increase. Months 4 and 5 for corn represented an analagous situation since the necessity to reseed created an unstable feeding situation for the nematode population. This population flux was anticipated. Because the number of *P. hexincisus* increased on corn beyond the flux (Figs. 1, 2), the environment presumably was suitable for the nematode. This situation did not occur with the prairie species because of their slower-growing root systems and perennial nature, which eliminated need for reestablishment.

Of the 3 prairie species, *H. grosseserratus* was generally, although not significantly, a better host than were *S. nutans* or *S. asper* (Fig. 2). However, the number of *P. hexincisus*/total root system (Fig. 2) on *H. grosseserratus* was not significantly different from month to month. This suggests that *P. hexincisus* was surviving and reproducing at a rate sufficient to maintain its population, despite the slowly increasing root biomass. Therefore, *H. grosseserratus* is a usable, but poor, food source for *P. hexincisus*. Townshend and Davidson (10) classified the roots of 55 weed species by texture and found that soft-textured roots contained more *P. penetrans* than did hard-textured roots. This may be a factor that allows *H. grosseserratus*, which has a relatively soft, mealy root, to support more *P. hexincisus* than *S. nutans* or *S. asper*, both of which have tough, wiry roots. Healthy *P. hexincisus* juveniles and adults were observed after 6 months on all plant species, which indicates that at least a few nematodes were able to penetrate the root and feed.

Zirakparvar (12) reported that both *Phalaris arundinacea* and *Poa pratensis* are inefficient hosts for *P. hexincisus*. Although *P. pratensis* is not indigenous, it is a significant component of Iowa prairies (11). *P. arundinacea, P. pratensis,* and the prairie species used in this study with the exception of *S. asper* (a drought-resistant disturbance species) have widely spreading rhizomes and abundant root systems (11). They tend to form dense clumps in the prairie and, as such, could effectively prevent the buildup of *P. hexincisus*. Because these prairie species serve as inefficient hosts in monoculture for *P. hexincisus*, compared with corn, it is likely that the same situation occurs in the prairie. Perhaps, because of interactions with other organisms, the number of *P. hexincisus* is so small as to be rarely detected by our sampling procedures.

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