# Invasion of Non-Host Plant Roots by Larvae of the Sugarbeet Nematode, Heterodera schachtii[1]

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A study by Steele (8)[3] showed that females of the sugarbeet nematode (*Heterodera schachtii* Schmidt 1871) developed to maturity and reproduced on 73 plant species. Of 17 species given an infection index rating of less than 1.0, only one or two females were observed on individual plants of these species.

Reports indicate that larvae of the sugarbeet nematode invade but do not develop to maturity in roots of *Phaseolus vulgaris* L. (navy bean), *Lactuca sativa* L. (lettuce), *Hesperis matronalis* L., *Beta procumbens* CHR-Smidt., *B. patellaris* Moq. and *B. webbiana* Moq., (1,2,3). However, Steele and Savitsky later reported that single females developed on two plants of *B. patellaris* (7). These findings suggest that many other non-host plants may be invaded by sugarbeet nematode larvae. To test this hypothesis, several non-host plants were selected at random and tested to determine which, if any, were invaded by sugarbeet nematode larvae.

## Materials and Methods

Six non-host plant species and a susceptible sugarbeet variety were tested in this study and are listed in Table 1. Seed of each species were germinated in sterilized sand. Twenty-five seedlings in the cotyledon stage were transplanted to individual aluminum-foil cylinders, filled with soil heavily infested with cysts containing eggs and larvae of *H. schachtii,* and grown in a greenhouse. Five plants of each species were removed from infested soil 15, 30, or 45 days after transplanting. The roots of each plant were washed, weighed, and stained in lactophenol-acid fuchsin, and examined for sugarbeet nematode larvae. The root systems of 10 plants of each species were examined for mature sugarbeet nematode females after the plants had grown 60 days in infested soil.

## Results and Discussion

Sugarbeet nematode larvae were found within roots of all plant species grown 30 or 45 days in nematode infested soil.

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[3] Numbers in parentheses refer to literature cited.

Table 1.—Plants tested for susceptibility to invasion by *H. Schachtii* larvae.

| Common name | Commercial variety | Scientific name | Family |
|---|---|---|---|
| Sunflower | | *Helianthus* spp. | Compositae |
| Morning glory | Candy pink | *Ipomea* sp. | Convolvulaceae |
| Parsley | Plain leaved | *Petroselinum hortense crispum* | Umbelliferae |
| Egg plant | New York Improved | *Solanum melongena* | Solanaceae |
| Celeriac | Smooth prague | *Apium graveolens var. rapaceum* | Umbelliferae |
| Sweet pea | Giant winter-flowering Spencer | *Lathryus odoratus* L. | Leguminosae |
| Sugarbeet | Var. US 75 | *Beta vulgaris* L. | Chenopodiaceae |

(Table 2). Sunflower was the only test plant grown 15 days in infested soil which was not invaded by larvae. However, roots of sunflower were large when transplanted, and the roots and soil may not have had sufficient contact to insure adequate exposure to larvae during the first few weeks of the test.

The observation that all of the 'non-host' plant species were invaded by relatively large numbers of larvae strongly suggests that under field conditions many other non-hosts may also be invaded by the sugarbeet nematode. Association of nematodes with other pathogenic microorganisms in the initiation and intensification of plant diseases has been well documented (4,5,6). Results of the present test raise the possibility that nematodes may have a broader role in the predisposition of plants, even non-host plants to plant diseases than was previously suspected.

Mature females with developing eggs were found on at least one plant in each of three species within different families. Since these species were selected at random for testing, many of the species thought to be immune may in fact be only highly resistant to *H. schachtii*. Such occasional development of the sugarbeet nematode on highly resistant species could, and perhaps does, maintain localized areas of low level infestations, which become detectable only after continuous cropping of susceptible host plants. On the other hand, truly immune plants, when used in rotations, may not be exerting simply a neutral effect on the nematodes. Instead, such species might actually reduce the nematode population at much greater than the normal decline rate by having a trap-crop effect.

Table 2.—Number of *H. schachtii* larvae recovered from roots of various plant species.

| Plant | No. days plants grown in infested soil | Number plants examined | Total weight of roots (gms) | Number plants infected | Total number larvae recovered | Average number larvae per plant | Average number larvae per gm root | Total number mature females |
|---|---|---|---|---|---|---|---|---|
| Sunflower | 15 | 5 | 5.75 | 0 | 0 | 0 | 0 | 0 |
| | 30 | 5 | 22.45 | 5 | 166 | 33.5 | 7.4 | 0 |
| | 45 | 5 | 28.50 | 5 | 135 | 27.0 | 4.7 | 0 |
| | 60 | 10 | ..... | 2 | .... | .... | .... | 2 |
| Morning glory | 15 | 5 | 2.35 | 1 | 8 | 1.6 | 3.4 | 0 |
| | 30 | 5 | 6.15 | 4 | 84 | 16.8 | 1.4 | 0 |
| | 45 | 5 | 24.10 | 3 | 38 | 7.6 | 0.3 | 1 |
| | 60 | 10 | ..... | 0 | .... | .... | .... | 0 |
| Parsley | 15 | 5 | 0.30 | 3 | 68 | 13.6 | 226.7 | 0 |
| | 30 | 5 | 3.85 | 5 | 859 | 171.8 | 223.1 | 0 |
| | 45 | 5 | 10.30 | 5 | 849 | 169.8 | 82.4 | 0 |
| | 60 | 10 | ..... | 0 | .... | .... | .... | 0 |
| Egg plant | 15 | 5 | 0.30 | 1 | 2 | 0.4 | 0.7 | 0 |
| | 30 | 5 | 3.97 | 5 | 804 | 160.8 | 202.6 | 0 |
| | 45 | 5 | 15.70 | 5 | 1,246 | 249.2 | 79.4 | 0 |
| | 60 | 10 | ..... | 1 | .... | .... | .... | 1 |
| Celeriac | 15 | 5 | 0.10 | 3 | 6 | 1.2 | 60.0 | 0 |
| | 30 | 5 | 1.00 | 5 | 176 | 35.2 | 17.6 | 0 |
| | 45 | 5 | 3.90 | 5 | 228 | 45.6 | 58.5 | 0 |
| | 60 | 10 | ..... | 0 | .... | .... | .... | 0 |
| Sweet pea | 15 | 5 | 2.70 | 4 | 296 | 59.2 | 109.6 | 0 |
| | 30 | 5 | 5.45 | 5 | 2,328 | 465.6 | 427.2 | 0 |
| | 45 | 5 | 10.80 | 5 | 3,605 | 721.0 | 333.8 | 0 |
| | 60 | 10 | ..... | 0 | .... | .... | .... | 0 |
| Sugarbeet | 15 | 5 | 0.80 | 5 | 1,950 | 390.0 | 2,437.5 | 0 |

## Summary

Larvae of the sugarbeet nematode invaded roots of sweet pea, celeriac, parsley, egg plant, morning glory, and sunflower. However, 60 days after transplanting to infested soil, only one mature female was found on each of 2 sunflower plants, 1 egg plant, and 1 morning glory.

### Literature Cited

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