THE SUGAR BEET NEMATODE, HETERODERA SCHACHTII, SCHMIDT, AND OTHER PLANT-PARASITIC NEMATODES ON RHUBARB IN ONTARIO[1]

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Abstract

A survey of rhubarb soils in seven counties in southern Ontario showed the sugar beet nematode, Heterodera schachtii Schmidt, to be present in six: Halton, Oxford, Peel, Simcoe, Wentworth and York. Large populations of root-lesion nematodes, Pratylenchus penetrans (Cobb) Filip. & Stekh., and pin nematodes, Paratylenchus projectus Jenkins, occurred in nearly all counties. Northern root knot nematodes, Meloidogyne hapla Chitwood, occurred in Halton and Peel counties. Of 17 vegetable crops tested, eight were hosts of H. schachtii. Some cysts of the sugar beet nematode were formed on tomato.

Introduction

In 1964, the sugar beet nematode, Heterodera schachtii Schmidt, was found in a field of table beets at Woodbridge, Ontario. These table beets were grown in rotation with rhubarb which is a host of the nematode (8). Nearly all rhubarb sets used by the fresh winter rhubarb industry in southern Ontario originate from one farm in Oxford County. When this source was found to be infested with the sugar beet nematode, a survey was made of the distribution of H. schachtii and other plant-parasitic nematodes in rhubarb fields in the intensive vegetable growing areas near Hamilton and Toronto.

The vegetable host range of H. schachtii was investigated to confirm earlier studies elsewhere and to detect possible strains of the nematode.

Materials and methods

In response to a questionnaire, 20 rhubarb growers in the Hamilton-Toronto area collected 75 soil samples during the months of August and September, 1964. Upon arrival in the laboratory, each sample was thoroughly mixed and divided into two 50 g subsamples. One moist sub-sample was placed on a tissue-lined sieve in a pan of water (11) to extract 2nd stage juveniles of H. schachtii and other migratory nematodes. The second sub-sample was air dried and then washed through a Fenwick can (7) to recover cysts.

To study the host range of the sugar beet nematode, 17 vegetable crops commonly grown in the infested area were either raised in flats and then transplanted to 10.2 cm clay pots or were seeded directly into the pots. All pots were filledwith a 1:1 mixture of composted soil and sand. Half the pots were inoculated with 165 cysts of H. schachtii in 25 g of soil. The cyst-infested soil came from a table beet field at Woodbridge and was cropped to table beets in the greenhouse. The remaining pots were not inoculated with the nematode and served as controls.

Each vegetable was grown in both infested and non-infested soil in four replications arranged in a randomized block design. After six weeks of growth, total fresh weights of all plants were determined and the number of cysts on each root grown in infested soil was counted.

Results

Nine of the 20 farms where rhubarb was grown were found to be infested with H. schachtii (Table 1). The root-lesion nematode, Pratylenchus penetrans, and the pin nematode, Paratylenchus projectus, were found in large numbers on most farms. On two farms, juveniles of the Northern root-knot nematode (Meloidgyne hapla) were present.

Cysts were formed on the roots of eight of the 17 vegetable crops tested in the host range experiment, and these may therefore be considered hosts of H. schachtii. Only a few vegetables suffered significant damage, as based on a comparison of total fresh weight of plants grown in infested and non-infested soil (Table 2).

Discussion

H. schachtii is now known to occur in at least eight counties in southern Ontario: Halton, Lambton, Middlesex, Oxford, Peel, Simcoe, Wentworth and York. Its presence in Middlesex County was reported in 1921 (3) and in Lambton Countyfrom 1939-1942 (1, 2). It is not known whether the nematode has spread to the surveyed area from these two counties during the last two to three decades or

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Table 1. Species and numbers of plant-parasitic nematodes associated with rhubarb on farms in several counties in southern Ontario.

County	No. of samples	No. of farms	Pratylenchus penetrans	Paratylenchus projectus	Meloidogyne hapla (juveniles)	Heterodera schachtii (juveniles)
Halton	23	6	914[1]/12[2]/4[3]	5101/21/6	1600/1/1	11,739/13/3
Lincoln	6	1	1393/6/1	3630/6/1	0/0/0	0/0/0
Oxford	13	1	2375/10/1	1691/12/1	0/0/0	1,390/4/1
Peel	11	4	533/9/4	8797/11/4	440/1/1	40/3/1
Simcoe	2	1	0/0/0	1950/2/1	0/0/0	20,000/2/1
Wentworth	6	4	1390/4/3	3845/6/4	0/0/0	1,400/1/1
York	14	3	853/6/3	3806/12/3	0/0/0	6,375/6/2

1 Average no. of nematodes/450 g soil.
2 No, of samples containing the nematode.
3 No. of farms infested with each nematode.

Table 2. A comparison of the susceptibility of various vegetables to the sugar-beet nematode.

Vegetables	Fresh Wt. (g) Control	Fresh Wt. (g) Infested	L. S. D. 0.05	Percentage reduction in fresh weight	Cysts/Root system
Sugar Beet var. 'Giant White'	21	2	8.5	90	-[1]
Table Beet var. 'Detroit Dark Red'	20	7	10.1	71	67
Spinach var. 'Early Hybrid #11'	14	9	4.2	36	38
Turnip var. 'Purple Top White Globe'	18	10	5.7	46	38
Cabbage var. 'Penn State Ballhead'	42	38	n.s.[2]	--	45
Cauliflower var. 'Super Junior'	25	21	n.s.	--	71
Radish var. 'Cherry Belle'	38	38	n.s.	--	5
Tomato var. 'Fireball'	49	47	n.s.	--	5
Bean var. 'Contender'	20	22	n.s.	--	0
Carrot var. 'Scarlet Nantes Strong Top'	12	10	n.s.	--	0
Celery var. 'Utah 52-70'	7	7	n.s.	--	0
Eggplant var. 'Imperial Black Beauty'	10	11	n.s.	--	0
Lettuce var. 'Imperial 456'	42	42	n.s.	--	0
Parsnip var. 'Harris Model'	8	11	n.s.	--	0
Pepper var. 'Vinedale'	15	13	n.s.	--	0
Potato var. 'Irish Cobbler'	45	51	n.s.	--	0
Onion var. 'Southport White Globe'	7	5	n.s.	--	0

1 Sugar beet seedlings were too severely stunted for cysts to develop.
2 n.s. = not significant.

whether its infestation results from a separate introduction from abroad.

Most samples contained large numbers of root-lesion nematodes (Pratylenchus penetrans) and pin-nematodes (Paratylenchus projectus). The presence of such large populations of root-lesion nematodes forms a threat to vegetable growing as certain crops, such as celery (10), suffer severely from them. Less is known about the importance of pin-nematodes. The presence of the Northern root-knot nematode (Meloidogyne hapla) may be serious if susceptible crops, such as carrots, are grown.

The host range study generally confirmed findings elsewhere (4, 8, 12). Tomato was found to be a host as a few cysts developed on its roots. In California, Golden and Shafer (6) and Steele (9) reported tomato to be a host of H. schachtii; however, Wheatley and McFarlane (12) did not find any cysts on tomato plants. In Ontario, Mulvey (8) reported that H. schachtii, recovered from sugar beet in Lambton County, did not produce cysts on tomato. These differences in response of tomato to the sugar beet nematode may be due either to the existence of strains or bio-types of H. schachtii or to differences in susceptibility of the tomato varieties involved (5).

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