

## NEMATODES ASSOCIATED WITH LONG-ESTABLISHED TREE SPECIES AND FRUIT CROPS IN ESSEX COUNTY, ONTARIO

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There are four general types of published Canadian survey records of soil-inhabiting nematodes. These are the annual records of nematodes encountered by the nematologists of the Entomology Research Institute, Canada Department of Agriculture; the annual reports of the Ontario Nematode Diagnostic and Advisory Service; surveys of specific agri-

cultural crops; and surveys of specific nematodes. There are few general geographical surveys of soil-inhabiting nematodes.

In 1968, 100 soil samples were collected from about the roots of long-established non-cultivated fruit crops in Essex County, Ontario. Five speci-

Table 1. Occurrence of thirteen nematode genera in soil associated with ten plant species

Plant species	<u>Cricone</u> <u>moides</u>	<u>Dipthero</u> <u>sphaera</u>	<u>Helicotylenchus</u>	<u>Hemicycliophora</u>	<u>Hoplolaimus</u>	<u>Longidorus</u>	<u>Meloidogyne</u>	<u>Paratylenchus</u>	<u>Pratylenchus</u>	<u>Rotylenchus</u>	<u>Trichodorus</u>	<u>Tylenchorhynchus</u>	<u>Xiphinema</u>
<u>Acer saccharum</u> Marsh.	40*	0	10	40	0	0	0	60	20	0	0	20	80
<u>Betula alba</u> L.	30	20	10	20	0	0	0	0	40	0	10	30	60
<u>Juniperus virginiana</u> L.	60	0	20	0	0	10	10	20	30	0	20	20	20
<u>Populus tremuloides</u> Michx.	80	50	30	50	0	0	0	0	10	0	10	0	20
<u>Prunus armeniaca</u> L.	20	0	0	0	0	0	0	0	80	0	0	10	20
<u>Prunus persica</u> L.	10	10	0	0	0	0	0	30	80	0	20	20	40
<u>Pyrus communis</u> L.	30	0	40	20	0	0	0	30	40	0	0	20	60
<u>Malus pumila</u> Mill.	10	0	30	0	0	0	0	60	40	10	0	10	80
<u>Quercus alba</u> L.	80	0	20	0	0	0	0	50	20	0	0	20	20
<u>Vitis labrusca</u> L.	60	0	10	0	20	0	0	40	50	0	10	40	30
Total	43	8	17	13	2	1	1	29	41	1	7	19	43

\* Percentage of samples containing the genus.

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mans of Acer saccharum Marsh. (maple), Betula alba L. (birch), Juniperus virginiana L. (cedar), Populus tremuloides Michx. (poplar), Prunus armeniaca L. (apricot), Prunus persica (L.) Batsch. (peach), Pyrus communis L. (pear), Malus pumila Mill. (apple), Quercus alba L. (oak), and Vitis labrusca L. (grape) were selected at various locations in Essex County, and two soil samples were taken

from the root zone of each plant. One sample was taken at a soil depth of 0-6 inches and the other at a 6 to 12-inch depth. Each sample consisted of approximately 500 g of soil, collected with a one-inch diameter soil tube. Nematodes were extracted from 100 g of each sample by a centrifugal-flotation technique (2), identified to genus, and counted.

#### Frequency of occurrence

Eighteen stylet-bearing nematode genera were identified during the survey. Aphelenchoides Fisher, 1894; Aphelenchus Bastian, 1865; Psilenchus de Man, 1921; Neotylenchus Steiner, 1931; and Wlenchus Bastian, 1865 were found in many of the samples. However, population density and frequency of occurrence data were not recorded for these genera. Xiphinema Cobb, 1913, and Cricone-moides Taylor, 1936 were the most frequently occurring genera, being isolated from 43% of the samples (Table 1). Pratylenchus Filipjev, 1936 was found in 41% of the samples. Four genera, Hoplolaimus Daday, 1905; Longidorus (Micoletzky, 1922)

Thorne and Swager, 1936; Meloidogyne Goeldi, 1887; and Rotylenchus Filipjev, 1936 occurred in less than 5% of the samples.

Criconemoides; Diptherophora de Man, 1880; and Hemicycliophora de Man, 1921 were isolated more frequently from long-established tree species than from fruit crops (Table 2). Pratylenchus was found in twice as many fruit crop samples, as from long-established tree species samples. Helicotylenchus Steiner, 1945 was found more often at soil depths of 0-6 inches than 6-12 inches, while Hemicycliophora and Trichodorus Cobb, 1913 occurred more frequently at the greater soil depth (Table 2).

Xiphinema americanum Cobb, 1913 and Hemicycliophora similis Thorne, 1955 were the only species of these two genera collected. The three species, Criconemoides annulatum Cobb in Taylor, 1936, C. xenoplax Raski, 1952, and C. lobatum Raski, 1952 were identified, and two undescribed species of the genus were collected; one closely resembled C. tribulis Raski and Golden, 1965 and

Table 2. Frequency of occurrence of thirteen nematode genera in 50 soil samples from long-established non-cultivated tree species, fruit crops, and two soil depths

Genus	Long established tree species	Cultivated fruit crops	0-6 inch soil depth	6-12 inch soil depth
<u>Criconemoides</u>	60*	26	42	44
<u>Diptherophora</u>	14	2	8	8
<u>Helicotylenchus</u>	18	16	22	12
<u>Hemicycliophora</u>	22	4	8	18
<u>Hoplolaimus</u>	0	4	2	2
<u>Longidorus</u>	2	0	2	0
<u>Meloidogyne</u>	2	0	0	2
<u>Paratylenchus</u>	28	30	28	30
<u>Pratylenchus</u>	24	58	40	42
<u>Rotylenchus</u>	0	2	2	0
<u>Trichodorus</u>	8	6	4	10
<u>Tylenchorhynchus</u>	18	20	20	18
<u>Xiphinema</u>	52	46	50	48

\* Percentage of samples containing the genus.

C. petasus Wu, 1965. Several samples from Pelee National Park contained more than one species of Criconemoides, while samples from fruit crops often contained more than one species of Paratylenchus.

All specimens of Trichodorus were similar, and closely resembled Trichodorus teres Hooper, 1962, T. allius Jensen, 1963, and T. rhodesiensis Siddiqi and Brown, 1965. Positive identification was not possible, since no males were found. Females of Trichodorus were cylindrical, tapering to the lip region, and had rounded tails. Body length ranged from 620 to 790  $\mu$ . The excretory pore was located midway between the base of the stylet and the base of the esophagus, while the esophagus had a pronounced ventral overlap of the intestine. The reproductive system consisted of a median vulva (V = 52-55%) with a transverse slit and paired opposite

ovaries. No lateral pores were observed; the anus was subterminal, and a single pair of terminal caudal pores were present.

#### Population density

With the exception of the single population of Hoplolaimus, the greatest mean population density was 34 Pratylenchus/100 g soil (Table 3). There were 31, 20, and 18 Paratylenchus, Criconemoides, and Helicotylenchus, respectively/100 g soil. The largest single population, 472 Paratylenchus/100 g soil was recovered from about the roots of A. saccharum.

Population densities of Helicotylenchus and Paratylenchus were greater in samples from long-established tree species than in samples from fruit crops, while population densities of Pratylenchus,

Table 3. Population density of thirteen nematode genera in soil associated with ten plant species

Plant species	<u>Criconemoides</u>	<u>Diptherophora</u>	<u>Helicotylenchus</u>	<u>Hemicycliophora</u>	<u>Hoplolaimus</u>	<u>Longidorus</u>	<u>Meloidogyne</u>	<u>Paratylenchus</u>	<u>Pratylenchus</u>	<u>Rotylenchus</u>	<u>Trichodorus</u>	<u>Tylenchorhynchus</u>	<u>Xiphinema</u>
<u>Acer saccharum</u> Marsh.	30*	0	2	3	0	0	0	111	3	0	0	2	4
<u>Betula alba</u> L.	2	1	2	1	2	0	0	0	3	0	2	5	5
<u>Juniperus virginiana</u> L.	5	0	59	0	0	4	1	4	7	0	8	7	9
<u>Populus tremuloides</u> Michx.	2	7	5	5	1	0	0	0	4	0	3	0	5
<u>Prunus armeniaca</u> L.	23	0	0	0	0	0	0	0	5	6	0	5	10
<u>Prunus persica</u> L.	1	1	0	0	0	0	0	1	7	2	0	7	5
<u>Pyrus communis</u> L.	2	0	5	1	2	0	0	8	6	0	0	18	25
<u>Malus pumila</u> Mill.	3	0	9	0	0	0	0	1	4	5	7	2	0
<u>Quercus alba</u> L.	23	0	61	0	0	0	0	1	5	2	0	0	6
<u>Vitis labrusca</u> L.	29	0	7	0	8	0	0	9	1	2	0	2	6
Total	20	4	18	3	80	4	1	31	34	2	5	7	10

\* Mean number of nematodes/100 g of soil recovered from samples containing the genus.

Hemicycliophora, Tylenchorhynchus, and Xiphinema were greater in samples from cultivated fruit crops. Mean population densities of Criconemoides and Paratylenchus were greater at 0-6 inch than at a 6-12 inch soil depths.

There are several differences between the frequency of occurrence of nematode genera and population densities reported in the present investigation and those of some previous surveys. For example, Criconemoides and Xiphinema were recovered from 43% of the present samples, while Criconemoides was present in 20% and Xiphinema in 11% of the samples processed in 1967 by the Ontario Nematode Diagnostic and Advisory Service (4). On the other hand, Pratylenchus occurred in 93% of the Advisory Service samples and in only 41% of those in the present survey. These variations occurred because different extraction techniques were used and different hosts were surveyed. Paratylenchus, which

occurred in a similar number of samples from long-established tree species and fruit crops (Table 2), had a similar frequency of occurrence in the present survey and in the Advisory Service Report.

In some cases, the depth at which a sample is taken can influence frequency of occurrence and population density (Tables 2 and 4). It is generally believed that phytopathogenic nematodes are most abundant in the upper portion of a rhizosphere (3). However, populations have been reported at substantially greater depths (1,5).

The frequency of occurrence and population densities of ectoparasitic nematodes in Essex County, indicate that there is a definite need for research on the host-parasite relationships of ectoparasitic nematode species, and on the possibility of their joint action in certain disease complexes

Table 4. Population density of thirteen nematode genera in 50' samples of soil from long-established non-cultivated tree species, fruit crops, and two soil depths

Genus	Long-established tree species	Cultivated fruit crops	0-6 inch soil depth	6-12 inch soil depth
<u>Criconemoides</u>	20*	18	29	12
<u>Diptherophora</u>	4	1	3	2
<u>Helicotylenchus</u>	28	7	15	21
<u>Hemicycliophora</u>	2	12	5	3
<u>Hoplolaimus</u>	0	80	83	76
<u>Longidorus</u>	4	0	4	0
<u>Meloidogyne</u>	1	0	0	1
<u>Paratylenchus</u>	57	10	24	11
<u>Pratylenchus</u>	7	46	19	27
<u>Rotylenchus</u>	0	2	2	0
<u>Prichodorus</u>	5	5	3	5
<u>Tylenchorhynchus</u>	5	9	4	b
<u>Xiphinema</u>	b	15	12	8

\* Mean number of nematodes/100 g of soil recovered from samples containing the genus.

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