Damage to an Apple Orchard Cover Crop of Creeping Red Fescue (*Festuca rubra*) Associated with *Meloidogyne microtyla*

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ABSTRACT

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Severe damage to a grass cover crop in an apple orchard associated with *Meloidogyne microtyla* is described for the first time. In a number of samplings, population densities ranging from 1,080 to 7,050 juveniles per kilogram of soil were found associated with a 10-yr decline in a stand of creeping red fescue (*Festuca rubra*). In the most severe cases, dandelions (*Taraxacum officinale*) had completely replaced the grass cover. Damage was more severe in the middle of the row than under the tree canopies, possibly because of periodic mowing and absence of shade.

Meloidogyne microtyla Mulvey et al was described in 1975 from turfgrasses in southwestern Ontario (3). Townshend et al (10) showed that this root-knot nematode reproduced on 62 of 87 plant species and cultivars, with grasses being the best hosts. Recent work (9) showed that creeping red fescue (*Festuca rubra* L.) is very sensitive to damage by *M. microtyla*. Red fescue has long been recommended as a cover crop in Ontario's apple orchards because it is a poor host of *Pratylenchus penetrans* Cobb (2,7). This paper presents the first report on the association of the nematode *M. microtyla* with serious damage to creeping red fescue, an orchard cover grass.

MATERIALS AND METHODS

The orchard was located near Clarksburg in the Georgian Bay area of southern Ontario. The soil, Tecumseh sand, was drained with tiles placed on 12-m centers. Apple trees, cultivars McIntosh and Northern Spy, grafted on MM106 rootstocks (spaced 4 × 6.7 m) were planted in 1968, and a cover crop of creeping red fescue was sown. In May 1982, soil samples were assayed to find the cause of the gradual disappearance over the previous 10 yr of the fescue and its natural replacement by dandelion (*Taraxacum officinale* Weber), which is not a host of *M. microtyla* (10). Levels of phosphorus, potassium, manganese, arsenic, and lead, as well as pH, were determined on portions of the soil; the remainder was used for the extraction of nematodes by the Baermann pan method (6). Additional sampling by mixing 20–30 soil cores 20–25 cm deep and 2.5 cm wide from affected and unaffected areas and nematode extractions were done in July and August. Seeds of red fescue cultivar Jamestown were sown in pots filled with soil from fescue root systems collected from the affected areas.

RESULTS AND DISCUSSION

Soil samples collected in May from poorly growing grass under the apple trees and from the middles of rows, where the grass had almost disappeared (Fig. 1), showed large numbers of *Meloidogyne* sp. juveniles, whereas the healthy areas did not contain root-knot nematodes (Table 1).

Because the only other root-knot nematode species in Ontario agricultural soils is *M. hapla* (5), which does not attack grasses, specimens were sent to B. A. Ebsary, Biosystematics Research Institute, Ottawa, who identified the species as *M. microtyla*.

M. microtyla does not cause conspicuous galls on grass roots but only slight swelling surrounding exposed females and egg masses (10). Consequently, the nematode could not be detected on mature fescue root systems collected from the orchard, because washing the soil from the roots probably also eliminated the egg masses. However, roots of 6-wk-old fescue seedlings grown in the orchard soil were shown to contain females and egg masses of *M. microtyla* (Fig. 2).

None of the other nematode species found were judged to be responsible for the damage to the fescue. There was no evidence of excessive arsenic or lead residues, nor could the difference between good and poor areas of grass growth be attributed to low phosphorus levels, although the relatively high pH could reduce phosphorus availability.

Subsequent sampling and extractions in July and August confirmed the presence of medium to high populations of *M. microtyla* in the problem areas and few in the healthy grass (Table 2).

The other nematode species present were not considered to have played a major role in the drastic decline in the fescue cover crop, because their numbers were not sufficiently large or they were not known to be detrimental to grasses. The large number of pin nematodes,

Fig. 1. Replacement of *Festuca rubra* (foreground) by *Taraxacum officinale* associated with the presence of medium to high population levels of *Meloidogyne microtyla* in an apple orchard soil.

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Table 1. Plant-parasitic nematodes in, and some chemical characteristics of, soil from a creeping red fescue cover crop in an apple orchard at Clarksburg, Ontario, in May 1982

Soil sample	Number of nematodes/kg of soil				Chemical soil test (ppm)			Pesticide residue (ppm)		
	Meloidogyne microtyla	*Pratylenchus* spp.	*Paratylenchus* spp.	*Helicotylenchus* spp.	P	K	Mg	As	Pb	pH
Unthrifty fescue, under tree canopy	1,760	1,000	7,280	1,080	4	72	144	5.6	10.4	7.8
Unthrifty fescue, middle of row	1,240	480	4,500	1,340	3	68	131	6.0	6.6	7.7
Healthy fescue, middle of row	0	2,080	480	1,040	4	140	175	32.0	29.0	7.4

Table 2. Plant-parasitic nematodes in soil from a creeping red fescue cover crop in an apple orchard at Clarksburg, Ontario, in July and August 1982

Soil sample	Number of nematodes/kg of soil					
	Meloidogyne microtyla	*Pratylenchus* spp.	*Paratylenchus* spp.	*Helicotylenchus* spp.	*Tylenchorhynchus* spp.	*Xiphinema* spp.
Unthrifty fescue, middle of row, July 1982[a]	1,080	1,080	7,240	360	0	0
Unthrifty fescue, middle of row, August 1982[a]	7,050	50	32,600	250	50	400
Healthy fescue, middle of row, July 1982[b]	70	410	950	0	25	0

[a] Average of two 50-g subsamples.
[b] Average of three 50-g subsamples.

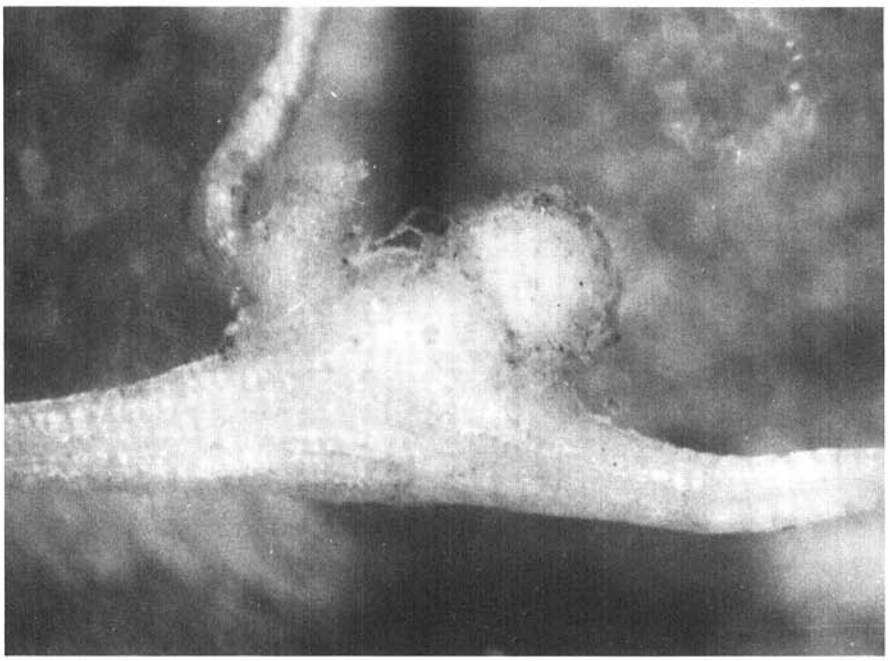

Fig. 2. Portion of the root system of a 6-wk-old creeping red fescue seedling (*Festuca rubra* 'Jamestown') showing slight swelling surrounding exposed female and egg mass of *Meloidogyne microtyla*.

probably *Paratylenchus projectus* Jenkins (5), found on unthrifty fescue in August (Table 2) may have contributed to the red fescue decline. Red fescue is a host of *P. projectus* (1), but there was little or no evidence of damage to Kentucky bluegrass (*Poa pratensis* L. 'Nugget') with populations as high as 100,000/kg of soil (4). Another grass, timothy (*Phleum pratense* L.), supported more than 265,000 *P. projectus* per kilogram of soil (8) without causing noticeable damage.

The creeping red fescue growing in the rows between the trees was more seriously damaged than the grass growing under the tree canopies within the tree row. Although the reason for this difference is not known, it could be the reduced plant vigor and greater weed establishment caused by periodic mowing coupled with greater water stress caused by less shading.

The association of *M. microtyla* with serious damage to cover crops in Ontario apple orchards was recently confirmed in studies that showed creeping red fescue very sensitive to damage by this root-knot nematode (9). Because of this sensitivity and the widespread occurrence of *Meloidogyne* sp. in neighboring orchards (T. H. A. Olthof, *unpublished*), creeping red fescue can no longer be recommended as an orchard cover in the apple orchards of the Georgian Bay area.

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