Phytoprotection

A note on the occurrence of root lesion nematodes under native sand-prairie plant species in the Regional Municipality of Haldimand-Norfolk, Ontario

A.W. McKeown, J.W. Potter, M.E. Gartshore and P. Carson

Volume 75, Number 3, 1994

URI: https://id.erudit.org/iderudit/706061ar
DOI: https://doi.org/10.7202/706061ar

See table of contents

Publisher(s)

Société de protection des plantes du Québec (SPPQ)l

ISSN

0031-9511 (print)
1710-1603 (digital)

Explore this journal

Cite this article

McKeown, A., Potter, J., Gartshore, M. & Carson, P. (1994). A note on the occurrence of root lesion nematodes under native sand-prairie plant species in the Regional Municipality of Haldimand-Norfolk, Ontario. *Phytoprotection*, *75*(3), 139–142. https://doi.org/10.7202/706061ar

Article abstract

The root lesion nematode *Pratylenchus penetrans*, which is the most important plant-parasitic nematode in southern Ontario, has an extremely wide host range. Because of the need to suppress lesion nematodes with cover-crop species which are poor or non-hosts of this parasite, a number of native sand-prairie species were evaluated for susceptibility. Eleven plant species belonging to the families Asclepiadaceae, Asteraceae, Poaceae and Fabaceae were determined to support very low numbers of P. penetrans and consequently to have potential as beneficial cover-crops.

A note on the occurrence of root lesion nematodes under native sand-prairie plant species in the Regional Municipality of Haldimand-Norfolk, Ontario

Alan W. McKeown[1], John W. Potter[2], Mary E. Gartshore[3], and Peter Carson[3]

Received 1994-04-05; accepted 1994-07-27

The root lesion nematode *Pratylenchus penetrans*, which is the most important plant-parasitic nematode in southern Ontario, has an extremely wide host range. Because of the need to suppress lesion nematodes with cover-crop species which are poor or non-hosts of this parasite, a number of native sand-prairie species were evaluated for susceptibility. Eleven plant species belonging to the families Asclepiadaceae, Asteraceae, Poaceae and Fabaceae were determined to support very low numbers of *P. penetrans* and consequently to have potential as beneficial cover-crops.

McKeown, A.W., J.W. Potter, M.E. Gartshore et P. Carson. 1994. Une note sur l'association entre le nématode des lésions des racines et des espèces végétales indigènes des prairies sablonneuses dans la Municipalité régionale de Haldimand-Norfolk (Ontario). PHYTOPROTECTION 75: 139-142.

Le nématode des lésions des racines (*Pratylenchus penetrans*), le nématode phytoparasite le plus important du sud de l'Ontario, possède une gamme d'hôtes extrêmement large. À cause de la nécessité de réprimer ces parasites avec des cultures recouvrantes qui sont peu ou pas hôtes, plusieurs espèces indigènes des prairies sablonneuses ont été évaluées pour leur susceptibilité au nématode des lésions. Onze espèces appartenant à quatre familles (Asclepiadaceae, Asteraceae, Poaceae et Fabaceae) ont été identifiées commes des hôtes faibles. Les populations très faibles de *P. penetrans* sur ces espèces indiquent qu'elles pourraient avantageusement servir comme cultures recouvrantes.

Sandy soils in The Regional Municipality of Haldimand-Norfolk, Ontario (42°51'N 80°16'W) are known to favour root lesion nematodes, *Pratylenchus penetrans* Cobb, in a wide range of crops (Marks and Townshend 1973; Olthof 1979, 1983; Olthof and Potter 1973, 1977; Potter and Olthof 1974, 1977). Part of the native ecology of these sandy soils is sand prairie (Gartshore *et al.* 1987), a habitat which supports indigenous plant species uniquely adapted to these soil type and moisture conditions (Brown 1993). Presumably, native sand-prairie plants have coexisted with root lesion nematodes in these soils for millennia and may have developed some tolerance or resistance. Townshend and

1. Horticultural Research Institute of Ontario, Box 587, Simcoe, Ontario, Canada N3Y 4N5
2. Agriculture and Agri-Food Canada Research Station, Vineland Station, Ontario, Canada L0R 2E0
3. R.R. # 1, Walsingham, Ontario, Canada N0E 1X0

Davidson (1960, 1962) screened over 100 plant species for susceptibility to the root lesion nematode and to the northern root knot nematode, *Meloidogyne hapla* Chitwood, but they did not test the species reported below.

We screened a collection of native sand-prairie plants found in the region for plant-parasitic nematodes. Two-year-old pure stands of each species were planted in 10 m rows spaced 1.5 m apart as a private restoration project by Gartshore and Carson (unpublished data), and were sampled on 21 May, 12 August, and 10 November 1993. This block was designed to produce seed of locally collected prairie plants in order to replant 25 ha of former tobacco farmland into native prairie. Isolated clumps of several other species were also sampled at the last date. At each sampling date, each species was sampled by collecting and bulking 10 soil cores 10 cm x 2.5 cm diam with an Oakfield soil sampler, through the root zone and 5 cm laterally from the plant crowns. Cores were stored and mixed in plastic bags, and nematodes were assayed from a 50 g subsample using the Baermann pan technique (Townshend 1963) and counted at 50X with a stereoscopic microscope. In mid-April 1993, samples were collected from three areas of prairie restoration plantings at three elevations on slopes - top, mid-slope and bottom. The three areas were established under a predominantly volunteer cereal rye (*Secale cereale* L.)-Canada fleabane (*Erigeron canadensis* L.) cover, a predominantly Canada fleabane cover, and mixed prairie species. Samples were processed as previously described.

A number of species were observed to support very low numbers (< 100 nematodes kg^{-1} of soil) of root lesion nematodes, *P. penetrans*, and low counts (< 500 nematodes kg^{-1}) of root knot nematodes, *Meloidogyne hapla* (Table 1). Brown-eyed Susan (*Rudbeckia hirta* L.) samples showed no root lesion nematodes throughout the season, and butterflyweed (*Asclepias tuberosa* L.) showed very low counts, while switch grass (*Panicum virgatum* L.) and Indian grass [*Sorghastrum nutans* (L.) Nash] samples showed a low root lesion nematode count on only one sampling date. Several species [*Liatris cylindracea* Michx., *Monarda punctata* L., *Pycnanthemum virginianum* L., *Echinacea purpurea* (L.) Moench] proved to be excellent hosts (> 500 nematodes kg^{-1} of soil) of the root lesion nematode, which confirmed its presence in the soil; hence the observed low counts were not the result of absence of nematodes. Trace amounts of the ring nematode (*Criconemoides* sp.) were found in May on *Lupinus perennis* L. (40 nematodes kg^{-1}). *Meloidogyne hapla* was found on *Monarda fistulosa* L. and *Geum triflorum* Pursh (120 and 280 nematodes kg^{-1}, respectively) in August. Stunt nematodes (*Tylenchorhynchus* spp.) were found on big bluestem (*Andropogon gerardi* Vitman), *L. perennis, P. virgatum* and little bluestem [*Schizachyrium scoparium* (Michx.) Nash] (400, 40, 20 and 100 nematodes kg^{-1}, respectively), in August. Trichodorid nematodes (20 nematodes kg^{-1}) were found on sideoats grama [*Bouteloua curtipendula* (Michx.) Torr.] on both sampling dates.

Root lesion nematode counts in the three restoration areas were moderate, averaging 380 nematodes kg^{-1} of dry soil, with no significant differences between areas or elevations (Table 2); these population counts were well below the frequently-used damage threshold of 1000 nematodes kg^{-1} of soil. Since Townshend and Davidson (1960) determined Canada fleabane as a poor host of root lesion nematode, the presence of Canada fleabane in each area may well explain the low counts.

Sand prairie is an unusual ecological habitat, requiring adaptation to the moisture conditions and soil type. In Ontario, Dore and McNeill (1980) have noted that species of *Andropogon, Bouteloua, Sorghastrum, Panicum,* and *Lespedeza* were found co-inhabiting a natural prairie at Spotiswood Lakes (43°30'N 80°20'W) in Brant County, one of only two areas in the province where *Bouteloua* was found. Formerly, several of the grass species were grown commercially in the USA in the early part of the century (USDA 1948);

Table 1. Population densities of *Pratylenchus penetrans* under selected wild species at three sampling dates in 1993

Plant species	Common name	Population density [a] (nematodes kg^{-1})			
		May	Aug.	Nov.	Average
Rudbeckia hirta L.	Brown-eyed Susan	0	0	0	0
Gaillardia sp. Foug.	Indian-blanket	-	-	0	0
Panicum virgatum L.	Switch grass	20	0	0	7
Asclepias tuberosa L.	Butterflyweed	20	0	8	9
Sorghastrum nutans (L.) Nash	Indian grass	0	0	40	13
Lespedeza capitata (Michx.)	Bush clover	-	-	40	40
Schizachyrium scoparium (Michx.) Nash	Little bluestem	20	0	200	73
Sporobolus cryptandrus (Torr.) Gray	Sand dropseed	-	-	120	120
Andropogon gerardi Vitman	Big bluestem	0	20	340	120
Bouteloua curtipendula (Michx.) Torr.	Side-oats grama	160	-	100	130
Lupinus perennis L.	Lupin	80	460	160	233
Andropogon virginicus L.	Broomsedge	-	-	280	280
Monarda fistulosa L.	Wild bergamot	560	280	-	420
Liatris cylindracea Michx.	Blazing star	100	120	1 540	587
Geum triflorum Pursh	Three-flowered avens	-	-	940	940
Pycnanthemum virginianum L.	Mountain mint	20	-	5 420	2 720
Monarda punctata L.	Horsemint	0	1 040	12 080	4 373
Echinacea purpurea (L.) Moench	Purple coneflower	-	-	11 340	11 340

[a] Number of root-lesion nematodes per kg of soil.

Table 2. Population densities of *Pratylenchus penetrans* at three levels of a prairie restoration planting area in 1993

Restoration area	Population density[a] (nematodes kg^{-1})		
	Top	Mid-slope	Bottom
Mixed prairie cover	360	420	220
Cereal rye cover	380	320	260
Canada fleabane cover	360	340	780

[a] Number of root lesion nematodes per kg of soil.

therefore, information on production exists for several of these species. Big bluestem and little bluestem, side-oats grama, switch grass, and sand dropseed [*Sporobolus cryptandrus* (Torr.) Gray] have been recommended for forage, pasture, and conservation uses. Domesticated *Rudbeckia* sp. has been demonstrated to reduce root lesion nematode populations (J. Brandle, personal communication). Domesticated butterfly weed, brown-eyed Susan, and Indian-blanket (*Gaillardia* spp.) are grown already as garden perennials; several of the grasses also show potential for use as ornamental plants. Thus we have identified native species that are well adapted to hot dry sands, have potential for cover, rotation, forage and ornamental use, and that may suppress

populations of root lesion nematodes. Such plants would be particularly beneficial as cover crops in sandy agricultural areas like the Regional Municipality of Haldimand-Norfolk, where these species are evidently indigenous.

REFERENCES

Brown, L. 1993. A garden of rarities, Ontario's prairie heritage. Seasons. Federation of Ontario Naturalists. Summer. Pages 20-36.

Dore, W.G., and J. McNeill. 1980. Grasses of Ontario. Monograph 26, Agriculture Canada Research Branch, Ottawa. 566 pp.

Gartshore, M.E., D.A. Sutherland, and J.D. McCracken. 1987. The natural areas inventory of the Regional Municipality of Haldimand-Norfolk. Vol. 1, 112 pp.; Vol. 2, 265 pp. The Norfolk Field Naturalists. Simcoe, Ontario.

Marks, C.F., and J.L. Townshend. 1973. Multiplication of the root lesion nematode *Pratylenchus penetrans* under orchard cover crops. Can. J. Plant Sci. 53: 187-188.

Olthof, Th.A. 1979. Effects of *Pratylenchus penetrans* and *Meloidogyne hapla* on potential crops for the tobacco growing areas of southwestern Ontario. Can. J. Plant Sci. 59: 1117-1121.

Olthof, Th.A. 1983. Reaction of six potato cultivars to *Pratylenchus penetrans*. Can. J. Plant Pathol. 5: 285-288.

Olthof, Th.A., and J.W. Potter. 1973. The relationship between population densities of *Pratylenchus penetrans* and crop losses in summer maturing vegetables in Ontario. Phytopathology 63: 577-582.

Olthof, Th.A., and J.W. Potter. 1977. Effects of population densities of *Meloidogyne hapla* on growth and yield of tomato. J. Nematol. 9: 296-300.

Potter, J.W., and Th.A. Olthof. 1974. Yield losses in fall maturing vegetables relative to population densities of *Pratylenchus penetrans* and *Meloidogyne hapla.* Phytopathology 64: 1072-1075.

Potter, J.W., and Th.A. Olthof. 1977. Analysis of crop losses in tomato due to *Pratylenchus penetrans*. J. Nematol. 9: 290-295.

Townshend, J.L. 1963. A modification and evaluation of the apparatus for the Oostenbrink direct cottonwool filter extraction method. Nematologica 9: 106-110.

Townshend, J.L., and T.R. Davidson. 1960. Some weed hosts of *Pratylenchus penetrans* in Premier strawberry plantations. Can. J. Bot. 38: 267-273.

Townshend, J.L., and T.R. Davidson. 1962. Some weed hosts of the northern root knot nematode, *Meloidogyne hapla* Chitwood, 1949, in Ontario. Can. J. Bot. 40: 543-548.

USDA. 1948. Grass, The Yearbook of Agriculture. United States Dep. Agric. U.S. Government Printing Office, Washington. 892 pp.