Fundam. appl. Nematol., 1997, **20** (6), 627-632

Short note

Occurrence of plant parasitic nematodes on weeds in agrobiocenosis in the Wielkopolska region in Poland

Stefan Kornobis and Stefan Wolny *

It is well known that weeds, or more generally wild plants, play a significant role in the ecology of many nematodes harmful to agriculture (Hooper & Stone, 1981). Little is known on how nematodes spread to cultivated plants in Poland and on their ability to survive control measures. Preliminary observations made in the Wielkopolska region suggest that weeds help with the survival of some nematode species (Ishaqe, 1992; Kornobis & Ishaqe, 1992). The results also suggest that their effect have been underestimated.

This study was made to determine the presence and distribution of plant parasitic nematodes on weeds in the Wielkopolska region of Poland, where nematodes are known to cause measurable damage to various crops (Kornobis, 1990).

Plant samples were collected in 1993 and 1994 during the vegetative period (May-September) from 205 fields cultivated with typical crops of the region: barley, oats, rye, wheat, triticale, potatoes, sugar beets, and oil rape. About 20% of fields were in fallow. In all, 700 samples were collected, representing almost the entire region, within a radius of *ca* 100 km of Poznan. Each sample included ten plants of a particular species found in one field. The plants were dug out and shaken free of soil; they were then placed in plastic bags and brought to the laboratory for identification. The nematodes were isolated from tissues of each plant by the modified Baermann method. The extraction continued for 24 h for aboveground parts and 72 h for roots with a change of water every 24 h. The extracted nematodes were killed and fixed in a 2% solution of commercial formalin. The fixed specimens were identified.

The collected plants belonged to 103 species and 28 families (Table 1) and they were parasitized by 32 nematode species (Table 2). Only two nematode species were isolated from aboveground parts. They belong to the genus *Aphelenchoides* and were provisory named *Aphelenchoides* sp. I and *Aphelenchoides* sp. II. The remaining 30 species were recovered from roots.

* *Institute of Plant Protection, Miczurina 20, 60-318 Poznan, Poland*

Accepted for publication 27 November 1996.

Key-words: *Ditylenchus dipsaci*, *D. destructor*, host plants, *Meloidogyne hapla*, plant parasitic nematodes, *Pratylenchus penetrans*, survey, survival, weeds.

Aphelenchoides spp. obtained from aboveground parts of plants were difficult to identify because many nominal species have been inadequately characterized for reliable recognition (Hunt, 1993). Five of the nematode species extracted from the roots are economically important plant parasites in Wielkopolska. These are: *Meloidogyne hapla, Ditylenchus dipsaci, Ditylenchus destructor, Pratylenchus penetrans,* and *Paratylenchus bukowinensis* (Kornobis, 1990).

Meloidogyne hapla is known to have a very wide range of host plants (Orton Williams, 1974). In our study, it was found only in dicotyledon weeds. This is consistent with the results obtained in pot tests that showed that Polish populations of *M. hapla* lacked the ability to reproduce in cereals (Brzeski & Baksik, 1981). Since corn fields make for 50% of arable land in Wielkopolska, we may assume that the cultivation of cereals limits the growth of *M. hapla.* Nevertheless, the nematode is common and survives in weeds. In favourable conditions it can multiply quickly and may cause damage. In Poland it is recommended that rotations include cereals to control *M. hapla.*

Ditylenchus dipsaci was found in three samples from three different plant species. Despite this low frequency, this nematode could easily infect cultivated plants because of its high reproductive potential and its ability for anabiosis.

Ditylenchus destructor is known to thrive on both plants and fungal mycelium. However, the significance of mycelium has never been evaluated for the survival of the nematode in the field (Sturhan & Brzeski, 1991). In Wielkopolska, *D. destructor* is known as a potato pest. Infected seed potatoes are largely responsible for the dispersal of the nematode and their elimination is the primary nematode control method. It is recommended that rotations include cereals to control *D. destructor.* Our results show that it is essential to control dicotyledon weeds for such rotations to be effective.

Pratylenchus penetrans is known to infest strawberries and also young trees and shrubs in Wielkopolska nurseries. It was observed thriving on cultivated dicotyledon plants, cereals, and maize (Kornobis, 1983; Wolny, 1990*a, b, c*). Therefore, management of *P. penetrans* through crop rotation is not very effective. *Tagetes* spp. may occasionally be used to control nematodes in nurseries growing trees and shrubs.

Table 1. *List of weeds and associated nematodes.*

Weed species	Associated nematode species*
EQUISETACEAE	
1. *Equisetum arvense* L.	Prc, Prn
POLYGONACEAE	
2. *Polygonum aviculare* L.	A. sp.I, A sp. II, Mb, Mn, Pp, Prn, Prpe, Td
3. *Polygonum convolvulus* L.	A. sp. II, Mel, Mb, Mta, Prc, Prn, Td
4. *Polygonum nodosum* Pers.	A. sp. II, Cc, Dm, Mel, Mb, Mm, Pp, Prc, Prn, Prpe
5. *Polygonum persicaria* L.	A. sp. II, Mb, Prc, Prn, Prpe
6. *Rumex acetosella* L.	A. sp. II, Mel, Prc, Prn, Td
7. *Rumex crispus* L.	Prn
8. *Rumex obtusifolius* L.	Cc, Prf, Prn, Td
CHENOPODIACEAE	
9. *Chenopodium album* L.	Ab, Dm, Hd, Mel, Mb, Mm, Mn, Prf, Prn, Prpe,Td
10. *Chenopodium bonus-Henricus* L.	
11. *Chenopodium polyspermum* L.	Td
AMARANTHACEAE	
12. *Amaranthus hybridus* L.	Prn
13. *Amaranthus retroflexus* L.	Cc, Mel, Prn, Prpe, Td
CARYOPHYLLACEAE	
14. *Agrostemma githago* L.	
15. *Arenaria serpyllifolia* L.	
16. *Cerastium arvense* L.	A. sp. II, Hd, Mm, Prf, Prn
17. *Melandrium album*	A. sp. I, Hd, Mel, Mta, Prc, Prn, Prpe, Prpr
18. *Scleranthus annuus* L.	Mel, Prc, Prn, Td
19. *Silene gallica* L.	
20. *Spergula arvensis* L.	Pp, Prc, Prn, Td
21. *Stellaria media* Vill.	A. sp. II, Ddi, Mel, Pp, Prc, Prpr, Td
EUPHORBIACEAE	
22. *Euphorbia cyparissias* L.	
23. *Euphorbia helioscopia* L.	A. sp. I, Mel, Mn, Prn
RANUNCULACEAE	
24. *Consolida regalis* S. F. Gray	Ab, De
PAPAVERACEAE	
25. *Fumaria officinalis* L.	Prc
26. *Papaver rhoeas* L.	A. sp. II, Dm, Mel, Prc, Prn, Prpe
CRUCIFERAE	
27. *Arabidopsis thaliana* (L.) Heynh.	
28. *Bertoroa incana* (L.) DC.	Dde
29. *Brassica napus* L.	Prc, Prn, Td
30. *Capsella bursa-pastoris* (L.) Med.	Cc, Mel, Mb, Mm, Prc, Prn, Prpe, Td
31. *Camelina microcarpa* Andrz.	De

(Table 1 continued next page)

Table 1. *(cont.)*

Weed species	Associated nematode species*
32. *Descurainia sophia* (L.) Webb.	
33. *Erysimum cheiranthoides* L.	Prn
34. *Lepidium campestre* (L.) R. Br.	Prpr
35. *Raphanus raphanistrum* L.	A. sp. I, A. sp. II, De, Prc, Prn, Td
36. *Sinapis arvensis* L.	A. sp. II
37. *Sisymbrium officinale* (L.) Scop.	
38. *Thlaspi arvense* L.	Cc, De, Mel, Mm, Prn, Td
VIOLACEAE	
39. *Viola arvensis* Murr.	Gt, Mel, Mb, Mte, Pp, Prc, Prn, Prpr, Td
ROSACEAE	
40. *Potentilla anserina* L.	Pb, Prn, Td
PAPILIONACEAE	
41. *Lupinus angustifolius* L.	Mm
42. *Medicago lupulina* L.	Prn
43. *Vicia cracca* L.	Prn, Prpe, Td
44. *Vicia faba* L.	Td
45. *Vicia hirsuta* (L.) S. F. Gray	Prn
46. *Vicia sativa* L.	Prpe
MALVACEAE	
47. *Malva neglecta* Wallr.	Prn
OXALIDACEAE	
48. *Oxalis acetosella* L.	Prn, Td
GERANIACEAE	
49. *Erodium cicutarium* (L.) L`Herit	A. sp. II, Mta, Prc, Prn, Td
50. *Geranium pusillum* L.	Cc, Dm, Ft, Hd, Mel, Mb, Prc, Prn, Prpe, Tw
UMBELLIFERAE	
51. *Daucus carota* L.	Prn
52. *Heracleum sphondylium* L.	Prn
53. *Petroselinum sativum* Hoffm.	Mel, Prc, Td
54. *Pimpinella magna* L.	
PRIMULACEAE	
55. *Anagallis arvensis* L.	Gt, Prn, Td
CONVOLVULACEAE	
56. *Convolvulus arvensis* L.	A. sp. I, Hd, Hp, Mb, Prn
HYDROPHYLLACEAE	
57. *Phacelia tanacaetifolia* Benth.	
BORAGINACEAE	
58. *Echium vulgare* L.	
59. *Lithospermum arvense* L.	A. sp. II, Prpe

(Table 1 continued next page)

Table 1. (cont.)

Weed species	Associated nematode species*
60. *Lycopsis arvensis* L.	A. sp. I, A. sp. II, Cc, Dde, De, Mb, Prn
61. *Myosotis arvensis* (L.) Hill.	A. sp. I, Mel, Prf, Prn
SOLANACEAE	
62. *Solanum nigrum* L.	Prn
SCROPHULARIACEAE	
63. *Veronica chamaedrys* L.	A. sp. I, A. sp. II, Ft, Prn, Prpe, Td
LAMIACEAE (LABIATAE)	
64. *Lamium album* L.	
65. *Lamium amplexicaule* L.	Mel, Prpe, Td
66. *Lamium purpureum* L.	Mn, Prn
67. *Stachys arvensis* L.	Prn, Prpe, Td
PLANTAGINACEAE	
68. *Plantago arenaria* W. K.	
69. *Plantago lanceolata* L.	
70. *Plantago maior* L.	A. sp. II, Dm, Fs, Hd, Mel, Mb, Mm, Mta, Prf, Prn, Prpe, Td
71. *Plantago media* L.	
RUBIACEAE	
72. *Galium aparine* L.	A. sp. II, Cc, Prn, Prpe, Td
COMPOSITAE	
73. *Achillea millefolium* L.	A. sp. II, Prn, Td
74. *Anthemis arvensis* L.	A. sp. I, A. sp. II, Cc, Dde, Fr, Mb, Prpr, Pp, Prn, Td, Tm
75. *Artemisia absinthium* L.	Mm, Prn
76. *Artemisia vulgaris* L.	Ab, A. sp. I, A. sp. II, Mel, Mta, Pp, Prf, Prpe, Td
77. *Carduus crispus* L.	Mb
78. *Centaurea cyanus* L.	A. sp. I, A. sp. II, Cc, Dm, Mel, Prf, Prn, Td
79. *Cirsium arvense* (L.) Scop.	Cc, Hd, Mm, Pp, Prf, Prn, Prpe, Prpr, Td, Tj
80. *Erigeron canadensis* L.	Prn, Prpe
81. *Galinsoga parviflora* Car.	A. sp. I, A. sp. II, Fr, Mel, Mb, Mta, Pp, Prn, Prpe, Prpr, Td
82. *Hypochoeris glabra* L.	
83. *Hypochoeris radicata* L.	Mm
84. *Lapsana communis* L.	
85. *Matricaria chamomilla* L.	A. sp. II, Ft, Prn, Prpe, Td
86. *Matricaria discoidea* DC.	Prn
87. *Senecio vulgaris* L.	Prpe
88. *Sonchus arvensis* L.	Ft, Mel, Prn, Td
89. *Tanacetum vulgare* L.	
90. *Taraxacum officinale* Web.	Ddi, Dm, Mb, Pp, Prn
91. *Tragopogon pratensis* L.	Prn
92. *Tripleurospermum inodorum* (L.) Schultz-Bip.	A. sp. II, Prn, Prpe
93. *Tussilago farfara* L.	

(End of Table 1 next page)

Table 1. *(end).*

Weed species	Associated nematode species*
LILIACEAE	
94. *Allium vineale* L.	
GRAMINEAE	
95. *Agropyron repens* (L.) P.B.	A. sp. I, A. sp. II, Dc, Hd, Mm, Prn, Prpe, Td
96. *Agrostis spica-venti* L.	Dm, Prn, Prpe
97. *Alopecurus myosuroides* Huds	Dm, Prn
98. *Digitaria sanguinalis* (L.) Scop.	Prpe
99. *Echinochloa crus-galli* (L.)	A. sp. I, A. sp. II, Pp, Prn, Prpe, Td
100. *Phalaris canariensis* L.	
101. *Poa annua* L.	Prn
102. *Secale cereale* L.	Ddi, Td
103. *Setaria viridis* (L.) P.B.	Mta, Prn, Prpe, Td.

* See Table 2 for abbreviations of nematode species names.

Table 2. *List of nematodes found on weeds in the Wielkopolska region.*

Abrev.	Nematodes	Absolute frequency	Host weeds*
Ab	*Aphelenchoides bicaudatus* (Imamura)	0.4	9, 24, 76
A. sp. I	*Aphelenchoides* sp. I	3.3	2, 17, 23, 35, 39, 56, 60, 61, 63, 74, 76, 78, 81, 95, 99
A. sp. II	*Aphelenchoides* sp. II	7.0	2, 3, 4, 5, 6, 16, 21, 26, 35, 36, 39, 49, 59, 60, 63, 70, 72, 73, 74, 76, 78, 81, 85, 92, 95, 99
Cc	*Coslenchus costatus* (de Man)	1.9	4, 8, 13, 30, 38, 50, 60, 72, 74, 78, 79
Dc	*Ditylenchus clarus* (Thorne & Malek)	0.1	95
Dde	*Ditylenchus destructor* Thorne	0.6	28, 60, 74
Ddi	*Ditylenchus dipsaci* (Kühn)	0.4	21, 90, 102
De	*Ditylenchus equalis* Heyns	0.7	24, 31, 35, 38, 60
Dm	*Ditylenchus medicaginis* Wasilewska	1.4	4, 9, 26, 50, 70, 78, 90, 96, 97
Fs	*Filenchus sandneri* (Wasilewska)	0.1	70
Ft	*Filenchus thornei* (Andrássy)	0.6	50, 63, 85, 88
Fv	*Filenchus vulgaris* (Brzeski)	0.3	74, 81
Gt	*Geocenamus tenuidens* Thorne & Malek	0.3	39, 55
Hd	*Helicotylenchus digonicus* Perry	1.7	9, 16, 17, 50, 56, 70, 79, 95
Hp	*Helicotylenchus pseudorobustus* (Steiner)	0.1	56
Mel	*Meloidogyne hapla* Chitwood	5.6	3, 4, 6, 9, 13, 17, 18, 21, 23, 26, 30, 38, 39, 50, 53, 61, 65, 70, 76, 78, 81, 88
Mb	*Merlinius brevidens* (Allen)	2.9	2, 3, 4, 5, 9, 30, 39, 50, 56, 60, 70, 74, 77, 81, 90
Mm	*Merlinius microdorus* (Geraert)	1.9	4, 9, 16, 30, 38, 41, 70, 74, 75, 79, 83, 95
Mn	*Merlinius nanus* (Allen)	0.4	2, 23, 66

(End of Table 2 next page)

Table 2. (cont.)

Abrev.	Nematodes	Absolute frequency	Host weeds*
Mta	*Merlinius tartuensis* (Krall)	1.1	3, 17, 49, 70, 76, 81, 103
Mte	*Merlinius tessellatus* (Goodey)	0.1	39
Pb	*Paratylenchus bukowinensis* (Mikoletzky)	0.1	40
Pp	*Paratylenchus projectus* Jenkins	0.7	2, 4, 20, 21, 39, 74, 76, 79, 81, 90, 99
Prc	*Pratylenchus crenatus* Loof	16.7	1, 3, 4, 5, 6, 9, 17, 18, 20, 21, 25, 26, 29, 30, 35, 39, 49, 50, 53
Prf	*Pratylenchus flakkensis* Seinhorst	1.1	8, 9, 16, 61, 70, 76, 78, 79
Prn	*Pratylenchus neglectus* (Rensch)	45.7	1, 2, 3, 4, 5, 6, 7, 8, 9, 12, 13, 16, 17, 18, 20, 21, 23, 26, 29, 30, 33, 35, 38, 39, 40, 41, 42, 43, 45, 103
Prpe	*Pratylenchus penetrans* (Cobb)	5.6	2, 4, 5, 6, 9, 13, 17, 26, 30, 43, 46, 50, 59, 63, 65, 67, 70, 72, 76, 79, 80, 81, 85, 87, 92, 95, 96, 98, 99, 103
Prpr	*Pratylenchus pratensis* (de Man)	0.9	17, 21, 34, 39, 79, 81
Td	*Tylenchorhynchus dubius* (Bütschli)	15.4	2, 3, 4, 6, 8, 9, 11, 13, 18, 20, 21, 29, 30, 35, 38, 39, 40, 43, 44, 48, 49, 53, 55, 63, 65, 67, 70, 72, 73, 74, 76, 78, 79, 81, 85, 88, 95, 99, 102, 103
Tj	*Tylenchorhynchus juditha*e Andrássy	0.1	79
Tm	*Tylenchorhynchus maximus* Allen	0.1	74
Tw	*Tylenchorhynchus wilskii* Kornobis	0.1	50

* No. from Table 1.

In Wielkopolska, *Paratylenchus bukowinensis* is a pest of celery and parsley. We observed this nematode only once, from the roots of *Potentilla anserina* L. This plant is not a common weed in the region studied, but it is more typically found in uncultivated patches of farmland.

References

BRZESKI, M.W. & BAKSIK A. (1981). [Types of *Meloidogyne hapla* populations in Poland.] *Zesz. Probl. Postêp. Nauk Roln.*, 249: 73-75.

HOOPER, D.J. & STONE, A.R. (1981). Role of wild plants and weeds in the ecology of plant-parasitic nematodes. *In*: Thresh, J.M. (Ed.) *Pests, pathogens and vegetation. The role of weeds and wild plants in the ecology of crop pests diseases.* Boston, MA, USA, Pitman Advanced Publishing Program: 192-215.

HUNT, D.J. (1993). *Aphelenchida, Longidoridae and Trichodoridae. Their systematics and bionomics.* Wallingford, UK, CAB International, v + 352 p.

ISHAQE, E. (1992). Plant parasitic nematodes associated with weeds in spring cereal field in the region of Wielkopolska. *Roczn. Nauk Roln.,* Ser. E, 22: 7-30.

KORNOBIS, S. (1983). [Plant parasitic nematodes associated with poor growth of maize in the Wielkopolska region.] *Zesz. Probl. Postêp. Nauk Roln.*, 232: 143-146.

KORNOBIS, S. (1990). [Nematodes as plant pests in the region Wielkopolska.] *Materiay XXX Sesji nauk. Inst. Ochr. Rosl.*, Czesc I - Referaty, Poznan, Poland: 209-221.

KORNOBIS, S. & ISHAQE, E. (1992) [Weeds in field of spring cereals as hosts of harmful nematodes.] *Materiay XXXII Sesji nauk. Inst. Ochr. Rosl.*, Czesc I - Referaty, Poznan, Poland: 88-93.

ORTON WILLIAMS, K.J. (1974). Meloidogyne hapla. *C.I.H. Descriptions of Plant-parasitic nematodes*, Set. 3, No.31.

STURHAN, D. & BRZESKI, M.W. (1991). Stem and bulb nematodes, *Ditylenchus* spp. *In*: Nickle, W.R. (Ed.) *Manual of agricultural nematology.* New York, USA, Marcel Dekker Inc.: 423-464.

WOLNY, S. (1990*a*). [Plant parasitic nematodes associated with poor growth of spring barley in the region Wielkopolska.] *Pr. nauk. Inst. Ochr. Rosl.,* 31: 5-16.

WOLNY, S. (1990*b*). [Plant parasitic nematodes associated with poor growth of spring wheat in the region Wielkopolska.] *Pr. nauk. Inst. Ochr. Rosl.,* 31: 17-28.

WOLNY, S. (1990*c*). [Plant parasitic nematodes associated with poor growth of oat in the region Wielkopolska.] *Pr. nauk. Inst. Ochr. Rosl.,* 31: 29-40.