

Plant Parasitic Nematodes of North Dakota

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ABSTRACT

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In North Dakota four new genera of plant parasitic nematodes were found: *Ditylenchus*, *Hemicycliophora*, *Macroposthonia*, and *Nothocriconema*. Twelve new species were detected in various plant associations. The species were *Helicotylenchus digonicus*, *H. platyurus*, *H. pseudorobustus*, *H. varicaudatus*, *Macroposthonia raskiensis*, *Merlinius leptus*, *Nothocriconema permistus*, *Paratylenchus hamatus*, *P. vexans*, *Pratylenchus fallax*, *Tylenchorhynchus maximus*, and *Tylenchus vulgaris*. Earlier reports of certain plant parasitic nematodes were confirmed. All plant parasitic nematodes reported in North Dakota are listed.

Before 1958 only two plant parasitic nematodes were reported in North Dakota. They were *Punctodera punctata* Mulvey & Stone and a *Heterodera* from the *H. cacti* group (9,20). In 1958,

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Heterodera schachtii Schmidt was reported in one soil sample from Cass County (2). The *H. schachtii* report was not confirmed subsequently. Eight other plant parasitic nematodes were reported in the 1958 article (2). In 1963 and 1968 Pepper (11,12) reported 22 plant parasitic nematodes in fields of barley, wheat, and forage grasses in North Dakota. In 1968 Thorne and Malek (26) reported an additional 19 plant parasitic nematodes in North Dakota. Although not specifically found in North Dakota, 10 other plant parasitic nematodes were reported as common throughout the northern Great Plains (10,26). Our objective was to

compile and expand the knowledge of plant parasitic nematodes in North Dakota.

MATERIALS AND METHODS

A range of soil types and vegetative habitats was represented in 20 soil samples collected from various locations mostly in eastern North Dakota (5). From each site 10 soil cores (2 × 30.5 cm) were removed and placed in a plastic bag. All samples were stored at 4 C until the nematodes were extracted, usually within 48 hr after collection, by Christie and Perry's extraction method (4). Nematodes were heat-killed, fixed in formalin-acetic acid-alcohol and mounted in glycerine for species identification. A Wild M 11 compound microscope was used for identification (5).

RESULTS AND DISCUSSION

In North Dakota four new genera of plant parasitic nematodes were found: *Ditylenchus*, *Hemicycliophora*, *Macroposthonia*, and *Nothocriconema*. Only juveniles of the *Ditylenchus* were found associated with grasses on 28 July and 15 August 1977 and yellow sweetclover (*Melilotus officinalis*) on 31 August 1977

(5). *Hemicycliophora* sp. was discovered beneath alfalfa (*Medicago sativa*) on 21 August 1977 (5). Twelve new species were detected in various plant associations. These species were *Helicotylenchus digonicus* Perry et al beneath red clover (*Trifolium pratense*) on 31 August 1977 (5,13), *H. platyurus* Perry et al beneath grasses on 3 October 1977 and oak (*Quercus* sp.) on 20 October 1977 (5,13), *H. pseudorobustus* Golden beneath grasses on 15 August and 3 October 1977 and red clover on 31 August 1977 (5,21), *H. varicaudatus* Yuen beneath aspen (*Populus* sp.) and oak on 20 October 1977 (5,28), *Macroposthonia raskiensis* de Grisse & Loof beneath grasses on 3 October 1977 (5,7,21,26), *Merlinius leptus* Siddiqi beneath sumac (*Rhus* sp.) on 31 August 1977 (5,16), *Nothocriconema permistus* de Grisse beneath grasses on 15 August 1977 (5,21), *Paratylenchus hamatus* Thorne & Allen beneath alfalfa on 31 August and grasses on 15 August 1977 (5,25), *P. vexans* Thorne and Malek beneath grasses on 3 October 1977 (5,26), *Pratylenchus fallax* Seinhorst beneath oak on 20 October 1977 (5,14), *Tylenchorhynchus maximus* Allen in a cultivated field on 18 July and beneath grasses on 15 August 1977 (1,5), and *Tylenchus vulgaris* Brzeski beneath oak on 20 October 1977 (5,21).

Earlier reports of certain plant parasitic nematodes were confirmed. These nematodes were *Aphelenchus avenae* Bastian beneath aspen on 20 October, corn (*Zea mays*) on 31 August, flax (*Linum usitatissimum*) on 18 October, and sugar beet (*Beta vulgaris*) on 15 October 1977 (5,21,26); *Helicotylenchus exallus* Sher beneath grasses on 3 October 1977, brome grass (*Bromus* sp.) and corn (5,15,26); *Helicotylenchus* sp. beneath grasses on 28 July, 15 August, and 3 October 1977, beneath sugar beet and wheat (*Triticum aestivum*) (2,5,11,12); *Heterodera* sp. beneath grasses on 3 October 1977, barley (*Hordeum vulgare*), and wheat (5,11); *Quinisulcius acutoides* Siddiqi in a cultivated field on 19 July 1977 (5,11,12,17,26); *Tylenchorhynchus nudus* Allen beneath barley, corn on 31 August, grasses on 28 July and 3 October, and sage (*Salvia* sp.) on 31 August 1977 (1,5,12); *Tylenchorhynchus* sp. beneath grasses on 28 July 1977, beneath barley, wheat, and sugar beet (5,11); *Tylenchus exiguus* de Man beneath aspen on 20 October, barley, corn on 31 August, grasses on 28 July, 15 August, and 3 October 1977, sugar beet, and wheat (5,11,12); *Tylenchus* sp. beneath aspen on 20 October, barley, grasses on 3 October, sugar beet on 15 October 1977, and wheat (5,11,12); and *Xiphinema americanum* Cobb beneath grasses on 28 July 1977, barley, sugar beet, wheat, and shelter belt trees (2,5,11,12,21).

Other plant parasitic and potentially parasitic nematodes previously reported in North Dakota were *Aphelenchoides confusus* Thorne & Malek beneath wheat

(26); *Aphelenchoides* sp. beneath barley and wheat (11,12); *A. vigor* Thorne & Malek beneath prairie sod (26); *Aphelenchus* sp. beneath barley and wheat (11); *Basiroides obliquus* Thorne and Malek (26); *Deladenus durus* Thorne beneath prairie sod (26); *Geocenamus tenidudens* Thorne and Malek beneath prairie sod (26); *Helicotylenchus leiocephalus* Sher (21,26); *H. erythrinae* Golden beneath sugar beet (2); *H. nannus* Steiner beneath sugar beet (2); *Heterodera cacti* group on potato (*Solanum tuberosum*) (20); *H. schachtii* Schmidt on sugar beet (reported in Cass county in 1958 but not found subsequently) (2,21); *Hoplolaimus* sp. beneath sugar beet (2,12); *Meloidogyne acrita* Esser, Perry and Taylor (reported as *M. incognita* in the greenhouse, occurs only in the greenhouse and in flower beds above steam pipes on the North Dakota State University campus) (11,12); *Merlinius lineatus* Siddiqi beneath barley (11,16); *M. stegus* Siddiqi (16,26); *M. varians* Siddiqi (16,26); *Negelus aberrans* Thorne and Malek beneath prairie sod (26); *Neotylenchus nudus* Thorne and Malek (26); *Paratylenchus nannus* Thorne and Smolik (27); *Paratylenchus* sp. beneath barley and sugar beet (2,12); *Pratylenchus agilis* Thorne and Malek beneath prairie sod (26); *P. minyus* Sher and Allen beneath sugar beet (2); *Punctodera punctata* Mulvey and Stone on potato and wheat (9,11,12,20); *Rotylenchus* spp. beneath sugar beet (2); *Tetylenchus joctus* Thorne beneath wheat (11,12,24); *Thada tatra* Thorne and Malek (26); *Trichodorus* sp. beneath barley (11,12); *Trophurus minnesotensis* Caviness (3,26); *Tylenchorhynchus acutus* Allen beneath barley, sugar beet, and wheat (2,11,26); *T. claytoni* Steiner beneath barley and wheat (11,12,21); *T. cylindricus* Cobb beneath barley and wheat (11,12,21); *T. latus* Allen beneath barley (1,11); *T. macrurus* Filipjev beneath barley (11,21); *T. pachys* Thorne and Malek (26); *Tylenchus butteus* Thorne and Malek beneath prairie sod (26); *T. costatus* de Man beneath barley (11); *T. cylindricollis* Thorne and Malek (26); *T. davanini* Bastian beneath prairie sod and shrubs (21,26); *T. platycephalus* Thorne and Malek (26); and *Xiphinema* sp. beneath barley (11,12).

Nematodes not specifically reported in North Dakota but mentioned as common in the northern Great Plains of North America were *Anguina agropyronifloris* Norton on western wheatgrass (*Agropyron smithii*) (10), *Aglenchus costatus* de Man (11,12,21,26), *Beleodorus thylactus* Thorne and Malek beneath corn and small grain (26), *Hoplolaimus galeatus* Cobb beneath prairie sod and wheat (21,26), *Pratylenchus scribneri* Steiner (21,26), and *Psilenchus hilarulus* de Man (21,26).

Many of the nematodes detected in this study are common to this region of the United States (6,8,10,12,18,19,22,23). Host ranges and economic importance of

these nematodes are as yet undetermined in North Dakota. Changes in crops and cultural practices such as conservation tillage and increased use of irrigation may result in increased nematode populations and ensuing economic problems. In addition, as complex root diseases are unraveled, nematodes may be found to play an important role. This report should aid future workers in determining what plant parasitic nematodes are present and may be involved in plant disease problems in North Dakota.

LITERATURE CITED

- ALLEN, M. W. 1955. A review of the nematode genus *Tylenchorhynchus*. Univ. Calif. Pub. Zool. 61:129-166.
- CAVENESS, F. E. 1958. A study of nematodes associated with sugar beet production in selected northwest and north central states. Sugar Beet Development Foundation. Ft. Collins, CO. 157 pp.
- CAVENESS, F. E. 1959. *Trophurus minnesotensis* (Caviness 1958) n. comb. Proc. Helminthol. Soc. Wash. 26:64.
- CHRISTIE, J. R., and V. G. PERRY. 1951. Removing nematodes from soil. Proc. Helminthol. Soc. Wash. 18:106-108.
- DONALD, P. A. 1978. Plant nematodes in and relevant to North Dakota. M.S. thesis, North Dakota State University, Fargo. 70 pp.
- FISHER, K. D., and J. McGUIRE. 1963. Occurrence of *Heterodera* cysts in association with sugar beets in eastern South Dakota. Plant Dis. Rep. 47:1060-1061.
- LUC, M. 1970. Contribution a l'etude du genre *Criconemoides* Taylor, 1936 (Nematoda: Criconemoidae). Cah. ORSTOM Ser. Biol. 11:69-131.
- MALEK, R. B. 1968. The dagger nematode, *Xiphinema americanum*, associated with decline of shelterbelt trees in South Dakota. Plant Dis. Rep. 52:795-798.
- MULVEY, R. H., and A. R. STONE. 1976. Description of *Punctodera matadorensis* n. gen n. sp. (Nematoda: Heteroderidae) from Saskatchewan with lists of species and generic diagnoses of *Globodera* (n. rank), *Heterodera* and *Sarisodera*. Can. J. Zool. 54:772.
- NORTON, D. C. 1965. *Anguina agropyronifloris* n. sp. infecting florets of *Agropyron smithii*. Helminthol. Soc. Wash. Proc. 32:118-122.
- PEPPER, E. H. 1963. Nematodes in North Dakota. Plant Dis. Rep. 47:102-106.
- PEPPER, E. H. 1968. In Nematology in the North Central Region 1956-1966. North Central Regional Publication 187. Special Report 58. Agric. and Home Econ. Exp. Stn. Iowa State Univ. of Science and Technol., Ames. 20 pp.
- PERRY, V. G., H. M. DARLING, and G. THORNE. 1959. Anatomy, taxonomy and control of certain spiral nematodes attacking blue grass in Wisconsin. Univ. Wisc. Res. Bull. 207:1-24.
- SEINHORST, J. W. 1968. Three new *Pratylenchus* species with a discussion of the structure of the cephalic framework and of the spermatheca in this genus. Nematologica 14:497-510.
- SHER, S. A. 1966. Revision of the *Hoplolaiminae* (Nematoda) VI. *Helicotylenchus* Steiner, 1945. Nematologica 12:1-56.
- SIDDIQI, M. R. 1970. On the plant parasitic nematode genera *Merlinius* gen. n. *Tylenchorhynchus* Cobb and the classification of the families *Dolichodoridae* and *Belonolaimidae* n. rank. Proc. Helminthol. Soc. Wash. 37:68-77.
- SIDDIQI, M. R. 1971. Structure of the oesophagus in the classification of the superfamily *Tylenchoidea* (Nematoda). Indian J. Nematol. 1:25-43.
- SMOLIK, J. D., and R. B. MALEK. 1972. *Tylenchorhynchus nudus* and other nematodes associated with Kentucky bluegrass turf in South Dakota. Plant Dis. Rep. 56:898-900.

19. SMOLIK, J. D., and R. B. MALEK. 1973. Effect of *Tylenchorhynchus nudus* on growth of Kentucky bluegrass. *J. Nematol.* 5:272-274.
20. SPEARS, J. F. 1956. Occurrence of the grass cyst nematode, *Heterodera punctata*, and *Heterodera cacti* groups cysts in North Dakota and Minnesota. *Plant Dis. Rep.* 40:583-584.
21. TARJAN, A. C., and B. E. HOPPER. 1974. Nomenclatorial compilation of plant and soil nematodes. *The Society of Nematologists.* 419 pp.
22. TAYLOR, D. P., R. V. ANDERSON, and W. A. HAGLUND. 1958. Nematodes associated with Minnesota crops. I. Preliminary survey of nematodes associated with alfalfa, flax, peas, and soybeans. *Plant Dis. Rep.* 42:195-198.
23. TAYLOR, D. P., and E. G. SCHLEDER. 1959. Nematodes associated with Minnesota crops. II. Nematodes associated with corn, barley, oats, rye and wheat. *Plant Dis. Rep.* 43:329-333.
24. THORNE, G. 1949. On the classification of the Tylenchida, new order (Nematoda: Phasmidia). *Proc. Helminthol. Soc. Wash.* 16:37-73.
25. THORNE, G., and M. W. ALLEN. 1950. *Paratylenchus hamatus* n. sp. and *Xiphinema index* n. sp., two nematodes associated with fig roots, with a note on *Paratylenchus anceps* Cobb. *Proc. Helminthol. Soc. Wash.* 17:27-35.
26. THORNE, G., and R. B. MALEK. 1968. Nematodes of the northern Great Plains. Part I. Tylenchida (Nemata: Secernetea). *S. Dak. Agric. Exp. Stn. Tech. Bull.* 31. 111 pp.
27. THORNE, G., and J. D. SMOLIK. 1971. The identity of *Paratylenchus nanus* Cobb, 1923. *Proc. Helminthol. Soc. Wash.* 38:90-92.
28. YUEN, P. H. 1964. Four new species of *Helicotylenchus* Steiner (Hoplolaiminae: Tylenchida) and a redescription of *H. canadensis* Wasum. 1961. *Nematologica* 10:373-387.