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Plant-Parasitic Nematodes in Iowa: Longidoridae and Trichodoriadae¹

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Plant-parasitic nematodes, although common, are little known in Iowa. Many are important plant pathogens. This paper documents the nine species of Longidoridae and Trichodoriadae known in Iowa. These are *Longidorus breviannulatus*, *L. crassus*, *L. macromucronatus*, *L. sylphus*, *Xiphinema americanum*, *X. bakeri*, *X. chambersi*, *Paratrichodorus minor*, and *Trichodorus proximus*.

INDEX DESCRIPTORS: Nematoda, plant-parasitic nematodes.

Nematodes are the most abundant metazoans inhabiting soil. Yet they are little known in Iowa even though many are important pathogens of cultivated plants. Although efforts to investigate plant-parasitic nematodes in Iowa began in 1959, a complete documentation of the species in the state has never been made. This paper is an initial attempt towards that end.

All nematodes treated in this paper are in the order Dorylaimida which includes a large and diverse group of species. Although dorylaimids are ubiquitous in soil, their food habits are often incompletely known. Many are predators of small soil biota. A few attack higher plants, but those that do include some important plant pathogens. Such species are in the families Longidoridae or Trichodoriadae and only these parasites are considered in this paper. Because the nematodes included are only a few of the many described in the genera discussed, original or monographic treatments should be consulted when identifying species. General treatments of morphology or taxonomy of nematodes are by Anderson and Mulvey (1), Decraemer (4), Dropkin (5), Ferris (6), and Thorne (15). General ecological treatments are by Norton (11) and Wallace (16).

MATERIALS AND METHODS

Nematode extraction from soil between 1959 and 1967 was generally by the sieving-Baermann funnel method (3). The centrifugal-flotation method (7) was used after 1967. Many larger nematodes, such as some *Longidorus* species, were recovered directly by wet screening. Nematode extraction from the roots was mainly by the shaker method (2). Representative specimens were preserved in glycerin (14) and are deposited in the Iowa State University nematode collection in the Department of Plant Pathology, Seed and Weed Sciences.

Because all species have been described, only abbreviated descriptions are provided. The deMan system of measuring is used, mostly from preserved specimens, where N=the number of specimens examined for measurements, L=the length of the nematode, a=the length of the nematode divided by the greatest width, b=the length of the nematode divided by the length of the esophagus, and c=length of the nematode divided by the length of the tail. V=the position of the vulva as a percentage of the body length from the anterior end. Measurement ranges are in parentheses.

RESULTS

LONGIDORIDAE. Nematodes usually more than 1.5 mm long. Stylet linear and elongate. Esophagus is muscular consisting of a narrow anterior portion and an expanded posterior portion.

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LONGIDORUS

Members in this genus are long nematodes with the elongated stylet divided into an anterior spear and a posterior extension. There is no

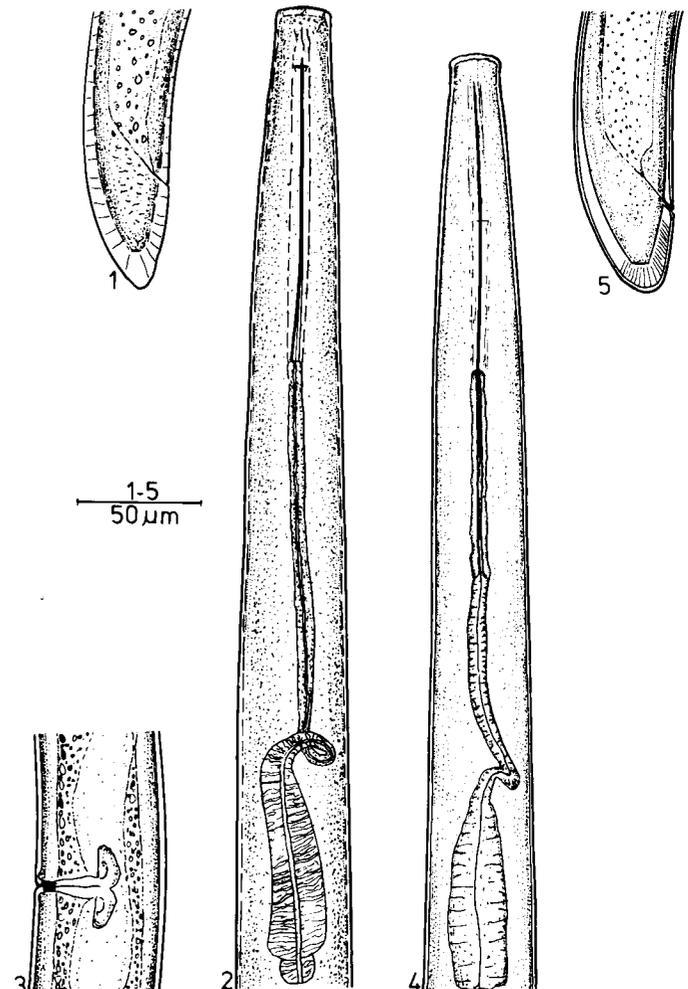


Fig. 1-3. *Longidorus breviannulatus* female: 1. tail, 2. anterior end, 3. vulva region. Fig. 4, 5. *Longidorus macromucronatus* female: 4. anterior end, 5. tail.

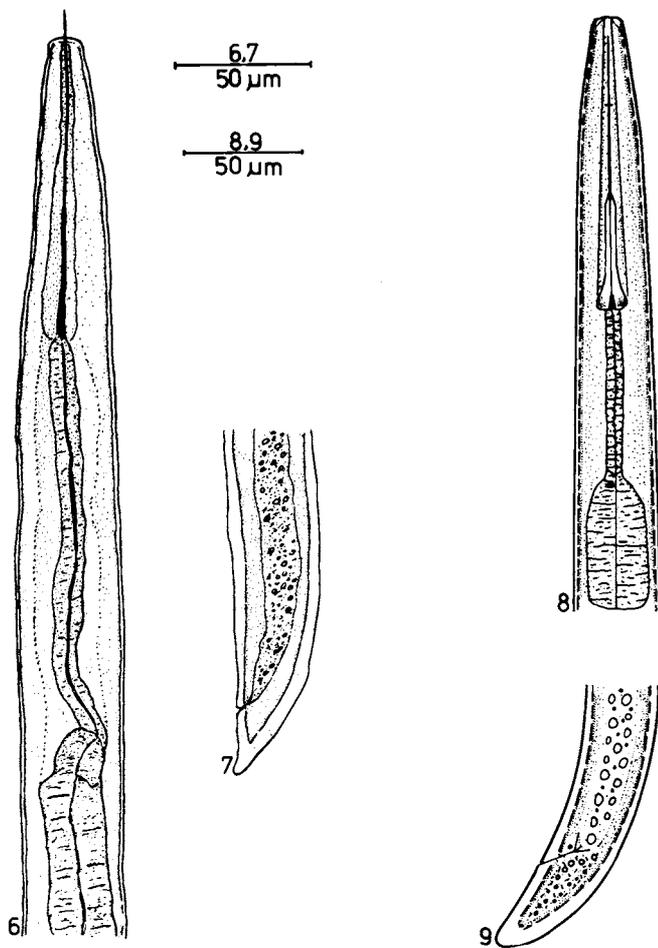


Fig. 6,7. *Longidorus sylphus* female: 6. anterior end, 7. tail. Fig. 8,9. *Xiphinema americanum* female: 8. anterior end, 9. tail.

expansion at the stylet base. The guiding ring (sheath) is located a short distance behind the lips.

Except for *L. breviannulatus* in some sandy fields, usually only few individuals in this genus are found at a time. Because of their large biomass, however, all species probably are capable of causing plant damage.

Longidorus breviannulatus Norton and Hoffmann, 1975
(Fig. 1-3)

Measurements are from the original description. N=14 females: L=4.76 mm (4.02-5.15); a=94 (86-114); b=16.9 (12.3-23.8); c=123 (111-143); c=46.7 (43.1-50.2); odontostyle 83.2 μm (81-88); spear extension without flanges=35 μm (28-45); guiding ring from anterior of nematode=23 μm (21-26).

Lips flattened, set off by a slight expansion. Wide bilobed amphidial pouches extending nearly to or reaching the guiding ring. Ovaries didelphic, reflexed.

Males have not been collected in Iowa, but specimens from Illinois (personal communication, Dr. Richard Malek, University of Illinois) appear to be this species.

The nematode is associated with corn (*Zea mays* L.) in Boone, Des Moines, Lee, Louisa, and Muscatine counties in Iowa (12) and also from Delaware, Illinois, and Indiana. Specimens from Canada are similar, if not identical.

This species can be one of the most devastating nematodes attacking corn (8). Large numbers are restricted to highly sandy soils.

Longidorus crassus Thorne, 1974

Thorne (15) reports this species as occurring around white oak (*Quercus alba* L.) in Ames, Iowa. The description is from Thorne.

L=5.0-6.0 mm; a=80-107; b=11.0; c=118-134; V=45-51. Body arcuate to almost spiral. Lip region rounded. Tail sub-hemispheroid to slightly conoid. Spear 105-115 μm long; extensions 65-70 μm. Guiding ring conspicuous. Ovaries reflexed. Males not known.

Known from native sod in South Dakota and about roots of white oak, Ames, Iowa.

Longidorus macromucronatus Siddiqi, 1962
(Fig. 4,5)

N=5 females: L=4.42 mm (3.79-5.03); a=87 (72-107); b=11.8 (10.1-13.0); c=162 (131-193); V=43 (40-46); odontostyle 114 μm (110-120); spear extension 73 μm (70-75); guiding ring from anterior of nematode=68 μm (64-72).

Lip region slightly swollen, semiknob-like. Tail length less than anal body diameter.

Males not found.

This species has the most posterior guiding ring of any *Longidorus* in Iowa. Associated with *Acer saccharinum* L. at Child's Access, Black Hawk County; *A. saccharinum* near Des Moines River near Madrid, Boone County; and *A. negundo* L. on Skunk River floodplain, Route 63 north of Oskaloosa, Mahaska County. As far as we know, this is the only report from North America.

We thank Dr. Franco Lamberti of Bari, Italy, for his opinion on this nematode.

Longidorus sylphus Thorne, 1939
(Fig. 6,7)

N=3 females: L=2.71 mm (2.39-2.94); a=66.7 (65.0-69.0); b=12 (11-13); c=66; V=48.6 (48-49). Odontostyle 82 μm (80-83); spear extensions 46 μm (45-48). Guiding ring from anterior of nematode=23 μm.

This nematode was associated with *Ostrya virginiana* (Mill.) K. Koch at Hanging Bog, Linn County. We thank Dr. R.T. Robbins for his opinion on this species.

XIPHINEMA

These nematodes also are generally long. They can be distinguished from *Longidorus* spp. by the position of the guiding ring, which is located near the junction of the spear and its extension. The base of the elongated stylet is flanged.

Xiphinema americanum Cobb, 1913
(Fig. 8,9)

N=15 females: L=1.70 mm (1.48-1.93); a=46 (42-49); b=6.4 (5.7-8.2); c=50 (42-63); V=52 (50-53); odontostyle=75 μm (64-93); spear extension=49 μm (41-66).

Spear with flanges, gonads didelphic.

This is one of the most common and widespread plant-parasitic nematodes in Iowa. It occurs in nearly all cultivated fields, orchards,

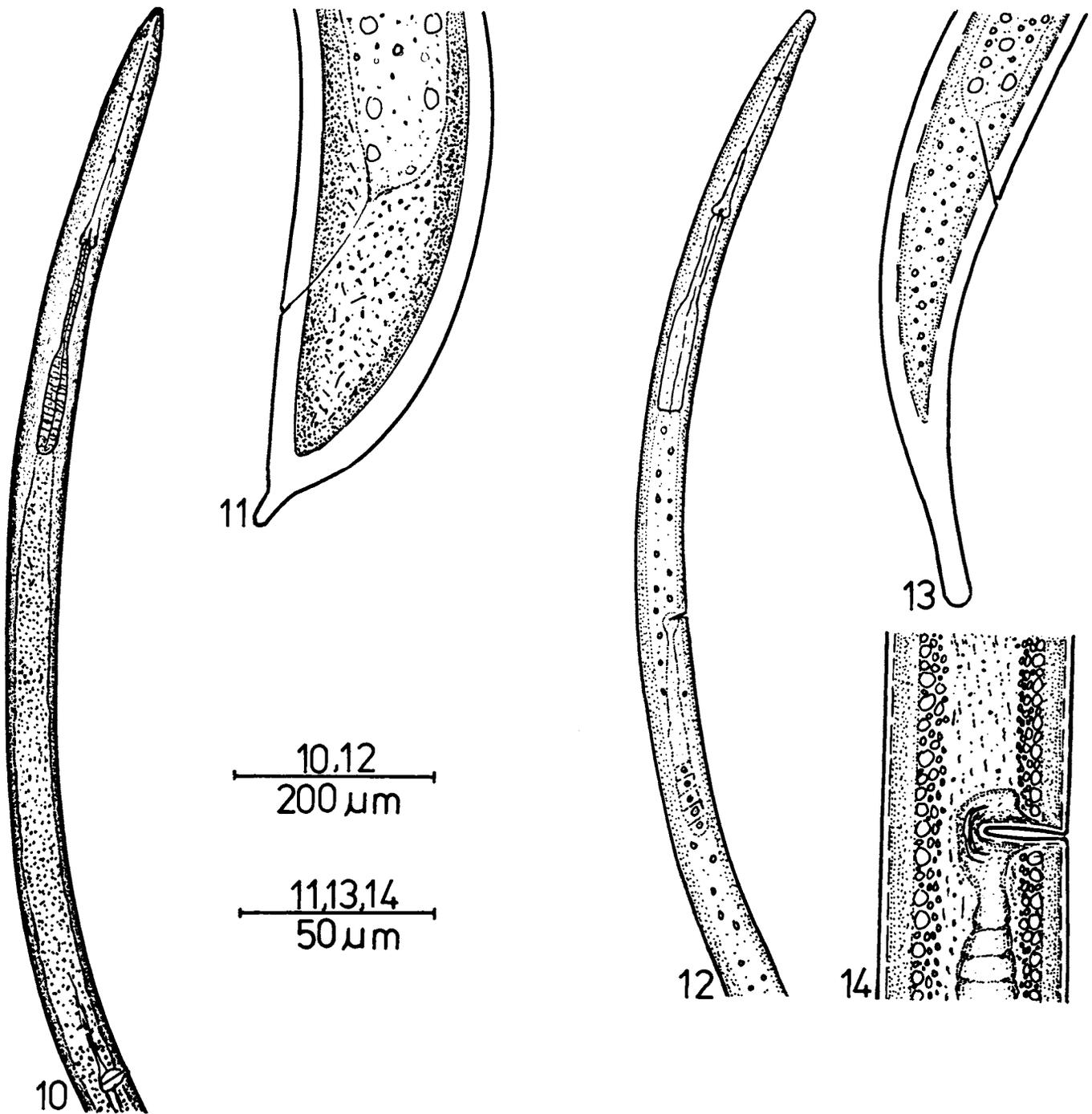


Fig. 10,11. *Xiphinema bakeri* female: 10. anterior end, 11. tail. Fig. 12-14. *Xiphinema chambersi* female: 12. anterior end, 13. tail, 14. vulva region.

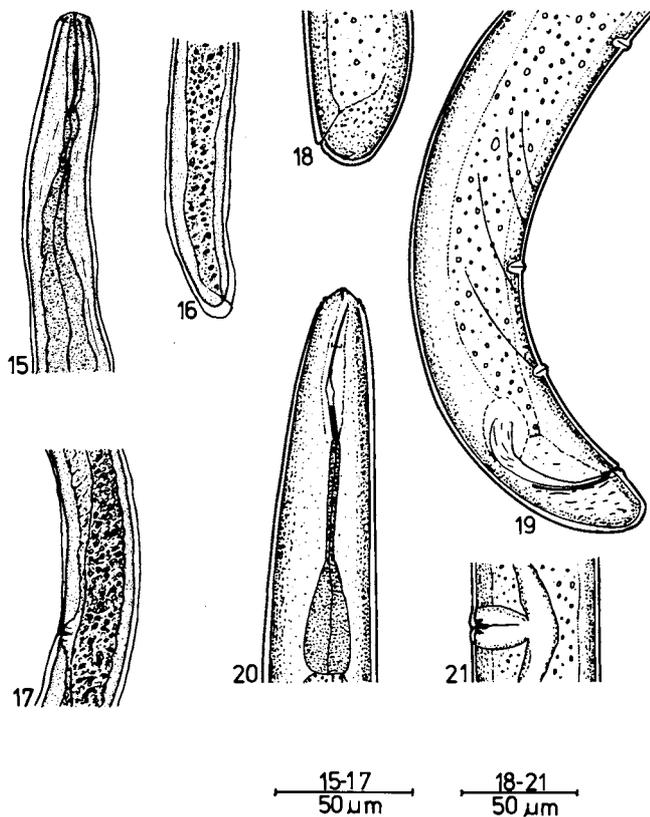


Fig. 15-17. *Paratrichodoros minor* female: 15. anterior end, 16. tail, 17. vulva region. Fig. 18-21. *Trichodoros proximus*. 18. female tail, 19. male tail, 20. female anterior end, 21. vulva region.

home plantings, native prairies, and woodlands. It causes serious damage to alfalfa (*Medicago sativa* L.) (9), red clover (*Trifolium pratense* L.) (10), and probably many other plants, although experimental data are largely lacking. On the basis of its wide distribution, its host range must be extensive.

Xiphinema bakeri Williams, 1961
(Fig. 10,11)

N=4 females: L=3.56 mm (3.06-3.79); a=61.6 (59.1-65.4); b= 7.9 (6.7-8.7); c= 67.6 (58.7-74.0); V = 30.3 (28.8-32.2). Odontostyle 128 μ m (128-129); spear extension=76 μ m (75-78). The lip region is continuous with the body contour.

This species was found around *Acer saccharum* Marsh. at the Retz Memorial, Clayton County.

We thank Dr. R.T. Robbins for his opinion on this nematode.

Xiphinema chambersi Thorne, 1939
(Fig. 12-14)

N=8 females: L=2.47 mm (2.22-2.88); a=47 (36-58); b=6.4 (5.9-7.4); c=21 (19-23); V=23 (22-27); odontostyle 113 μ m (102-122); 1 spear extension 69 μ m (63-73).

Stylet base with flanges. Tail digitate. Female gonad monodelphic. Found in woodlands and native prairies in small numbers (13); occasionally found in cornfields in Black Hawk and Muscatine counties.

TRICHODORIDAE. Body length is about 1 mm or less. Stylet arcuate with no knobs or flanges at its base. Base of esophagus pyriform. Anus almost terminal.

Two genera, *Paratrichodoros* and *Trichodoros*, are known in Iowa. The species are rather stubby nematodes, with curved stylets, and a nearly terminal anus. Tails are bluntly rounded.

PARATRICHODORUS

The cuticle usually swells strongly during fixing. The females are without lateral pores within one body width from the vulva. The vaginal sclerotization is weakly developed. Male with bursa.

Paratrichodoros minor (Colbran, 1956) Siddiqi, 1974
(Fig. 15-17)

N=3 females: L=0.64 mm (0.56-0.67); a=20 (16-22); b=5.4 (5.2-5.6); stylet 35 μ m (30-42); V=50 (49-51).

In Iowa, this nematode has been associated with corn growing in sandy soils in Black Hawk, Boone, Lee, and Louisa counties. It is a destructive pathogen in sandy soils in the southern United States and is doubtless more widespread in Iowa than now recognized.

TRICHODORUS

The cuticle usually does not swell strongly during fixation. Females possess a pair of lateral body pores within one body width of the vulva. Vaginal sclerotizations usually are strongly developed. Males are numerous but do not possess bursae.

Trichodoros proximus Allen, 1957
(Fig. 18-21)

N=3 females: L=1.24 mm (1.11-1.29); a=19.6 (19.1-31.8); b=7.3 (6.8-9.2); c=subterminal. Stylet=60 μ m (51-69); V=51 (45-57).

N=6 males: L=1.14 mm (0.96-1.34); a=30.8 (27.6-33.6); b=7.1 (6.9-7.4); c=73 (61-79). Stylet=57 μ m (51-64). Spicules=58 μ m (51-63).

Stylet curved; anus almost terminal. Two supplementary papillae in male about one body width apart and just anterior to spicules; a third papilla is located about two body widths anterior to the middle ventral papilla.

This nematode is relatively common in Iowa prairies. It has been found in the Kalsow and Cayler prairies, the Freda Haffner Kettlehole in Dickinson County, and in turf in Calhoun County.

REFERENCES

- ANDERSON, R.V., and R.H. MULVEY, 1979. Plant-parasitic nematodes in Canada. Part I. Agric. Can. Res. Branch. Monogr. 20. 152 p.
- BIRD, G.W., 1971. Influence of incubation solution on the rate of recovery of *Pratylenchus brachyurus* from cotton roots. J. Nematol. 3:378-385.
- CHRISTIE, J.R., and V.G. PERRY, 1951. Removing nematodes from soil. Proc. Helminthol. Soc. Wash. 18:106-108.
- DECRAEMER, W., 1980. Systematics of the Trichodoridae (Nematoda) with keys to their species. Rev. Nematol. 3:81-99.
- DROPKIN, V.H., 1980. Introduction to Plant Nematology. Wiley-Interscience. New York. 293 p.
- FERRIS, V.R., 1971. Taxonomy of the Dorylaimida. p. 163-189. In B.M.

- Zuckerman, W.F. Mai, and R.A. Rohde (ed.). Plant Parasitic Nematodes. Vol. 1. Academic Press, New York.
7. JENKINS, W.R., 1964. A rapid centrifugal-flotation technique for separating nematodes from soil. *Plant Dis. Rep.* 48:692.
 8. MALEK, R.B., D.C. NORTON, B.J. JACOBSON, and N. ACOSTA, 1980. A new corn disease caused by *Longidorus breviannulatus* in the Midwest. *Plant Dis.* 64:1110-1113.
 9. NORTON, D.C., 1965. *Xiphinema americanum* populations and alfalfa yields as affected by soil treatment, spraying and cutting. *Phytopathology.* 55:615-619.
 10. NORTON, D.C., 1967. *Xiphinema americanum* as a factor in unthriftiness of red clover. *Phytopathology.* 57:1390-1391.
 11. NORTON, D.C., 1978. *Ecology of Plant-Parasitic Nematodes.* Wiley-Interscience. New York. 268 p.
 12. NORTON, D.C., and J.K. HOFFMANN, 1975. *Longidorus breviannulatus* n. sp. (Nematoda: Longidoridae) associated with stunted corn in Iowa. *J. Nematol.* 7:168-171.
 13. SCHMITT, D.P., and D.C. NORTON, 1972. Relationships of plant parasitic nematodes to sites in native Iowa prairies. *J. Nematol.* 4:200-206.
 14. SEINHORST, J.W., 1959. A rapid method for the transfer of nematodes from fixative to anhydrous glycerin. *Nematologica* 4:67-69.
 15. THORNE, G., 1974. Nematodes of the northern great plains. Part II. Dorylaimida in part (Nemata: Adenophorea). S.D. Agric. Exp. Stn. Tech. Bull. 41. 120 p.
 16. WALLACE, H.R., 1973. *Nematode ecology and plant disease.* Arnold, Lond. 228 p.