

CYSTOID NEMATODES AND THEIR ECONOMIC IMPORTANCE

R. N. Inserra¹ and N. Vovlas²

The cystoid nematodes, Meloidodera spp., were first described by Chitwood, Hannon and Esser in 1956 (2). These nematodes are similar to cyst nematodes (Heterodera and Globodera) and may be confused with them because the adult females are spheroid to pyriform and retain eggs inside their bodies as do cyst nematodes. They may also be confused with root-knot nematodes (Meloidogyne spp.) because the swollen females do not form cysts. However, adult females of Meloidodera differ from those of both cyst and root-knot nematodes because of the vulval position, which is equatorial, and the wide distance between vulva and anus (Fig. 1).

Geographical Distribution: Meloidodera species have been reported only in the United States and in the Soviet Union (3,4,5,6,7). Among the seven species belonging to this genus, M. belli Wouts is present in California (7), M. charis Hopper was reported in California, Nebraska and Texas (5), M. eurytyla Bernard in the Aleutian Islands (Alaska) (1), and M. floridensis Chitwood et al. in the southeastern United States (4). Meloidodera armeniaca Poghossian, M. sikhotealinensis Eroshenko, and M. tadshikistanica Kir'yanova and Ivanova were reported from the Soviet Union, in ArmSSR, in Primorsk territory, and TadzhSSR, respectively (3,6).

Host Range: Except for M. charis, all other Meloidodera species were detected only on noncultivated hosts. M. belli infects sage (Artemisia tridentata), M. eurytyla was detected on a grass Elymus mollis and on a weed Honkenya peploides ssp. major, while M. floridensis was found only on Pinus spp. Meloidodera armeniaca, M. sikhotealinensis, and M. tadshikistanica infect nightshade (Solanum nigrum), birch (Betula platyphylla), and Cousinia microcarpa, respectively. Meloidodera charis infects noncultivated plants such as honey mesquite (Prosopis juliflora), peony (Paeonia californica), and ridgeseed spurge (Euphorbia glyptosperma), but it also reproduces on cultivated plants such as corn (Zea mays), okra (Abelmoschus esculentus), and St. Augustinegrass (Stenotaphrum secundatum) (5).

Life Cycle: Only the biology of M. charis and M. floridensis have been studied in detail (4,5). Meloidodera second stage juveniles (J2) are the infective stage. The J2 penetrate root tips of their hosts and establish a feeding site in the pericycle. The female nematodes become sedentary and enlarge. After reaching maturity, the female body in some cases may rupture the root tissues and protrude from the root (Fig. 2A). Eggs develop inside the female and have been observed 40 days after J2 penetration in M. charis (5). Eggs usually hatch inside the female body (5). The vermiform adult males are rarely seen; they move out into surrounding plant tissue or soil, but they are not parasitic.

¹Nematologist, Bureau of Nematology, P.O. Box 1269, Gainesville, FL 32602

²Nematologist, Istituto Nematologia agraria, CNR, 70126 Bari, Italy

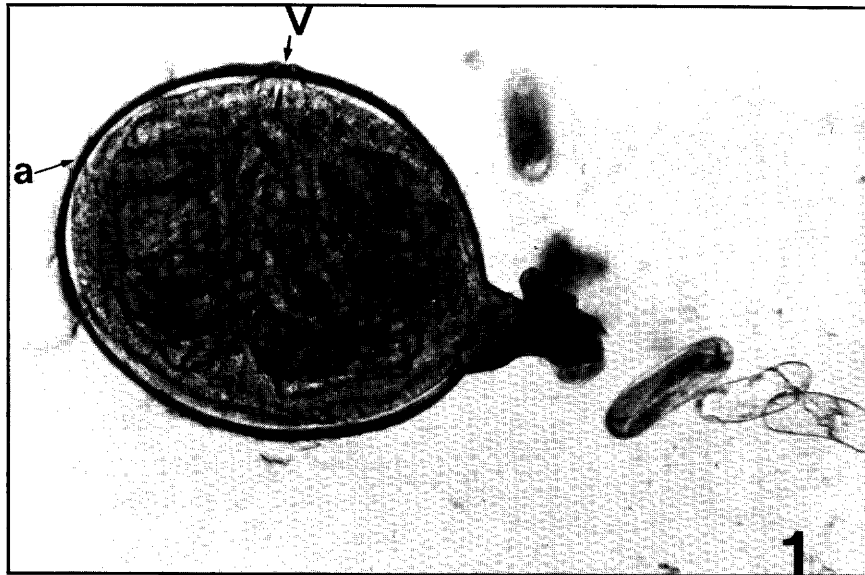


Fig. 1. Adult female of pine cystoid nematode, Meloidodera floridensis. Note the vulva (V) in equatorial position and the wide distance between vulva and anus (a).

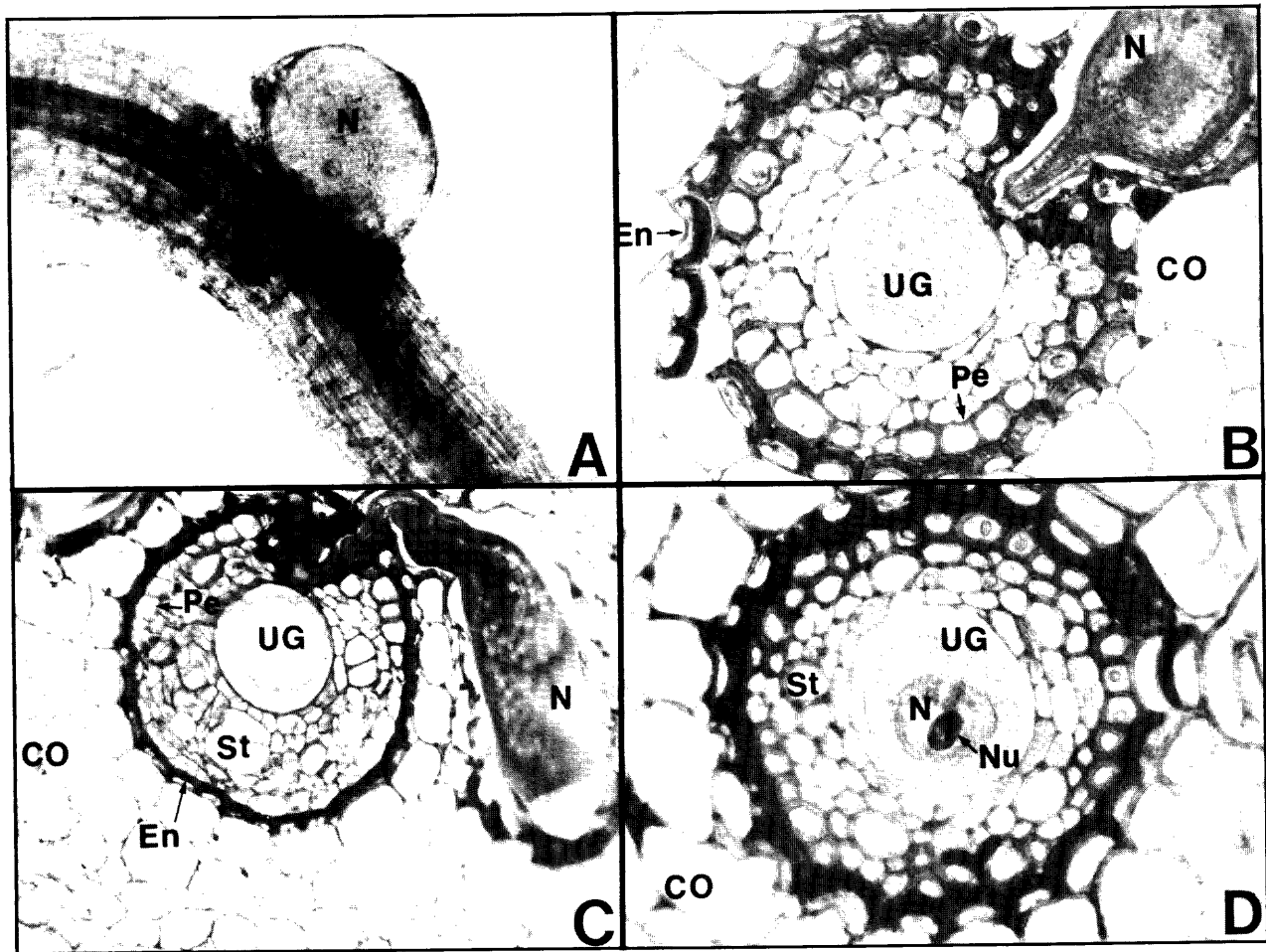


Fig. 2. Corn root infected with *Meloidodera charis*. A) Root segment showing a swollen female (N) protruding from the root surface. B) Cross section showing a nematode (N) that had penetrated into the cortex (CO) and into the stele away from endodermis (En) and pericycle (Pe) and feeding from a single uninucleate giant cell (UG) which originated from vascular parenchyma. C) Cross section showing a nematode (N) that had penetrated the cortex (CO) and into the stele (St), and was feeding from a single giant cell (UG) expanding into the stele and away from the endodermis (En) and pericycle (Pe). D) Cross section showing a single uninucleate giant cell (UG) in the stele (St). Note the enlarged nucleus (N) and the prominent nucleolus (Nu), CO = cortex.

Host Response: Histological examination of roots infected with M. belli and M. floridensis show these nematodes induce the formation of a single, uninucleate giant cell that originates from a pericycle cell (7). This specialized cell enlarges and can occupy a large portion of the root stele (7). Meloidodera charis is a stelar feeder in corn roots. It penetrates the cortex and 4-5 cells deep into the stele, forming a single, uninucleate giant cell from the vascular parenchyma (Fig. 2B,C). On corn roots there is no evidence of giant cell initiation from the pericycle as reported in other hosts of M. charis (7). The giant cell has very dense cytoplasm with an enlarged nucleus and prominent nucleolus (Fig. 2D). The nematode feeds only from this specialized cell until it completes its reproduction. With nematode death, the giant cell disintegrates.

Economic Importance: In southeastern U.S., M. floridensis is a serious pest of pine trees, especially in nurseries. The damage of this nematode to pine is documented in the literature (4,8). So far, Texas is the only state in which M. charis has been reported attacking cultivated plants such as corn and okra (5). In the Lower Rio Grande Valley, infections of M. charis on corn were observed only occasionally under field conditions; however, no damage was reported in these infested fields. Continuous exposure of corn to M. charis may cause selection of virulent strains that can adversely affect corn growth. The introduction of M. charis to other non-infested areas in the United States should be avoided.

LITERATURE CITED:

1. Bernard, E. C. 1981. Three new species of Heteroderoidea (Nematoda) from Aleutian islands. *J. Nematol.* 13:499-513.
2. Chitwood, B. G., C. I. Hannon, and R. P. Esser. 1956. A new nematode genus, Meloidodera, linking the genera Heterodera and Meloidogyne. *Phytopathology* 46:264-266.
3. Eroshenko, A. S. 1978. A new species of Meloidodera (Nematoda, Heteroderidae) from the Primorsk territory. *Parazitologiya* 12:456-459 (In Russian).
4. Esser, R. P. 1974. Pine cystoid nematode (Meloidodera floridensis). *Fla. Dept. Agric. & Consumer Serv., Div. Plant Ind., Nem. Circ. No. 12.* 2 pp.
5. Heald, C. M. 1984. Histopathology of okra and ridgeseed spurge infected with Meloidodera charis. *J. Nematol.* 16:105-108.
6. Kir'yanova, E. S., and E. L. Krall. 1980. Plant-parasitic nematodes and their control. Vol. II, 748 pp. Amerind Publishing: New Delhi.
7. Mundo-Ocampo, M., and J. M. Baldwin. 1983. Host response to Meloidodera spp. (Heteroderidae). *J. Nematol.* 15:544-554.
8. Ruehle, J. L., and J. N. Sasser. 1962. The role of plant-parasitic nematodes in stunting of pines in southern plantations. *Phytopathology* 52:56-68.

Contribution No. 305, Bureau of Nematology

This publication was issued at a cost of \$947.24 or .27 per copy to provide information on proper recognition of plant pests.

PI86T-13