

Description of *Meloidodera mexicana* n. sp. (Nemata : Heteroderinae) with key to species

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SUMMARY

A new species of Heteroderinae *Meloidodera mexicana* n. sp. from Puebla State, Mexico is described and illustrated. Females are characterized by : spherical or pyriform shaped body; variable but short neck, sometimes surrounded by yellowish material; female stylet bent with knobs sloping posteriorly; hypodermis 6-8 μm thick; vulva postequatorial with slightly prominent vulva lips; anus subterminal. Second-stage juveniles (J2) are characterized by : small body; oesophageal glands occupying only about one half of internal body cavity; stylet robust with moderate knobs and with slight anterior projections; phasmid with lens-like ampulla; tail short (33 μm long), conical with rounded terminus, and hyaline portion of tail slightly less than 50 % of tail length. Males are characterized by : small body, slightly curved after death; head with four annules and irregular longitudinal striations; labial disc elevated; stylet weaker than that of J2; spicules slightly curved; gubernaculum delicate; penial tube absent; lateral field areolated and with four incisures. A key to the seven valid species of *Meloidodera* is proposed.

RÉSUMÉ

Description de Meloidodera mexicana n. sp. (Nemata : Heteroderinae) et clé des espèces du genre

Une nouvelle espèce d'Heteroderinae, *Meloidodera mexicana* n. sp., provenant de l'État de Puebla, Mexique, est décrite et figurée. Les femelles sont caractérisées par : corps sphérique ou pyriforme; cou variable mais court, parfois entouré par une matière jaunâtre; stylet de la femelle courbé avec boutons basaux inclinés vers l'arrière; hypoderme épais de 6 à 8 μm ; vulve post-équatoriale avec lèvres légèrement en relief; anus sub-terminal. Les juvéniles de deuxième stade (J2) sont caractérisés par : corps court; glandes oesophagiennes ne remplissant pas la cavité du corps; stylet robuste avec des boutons basaux moyennement développés et pourvus de petits procès antérieurs; phasmides avec ampoule pourvue d'une lentille; portion hyaline de la queue équivalant à un peu moins de 50 % de la longueur totale de la queue. Les mâles sont caractérisés par : corps légèrement courbé après fixation; région céphalique comportant quatre anneaux avec des stries longitudinales irrégulières; disque labial en relief; stylet moins développé que celui des J2; spicules légèrement courbés; gubernaculum fin; tube pénien absent; champ latéral aréolé, pourvu de quatre incisures. Une clé des sept espèces valides est proposée.

During nematodes surveys in 1987, Martha Salgado discovered low density of unusual heteroderid juveniles in fields where several associated crops were grown. Until November 1988 Reyna Rojas collected mature plants of different kinds of chile (*Capsicum annum*) from Tecamachalco Agricultural Station, Puebla and was successful in obtaining significant amount of all stages of the same nematode.

Males and juveniles (J2) were collected every 24 h, from washed roots of chile plants in a mist chamber. Females were individually dissected from the roots. Specimens were killed by heating the water nematode suspension (ca 45 °C) and subsequently fixed in FAA, processed to glycerin by slow infiltration at room temperature, and mounted in dehydrated glycerin for light microscopy studies. For scanning electron microscopy (SEM) nematodes were prepared as previously reported

(Cid del Prado, Lownsbery & Maggenti, 1983) and processed through critical point drying. Specimens were mounted on stubs, sputter coated with gold palladium and examined with a Jeol scanning electron microscope, at 10 kV.

Meloidodera mexicana n. sp.

(Figs 1-3)

MEASUREMENTS

Female (n = 10) : L (including neck) = 480-800 (669 \pm 62) μm ; width = 328-508 (414 \pm 35) μm ; neck length = 53-120 (89 \pm 21) μm ; stylet = 28-32

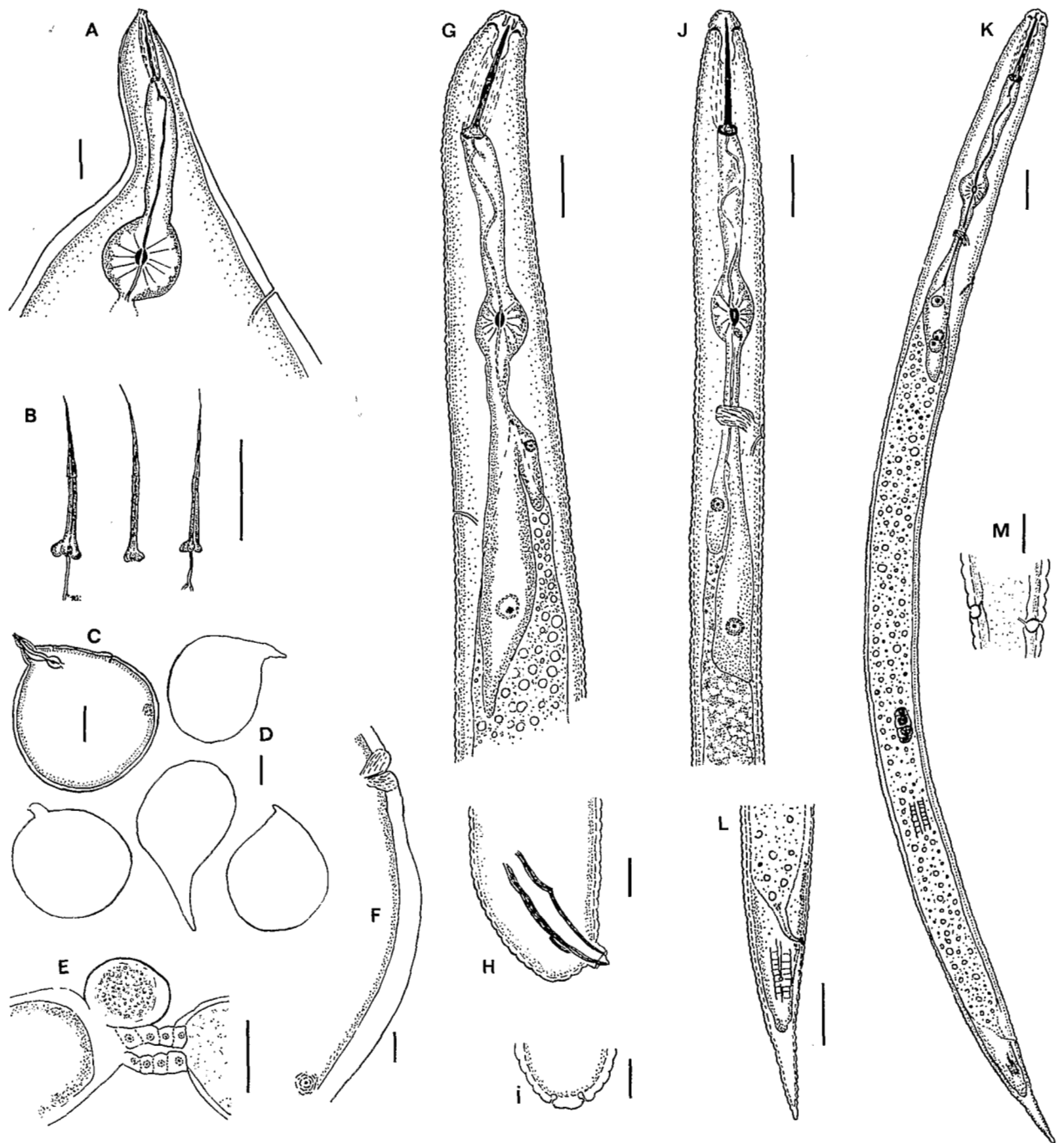


Fig. 1. *Meloidodera mexicana* n. sp. - Female. A : Anterior region; B : Stylets; C, D : Entire females; E : Spermatheca; F : Vulva and anus - Male. G : Oesophageal region; H : Posterior part (laterad); I : Phasmid (ventrad) - Juvenile 2nd stage. J : Oesophageal region; K : J2, *in toto*; L : Tail; M : Phasmids (ventrad) (Bars equivalents : A, B, E-G, J-L = 20 μ m; C,D. = 100 μ m; H, I, M = 5 μ m).

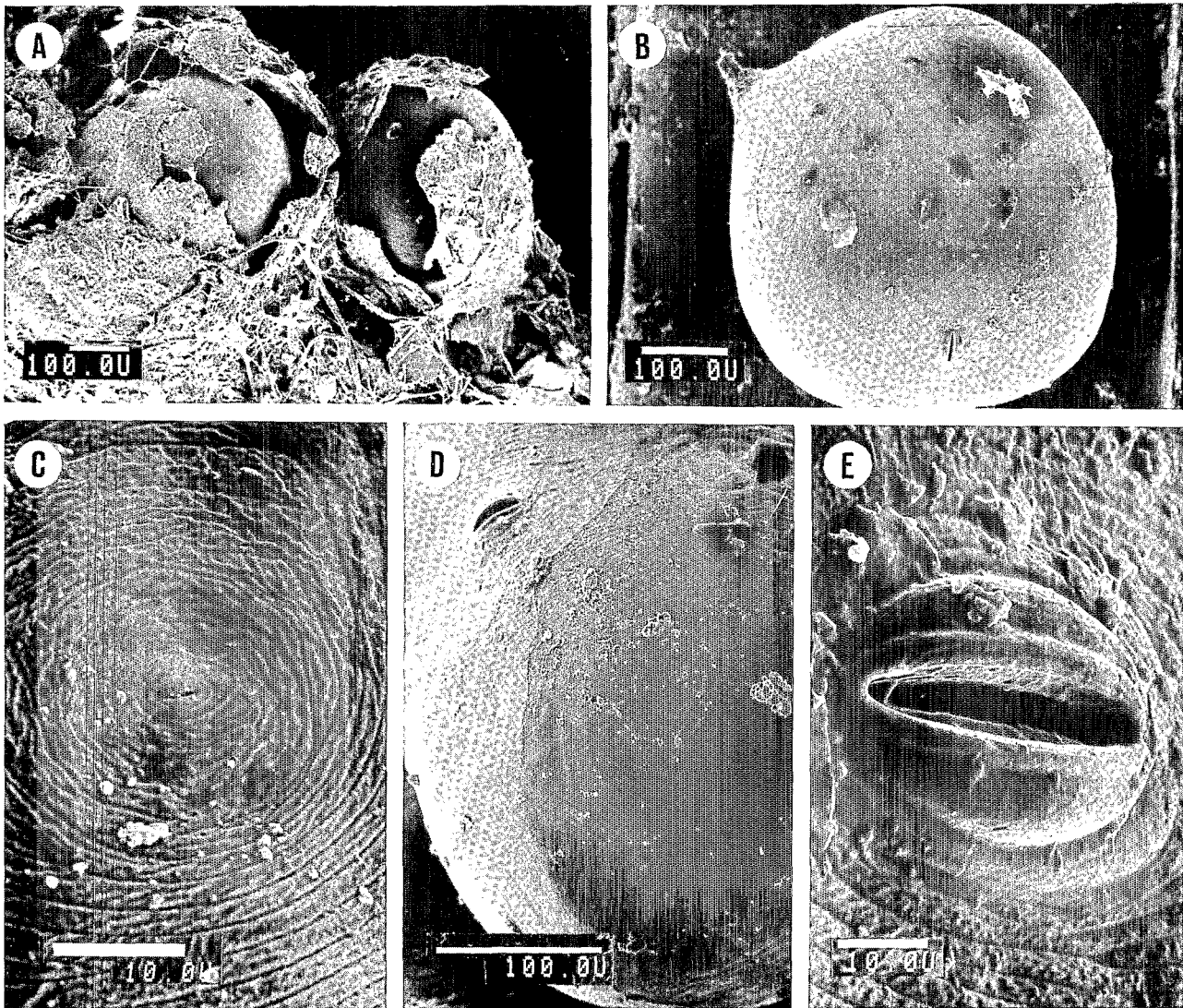


Fig. 2. *Meloidodera mexicana* n. sp. S.E.M. graphs. A : Females attached to the root; B : Female *in toto*; C : Anus area; D : Posterior end; E : Vulva.

(30 ± 1.1) μm ; DGO = 7-10.5 (8.9 ± 1.1) μm ; median bulb width = 28-46.5 (34.0 ± 5.0) μm ; median bulb length = 33.5-48.5 (39.5 ± 4.9) μm ; length/width median bulb = 0.7-1 (0.8 ± 0.065); O = 23-34 (29.5 ± 3.3); dist. excretory pore to anterior end (n = 2) = 100-140 μm ; vulva slit length (n = 5) = 25.5-46 (33 ± 9.1) μm .

Holotype (female) : L = 700 μm ; neck length = 70.0 μm ; width = 384 μm ; stylet = 30 μm ; distance

vulva-anus = 220 μm ; median oesophageal bulb : 24 μm long and 23 μm wide.

Male (n = 9) : L = 484-704 (580 ± 0.05) μm ; stylet = 20.8-27.2 (23.0 ± 1.4) μm ; DGO = 2.8-4.0 (3.4 ± 0.34) μm ; oesophagus length = 112-156 (121 ± 15.7) μm ; dist. excretory pore to anterior end = 89-120 (107.5 ± 15.0) μm ; tail length = 4-7 (5.6 ± 1.1) μm ; testis length = 252-372 (310 ± 36.1) μm ; spicule = 16-20 (18.0 ± 1.8) μm ; gubernaculum (n = 3) = 5-8 (5.5 ± 4.5) μm ; a = 20.2-27.0 (23.5 ± 1.0); b = 4.8-7.8 (6.4 ± 0.78); O = 7.6-14.7 (12.3 ± 2.38).

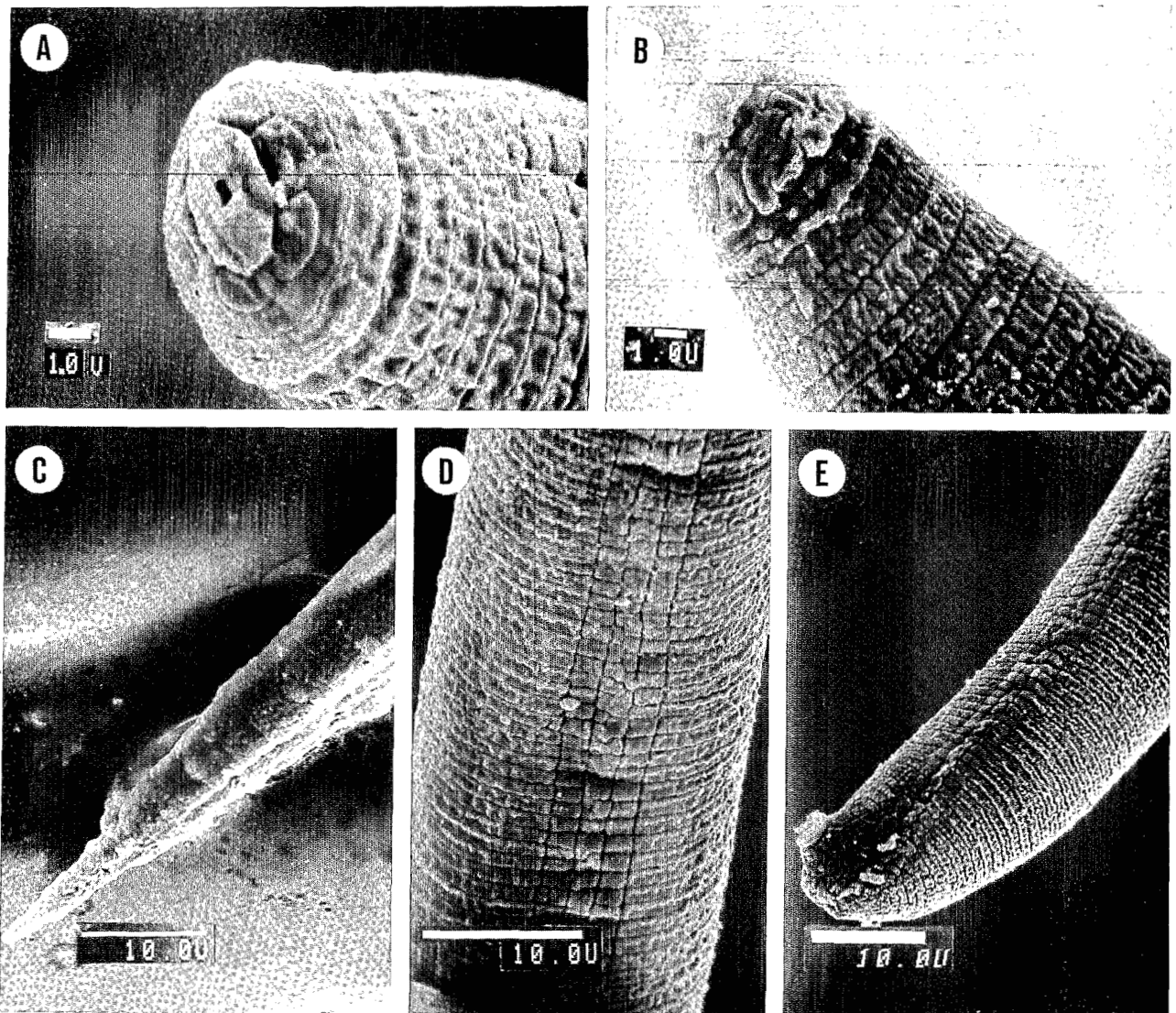


Fig. 3. *Meloidodera mexicana* n. sp. S.E.M. graphs. A : J2 face; B : Male face; C : J2 tail; D : Male, lateral field at mid-body; E : Male, posterior end.

Second stage juvenile (n = 18) : L = 202-404 (330 ± 71.8) μm ; stylet = 19-24.5 (22 ± 0.79) μm ; DGO = 3.2-6.0 (4.3 ± 0.37); oesophagus length = 100-136 (113 ± 5.0) μm ; dist. excretory pore to anterior end = 68.5-92 (76.5 ± 3.6) μm ; tail length = 27-39 (33 ± 1.8) μm ; tail hyaline portion = 11-19 (14.5 ± 0.97) μm ; dist. phasmid to tail end = 21-39 (26.5 ± 2.2) μm ; dist. genital primordium to tail end = 104-180 (134.5 ± 11.6) μm ; a = 12.3-23.7 (19.6 ± 1.3); b = 3.2-4.8 (4 ± 0.24); b' = 2.1-3.5 (2.9 ± 0.16); c = 8.8-11.7 (10.2 ± 0.45); c' = 1.4-3.4 (2.8 ± 0.30); O = 13.5-27.2 (19.9 ± 1.8).

DESCRIPTION

Female : Mature females white, spherical to pyriform shaped, sometimes covered with a tissue-like material. Neck typically short, sometimes encased in yellowish material. Lip region separated from the rest of the body by a constriction. Subcrystalline layer absent. Cuticle with fine annulation over entire body. Stylet cone = 15-17.5 (15.5 ± 0.6) μm long, sometimes curved; knobs sloping backwards; shaft and knobs = 10.5-16.5 (14 ± 1.6) μm long. Excretory pore posterior to median bulb. Thickness of hypodermis : at the base of the neck, 6 μm ;

at midbody, 8 μm ; vulva postequatorial with slightly protruding lips. Anus subterminal; striae of perineal region encircling the anus. Vulva-anus distance ($n = 7$) = 130-240 (190 ± 49.7) μm . Spermatheca ($n = 1$) oval, $32 \times 26 \mu\text{m}$. Spermatozoa present in spermatheca.

Male : Body cylindrical, slightly ventrally curved after death. Lip region separated from the rest of the body by a conspicuous constriction, with four annules and irregular longitudinal striations, thus forming blocks; labial disc elevated. Stylet less robust than that in J2. Oesophageal glands not filling internal body cavity. Hemizonid five annules anterior to excretory pore. Lateral field with four incisures, entirely areolated. Spicules slightly curved; gubernaculum delicate. Penial tube not observed. Tail short, with three to five annules. Phasmids present, almost terminal.

Second-stage juveniles : Body cylindrical, short, slightly curved after death. Head region with slight constriction and three annules. Labial disc oval, not elevated. Submedian and lateral lips separated. Oesophageal glands not filling internal body cavity. Stylet robust; knobs large with slight anterior projection. Hemizonid immediately anterior to excretory pore and anterior to oesophago-intestinal junction. Phasmids with lens-like ampulla, situated three to four annules posterior to anus level. Tail conical with rounded terminus. Lateral field with four incisures, areolated and reduced to three incisures posterior to phasmid.

TYPE MATERIAL

Holotype (female, slide No. A-053-1) deposited in Colegio de Postgraduados Colección de Nematodos (CPCN). *Paratypes* (females, males, J2) deposited in the following institutions : Colección de Nematodos (CPCN; slide No. A-053-2), University of California Davis Nematode Collection (UCDNC), United States Department of Agriculture Collection (USDANC), Beltsville, Maryland; Nematode Collection of the Entomology and Nematology Department, Rothamsted Experimental Station, Harpenden, England; Colección Helmintologica del Instituto de Biología UNAM, Mexico; Laboratoire des Vers, Museum national d'Histoire naturelle, Paris, France.

TYPE HABITAT, HOST AND LOCALITY

Roots and surrounding soil of *Capsicum annum* cv. Pasilla, Tecamachalco, Puebla State Agricultural Station, Mexico.

DIAGNOSIS AND RELATIONSHIPS

Meloidodera mexicana n. sp. females are characterized by lenticular and slightly protruding vulva; smooth vulva lips; vulva slit *ca* 29 μm long and presence of an oval spermatheca. Males are characterized by head with

cuticular blocks; lateral field areolated, with four incisures. Second stage juveniles are characterized by head with three annules; lateral field areolated with four incisures; phasmids with lens-like ampulla, situated three to four annules posterior to anus level; tail hyaline portion *ca* 15 μm long; oesophageal glands not filling the body cavity.

M. mexicana n. sp. is close to *M. belli* Wouts, 1973, in stylet length of females, males and J2, and in the short hyaline area of J2 tail. It differs from this species by female body size : L = 0.40 (0.27-0.57) *vs* 0.67 (0.48-0.80) mm; DGO value : 7-12 (9) *vs* 5.5 μm and also the presence of a lens-like structure in the phasmid of J2. Lip pattern of *M. mexicana* n. sp. male and J2 is identical to those of *M. charis* Hopper, 1960 and *M. belli*.

REMARKS

Until today six species of the genus *Meloidodera* are recognized as valid (Luc, Maggenti & Fortuner, 1988). Most of *Meloidodera* species have been associated with non-cultivated plants (Wouts, 1973; Bernard, 1981; Ivanova & Krall, 1985; Turkina & Chizhov, 1986). Studying the host range of *M. charis*, Heald (1978) found that this species can parasitize some cultivated plants, but the natural hosts are non-cultivated plants. *M. mexicana* n. sp. does differ from all the species of the genus because it is found only on cultivated plants such as corn (*Zea mays*), tomato (*Lycopersicon esculentum*), *Physalis* sp., squash (*Cucurbita pepo*) and chile (*Capsicum annum*), the type host.

A tissue material partially covering the body was observed in some adult females attached to root (Fig. 2 A). It is supposed that this hard "shell" is composed of host root material and externally, of fungi hyphae. In histological sections this "shell" is apparently composed of collapsed root cells which were often contiguous with an adjacent similarly stained layer within the plant tissue. This tissue material can be differentiated from a subcrystalline layer by its hard consistency; at the difference of a true crystalline layer, it is not a waxy translucent substance. In some *Meloidodera* species, the presence of a thin or thick subcrystalline layer has been described. In other species, the authors do not mention this character. For this reason presence *vs* absence of a subcrystalline layer is not to be considered a reliable character for distinguishing the species.

Key to species of the genus *Meloidodera* Chitwood, Hannon & Esser, 1956

- | | |
|--|---------------------------|
| 1 - J2 phasmid with lens-like ampulla | 2 |
| - J2 phasmid pore-like, or not conspicuous | 3 |
| 2 - J2 : distance phasmid-tail end less than 30 μm ; tail length under 30 μm ; body length under 400 μm | <i>M. mexicana</i> n. sp. |

- J2 : distance phasmid-tail end more than 30 µm; tail length over 50 µm; body length over 500 µm
..... *M. floridensis* Chitwood, Hannon & Esser, 1956
- 3 - J2 : stylet knobs very large, more than 7 µm wide, oesophageal glands not filling the body cavity. Males stylet knobs posteriorly sloping
..... *M. eurytyla* Bernard, 1981
- J2 : stylet knobs less than 5 µm wide, oesophageal gland filling the body cavity. Male : stylet knobs not posteriorly sloping 4
- 4 - J2 : hyaline part of tail occupying almost the total tail length; male and J2 DGO = 6 µm
..... *M. alni* Turkina & Chizhov, 1986
- J2 : hyaline part of tail occupying less than 50 % of the total tail length; male and J2 DGO less than 6 µm 5
- 5 - Female : a single wide lip annule. J2 : wide tail terminus; body length over 450 µm
..... *M. tianschanica* Ivanova & Krall, 1985
- Female : variable number of lip annules. J2 : narrow tail terminus; body length under 450 µm 6
- 6 - J2 : tail length under 35 µm, tail end rounded
..... *M. belli* Wouts, 1973
- J2 : tail length over 35 µm, tail end narrow
..... *M. charis* Hopper, 1960

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