

*Laboratory of Agricultural Zoology and Entomology
University College of Agriculture, Athens 301, Greece
and
Laboratorio di Nematologia Agraria del C.N.R., 70126 Bari, Italy*

RECORDS OF SOME PLANT PARASITIC NEMATODES IN GREECE WITH MORPHOMETRICAL DESCRIPTIONS

by

C. N. KOLIOPANOS and N. VOVLAS

Although there are several reports on the occurrence of plant-parasitic nematodes in different areas of Greece (Hirschmann *et al.*, 1966; Isaakides, 1935; Kalyviotis-Gazelas, 1971; Koliopanos and Kalyviotis-Gazelas, 1969, 1973, 1977; Kyrou, 1966; Pelekassis, 1962), in general little is known of their geographical distribution. This paper presents further information on the nematofauna of Greece with several nematodes and their host-plants reported for the first time. Morphometric characters are given for some of the species listed for comparison with the same species reported elsewhere.

RESULTS

Criconemoides informis (Micoletzky, 1922) Taylor, 1936.

Reported for the first time from Greece on pistachio (*Pistacia vera* L.) (Koliopanos and Kalyviotis-Gazelas, 1973). The following measurements were taken on our specimens.

Female (n = 14): L = 504 μ m (474-528), stylet = 73 μ m (65-79), number of body annules (R) = 64 (61-67), distance from vulva to tail terminus divided by body width at vulva (VL/VB) = 1.3 (mean). Stylet robust; body annules smooth to irregular; vulva closed; tail conoid.

Ditylenchus destructor Thorne, 1945.

Large populations were found in the roots of hop (*Humulus*

lupulus L.) at several places in Larissa county (Koliopanos and Kalyviotis-Gazelas, 1977).

Female (n = 11): L = 1,112 μm (1,046-1,165), a = 41.1 (34-49), b = 7.4 (6.2-8.8), b' = 6.6 (5.5-7.9), stylet = 13.2 μm (12.2-13.8), c = 12.1 (11.2-13.6), c' = 4.9 (4.1-5.8), V% = 76.6 (70-81). Head flat with 3 to 4 inconspicuous annules; stylet knobs slope posteriorly; dorsal oesophageal gland orifice at 1.1 μm ; hemizonid about 3 annules width and 2 annules anterior to excretory pore; deirids present at the area of excretory pore; median bulb well developed, ellipsoidal; oesophageal glands overlapping intestine ventrally or dorsally; lateral field with 6 incisures; post-vulval sac = 87 μm (80-92); phasmids not observed; tail attenuated 91 μm (84-97) long with round tip.

Males present with similar measurements as for females but with median bulb less robust; caudal alae enveloping anus from anterior to about 1/2 tail length.

Ditylenchus dipsaci (Kühn, 1857) Filipjev, 1936.

Found associated with the roots of sunflower (*Helianthus annuus* L.) at the village of Louros, Preveza county. Sunflower is a new host for *Ditylenchus* in Greece.

Hemicycliophora thienemanni (Schneider, 1925) Loos, 1948.

Several specimens were found associated with the roots of apricot (*Prunus armeniaca* L.) in the district of Korinthos. The species is reported for the first time from Greece. The mean measurements of 3 females are: L = 925 μm , a = 19.8, stylet = 92 μm , distance from vulva to tail terminus = 110 μm (i.e. 1.2 times stylet length), V% = 88. Body without longitudinal striae and longitudinal markings; tail acute, not attenuated.

Heterodera avenae Wollenweber, 1924.

A large number of cysts were collected from the roots of wheat (*Triticum vulgare* L.) in the area of Aliartos, Viotia county. The same nematode has been reported on wheat and oats (*Avena sativa* L.) (Hirschmann *et al.*, 1966). A description of our specimens is given.

Cyst (n = 26): Length excluding neck = 668 μm (583-832), neck length = 123.4 μm (75-187), width = 488 μm (411-598), length of vulval slit = 10.9 μm (9.4-13.1), distance from anus to vulval slit = 46.2 μm (42.5-50.1), distance from anus to nearest fenestral edge = 22.7 μm (22.1-24.8), fenestral diameter: fenestra proximal to anus = 20.9 μm (19.5-23.0), fenestra distal to anus = 21.8 μm (20.0-23.9). Vulval bridge narrow.

Male (n = 9): L = 1,325 μm (1,160-1,454), a = 43.0 (38.1-44.5), b = 8.3 (7.7-9.0), stylet = 29.0 μm (26.6-31.1), spicules = 32.6 μm (29.8-36.4). Lip region rounded, offset; lip height = 6.1 μm (5.4-6.7); lip annules 5 (4-6); lateral field with 4 incisures, outer bands usually areolated; tail end twisted.

Second-stage larva (n = 23): L = 546.5 μm (505-597), a = 26.0 (22.6-28.4), stylet = 25.6 μm (24.8-26.5); c = 8.7 (8.0-9.4), c' = 4.1 (3.8-4.4). Lip height = 4.1 μm (3.5-4.4), lip annules 3 (2-3); width at base of head = 10.0 μm (9.2-10.6); stylet dorsal knob projecting mostly anteriorly (Fig. 1). Lateral field with 4 incisures in the middle of the body, becoming 2 towards the end of the tail (outer bands areolated); dorsal oesophageal gland orifice at 5.7 μm (5.0-6.2); tail length = 63.0 μm (61-66), hyaline tail terminus = 40.2 μm (34-44); head tip to median valve = 75 μm (68-81); head tip to excretory pore = 108 μm (99-114), annules width = 2 μm (mean).

Egg (n = 19): Length = 126 μm (114-149), width = 46 μm (41-49).

Longidorus africanus Merny, 1966.

Found in association with roots of Jerusalem sage (*Phlomis fruticosa* L.) at the village of Louros, Preveza county. The species is reported for the first time from Greece and Jerusalem sage constitutes a new host record.

Macroposthonia macrolobata (Jairajpuri *et* Siddiqi, 1963) De Grisse *et* Loof, 1965 (Fig. 2).

Large populations of this nematode were found in association with the roots of orange [*Citrus sinensis* (L.) Osbeck] at several locations near Argos, Argolis county. This is the first report of the species from Greece.

Female (n = 12); L = 629 μm (551-698), a = 10.7 (10-12), stylet = 77 μm (75-80). Stylet length divided by body length x% = 12.2 (mean); number of body annules (R) = 90 (84-96); number of annules from labial disc to excretory pore (R ex) = 23 (21-25); number of annules from vulva to tail end (RV) = 7 (6-8); vulva to terminus = 45.3 μm (37-51); annules width 7 μm (mean); vulva open; posterior margin of annules smooth.

Meloidogyne arenaria (Neal, 1889) Chitwood, 1949.

A severe infestation was observed on the roots of okra [*Abelmoschus esculentus* (L.) Moench] in the region of Philippias, Preveza county. Okra constitutes a new host of this species for Greece. Other reported hosts are: cucumber (*Cucumis sativus* L.) (Kyrou, 1963),

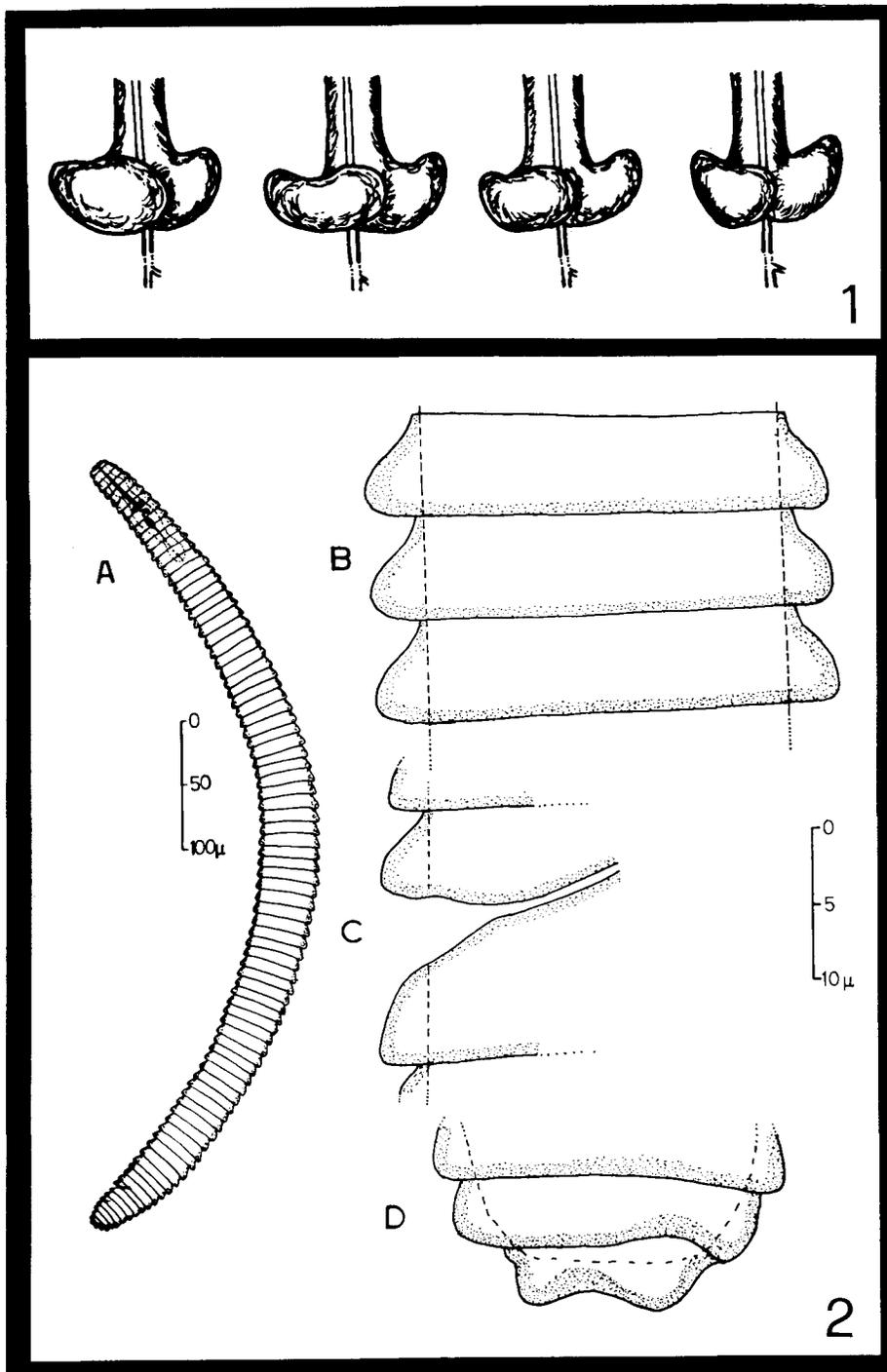


Fig. 1 - *Heterodera avenae*. Variation of stylet knobs of second-stage larvae.
 Fig. 2 - *Macroposthonia macrolobata*. A, « in toto » view; B, annule structure;
 C, vulva in lateral view; D, terminus.

grape (*Vitis vinifera* L.), potato (*Solanum tuberosum* L.) (Hirschmann *et al.*, 1966), tomato (*Lycopersicon esculentum* Miller) (Kyrou, 1966a), lettuce (*Lactuca sativa* L.), corn poppy (*Papaver rhoeas* L.), geranium (*Pelargonium* sp.) (Kyrou, 1968), bindweed (*Convolvulus* sp.), and snapdragon (*Antirrhinum majus* L.) (Koliopanos and Kalyviotis-Gazelas, 1969).

Meloidogyne incognita (Kofoid *et* White, 1919) Chitwood, 1949.

Large populations were found on the roots of fuchsia (*Fuchsia* sp.) at Philippias, Preveza county. Fuchsia constitutes a new host for this nematode for Greece. Other reported hosts are: cucumber, potato, okra, fig (*Ficus carica* L.), tomato, beans (*Phaseolus vulgaris* L.) (Hirschmann *et al.*, 1966), pepper (*Capsicum annuum* L.), sugar beet (*Beta vulgaris* L.), hyacinth (*Hyacinthus* sp.), cotton (*Gossypium hirsutum* L.), tobacco (*Nicotiana tabacum* L.), watermelon (*Citrullus vulgaris* Schrad.), egg-plant (*Solanum melongena* L.) (Kyrou, 1968), carrot (*Daucus carota* L.) (Kalyviotis-Gazelas, 1971), rose (*Rosa* sp.) (Koliopanos and Kalyviotis-Gazelas, 1973).

Merlinius brevidens (Allen, 1955) Siddiqi, 1970.

Found in association with the roots of pear (*Pyrus communis* L.) and constitutes a first report of the species from Greece.

Female (n = 10): L = 576-660 μ m, a = 24.5-27.0, b = 4.6-4.8, c = 11.5-13.7, c' = 3.1-3.5, stylet = 14.2-16.5 μ m. Head continuous with 5 to 6 annules; framework moderately sclerotized; stylet knobs slope posteriorly; deirids present; lateral field with 6 incisures; no longitudinal lines; tail subcylindrical, smooth, hemispherical, with 55-60 annules and 47-50 μ m long.

Paratylenchus hamatus Thorne *et* Allen, 1950.

Found associated with the roots of rose at the village of Rodavgi, Arta county. Rose constitutes a new host for the genus *Paratylenchus* in Greece. Other reported hosts are: grape, oat (Hirschmann *et al.*, 1966), magnolia (*Magnolia* sp.) (Koliopanos and Kalyviotis-Gazelas, 1969) and fig (Kalyviotis-Gazelas, 1971).

Pratylenchus neglectus (Rensch, 1924) Filipjev *et* Schuurmans Stekhoven, 1941 (= *P. minyus*, Sher *et* Allen, 1952).

Large numbers of nematodes were found on the roots of wheat in a few fields at Viotia county and in some areas at Philippias, Preveza county. At Philippias high populations also were found on the roots of oat.

The following morphometrics relate to the population from Viotia on wheat:

Female (n = 17): L = 482 μm (452-539), a = 24.7 (24.3-25.4), b = 6.7 (6.2-7.4), V% = 83 (81-85), c = 25.4 (24.2-26.9), c' = 1.6 (1.4-1.7), stylet = 17.0 μm (16.1-17.8). Head tapering smoothly; lip annules 2 cuplike, convex; stylet knobs cupped anteriorly excretory pore posterior to oesophageal-intestinal valve; lateral field with 4-6 incisures, usually 5 at the middle of the body; spermatheca inconspicuous; body width at excretory pore 19.5 μm (mean); post-vulval sac 21.4 μm (mean); tail conical with 19.0 μm (17.7-21.2) length; tail tip smooth.

Males not observed.

Egg (n = 8): L = 55-58 μm , width = 20.1-21.4 μm .

Oat is a new host for *P. neglectus* in Greece. The following hosts have also been reported: cotton, cucumber, grape, olive (*Olea europaea* L.), peach [*Prunus persica* (L.) Batsch], potato, rose, walnut (*Juglans regia* L.) (Hirschmann *et al.*, 1966), spinach (*Spinacia oleracea* L.) (Kyrrou, 1971).

Pratylenchus penetrans (Cobb, 1917) Chitwood *et* Oteifa, 1952.

Many specimens were found in roots of wheat and oat in the region of Philippias, Preveza county; these constitute new host records for *P. penetrans* in Greece. High populations were found again (Koliopanos and Kalyviotis-Gazelas, 1973) in the tissue of dahlia (*Dahlia* sp.), causing considerable damage to plants in the region of Athens.

Female (n = 7): L = 740 μm (mean), a = 26.1 (mean), stylet = 17.5 μm (mean), V% = 77.8 (mean). Head conical with 3 annules; spermatheca present with sperm mainly spherical; lateral field with 4 incisures; tail tip smooth rounded; tail with 21 annules (mean).

Males present.

Rotylenchulus macrodoratus Dasgupta, Raski *et* Sher, 1968 (Fig. 3).

Found on the roots of olive at several places in Arta and Preveza counties. Olive is a new host for this nematode in Greece, but the species has also been reported in association with the roots of Jerusalem sage and oak (*Quercus farnetto* Ten.) (Vovlas and Lambert, 1974).

Tylenchorhynchus clarus Allen, 1955.

Large numbers were associated with the roots of wheat in several fields of Viotia county. Wheat constitutes a new host for the species in Greece, but it has also been found on cotton (Hirschmann *et al.*, 1966).

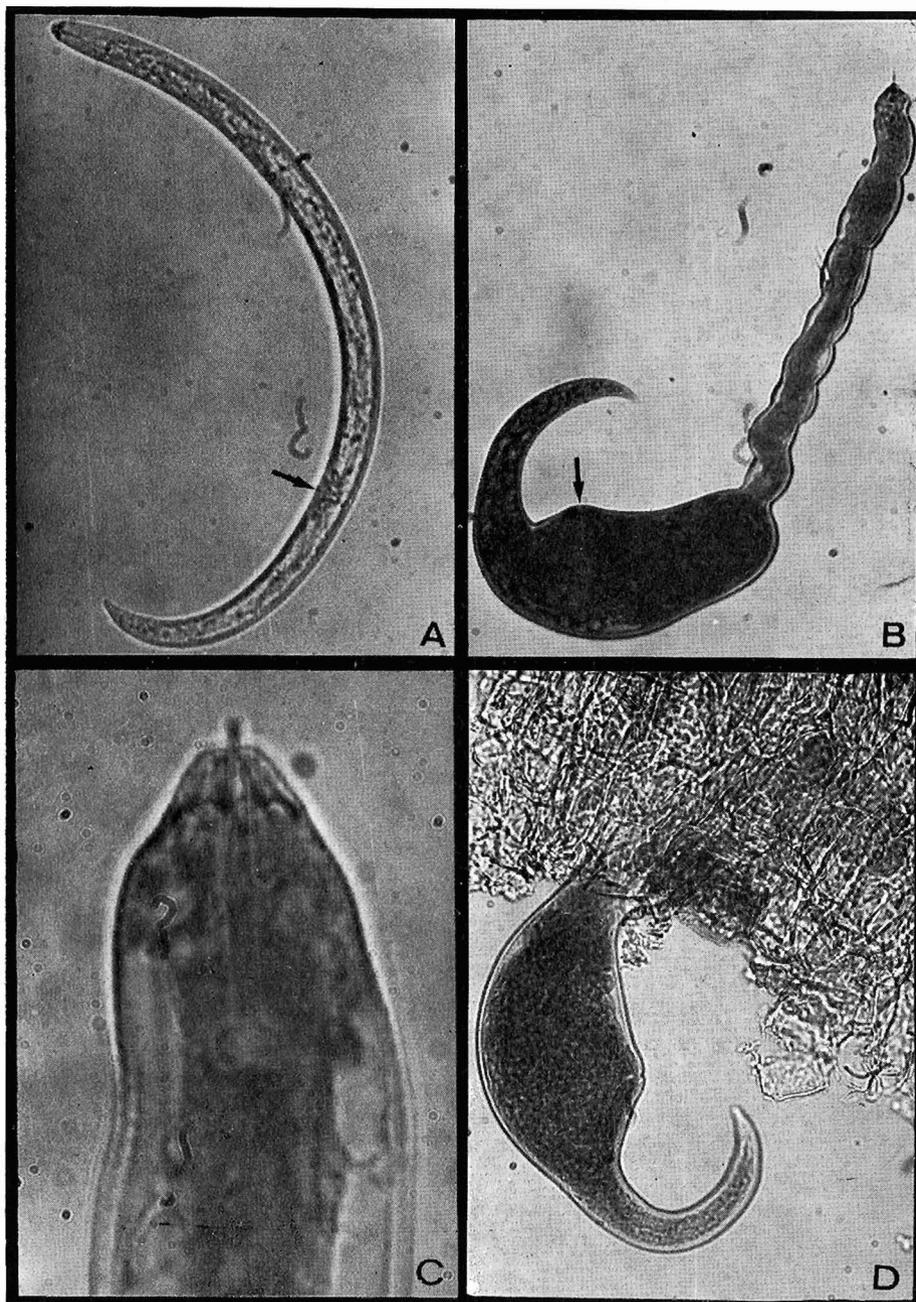


Fig. 3 - *Rotylenchulus macrodoratus*. A, immature female; B, mature female extracted from roots; C, female anterior region; D, female in root tissue (vulva is arrowed).

Female (n = 10): L = 597 μm (562-623), a = 29.3 (25.6-33.7), b = 5.4 (5.1-5.6), c = 18.1 (17.3-18.8), c' = 2.1 (2.0-2.2), stylet = 17.7 μm (17.3-17.9), V% = 58 (56-60). Labial framework slightly sclerotized; lip region continuous, without perioral disc; lip annules 5; oesophageal glands slightly overlapping intestine; lateral field with 4 incisures; no longitudinal striae; stylet knobs round, extending slightly anteriorly; phasmids normal, clearly visible, posterior to anus; tail conical 32.9 μm (30.4-34.3) long and with 11 or rarely 12 annules; tail terminus smooth, bluntly pointed; no epiptygma on vulva.

Males not observed.

Tylenchorhynchus ewingi Hooper, 1959.

Several individuals were associated with the roots of orange at the village of Marcopoulon, Attica county. This is the first report of this species from Greece.

Female (n = 9): L = 570 μm (mean), stylet = 17.7-19.1 μm , c = 16 (mean), c' = 1.7-2.5. Head slightly set off or continuous; framework weakly sclerotized; lip annules 4 and rarely 3; stylet knobs sloping posteriorly; lateral field with 4 incisures; no longitudinal striae; spermatheca present; tail length 35.5 μm (mean) with 13-17 annules; tail subcylindrical to conical, with tail tip smooth, subhemispherical.

Males present with spicules 18.0 μm (mean) length.

Xiphinema index Thorne et Allen, 1950.

Found in association with the roots of hop at the village of Drosopigi, Arta county. Hop is a new host for *X. index* in Greece, but it has also been recorded on grape in several regions of Greece (Hirschmann et al., 1966).

Xiphinema pachtaicum (Tulaganov, 1938) Kirjanova, 1951 (= *X. mediterraneum* Martelli et Lamberti, 1967).

Large numbers of nematodes were found in association with the roots of cherry (*Prunus avium* L.) and fig at the village of Rodavgi, Arta county, and with cypress (*Cupressus sempervirens* L.) in the region of Philippias, Preveza county. Cherry, cypress and fig constitute new hosts for *X. pachtaicum* in Greece; it has also been reported on orange (Koliopanos and Kalyviotis-Gazelas, 1977).

S U M M A R Y

The following plant parasitic nematodes are reported, for the first time, from Greece: *Hemicycliophora thienemanni*, *Longidorus africanus*, *Macroposthonia macrolobata*, *Merlinius brevidens* and *Tylenchorhynchus ewingi*. Morphome-

trics are given for 10 nematodes species and 19 plant species are reported as new hosts for 17 nematodes.

R I A S S U N T O

Segnalazione di specie di nematodi fitoparassiti in Grecia e descrizioni morfometriche di alcune di esse.

Vengono segnalate, per la prima volta, in Grecia le seguenti specie di nematodi fitoparassiti: *Hemicycliophora thienemanni*, *Longidorus africanus*, *Macroposthonia macrolobata*, *Merlinius brevidens* e *Tylenchorhynchus ewingi*. Vengono riportate 19 specie vegetali, trovate associate per la prima volta nel Paese, con 17 specie di nematodi. Di popolazioni di 10 specie di nematodi vengono anche date brevi descrizioni.

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Accepted for publication on 3 September 1977.

EVOLUTION AS A BASIS FOR THE SYSTEMATIZATION
OF NEMATODES

I. Andrassy

Pitman Publishing - London, San Francisco, Melbourne - 288 pp.
Price Lg 7.90/US \$ 18.75

This is a remarkable and interesting approach to solution of taxonomical problems taking in account the little information we have on phylogeny of nematodes. The effort is worthwhile but the tentative conclusions are often supported only by personal although competent and experienced views. The check list of genera and subgenera and the index of families of nematodes are particularly useful. The book is reasonably priced and should not be missing in the library of zoologists and nematologists.

F. L.