

Research Article

First report of the genus *Hoplotylus* s'Jacob, 1960 (Nematoda: Hoplolaimidae) and two species of the genus *Malenchus* Andrassy, 1968 (Nematoda: Tylenchidae) from Iran

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Abstract: In order to identify plant-parasitic nematodes of eastern forests in Guilan province, soil and root samples were collected and the extracted nematodes were studied based on morphological and morphometric characters. Twenty eight species of plant parasitic nematodes were identified. A population of the genus *Hoplotylus* was recovered and identified as *H. femina*. The identification was also verified by partial sequencing of the large subunit ribosomal DNA (rDNA). In addition, two populations of the genus *Malenchus* were also recovered and based on morphological and morphometric characteristics were identified as *M. solovjovae* and *M. acarayensis*. The two species *Hoplotylus femina* and *Malenchus solovjovae* are new records for Iran.

Keywords: *Hoplotylus femina*, *Malenchus solovjovae*, *M. acarayensis*, large subunit ribosomal DNA

Introduction

Guilan province is one of the northern provinces of Iran with a subtropical climate and very heavy rainfall. Large parts of the province are mountainous, and covered with natural forests. So far, several nematode species have been reported from the province (Alem *et al.*, 2010; Aliramaji *et al.*, 2012; Divsalar *et al.*, 2011; Eskandari *et al.*, 2009; Nassaj Hosseini *et al.*, 2004; Pedramfar *et al.*, 1998, 2001; Shahabi *et al.*, 2016; Soleymanzadeh *et al.*, 2016; Tanha Maafi *et al.*, 1998, 2002, 2006). In a recent attempt to identify the plant parasitic nematodes of forests in eastern part of the province, several species were recovered and identified. Two species namely *Hoplotylus femina* s'Jacob,

1960 and *Malenchus solovjovae* Brzeski, 1989 are new records from Iran and the species *Malenchus acarayensis* Andrassy, 1968, previously reported from Iran (Namadipour *et al.*, 2014), are all illustrated herein.

The genus *Hoplotylus* was originally described by s'Jacob (1960) from the surrounding soil of the roots of *Quercus robur* L. and *Chamaecyparis lawsoniana* Parl in Wageningen, The Netherlands. Species of the genus *Hoplotylus* are endoparasitic plant nematodes. Based on head shape and mode of parasitism, *Hoplotylus* is close to members of the family Pratylenchidae Thorne, 1949 and based on stylet shape and position of the phasmid (near to anus) it is similar to members of the family Hoplolaimidae Filipjev, 1934. In the taxonomic framework of Siddiqi (2000), the genus *Hoplotylus* was included in Pratylenchidae under the subfamily Radopholinae Allen & Sher, 1967 and was distinguished from other members of the

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subfamily by females with stout and rather long stylet, having rounded to tulip-shaped knobs, males with developed bursa not enveloping tail and high and asymmetrical head. A recent study shows close relationship of this genus with members of the family Hoplolaimidae (Palomares-Rius *et al.*, 2016).

The genus *Malenchus* was originally described by Andrassy (1968) with *M. machadoi* as the type species. Species of the genus *Malenchus* are characterized by prominent body annuli. In some species, lateral fields have two incisures under light microscope which, in scanning electron microscopy (SEM), shows very fine longitudinal lines and in some species, four or six incisures can be seen (Siddiqi, 2000). Historically, Andrassy (1981) described seven species and proposed *Neomalenchus* as a synonym of *Malenchus*. Sumenkova (1988) established *Paramalenchus* Sumenkova, 1988 for the species *P. anthrisulcus* Sumenkova, 1988 but, it was synonymised with *Malenchus* by Ebsary (1991). Siddiqi (2000) introduced subgenus *Telomalenchus* and also considered *Neomalenchus* and *Malenchus* as valid subgenera for this genus. According to Geraert (2008), the genus includes two subgenera, *Malenchus* Siddiqi, 2000 and *Telomalenchus* Siddiqi, 2000. *Telomalenchus* includes three unusual *Malenchus* species namely *M. williamsi* Geraert & Raski, 1986, *M. parthenogeneticus* Geraert & Raski, 1986 and *M. leiodermis* Geraert & Raski, 1986 which differ from the subgenus *Malenchus* in having wider lateral field with four or six incisures, distinct vulval lateral membrane and straight amphidial apertures (sinuate in subgenus *Malenchus*). Here we followed Geraert's (2008) scheme for classification of the recovered species of the genus *Malenchus*.

Materials and Methods

Soil and root samples were randomly collected from different regions of forests in the eastern

parts of Guilan province during 2014-2015. The nematodes were recovered from soil samples using tray method (Whitehead and Hemming 1965) and the extracted nematodes were killed by gentle heat, fixed in a solution of TAF (8% formalin and 2% triethanolamine in distilled water) and then processed to anhydrous glycerin (De Grisse, 1969). Permanent slides were made and examined using an Olympus BH2 light microscope. Morphometric data were obtained and line drawings were made using a drawing tube attached to a Nikon E200 light microscope. Photomicrographs were taken using a digital camera attached to the same microscope.

The partial sequence of the D2/D3 expansion segment of 28S rRNA gene was obtained for the *Hoplotylus* population; total DNA was extracted using worm lysis buffer containing proteinase K (Williams *et al.*, 1992). The forward D2A (5'-ACAAGTACCGTGAG GGAAAGTTG-3') and reverse D3B (5'-TCGGAAGGAACCAGCTACTA-3') primers (Nunn, 1992) were used for amplification and sequencing of this region. Polymerase Chain Reaction (PCR) assays and sequencing of DNA products were performed according to Heydari *et al.* (2014).

Results

During this study, 28 plant parasitic nematode species belonging to 18 families were identified (Table 1). A population of the genus *Hoplotylus* was isolated and based on morphological, morphometric and molecular characteristics, identified as *H. femina*; being the first representative of the genus from Iran.. Two species of the genus *Malenchus* (subgenus *Malenchus*) i.e. *M. solovjovae* (as a new record) and *M. acarayensis* were also identified. A complementary description was provided for the latter species, previously reported from Iran without description (Namadipour *et al.*, 2014).

Table 1 List of nematode species identified from the forest in eastern Parts of Guilan province in the present study.

Species	Locality	Associated plants
<i>Aphelenchus avenae</i>	Langarud, Lahijan, Deylaman	Blackberry
<i>Paraphelenchus myceliophthorus</i>	Deylaman	Caucasian Wingnut
<i>Aphelenchoides centralis</i>	Lahijan	Caucasian elm
<i>Aphelenchoides fuchsii</i>	Deylaman	Caucasian Wingnut
<i>Aphelenchoides parabicaudatus</i>	Langarud	Moss
<i>Aphelenchoides varicaudatus</i>	Deylaman	Pine
<i>Seinura hyrkania</i>	Deylaman	Pine
<i>Ditylenchus triformis</i>	Deylaman	Elm
<i>Nothotylenchus affinis</i>	Deylaman	Caucasian Wingnut
<i>Nothotylenchus medians</i>	Deylaman	Caucasian elm
<i>Helicotylenchus pseudodigonicus</i>	Deylaman	Elm
<i>Rotylenchus agnetis</i>	Deylaman	Fern
<i>Pratylenchus caffae</i>	Lahijan	Maple
<i>Pratylenchus mediterraneus</i>	Deylaman	Elm
<i>Hoplotylenchus femina</i>	Deylaman	Caucasian elm
<i>Coslenchus costatus</i>	Siahkal	Elm
<i>Cephalenchus leptus</i>	Deylaman, Siahkal, Langarud	Caucasian Wingnut, Caucasian elm, Willow, Black Locust, Fem
<i>Boleodorus thylactus</i>	Siahkal	Elm
<i>Filenchus afghanicus</i>	Lahijan, Deylaman	Maple, Caucasian Wingnut
<i>Filenchus discrepans</i>	Siahkal	Caucasian Wingnut, Elm
<i>Filenchus misellus</i>	Amlash	Beech
<i>Filenchus thornei</i>	Langarud	Beech
<i>Malenchus acarayensis</i>	Deylaman	Caucasian elm
<i>Malenchus soloyoviae</i>	Deylaman	Pine
<i>Deladenus durus</i>	Deylaman	Caucasian elm
<i>Paratylenchus lepidus</i>	Siahkal	Walnut
<i>Paratylenchus straeleni</i>	Deylaman	Caucasian elm
<i>Xiphinema hymenense</i>	Deylaman	Caucasian elm

Iranian population of *Hoplotylenchus femina* s'Jacob, 1960

(Figs. 1 and 2; Table 2)

Description

Female: Body cylindrical. Lip region slightly set off from body contour with heavily sclerotized labial framework and three or occasionally four annuli. Lateral field with four incisures at mid-body, the outer lines areolated all along the body. Stylet well developed, basal knobs tulip-shaped. Orifice of dorsal pharyngeal gland at 6-7 µm distance posterior to stylet base. Glandular region of pharynx overlapping intestine dorsally. Hemizonid at 1-2 annuli anterior to excretory pore. Reproductive system monodelphic, ovary outstretched with one row of oocytes.

Spermatheca spherical, filled with sperm. Vulva a transverse slit, post-vulval uterine sac small. Tail conical, its tip pointed or finely rounded, having hyaline region at terminus with smooth or coarse irregularly annulated outline. Phasmids pore-like, four annuli posterior to anus.

Male: Body shorter and more slender than that of females. Sexual dimorphism present in anterior region, i.e. males have higher and asymmetrical head with three annuli. Stylet and pharynx reduced. Basal stylet knobs small and rounded. Testis single, outstretched. Spicules slightly curved ventrally. Bursa not enveloping tail, with phasmidial extension and three incisures in this region. Tail conical, with a pointed terminus.

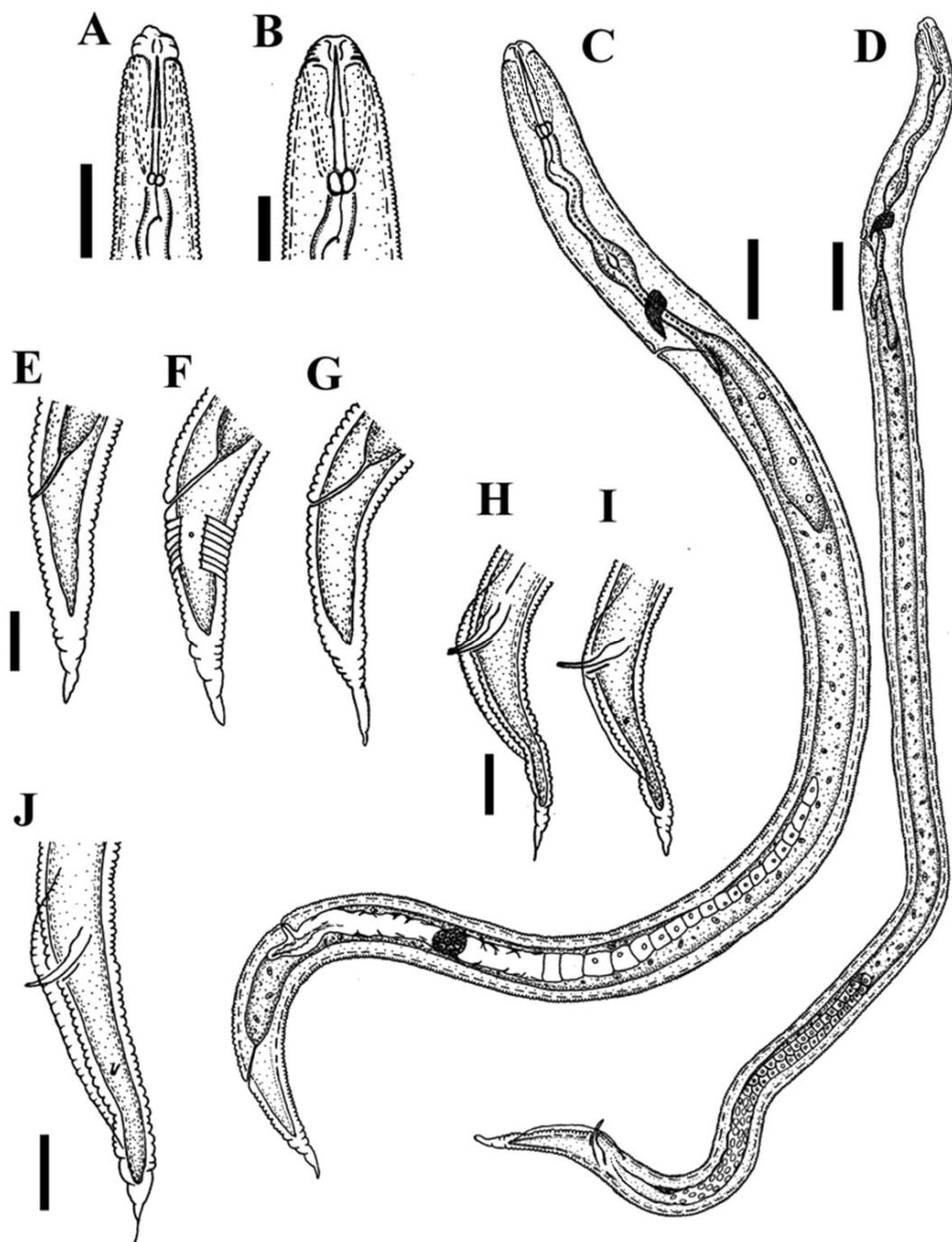


Figure 1 Iranian population of *Hoplotylus femina* s'Jacob, 1960. A: Male head end; B: Female head end; C: Female entire body; D: Male entire body; E-G: Posterior region of female tail showing hyaline portion; H-J: Male posterior end showing spicules and caudal alae. (Scale bars: A, B, E-J = 10 μ m; C, D = 20 μ m).

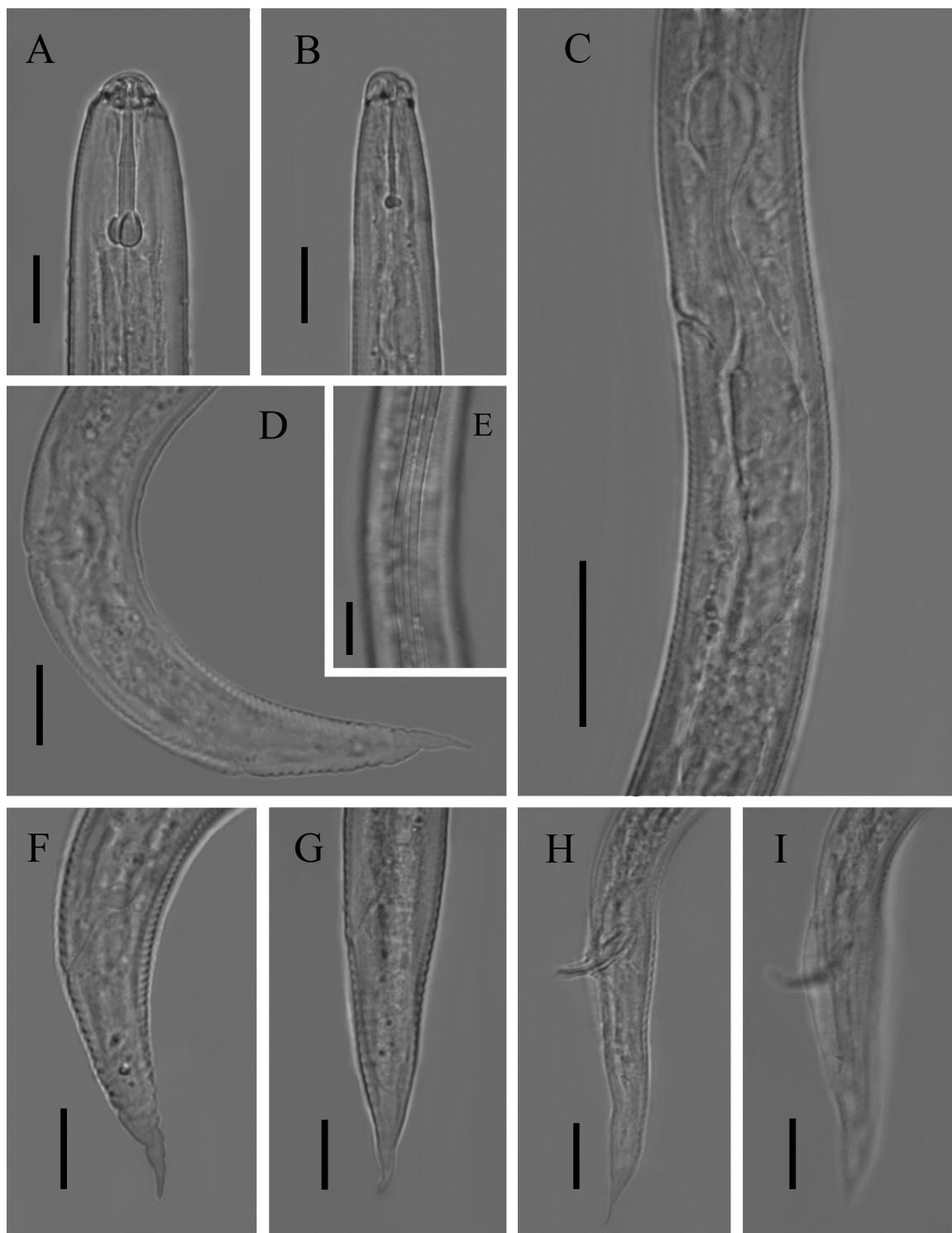


Figure 2 Iranian population of *Hoplotylus femina* s'Jacob, 1960. A: Female head end; B: Male head end; C: Female pharyngeal region showing excretory pore; D: Female posterior end showing vulval region and post uterine sac (PUS); E: Lateral field at mid-body; F, G: Posterior region of female tail showing hyaline portion; H: Male posterior end showing spicules; I: Male caudal alae. (Scale bars = 10 μ m).

Table 2 Morphometrics of *Hoplotylus femina* from Iran and the data from other reports.

Characters	Guilan province		s'Jacob, 1960		Palomares-Rius et al., 2016	
	Female	Male	Female	Male	Female	Male
n	7	8	29	10	10	2
L	527 ± 68.6 (429-598)	421 ± 38.3 (378-478)	536 (450-656)	580	611 ± 60 (525-694)	520 (480-560)
a	26.9 ± 2.1 (24.4-29.9)	30.6 ± 3.8 (25.3-36.1)	26.2 (23.1-30.6)	44	28.3 ± 4.2 (23.3-36.5)	40.3 (32.0-48.7)
b	5.8 ± 0.6 (4.7-6.8)	5.2 ± 0.6 (4.3-6.2)	5.9 (5.1-7.5)	6.8	6.2 ± 0.6 (5.5-7.0)	6.5 (5.9-7.1)
b'	3.5 ± 0.4 (2.9-4.0)	4.0 ± 0.4 (3.4-4.6)	-	5.8	5.0 ± 0.6 (4.5-6.0)	5.1 (4.3-5.8)
c	14.8 ± 2.0 (13.2-18.6)	18.1 ± 4.3 (10.6-21.3)	16.1 (14.2-19.2)	13.5	16.6 ± 1.9 (12.5-19.0)	15.1 (14.1-16.0)
c'	3.0 ± 0.3 (2.6-3.4)	2.3 ± 0.6 (1.7-3.4)	-	3.6	2.7 ± 0.2 (2.5-3.0)	3.7 (3.2-4.1)
V or T	85.2 ± 1.7 (83.7-88.7)	38.5 ± 9.8 (17.6-46.0)	85.9 (84.0-87.3)	58	86.2 ± 1.7 (82.5-88.0)	15.1 (10.1-20.0)
V'	91.4 ± 1.1 (90.4-93.7)	-	-	-	-	-
Stylet	23.6 ± 1.5 (21-26)	13.3 ± 0.5 (13.0-14.5)	25 (21-26)	18	21.2 ± 2.6 (18.5-24.5)	14.3 (12.5-16.0)
Excretory	95 ± 8.3 (84-104)	72 ± 4.8 (65-78)	-	94	94 ± 10.4 (85-108)	75 (67-82)
Pore						
Pharynx	90.6 ± 7.5 (76-99)	81 ± 7.3 (70-91)	-	-	100 ± 14.2 (84-122)	80 (79-81)
MB	69.1 ± 5.2 (63.9-77.6)	61.1 ± 8.6 (53.3-80.8)	-	53	67.6 ± 7.6 (57.2-75.4)	70.2 (69.9-70.4)
PUS	10.7 ± 1.6 (9-13)	-	-	-	19.8 ± 3.3 (16.5-24.0)	-
Head-vulva	449 ± 62.1 (364-514)	-	-	-	-	-
Vulva-anus	41.7 ± 6.0 (33-48)	-	-	-	42 ± 10.4 (22-51)	-
Tail	36 ± 5.7 (29-44)	24 ± 7.3 (19-37)	-	49	37 ± 4.7 (30-43)	34 (34-35)
Spicules	-	14.6 ± 0.7 (14-16)	-	17		14.3 (14.0-14.5)
Gubernaculum	-	4.8 ± 0.5 (4-5)	-	5		4.8 (4.5-5.0)

Measurements are in μm and in the form mean \pm SD (range).

Discussion

Hoplotylus femina was originally described by s'Jacob (1960) as the type species of the genus from the rhizosphere of *Quercus robur* and *Chamaecyparis lawsoniana* in Wageningen, The Netherlands. It is characterised by having well developed stylet with tulip-shape knobs, four areolated lateral lines, conical tail with smooth or coarse irregular annulation in distal region, males with higher and asymmetrical head and developed bursa. In the original description of the species (s'Jacob, 1960), sperm cells or functional spermatheca was not seen in the female reproductive system, but a spherical to slightly oblong spermatheca with spheroid to slightly elongate sperm cells were commonly observed in other reports, even in populations apparently lacking males (Sturhan and Lis'kova, 2007). In Iranian population of *H. femina*, a functional spermatheca filled with spheroid sperm cells was observed in the female reproductive system.

The genus *Hoplotylus*, has four other known species namely *H. silvaticus* Bernard & Niblack, 1982., *H. sjacobi* Bernard & Niblack, 1982., *H. montanus* Minagawa, 1984, and *H. triversus* (Minagawa, 1984) Siddiqi, 1986. *H. femina* is morphologically and morphometrically similar to *H. silvaticus*, *H. montanus* and *H. sjacobi*. It can be distinguished from *H. silvaticus* by its longer tail ($c' = 2.6-2.9$ vs. 1.7-2.5 and $c = 14.2-19.2$ vs. 15-28.7) and also tail shape (posterior tail region is smooth or coarsely and irregularly annulated in *H. femina* vs. tail tip annulated dorsally in *H. silvaticus*). It differs from *H. montanus* by having shorter stylet (21-26 vs. 26-30.3 μm), more posterior location of phasmids in females and different tail end in males (pointed vs. clavate). This species can also be distinguished from *H. sjacobi* by having shorter tail ($c' = 2.6-2.9$ vs. 3.3-4.3 and $c = 14.2-19.2$ vs. 12.1-14) and morphology of stylet knobs (closely appressed to shaft and edges in profile are parallel in *H. femina* vs. stylet knobs extending away from shaft and edges in profile diverge anteriorly in *H. sjacobi*).

In this study, *H. femina* was recovered from the rhizosphere of Caucasian elm (*Zelkova carpinifolia*) in Deylaman region, Guilan province. Morphological and morphometric characters of the Iranian population of *H. femina* fit well with the data in original description of the species by s'Jacob (1960) and the population reported from Spain by Palomares-Rius *et al.* (2016).

Molecular analysis

Amplification of D2-D3 expansion segment of the 28S rRNA gene from a single nematode produced a fragment of 686 nt (accession number KY614234). The Blast search using this sequence revealed the highest identity with other available sequences of this region for *H. femina* isolates from Spain (98% identity with KU513546, 98% identity with KU513545, 98% identity with KU513544 and 95% identity with KU513543).

Iranian population of *Malenchus* (*Malenchus solovjovae* Brzeski, 1989 (Figs 3 and 4; Table 3)

Description

Female: Body straight or slightly ventrally curved upon fixation, tapering towards both ends. Lateral field with two lines under light microscope, originating at level of stylet, near middle of stylet shaft. Cuticle with distinct annuli, annulus 2.0-2.5 μ m wide at mid-body. Head narrower than body contour, with 4-5 fine annuli. Amphidial apertures large and sinuous shaped. Stylet delicate, with small knobs. Orifice of dorsal pharyngeal gland behind stylet knobs at about 1 μ m from base of stylet. Median bulb fusiform, valvular apparatus not distinct. Excretory pore at level of anterior part of pharyngeal bulb. Reproductive system monodelphic, ovary outstretched with one row of oocytes. Vulva not sunk in body, with epiptygmata. Spermatheca rounded, offset and filled with globular sperm. Post vulval uterine sac 12-14 μ m long. Prophasmids located at 3-9 annuli anterior to vulva. Tail conical with a short filiform tip.

Male: Similar to females except for reproductive system and rather longer tail. Testis single, spermatocytes arranged in one row. Spicules sickle shaped. Bursa prominent, cloacal. Gubernaculum 5 μ m long. Tail with pointed tip.

Discussion

Malenchus solovjovae was originally described by Brzeski (1988) from various shrubs and birch tree (*Betula* sp.) roots in Karelia, USSR. It is distinguished by annuli 2.0-2.5 μ m wide at mid-body, fusiform, more elongated and narrow median bulb, prophasmids located at 2-9 annuli anterior to vulva, 27-36 annuli between vulva and anus, and long tail in relation to vulva-anus distance. This species is morphologically and morphometrically similar to *M. undulatus* Andrassy, 1981, *M. pachycephalus* Andrassy, 1981 and *M. machadoi* (Andrassy, 1963) Andrassy, 1968. It most closely resembles *M. undulatus* but it differs from it by having wider annuli (2.0-2.5 vs. 1.7-1.9 μ m), different shape of median bulb (fusiform and narrow vs. relatively well developed), positions of prophasmids (2-9 vs. 7-15 annuli anterior to vulva) and less annuli between vulva and anus (27-36 vs. 44-47 annuli). It can be distinguished from *M. pachycephalus* by having narrower head, position of the prophasmids (2-9 vs. 11 annuli anterior to vulva), longer tail in relation to vulva-anus distance and shape of spicules (sickle shaped vs. straight). And finally, this species differs from *M. machadoi* by having wider annuli (2.0-2.5 vs. 1.6-1.8 μ m), longer tail in relation to vulva-anus distance, less annuli between vulva and anus (27-36 vs. 52-54 annuli), longer and different shaped spicules (18-19 vs. 15-16 μ m, sickle shaped vs. arcuate).

In this survey, this species was recovered from wood sample of a dead pine tree (*Pinus* sp.) in Siahkal region, Guilan province. The Iranian population of *M. solovjovae* is morphologically and morphometrically similar to the type population, except for a slightly longer stylet (10-11 vs. 8.0-9.5 μ m) and number of annuli between vulva and anus (35-39 vs. 27-36).

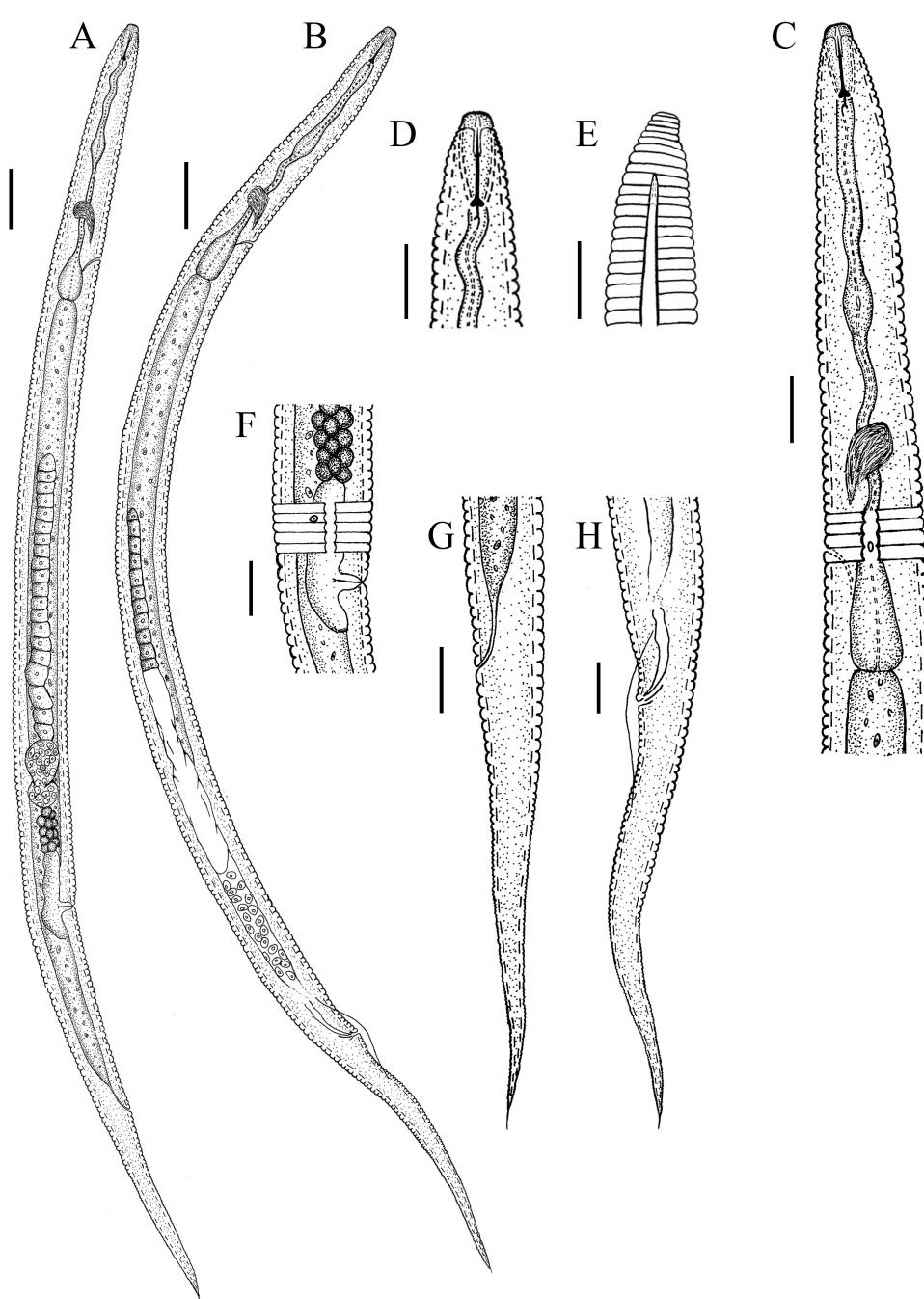


Figure 3 Iranian population of *Malenchus solovjovae* Brzeski, 1989. A: Female entire body; B: Male entire body; C: Female pharyngeal region showing excretory pore; D: Female head end; E: Origination of Lateral field; F: Vulval region showing prophasmid; G: Female tail; H: Male posterior end showing spicules and caudal alae. (Scale bars: C-H = 10 μ m; A, B = 20 μ m).

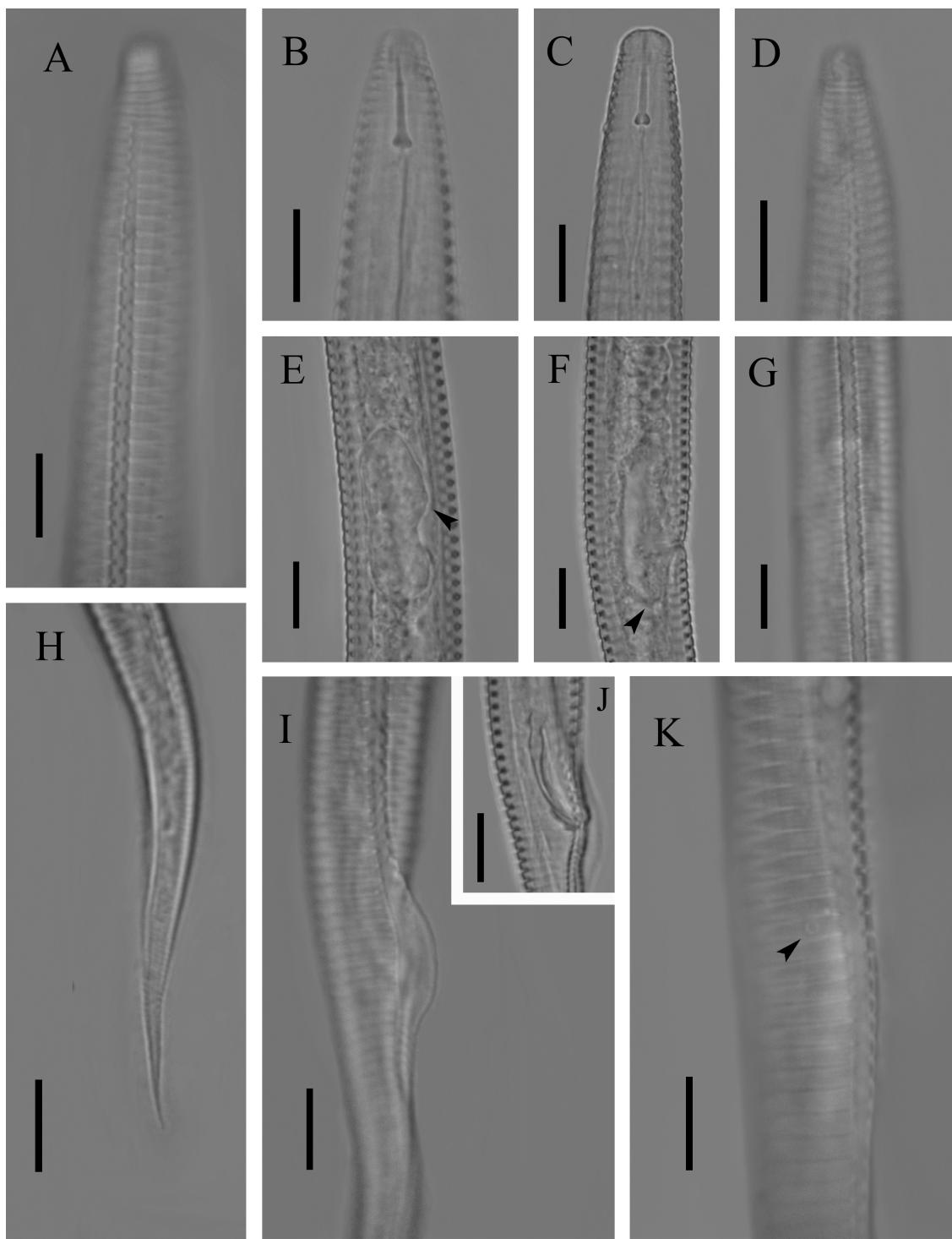


Figure 4 Iranian population of *Malenchus solovjovae* Brzeski, 1989. A: Beginning of lateral field; B, C: Female head end; D: Amphidial fovea; E: lobed spermatheca with sperm cells; F: Vulval region showing post uterine sac (PUS, arrowhead); G: Lateral field at mid-body; H: Female tail; I: Male caudal alae; J: Spicules; K: Prophasmid in female. (all scale bars = 10 μ m).

Table 3 Morphometrics of *Malenchus solovjovae* from Iran and the data from type population.

Characters	Guilan province		Brzeski, 1989		
	Female	Male	Velika Manga population		Kroshnozero population
			Female	Male	Female
n	8	3	31	5	5
L	461 ± 25.8 (428-504)	445.3 ± 17.2 (427-461)	439 (403-466)	427 (412-451)	424 (397-444)
a	24.8 ± 1.2 (23.4-27.0)	26.8 ± 2.0 (24.9-28.8)	19 (18-21)	22 (21-23)	19 (17-20)
b	4.5 ± 0.2 (4.3-4.9)	4.4 ± 0.2 (4.2-4.6)	4.8 (4.5-5.2)	4.7 (4.5-4.8)	4.8 (4.5-5.1)
c	6.3 ± 0.3 (6.0-6.8)	5.0 ± 0.1 (4.9-5.1)	5 (4.5-6.3)	3.9 (3.8-4.1)	4.9 (4.5-5.6)
c'	7.2 ± 0.3 (6.9-7.7)	7.6 ± 0.2 (7.5-7.9)	8.7 (7.6-10)	8.7 (8.1-9.5)	8.2 (6.7-8.9)
V or T	68.3 ± 0.7 (67.2-69.5)	36.1 ± 1.7 (34.2-37.3)	66 (64-70)	-	65 (64-68)
V'	81.1 ± 1.1 (80.1-83.4)	-	82 (81-84)	-	82
Stylet	10.4 ± 0.5 (10-11)	10.3 ± 0.6 (10-11)	9 (8.5-9.5)	9	8.4 (8-9)
MB	44.0 ± 0.9 (42.6-45.0)	43.5 ± 1.4 (42.2-45.0)	48 (43-51)	48-50	47 (46-48)
Excretory pore	83.8 ± 6.9 (74-98)	78.7 ± 2.9 (77-82)	84 (78-94)	79-88	81 (77-87)
Pharynx	101.5 ± 3.7 (98-109)	100.3 ± 1.5 (99-102)	91 (85-96)	87-95	89 (88-92)
Annuli width	2.1 ± 0.1 (2.0-2.2)	-	2.3 (2.0-2.5)	-	2.3 (2.0-2.5)
PUS	0.7 ± 0.0 (0.6-0.8)	-	-	-	-
Head-vulva	314.5 ± 17.9 (291-347)	-	289 (264-304)	-	277 (252-300)
Vulva-anus	73.3 ± 6.2 (63-80)	-	62 (54-70)	-	61 (57-65)
Tail	72.9 ± 4.7 (64-77)	89.0 ± 1.7 (87-90)	89 (67-98)	105-133	86 (79-91)
Spicules	-	19.3 ± 0.6 (19-20)	-	18-21	-
Gubernaculum	-	5.0 ± 0.0 (5-5)	-	3-5	-

Measurements are in μm and in the form mean \pm SD (range).

Malenchus acarayensis (*Malenchus*) Andrassy, 1968

(Figs 5 and 6; Table 4)

Description

Female: Body straight or slightly ventrally curved upon fixation. Lateral field originating at about one-third of procorpus with two lines under light microscope Cuticle with distinct annuli, annulus 1.0-1.7 μm wide at the middle of the body. Head 4-5 μm wide, with 5-6 fine annuli. Amphidial apertures large and sinuous in shape. Stylet delicate with small knobs. Orifice of dorsal pharyngeal gland about 1 μm from knobs. Median bulb rather weak, valvular apparatus small. Excretory pore at level of anterior part of pharyngeal bulb. Reproductive system monodelphic, ovary outstretched with one row of oocytes. Vulva with epiptygmata. Spermatheca oval, offset and filled with rounded sperm cells. Post vulval uterine sac about half vulval body width long. Prophasmids at 7-14 annuli anterior to vulva. Tail straight with sharp to thread-like tip.

Males: Similar to females except for rather finer cuticular annuli (0.7 μm at middle of the

body). Bursa cloacal and finely crenate. Tail similar to female with fine and indistinguishable cuticular annuli.

Discussion

Malenchus acarayensis was originally described by Andrassy (1968) from Paraguay. Males of this species were described by Knobloch (1976) from low bog-like area in association with white birch, *Betula papyrifera* Marsh, Michigan, USA. It is characterised by 1.2-1.4 μm wide annuli at mid-body, rather weak median bulb, prophasmids at 7-14 annuli anterior to vulva and long tail in relation to vulva-anus distance. Morphological and morphometric characters of the Iranian population of *M. acarayensis* fit well with the original description. *M. acarayensis* is morphologically and morphometrically similar to *M. shaheenai* Khan & Ahmad, 1991. It can be distinguished from *M. shaheenai* by having different origination of lateral field (1/3 to mid procorpus vs. at level of median bulb) and shape of spermatheca (oval vs. oblong pouch-like).

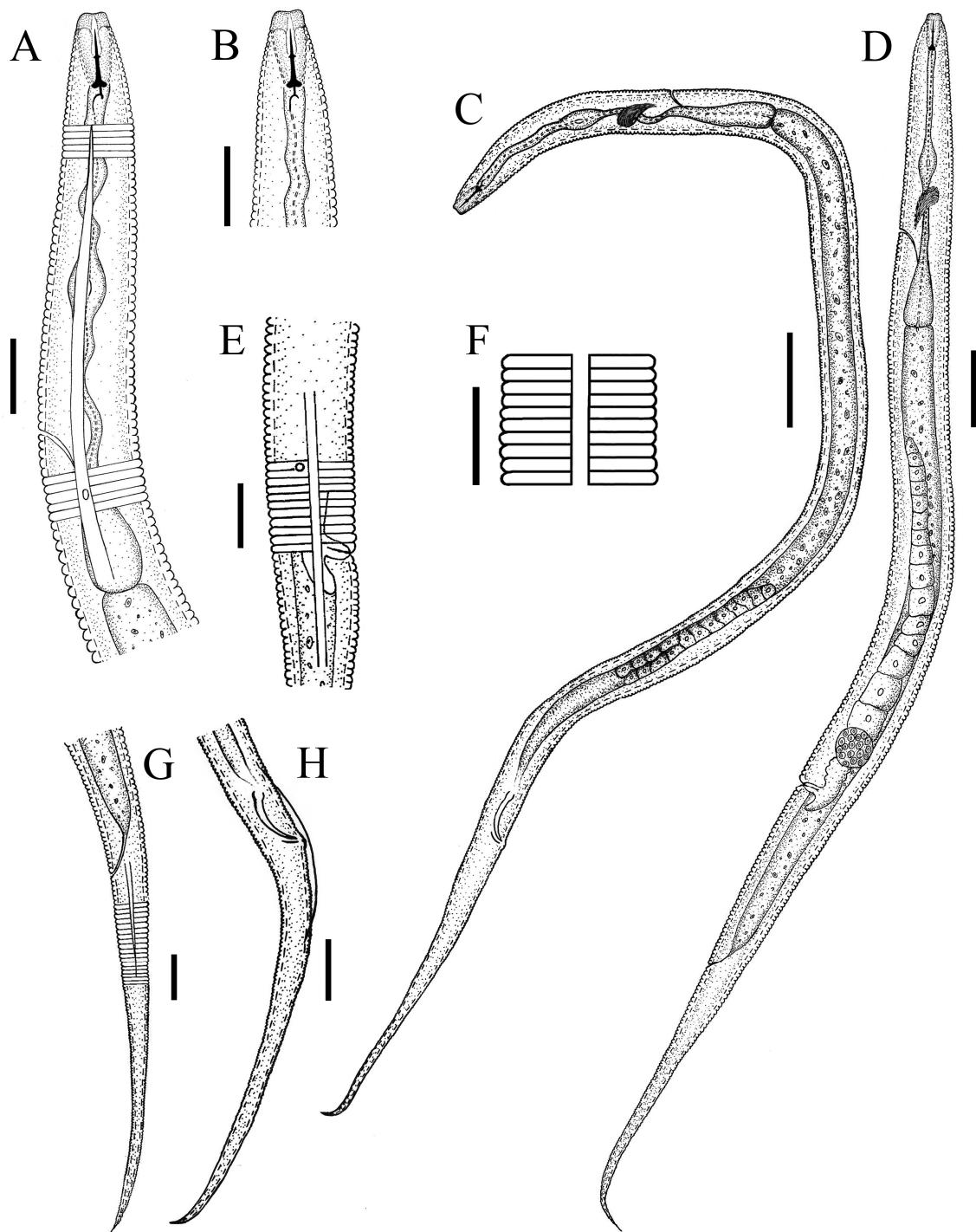


Figure 5 Iranian population of *Malenchus acarayensis* Andrassy, 1968. A: Beginning of lateral field; B: Female head end; C: Male entire body; D: Female entire body; E: Vulval region showing prophasmid; F: Lateral field at mid-body; G: Female tail; H: Male posterior end showing spicules and caudal alae. (Scale bars: A, B, E-J = 10 μ m; C, D = 20 μ m).

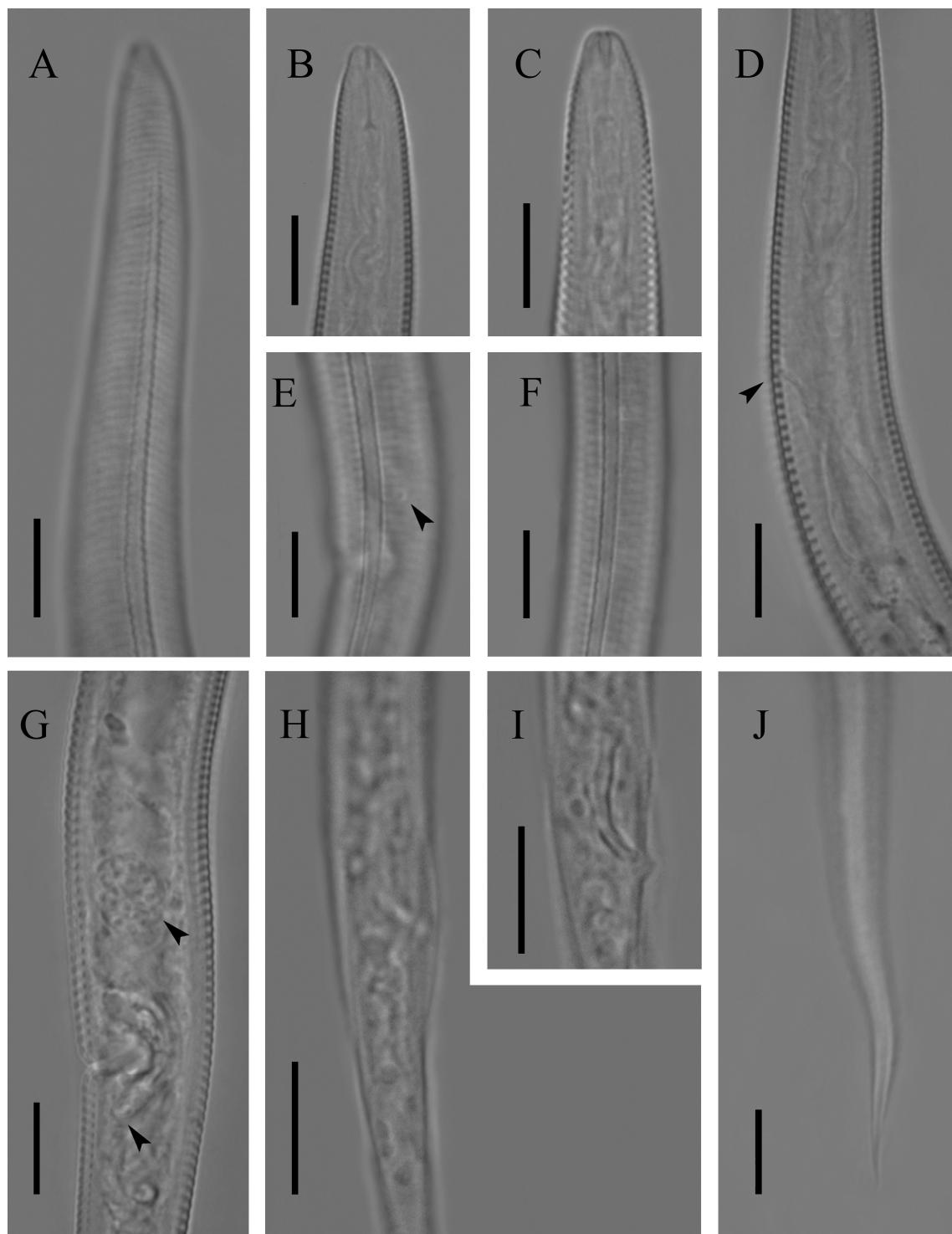


Figure 6 Iranian population of *Malenchus acarayensis* Andrassy, 1968. A: Origination of Lateral field; B: Female head end; C: Amphidial fovea; D: Female pharyngeal region showing excretory pore (arrowhead); E: Vulval region showing prophasmid; F: Lateral field at mid-body; G: Posterior region of female showing filled spermatheca, vulval region and post uterine sac (PUS, arrowhead); H: Male caudal alae; I: Spicules; J: Female tail. (Scale bars = 10 μ m).

Table 4 Morphometrics of *Malenchus acarayensis* from Iran and the data from other reports.

Characters	Guilan province		Andrássy, 1968		Knobloch, 1976		Gomez-Barcina <i>et al.</i> , 1992
	Female	Male	Female	Male	Female	Male	
n	4	2	-	5	20	5	
L	345.3 ± 9.2 (340-359)	331, 342	280-410	300 (270-330)	353 ± 23.5 (305-389)	344 ± 23 (306-365)	
a	22.3 ± 0.7 (21.3-22.7)	36.8, 38	19-26	25 (21-29)	21.8 ± 2.3 (18.2-28.2)	24.4 ± 2.6 (22.4-27.8)	
b	4.4 ± 0.2 (4.2-4.5)	4.5, 4.6	-	4.3 (3.8-4.7)	4.5 ± 0.3 (3.9-5.0)	4.5 ± 0.3 (4.1-5)	
c	4.2 ± 0.1 (4.1-4.4)	4.6, 4.7	3.8-5.5	4.1 (3.6-4.5)	4.5 ± 0.5 (3.8-5.5)	3.8 ± 0.2 (3.6-4)	
c'	9.7 ± 0.5 (9.1-10.4)	10.1, 10.6	7.5-10	-	8.8 ± 1.4 (7.0-11.9)	9.8 ± 1.2 (8.2-11)	
V or T	61.5 ± 1.0 (60.2-62.5)	15.7, 21.3	61-66	37 (32-41)	62 ± 2.2 (60-66)	43 ± 4.6 (37-48)	
V'	80.7 ± 1.7 (79.1-82.6)	-	-	-	80 ± 1.5 (78-80)	-	
Stylet	8.5 ± 0.6 (8-9)	7	8-8.5	8	8.5 ± 0.5 (8-9.5)	8.6 ± 0.7 (7.5-9)	
MB	47.0 ± 0.4 (46.8-47.6)	44.6, 45.9	47	-	47 ± 2.4 (41-50)	48 ± 3.2 (42-50)	
Excretory pore	60.8 ± 5.0 (56-66)	53, 54	-	-	62 ± 7.2 (50-78)	64 ± 4.9 (57-69)	
Pharynx	78.8 ± 2.4 (77-82)	74	70-80	-	78 ± 6.7 (70-96)	76 ± 6.9 (67-84)	
Annuli width	1.3 ± 0.1 (1.2-1.4)	0.7	1-1.7	-	1.4-1.7	1.2 ± 0.06 (1.2-1.3)	
PUS	7.5 ± 1.3 (6-9)	-	-	-	5.5-8	-	
Head-vulva	212.3 ± 3.0 (209-216)	-	-	-	-	-	
Vulva-anus	50.8 ± 5.7 (45-57)	-	-	-	55 ± 4.1 (51-64)	-	
Tail	82.3 ± 3.3 (78-86)	71, 73	70-76	-	79 ± 6.6 (69-89)	90 ± 7.6 (77-96)	
Tail/vulva-anus	-	-	1.1-1.5	-	1.4 ± 0.1 (1.3-1.6)	-	
Spicules	-	12	-	15 (13-16)	-	15.3 ± 1.5 (13-16)	
Gubernaculum	-	3, 4	-	4 (4-5)	-	4.2 ± 0.8 (3-5)	

Measurements are in μm and in the form mean ± SD (range).

In the present study it was recovered from the rhizosphere of Caucasian elm (*Zelkova carpinifolia*) in Deylaman region, Guilan province. The Iranian population of *M. acarayensis* is similar to the type population based on its morphology and morphometric data; however, it has slightly shorter spicules (12 vs. 13-16 μm). Namadipour *et al.* (2014) reported this species from Zanjan province as a short note.

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اولین گزارش از جنس *Hoplotylus* (Nematoda: Hoplolaimidae) و توصیف دو گونه از جنس *Malenchus* (Nematoda: Tylenchidae) در ایران

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چکیده: بهمنظور بررسی فون نمادهای انگل گیاهی جنگلهای شرق استان گیلان، نمونه‌هایی از خاک و ریشه گیاهان این مناطق جمع‌آوری شده و نمادهای موجود در آن‌ها جداسازی شدند. شناسایی براساس ویژگی‌های ریخت‌سنگی و ریخت‌شناسی انجام شد. در بین نمادهای شناسایی شده جمعیتی از جنس *Hoplotylus* جداسازی شد که سپس به عنوان *H. femina* شناسایی شد. شناسایی مرفو‌لوزی به‌وسیله توالی بخش‌هایی از زیرواحد بزرگ DNA ریبوزومی نیز تأیید گردید. همچنین دو جمعیتی از جنس *Malenchus* جداسازی شد که براساس خصوصیات ریخت‌سنگی و ریخت‌شناسی، *M. solovjovae* و *M. acarayensis* شناسایی شدند. دو گونه *M. solovjovae* و *H. femina* برای اولین بار از ایران گزارش می‌شوند. گونه *M. acarayensis* قبلاً بدون توصیف از ایران گزارش شده بود، لذا این گونه نیز توصیف و تشریح شده است.

واژگان کلیدی: *M. acarayensis* *Malenchus solovjovae* *Hoplotylus femina* زیرواحد بزرگ DNA ریبوزومی