

**THE GENUS *FILENCHUS* ANDRÁSSY, 1954
(NEMATA : TYLENCHIDAE)
FROM IRAN**

by

AKBAR KAREGAR and ETIENNE GERAERT
Instituut voor Dierkunde, Universiteit Gent,
K.L. Ledeganckstraat 35, B-9000 Gent, Belgium

SUMMARY

Seven known species of the genus *Filenchus* were found in soil samples collected from the rhizosphere of wild and agricultural plants in the central, western, and northern parts of Iran. *F. facultativus* (Szczygiel, 1970) Raski and Geraert, 1987 was found in two types: finely rounded tail tip and bluntly rounded tail tip. *F. acris* (Brzeski, 1986) Raski and Geraert, 1987 was found for the first time since its description. These species along with *F. baloghi* (Andrássy, 1958) Siddiqi, 1986, *F. discrepans* (Andrássy, 1954) Raski and Geraert, 1987, *F. misellus* (Andrássy, 1958) Raski and Geraert, 1987, *F. sheri* (Khan and Khan, 1978) Siddiqi, 1986 and *F. vulgaris* (Brzeski, 1963) Lownsbey and Lownsbey, 1985 are reported for the first time from Iran.

Key words: taxonomy, morphology, Tylenchida, *Filenchus*, Iran.

INTRODUCTION

Nematology in Iran has only recently received attention. Only about 20 species of the family Tylenchidae have been identified (KHEIRI, 1970; KHEIRI, 1972 and some unpublished reports and studies). An attempt to identify some species of the family Tylenchidae has been carried out on the basis of soil samples collected since 1988, mostly in 1993, from natural and agricultural lands in the following areas: Lahijan in the north, Yazd and Varamin in the centre, and mostly Hamadan Province in the west. The species of the genus *Filenchus* will be dealt with here.

MATERIAL AND METHODS

Nematodes were extracted by the centrifugal-flotation method, killed and fixed by hot FAP, transferred to anhydrous glycerine by the modified Seinhorst method (DE GRISSE, 1969). The nematodes were mounted on aluminium slides with double cover slips (COBB, 1917), and examined by light microscope (LM) and scanning

electron microscope (SEM). For SEM, glycerine embedded nematodes in the permanent slides were first transferred into a drop of glycerine in a small embryo dish. Then distilled water was added drop by drop until nematodes were in pure distilled water. Ultrasonic treatment for about 8 minutes was used to remove adhering particles. The nematodes then were initially dehydrated by passing through a gradual ethanol concentration of 25, 50, 75, 95, and 100 % at two hourly intervals, followed by an overnight dehydration in 100 % ethanol. The standard critical point drying procedure was used with CO₂ as a drying liquid. Finally, dried nematodes were placed on a self-adhesive conducting aluminium tape and coated with gold. These gold coated specimens were studied under the scanning electron microscope.

RESULTS AND DISCUSSION

Filenchus acris (Brzeski, 1986) Raski and Geraert, 1987 (Figs. 1 G-J; 2 A-D)

Measurements

Females (n = 3) : L = 0.409 ± 0.02 (0.385-0.425) mm ; a = 35 ± 1.5 (32-35) ; b = 5.7 ± 0.7 (4.9-6.7) ; c = 4.1 ± 0.2 (3.9-4.4) ; c' = 13 ± 1.2 (12-15) ; V = 61.2 ± 1.5 (59.3-62.8) ; V' = 81.1 ± 1.1 (79.6-82.1) ; VL = 250 ± 6.8 (241-257) µm ; Stylet = 5-6 µm ; Excretory pore = 58 ± 0.9 (57-59) µm ; Oesophagus = 73 ± 6.2 (64-78) µm ; MB = 43 ± 1.5 (42-45) ; V-a = 57 ± 4.7 (54-64) µm ; L' = 309 ± 9.9 (295-318) µm ; Tail = 101 ± 9.1 (88-109) µm.

Description

Female : Cuticle thin, with flat and wide annuli ; 1.8 (1.6-1.9) µm near mid body. Lateral field as a single ridge uncrenated. SEM photos show fine annuli on the head ending in a squarish cephalic plate with rounded corners, slightly indented on dorsal and ventral borders, circumoral plate set off by depression, approximately rounded. Amphidial apertures begin at cephalic plate, continue as simple, oblique slits posteriorly. Stylet delicate, knobs elongated and backwardly directed. Dorsal gland opening near stylet knobs. Metacarpus fusiform, muscular. Isthmus slender, long, crossed by nerve ring at its middle. Basal bulb pyriform.

Gonad outstretched ; oocytes in one row ; spermatheca small, ovate, without sperm. Uterus with four rows of four cells. Post-vulval-uterine sac rounded, 8-10 µm long, 0.7-0.9 times of VBD. Vulva slit, about one third of VBD, with small lateral membranes. Vagina straight with thin walls. Anus indistinct. Tail elongated conical, annulation disappears on posterior part of tail. Tail tip finely rounded.

Male not found.

Discussion

This population comes close to *Filenchus neoparvus* Raski and Geraert, 1987, *F. facultativus* (Szczygiel, 1970) Raski and Geraert, 1987, and *F. acris* (Brzeski, 1986) Raski and Geraert, 1987. It differs from the first species by having a shorter

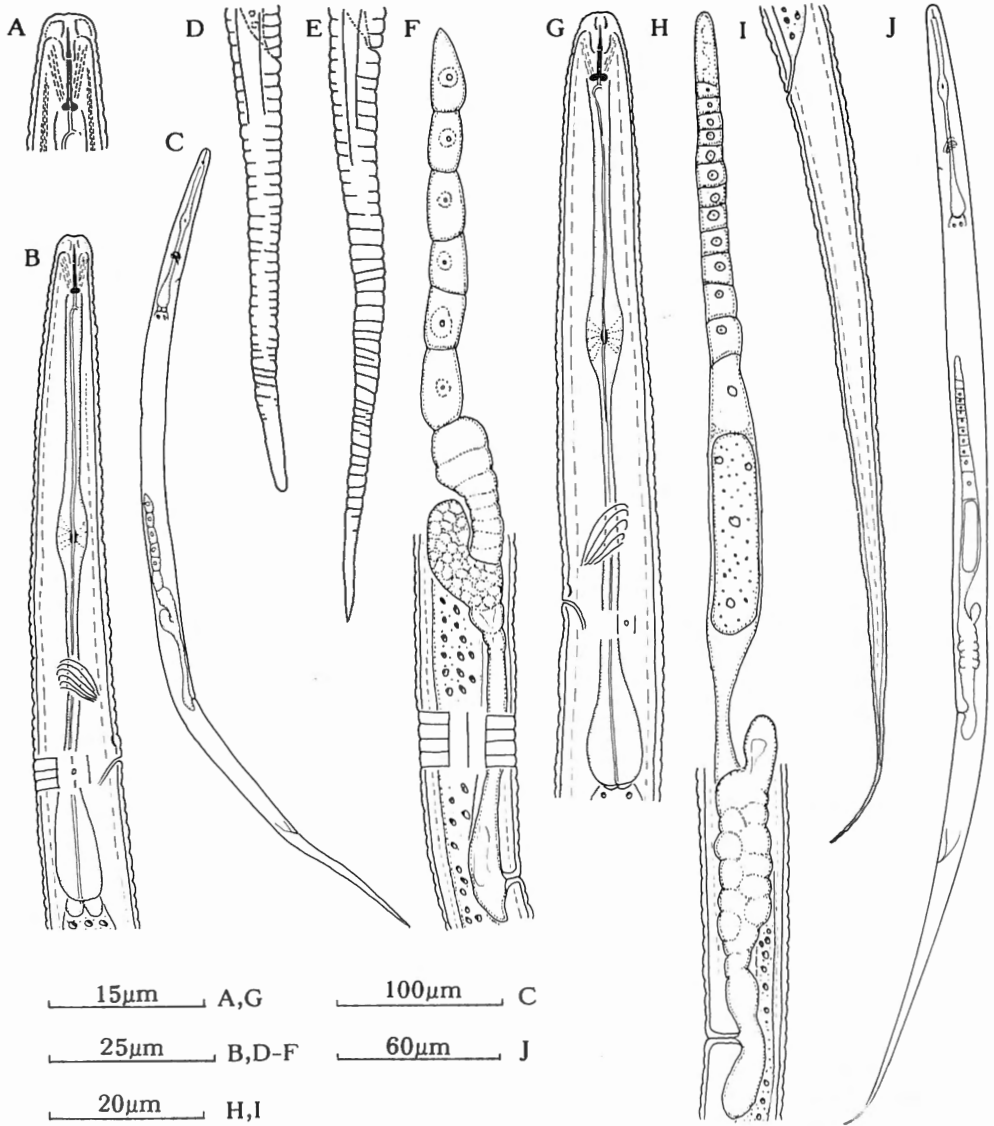


Fig. 1. — A-F. *Filenchus baloghi* — A. Anterior end - B. Oesophagus region - C. General view - D and E. Tail - F. Reproductive system - G-I. *Filenchus acris* - G. Oesophagus region - H. Reproductive system - I. Tail - J. General view.

stylet and genital tract, and striation on the head (stylet = 7-8 μm , ovary extending up to basal oesophageal bulb and the striation of the head is not clear in *F. neoparvus*). The second species has a longer stylet (stylet = 6-8 μm in various populations of *F. facultativus* versus 5-6 μm). It differs from *F. acris* by having different V, V'

and MB ratios : $V = 67$ (66-69), $V' = 84$ (83-86), $MB = 37$ (35-38). In spite of these morphometrical differences, this population is considered as *F. acris*.

Habitat and locality

This population was found in natural grassland, Cheshmeh Farshe, Hamadan, Iran. This is the first record since the original description.

Filenchus baloghi (Andrássy, 1958) Siddiqi, 1986

(Figs 1 A-F, 2 E)

Measurements

Females ($n = 4$) : $L = 0.511 \pm 0.022$ (0.480-0.540) mm ; $L' = 0.433 \pm 0.015$ (0.415-0.450) mm ; $a = 38 \pm 2.9$ (36-43) ; $b = 5.7 \pm 0.27$ (5.3-6.0) ; $c = 6.7 \pm 0.39$ (6.2-7.3) ; $c' = 10 \pm 1$ (8.7-11.4) ; $V = 64-65$; $V' = 75.8 \pm 0.8$ (75-77) ; stylet = 7-8 μm ; oesophagus = 91 ± 7.8 (80-102) μm ; $MB = 47 \pm 1.6$ (46-50) ; $V-a = 106 \pm 3.2$ (102-111) μm ; tail = 77 ± 7.5 (66-87) μm ; $T/V-a = 0.72 \pm 0.06$ (0.65-0.82) ; annuli = 1.85 ± 0.09 (1.7-1.9) μm .

Male : not found.

Description

The annulation of the cuticle is irregular, flat from anterior end to vulva and more rounded from vulva to tail end ; some annuli 2-3 times wider than the others ; 2-3 annuli anterior and posterior to vulva, at ventral side, are about twice as wide as the adjoining ones. Lateral field consists of three lines, the outer ones are crenate ; ends slightly posterior to anus. Cephalic region bluntly rounded, almost hemispherical outline, continuous with body contour. SEM photos show fine annuli continue onto head ending at squarish cephalic plate with rounded corners, indents on dorsal and ventral borders. Stylet delicate with small but distinct knobs. Metacarpus weakly developed, ovate, 43 ± 5 (37-51) μm from the anterior end. Excretory pore 78.3 ± 5.5 (69-83) μm from the anterior end, hemizonid 1-2 annuli in front of it ; deirids at level of excretory pore. Gonad outstretched ; ovary with few cells in one row ; spermatheca small to large, elongate, filled with sperm. Post vulval-uterine sac rounded, 6-11 μm long. Vagina short, at right angle to body axis. Tail conoid with annulated and finely or broadly rounded terminus.

Discussion

This population very closely corresponds with the original description. In comparison with an Argentinean population (TORRES and GERAERT, 1996), it has smaller stylet, more posterior median bulb, and longer oesophagus : stylet = 7-8 μm , $MB = 47 \pm 1.6$ (46-50), and oesophagus = 91 ± 7.8 (80-102) μm versus 8-10 μm , 41-42, and 81.4 ± 3.3 (77-87) μm , respectively in that population.

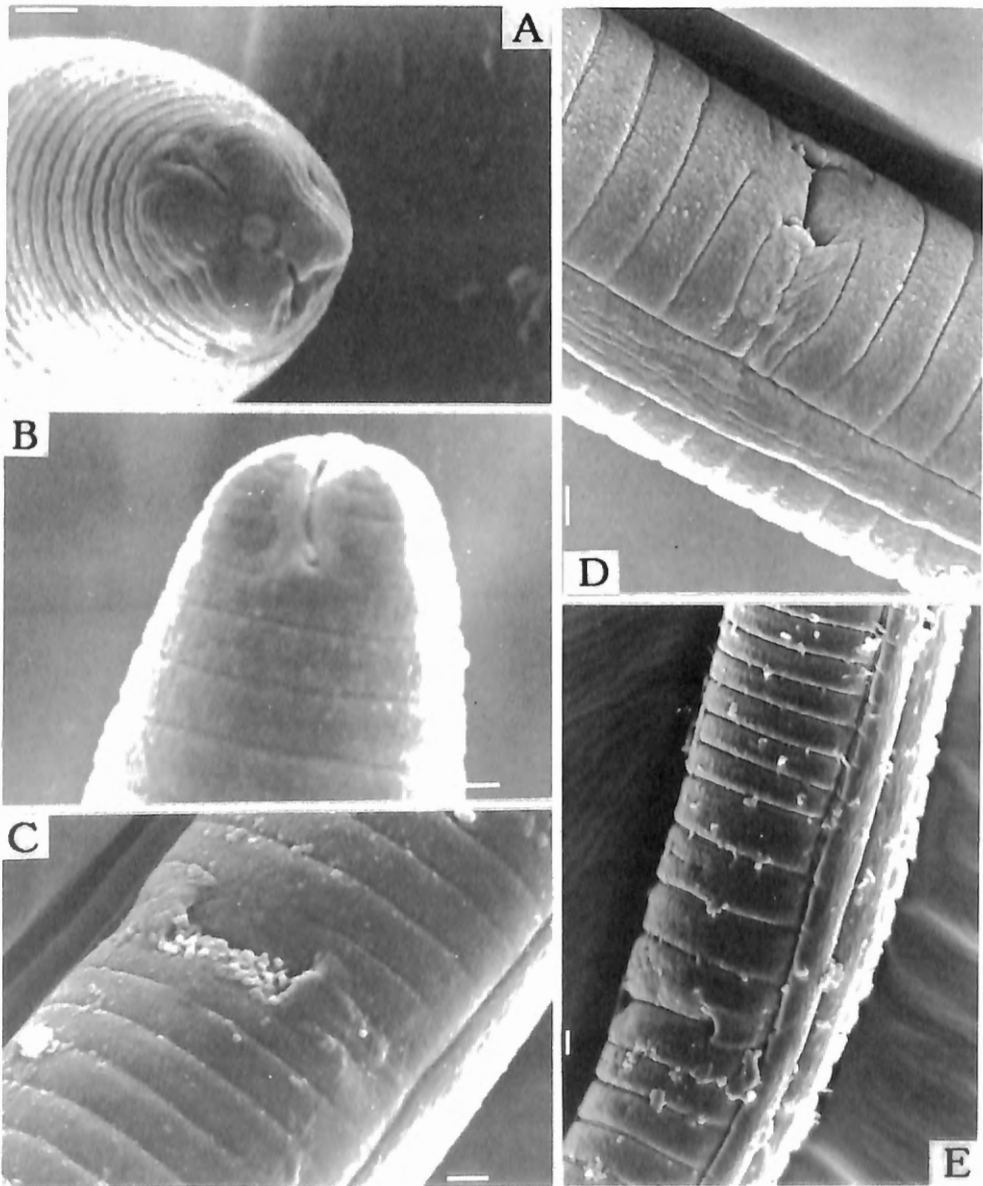


Fig. 2. — A-D. *Filenchus acris*, Female — A. Face view - B. Lateral view of head - C and D. Vulva with lateral field - E. *F. baloghi* - Lateral field and annulation at vulva. Bars equal $1\ \mu\text{m}$ on A-E.

Habitat and locality

This population has been collected in the soil around *Equisetum arvensis* from « Darahe Morad Bayke », Hamadan.

***Filenchus discrepans* (Andrássy, 1954) Raski and Geraert, 1987**
(Figs 3, 4)

Measurements

Population No. 1 : Females (n = 6) : L = 0.530 ± 0.02 (0.505-0.565) mm ; L' = 0.390 ± 0.017 (0.370-0.420) mm ; a = 45.6 ± 2.4 (43-53) ; b = 5.6 ± 0.2 (5.3-6) ; c = 3.8 ± 0.1 (3.6-4.0) ; c' = 16.8 ± 1.7 (14.4-19.6) ; V = 60.4 ± 1.3 (59-63) ; V' = 82 ± 2.9 (79-88) ; stylet = 6.5-7 μm ; oesophagus = 93.8 ± 2.9 (89-98) μm ; MB = 37.6 ± 1.1 (36-39) ; V-a = 76.2 ± 3.8 (71-82) μm ; tail = 138.4 ± 6.2 (125-143) ; T/V-a = 1.8 ± 0.1 (1.6-2) ; annulation = 0.8 ± 0.1 (0.7-0.9) μm .

Male (n = 1) : L = 0.535 mm ; L' = 0.405 mm ; a = 46 ; b = 5.2 ; c = 4.2 ; c' = 15.7 ; T = 24 ; stylet = 6.5 μm ; oesophagus = 103 μm ; MB = 36 ; tail = 127 μm ; spicula = 15.5 μm ; gubernaculum = 4 μm ; annulation = 1 μm .

Population No. 2 : Females (n = 10) ; L = 0.530 ± 0.048 (0.435-0.600) mm ; L' = 0.388 ± 0.039 (0.320-0.450) mm ; a = 42.2 ± 4.2 (33.3-47.7) ; b = 5.8 ± 0.5 (4.9-6.5) ; c = 3.7 ± 0.2 (3.4-4.0) ; c' = 16.5 ± 1.8 (12.5-18.5) ; V = 58.2 ± 1.6 (55-61.2) ; V' = 79.5 ± 1.3 (78-82.3) ; stylet = 6-7 μm ; oesophagus = 91.3 ± 5.9 (79-100) μm ; MB = 38.6 ± 2 (35-41) ; V-a = 77.7 ± 11.4 (56-94) μm ; tail = 142.5 ± 11 (111-154) μm ; T/V-a = 1.9 ± 0.2 (1.6-2.1) ; annulation = 1 ± 0.1 (0.9-1.3) μm .

Male : not found.

Description

Female (based on population No. 1) : cuticle marked with delicate transverse striae ; lateral field in form of plain band ; SEM photos show some faint, interrupted inner lines in the band. Cephalic region continuous with body contour, almost truncate, about 4 μm wide and 2 μm high ; SEM shows fine annuli continuing onto head ending at squarish cephalic plate with rounded corners ; circumoral plate set off by depression, rounded and raised. Amphidial apertures big clefts beginning at the middle of labial plate, continuing posteriorly with slight curvature along the four head annuli ; cephalic framework moderately sclerotized.

Female reproductive system outstretched, spermatheca small to moderate, axial to offset (based on the size) ; offset part consisted of cells with globular nucleus ; with or without sperm ; post-uterine sac 7-10 μm long, 0.6-1.0 VBD. Vagina perpendicular to body axis.

Male : similar to female. Body narrows markedly at level of cloacal opening, cloacal lips make a short protruded tube. Caudal alae low rounded, adanal, beginning slightly after the spicule head, extending an equal distance posterior to cloaca.

Discussion

The two populations are similar except small differences in V and V' values, population No. 2 having lower values. These populations with lateral field as a plain band set off by two lines, short stylet, and fine annuli come close to *F. neonanus* Raski and Geraert, 1987, *F. discrepans* (Andrássy, 1954) Raski and

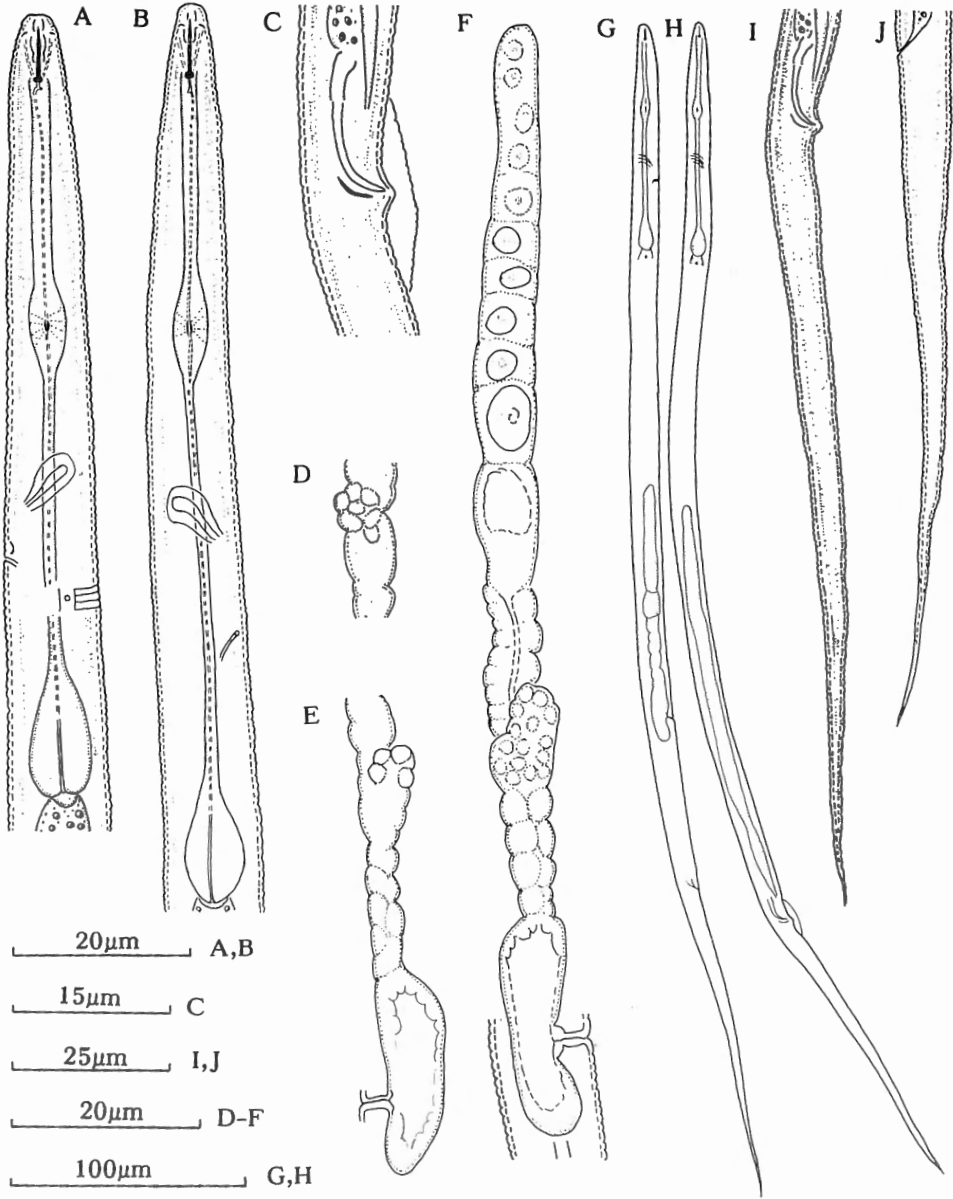
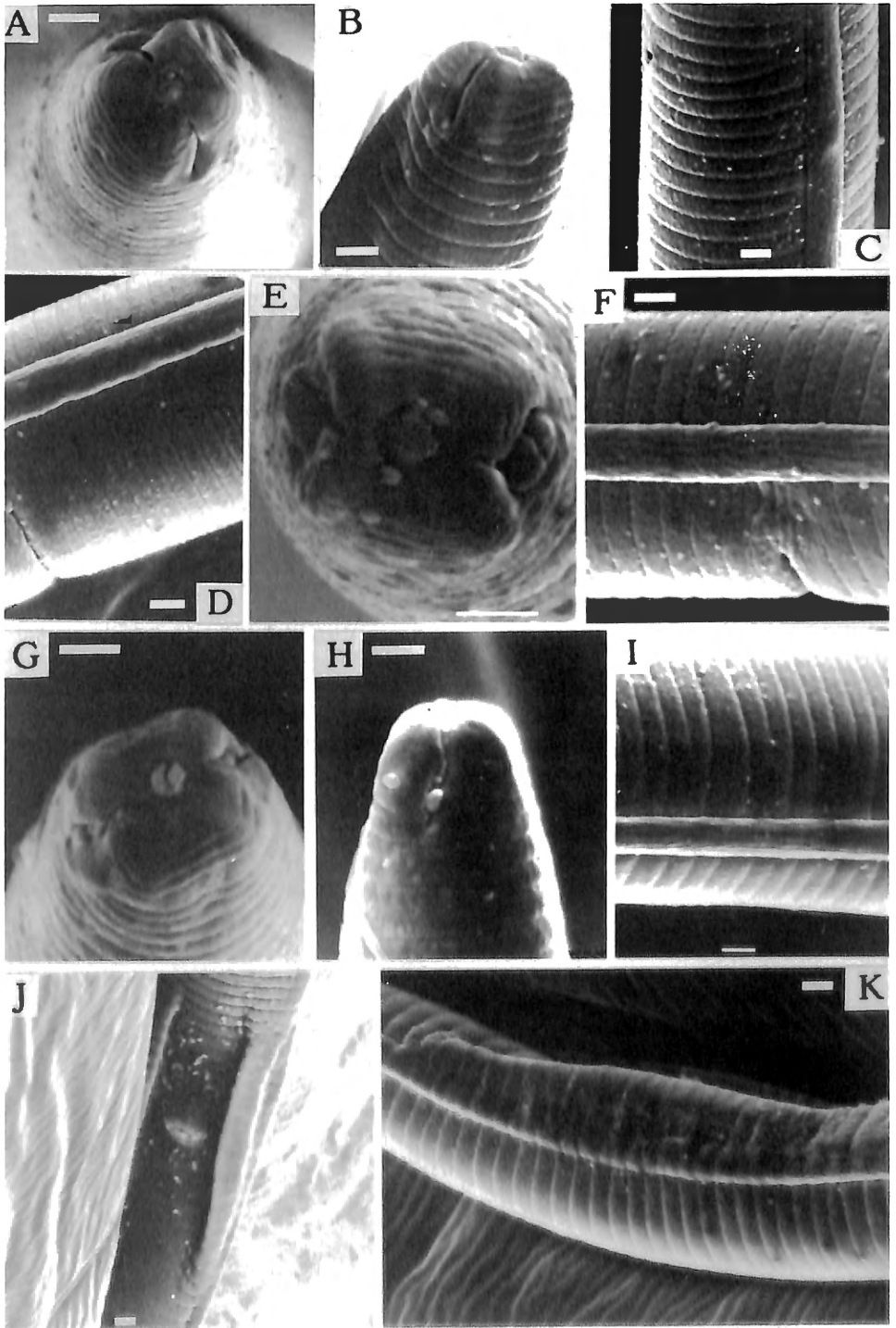


Fig. 3. — *Filenchus discrepans* — A, D-F, G, J. Female — A. Anterior end - D-F. Reproductive system - G. General view - J. Tail — B, C, H, I. Male — B. Anterior end. - C. Cloacal region - H. General view - I. Tail.



Geraert, 1987, and *F. helenae* (Szczygiel, 1969) Raski and Geraert, 1987. *F. neonanus* has shorter tail (higher c value) longer stylet, more posterior metacarpus and vulva, and shorter post-vulval-uterine sac and tail : stylet = 7-8.5 μm , MB = 47 (44-51), V = 63 (62-65), tail = 90-113 μm . The other two species are not easy to differentiate from each other : *F. discrepans* is described with males, *F. helenae* without; *F. discrepans* has a vulva position of 61-64 %, *F. helenae* 53-61 % (GERAERT, 1991). So, according to vulva position, our populations are *F. helenae*, but population No. 1 has a male. On the other hand MIZUKUBO (1994), after studying some Japanese populations (one population with male) as *F. helenae* has come to the conclusion that both species are the same, and suggested that *F. helenae* is a junior synonym of *F. discrepans*. We consider our populations as *F. discrepans*.

Habitat and locality

These populations were found in grasslands from different sides of Alvand Mountain in Hamadan.

Filenchus facultativus (Szczygiel, 1970) Raski and Geraert, 1987 (Figs 5, 6)

Measurements

Type I; finely rounded tail tip :

Females (n = 9) : L = 0.460 ± 0.03 (0.415-0.510) mm ; a = 35 ± 2 (32-38) ; b = 5.6 ± 0.5 (5.3-6.1) ; c = 5.1 ± 0.3 (4.2-5.4) ; c' = 10.1 ± 1.2 (9.2-13.2) ; V = 70 ± 1 (68-71) ; V' = 88 ± 1 (86-89) ; VL = 325 ± 26 (270-365) μm ; stylet = 6-7 μm ; median bulb = 34.6 ± 1.3 (33-38) μm ; MB = 42 ± 1.5 (41-45) ; tail = 91 ± 6 (81-100) μm ; V-a = 45 ± 4 (39-52) μm ; T/V-a = 2 ± 0.2 (1.8-2.3).

Males (n = 3) : L = 0.410 ± 0.02 (0.380-0.430) mm ; a = 34 ± 3 (31-38) ; b = 5.2 ± 0.3 (4.9-5.6) ; c = 4.8 ± 0.1 (4.7-5) ; c' = 10 ± 1 (9-11) ; MB = 44 ± 1.3 (43-46) ; stylet = 6 (5-7) μm ; T = 40 ± 4 (36-46) ; spicules = 13 ± 1 (12-14) μm ; gubernaculum = 3-4 μm ; tail = 85 ± 4.6 (80-91) μm .

Type II; bluntly rounded tail tip :

Females (n = 4) : L = 0.460 ± 0.017 (0.445-0.490) mm ; a = 35 ± 2.5 (32-38) ; b = 5.1 ± 0.1 (4.9-5.3) ; c = 5.8 ± 0.4 (5.3-6.1) ; c' = 9.3 ± 1 (7.8-10.7) ; V = 70 ± 1 (68-71) ; V' = 84-85 ; VL = 320 ± 17 (300-340) μm ; stylet = 6-6.5 μm ; median bulb = 37.5 ± 1.5 (35-39) μm ; MB = 42 ± 2 (39-44) ; V-a = 58 ± 2 (56-61) μm ; tail = 81 ± 2.5 (77-84) μm ; tail/V-a = 1.4 ± 0.1 (1.3-1.5).

Fig. 4. — *Filenchus discrepans* — A-F. Female — A,E. Face view - B. Vento-lateral view of head - C. Lateral field at level of deirid and excretory pore - D,F. Lateral field at vulva. (E and F, population without male) — G-K Male — G. Face view - H. Lateral view of head - I. Lateral field - J. Ventral view of caudal alae - K. Lateral view of caudal alae. Bars equal 1 μm on A-K.

Male (n = 1) : L = 0.395 mm ; a = 34 ; b = 4.7 ; c = 5.3 ; c' = 8.5 ; MB = 40 ; stylet = 6.5 μ m ; T = 46 ; spicules = 12 μ m ; gubernaculum = 3 μ m ; tail = 74 μ m.

Description

Female

Type I : body 13 ± 1 (11-15) μ m wide ; cylindrical in shape from vulva to base of stylet then narrows gradually to bluntly rounded at anterior end. Cuticular annuli flat, 1.5 ± 0.2 (1.2-1.7) μ m wide. Lateral field a prominent band set off by two sharp lines. SEM photos show one or two irregular shallow incisures in the band. Cephalic region with three annuli ; continuous with body countour, 4.5-5 μ m wide and 2-2.5 μ m high. Labial plate almost rectangular with rounded corners ; oral plate is concave oval. Amphidial apertures begin near oral plate with closed anterior end, and sinuous outline cutting through 2-3 annuli beyond labial plate. Stylet slender with rounded basal knobs. Oesophagus 82 ± 3 (76-86) μ m long. Excretory pore situated at 67 ± 3 (61-72) μ m from anterior end. Hemizonid just anterior to excretory pore. Deirids 2-4 annuli posterior to the excretory pore.

Reproductive tract with one row of oocytes ; spermatheca offset with long pocket, 31 ± 7 (22-41) μ m, extending anteriorly parallel to body axis, filled with rounded sperm. Vagina more than half of the body diameter, slightly anteriorly tilted. Vulva a simple indented transverse slit without lateral membranes. Post-vulval-uterine sac 5.5 ± 1.5 (3-8) μ m, shorter than VBD ; P.V.S./VBD = 0.5 ± 0.1 (0.3-0.7). Tail narrowly conoid ending in finely rounded tip. The annulation of posterior part of the tail is irregular.

Type II : Similar to type I, but with the following differences. Cuticular annuli 1.8 ± 0.2 (1.6-2) μ m wide. SEM doesn't show any incisure in the lateral fields. Cephalic region with one or two annulations ; labial plate squarish with rounded corners, indented on dorsal and ventral borders. Oesophagus is longer ; 90 ± 2.4 (88-94) μ m. The V-a distance is larger ; 59 ± 2 (56-61) μ m versus 45 ± 4 (39-52) μ m in type I, but the tail is shorter ; 80.5 ± 2.5 (77-84) μ m versus 90.5 ± 6.1 (81-100) μ m, and tail shape is narrowly cylindroid with bluntly rounded terminus.

Males

Type I : Similar to female in general outline of head except for two prominent, button-like sensilla in a small depression on ventral side that gives an asymmetrical pattern to face view (agreeing with Raski & Geraert, 1987). The ventral side of the head and labial plate is slightly depressed. SEM shows one or two irregular shallow incisures in the lateral field, as in females. Ventral line of lateral field disappears on 4-5 annuli posteriad to beginning of caudal alae.

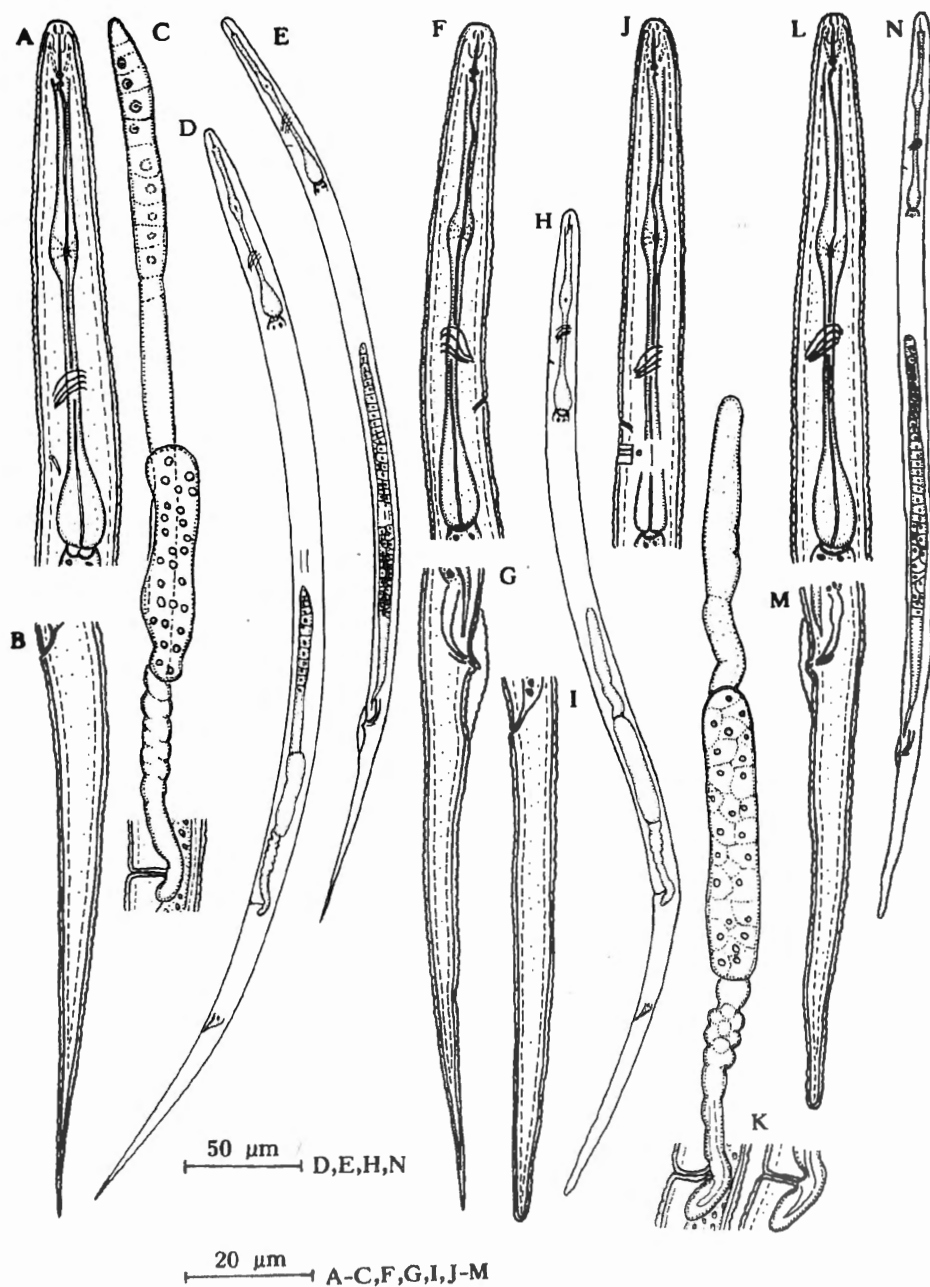
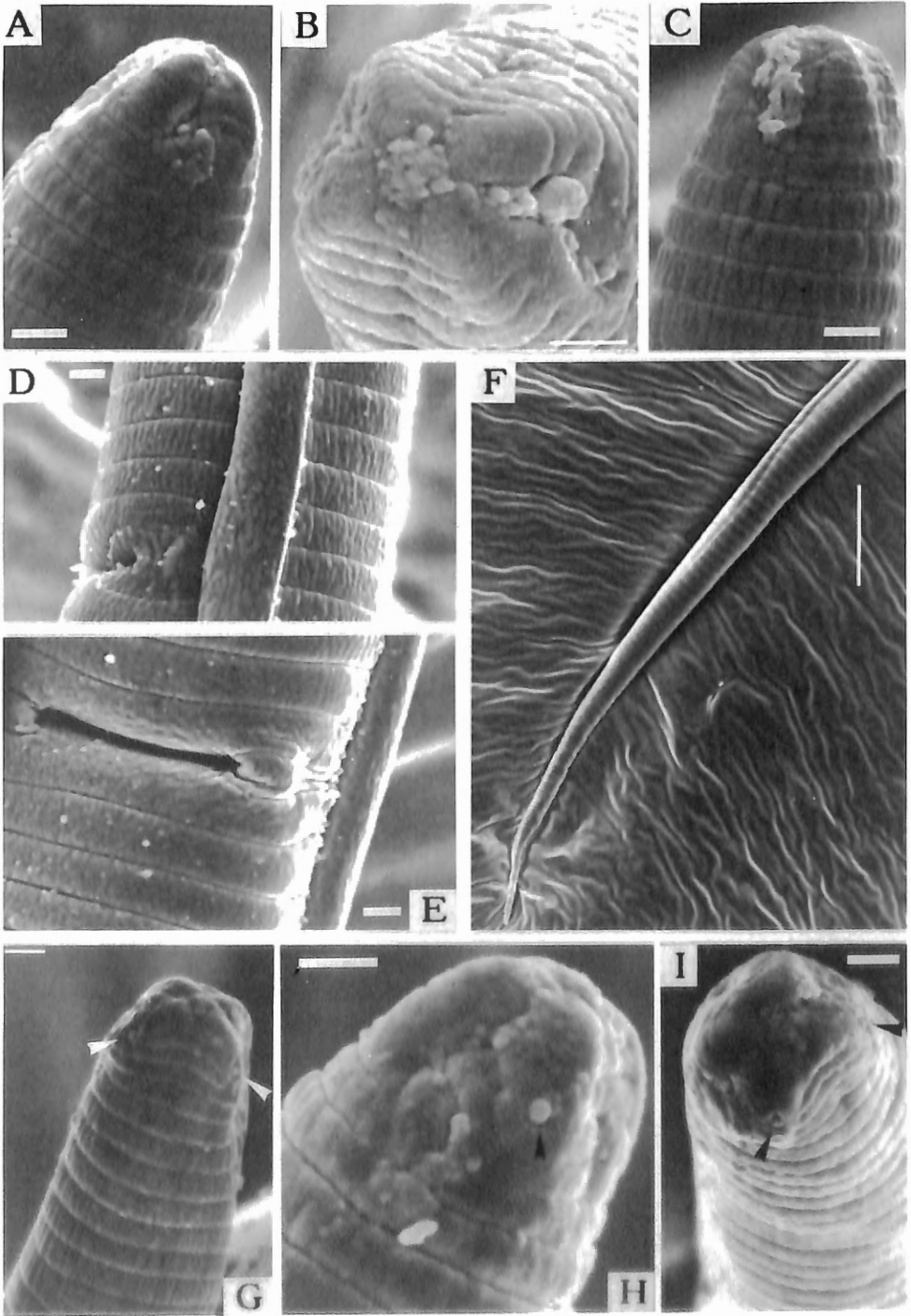


Fig. 5. — *Filenchus facultativus* — A-G. Type I, finely rounded tail tip — A-D. Female — A. Anterior end - B. Tail - C. Reproductive system - D. General view — E-G. Male — E. General view - F. Anterior end - G. Tail — H-N. Type II, rounded tail tip — H-K. Female - H. General view - I. Tail - J. Anterior end - K. Reproductive system - L-N. Male - L. Anterior end - M. Tail - N. General view.



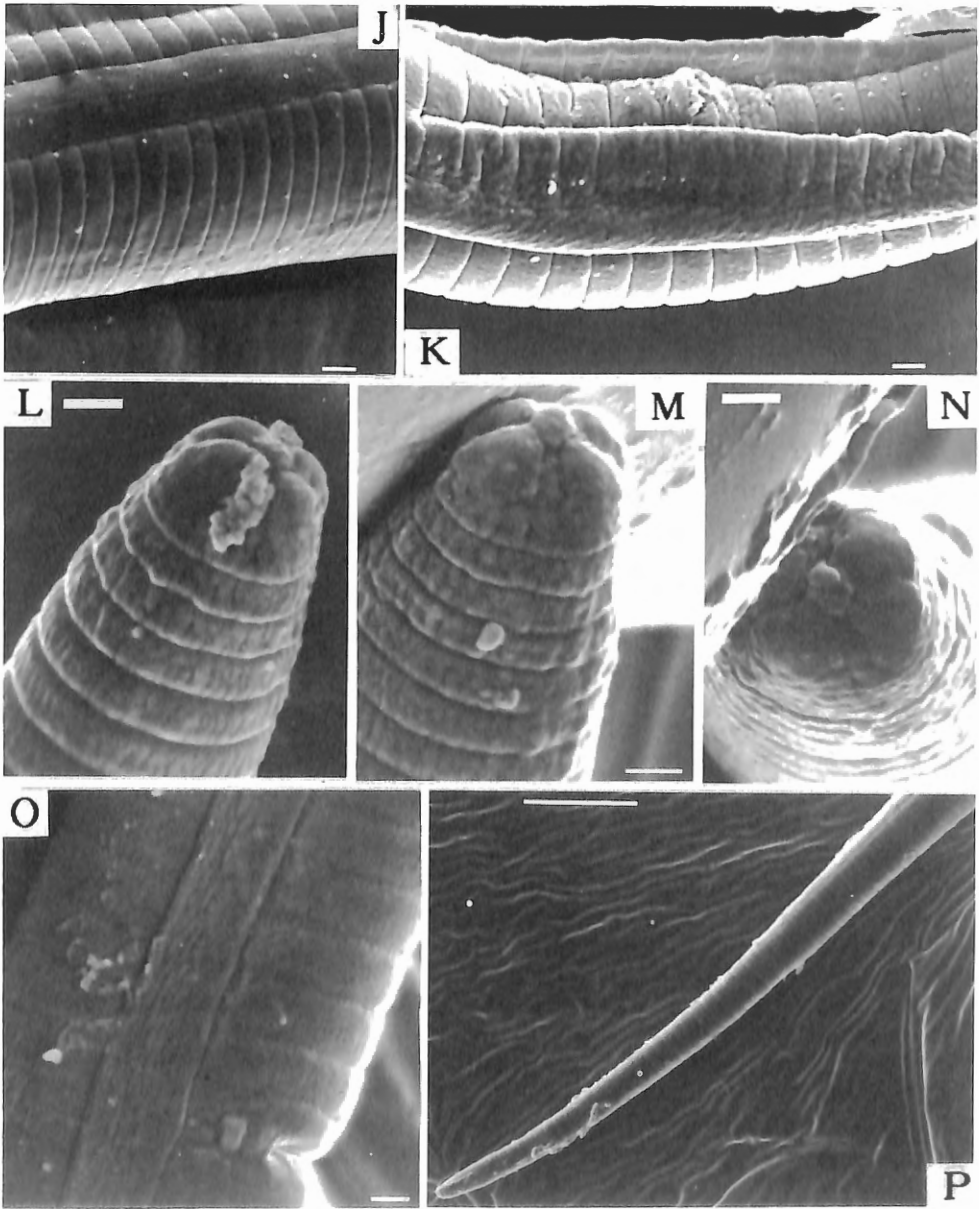


Fig. 6. — *Filenchus facultativus* — A-K. Type I, finely rounded tail tip — A-F. Female — A and C. Lateral views of head - B. Face view - D. Lateral field at vulva - E. Vulva - F. Tail — G-K. Male — G. Ventral view of head - H and I. Ventro-lateral view of head - J. Lateral field - K. Caudal alae — L-P. Type II, rounded tail tip, Female — L. Lateral view of head - M. Ventral view of head - N. Face view - O. Lateral field at vulva - P. Tail. Bars equal 1 μ m on A-E, G-O; 10 μ m on F and D. Arrows indicate paired subventral cephalic papillae.

Type II : There are some differences between the males of this type and the first type but they are consistent with the females : tail is shorter, 74 μm versus 85 ± 5 (80-91) μm ; oesophagus is longer, 84 μm against 78 ± 1.2 (77-80) μm , and the tail end is bluntly rounded.

Discussion

The two types were compared with several populations of *Filenchus facultativus*. Type I with pointed tail tip is close to a Sudanese population (ZEIDAN and GERAERT, 1991), but both types have shorter stylet and tail ; stylet = 8 ± 0.5 (7.5-8.5) and tail = 126 ± 9 (112-140) μm in Sudan population, also the ratios c , c' , and V are smaller in type II : $c = 4.2 \pm 0.4$ (3.8-4.8), $c' = 12.3 \pm 1.1$ (11.2-13) and $V = 63 \pm 1$ (62-65). They differ from an Argentinean population (TORRES and GERAERT, 1996) by having shorter stylet and tail in females ; stylet = 8 ± 0.5 (7.5-9) μm and tail = 141.5 ± 12 (127-161) μm . Two populations from California (RASKI and GERAERT, 1987) and the original description (SZCZYGIEL, 1969) show no differences.

As a whole, the morphometrics of our populations are within the range studied until now, but it is necessary to point out that approximately all studied populations, except the type materials (SZCZYGIEL, 1970) were mixed and have had pointed to rounded tail ends. It seems that there is a correlation between tail shape and oesophagus length and maybe these two types represent two species or one dimorphic species.

Habitat and locality

This population was found at the rhizosphere of cotton, *Gossypium sp.* in Varamin, Iran.

Filenchus misellus (Andrássy, 1958) Raski and Geraert, 1987 (Figs 7 A-F, 8)

Measurements

Females ($n = 5$) : $L = 0.365 \pm 0.01$ (0.350-0.380) mm ; $L' = 0.310 \pm 0.012$ (0.295-0.325) mm ; $a = 28.8 \pm 2.2$ (27-33) ; $b = 5 \pm 0.2$ (4.7-5.4) ; $c = 6.3 \pm 0.3$ (5.9-6.6) ; $c' = 7 \pm 0.8$ (5.6-8.2) ; $V = 69 \pm 1.6$ (67-72) ; $V' = 82.2 \pm 1.6$ (80-85) ; head-anus (VL) = 255 ± 13 (240-275) ; stylet = 6.5-7 μm ; oesophagus = 73.4 ± 4.5 (67-80) μm ; MB = 45.2 ± 2.9 (40-49) ; tail = $58.8 \pm (56-62)$ μm ; $V-a = 54.8 \pm 3.4$ (51-59) μm ; $T/V-a = 1.0-1.1$.

Male : not found.

Description

Females : Cuticle with very fine striation, about 0.9 μm apart. Lateral field with four lines, SEM photo shows two outer bands wider than the middle one, and

aerolated. Cephalic region rounded, with three or four incomplete annuli; labial plate rectangular with rounded corners. Amphidial aperture sinuous, continues to the first head annulus. Oesophagus with oval metacarpus, situated at 33 ± 3.2 (30-39) μm from anterior end. Excretory pore at 56.6 ± 1.9 (53-58) μm from anterior end. Deirid not distinct. Reproductive system outstretched; ovary with one row of oocytes. Vagina short, about 1/3 of VBD, in a right angle to body axis. Vulva-anus distance as long as tail length. Tail conical with pointed terminus; annulation continues to tail end; the latter shows some variation.

Discussion

This population comes close to *F. magnus* (Husain and Khan, 1977) Siddiqi, 1986 and *F. misellus*. The first one has a shorter stylet, 5-6 μm , and the tail is longer than vulva-anus distance. In comparison with a Sudanese population of *F. misellus* (ZEIDAN and GERAERT, 1991) it shows some differences. That population has a slightly shorter stylet, longer tail, more anterior vulva and higher T/V-a value: stylet = 5.5-6.5 μm , tail = 66 ± 4 (60-71) μm , V = 65 ± 1 (63-66), and T/V-a = 1.39 ± 0.17 (1.13-1.57). We consider our population as *F. misellus*.

Habitat and locality

This population was found in the soil around roots of pomegranate, *Punica granatum*, in Yazd.

Filenchus sheri (Khan and Khan, 1979) Siddiqi, 1986 (Fig. 7, G-N)

Measurements

Females (n = 4): L = 0.515 ± 0.019 (0.490-0.535) mm; L' = 0.380 ± 0.015 (0.360-0.395) mm; a = 35.3 ± 3.3 (31.1-39.9); b = 5.6 ± 0.3 (5.3-6.1); c = 3.8 ± 0.1 (3.6-3.9); c' = 14.8 ± 0.9 (13.6-15.8); V = 58.1 ± 1.7 (56.1-60.7); V' = 79 ± 1.8 (76.8-81.5); Stylet = 7.5-8.5 μm ; oesophagus = 92 ± 2.9 (88-95) μm ; MB = 40.4 ± 1.7 (38.9-43.2); V-a = 80.5 ± 2.2 (78-84) μm ; tail = 136 ± 5.8 (127-142) μm ; tail/V-a = 1.7 ± 0.1 (1.5-1.8).

Males (n = 2): L = 0.495-0.500 mm; L' = 0.385-0.390 mm; a = 33.6-39.1; b = 5.6-5.7; c = 4.5-4.6; c' = 11.4-12.9; T = 22.1-40.6; stylet = 9 μm ; oesophagus = 87-90 μm ; MB = 44.4-44.8; tail = 109-112 μm ; spicula = 14.5 μm ; gubernaculum = 4-6 μm .

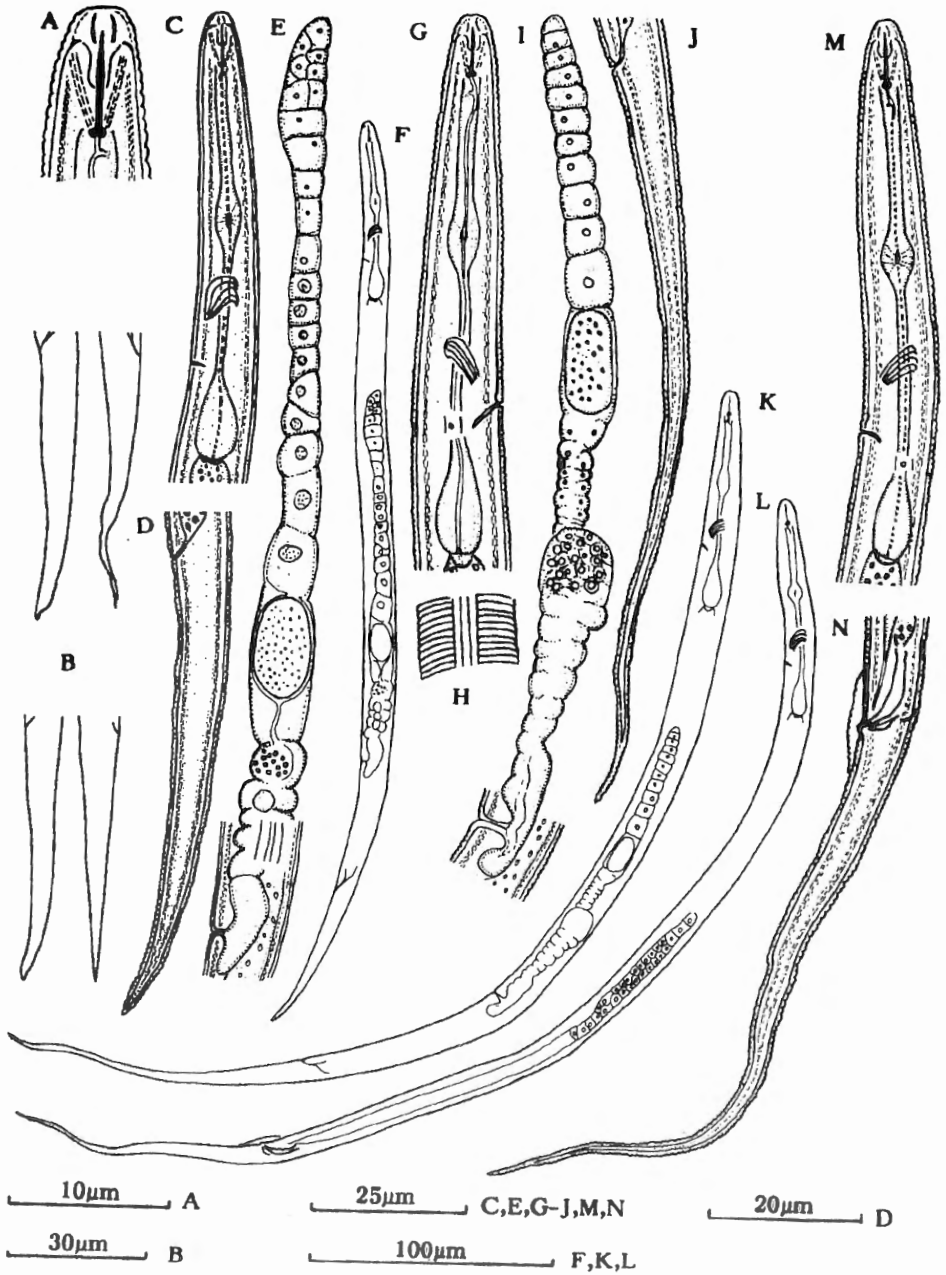


Fig. 7. — A-F. *Filenchus misellus* — A Anterior end - B. Variation in tail shape - C. Oesophagus region - D. Tail - E. Reproductive system - F. General view — G-N. *Filenchus sheri* — G-K. Female — G. Oesophagus region - H. Annulation and lateral field at mid body - I. Reproductive system - J. Tail - K. General view — L-N. Male — L. General view - M. Oesophagus region - N. Tail.

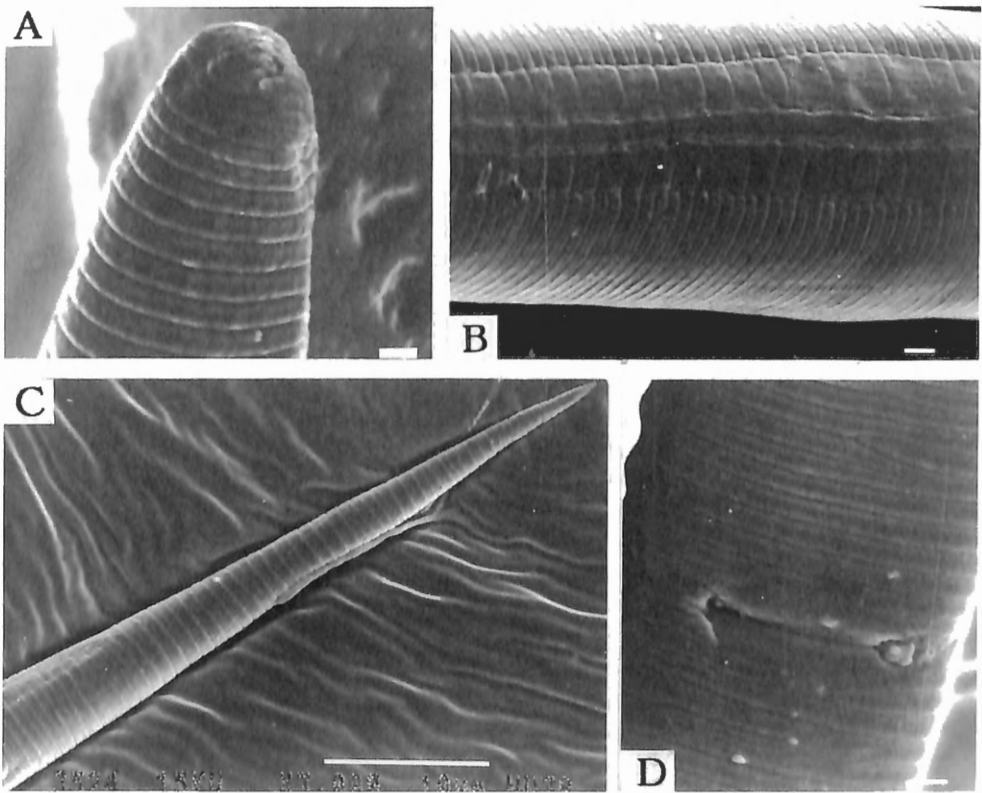


Fig. 8. — *Filenchus misellus* — A. Lateral view of head - B. Lateral field - C. Tail - D. Vulva. Bars equal 1 μm on A, B, D; 10 μm on C.

Description

Female : Cuticle with fine annuli 1-1.1 μm wide ; lateral field with four incisures at midbody, the inner ones difficult to see by light microscope. Head region continuous with body contour, not set off, bears three to four fine annuli up to labial plate. Stylet delicate, knobs well-developed. Metacarpus ovate, with well-developed valvular apparatus, situated at 37 (36-38) μm from anterior end. Isthmus slender ; posterior, glandular region bulb-like pyriform, about 1.5 times the metacarpus. Excretory pore and hemizonid at the same level, 72.5 (66-77) μm from anterior end. Deirids 2-3 annuli posterior to excretory pore.

Gonad outstretched, spermatheca offset, small with rounded sperms. Post-vulval-uterine sac rounded, 8-11 μm long, 0.6-0.9 VBD. Vulva-anus distance shorter than tail length. Tail elongate-conoid, tapering evenly to a finely rounded terminus ; annulation continues to tail end.

Male : corresponds to female except small differences in stylet, tail length, and c ratio : males have slightly longer stylet, shorter tail and higher c value. Spicula ventrally curved ; gubernaculum simple, trough shaped ; bursa adanal.

Discussion

This population with four lines in lateral field comes close to *F. afghanicus* (Khan & Khan, 1978) Siddiqi, 1986 and *F. sheri* (Khan & Khan, 1978) Siddiqi, 1986. *F. afghanicus* has slightly longer stylet, 8-10 μm . Morphometrically our population corresponds to *F. sheri*, but in this species annuli are wider (1.4 μm), and c ratio is slightly higher (4-5), nevertheless, we consider our population as *F. sheri*.

Both species were first found in Afghanistan and described by KHAN and KHAN (1979) as *Tylenchus* species. The original descriptions do not show any big difference between these two. *F. afghanicus* has slightly longer stylet (8-10 μm versus 7-8 μm in *F. sheri*), and more posterior excretory pore, but a Sudanese population of *F. afghanicus* has shorter stylet, 8-8.5 μm long (ZEIDAN and GERAERT, 1991), and in our population excretory pore is like in *F. afghanicus*, and the stylet in males is 9 μm long. So it seems that these two species could be the same, and it is suggested, that for synonymization, the original material is reexamined.

Habitat and locality

Our population was collected from the soil around *Equisetum arvensis* in «Darahe Morad Bayke» Hamadan.

Filenchus vulgaris (Brzeski, 1963) Lownsbery and Lownsbery, 1985

Measurements

Females (n = 5) : L = 0.640 ± 0.06 (0.580-0.730) mm ; L' = 0.485 ± 0.05 (0.430-0.570) ; a = 35 ± 2.2 (31.6-37.2) ; b = $6.1 \pm$ (5.9-6.4) ; c = 4.1 ± 0.2 (3.9-4.5) ; c' = 15.1 ± 1.5 (13.4-17.4) ; V = 57.1 ± 2 (54.6-60.2) ; V' = 75.8 ± 1.5 (73.6-77.5) ; head-vulva = 360 ± 47 (325-440) μm ; stylet = 9.2 ± 0.9 (8.1-10.5) μm ; oesophagus = 105 ± 7.7 (96-115) μm ; MB = 40.8 ± 2.7 (38.1-45.8) ; Vulva-anus = 114 ± 5.4 (105-122) μm ; tail = 156 ± 9.5 (145-172) μm ; annuli = 1.4 ± 0.1 (1.3-1.6) μm ;

Males (n = 6) : L = 0.660 ± 0.034 (0.595-0.670) mm ; L' = 0.505 ± 0.032 (0.445-0.540) mm ; a = 37.6 ± 3 (33.5-42.6) ; b = 6.1 ± 0.2 (5.8-6.4) ; c = 4.3 ± 0.4 (3.9-5.2) ; c' = 12.9 ± 1.7 (9.8-15.3) ; T = 36.2 ± 2.5 (33.5-40.4) ; stylet = 9.3 ± 0.4 (8.5-10) μm ; oesophagus = 109 ± 5.9 (100-119) μm ; MB = 42.2 ± 2.1 (39.6-46.2) ; tail = $154.3 \pm$ (128-177) μm ; Spicula = 16.7 ± 1 (15.5-18.5) μm ; gubernaculum = 4.4 ± 0.7 (3.8-5.8) μm ; annuli = 1.2 ± 0.1 (1-1.5) μm .

Habitat and locality

This population that very closely corresponds with the original description and several populations of *F. vulgaris* (Raski and Geraert, 1987) was found in the soil around tea, *Thea sp.* in Tea Research Centre, Lahijan.

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