

## Three Unrecorded Species of Tylenchidae in Korea\*

참線蟲科의 韓國 3 未記錄種

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**ABSTRACT** During the study on nematodes associated with medicinal herbs, three species of Tylenchidae, *Ditylenchus citri*, *D. equalis* and *Psilenchus iranicus* were firstly recorded in Korea. AS these species are not common a short description is presented.

**KEY WORDS** Nematoda, Tylenchidae, systematics, medicinal plant

**초 록** 藥用作物 寄生線蟲 調査中 Tylenchidae 科 韓國 未記錄 線蟲 3種 *Ditylenchus citri*, *Ditylenchus equalis*, *Psilenchus iranicus*를 發見하였기로 이들의 分類 形態學的 特徵 및 寄主植物을 發表한다.

**검색어** 분류, 線蟲綱, 참선충과, 약용작물

### DESCRIPTION

*Ditylenchus citri*(Varaprasad, Khan & Lal, 1980) Fortuner & Maggenti, 1987 (Fig. 1)

**Female:** Body relatively slender, lateral field with six incisures occupying about one third of body width. Lip region low, not offset from body contour. Stylet slender with small knobs. Excretory pore one body diameter anterior base of oesophagus. Corpus of oesophagus slightly shorter than isthmus. Basal bulb elongate, overlapping. Ovary single, outstretched. Postuterine branch two times long vulval body width, extending about one third of the vulva-anus dis-

tance. Tail elongate, tapering gradually, terminus pointed.

**Male:** General shape similar to female. Bursa extending about half of the tail length. Spicule slightly arcuate. Gubernaculum thin.

**Host plant and locality:** Soil around *Rehmannia glutinosa* at Jojeong-ri, Kunbuk-myon, Kumsan-gun, Ch'ungcheongnam-do and *Cinidium officinale* at Seogdong-ri, Nami-myon, Kumsan-gun, Ch'ungcheongnam-do.

*Ditylenchus equalis* Heyns, 1964

(Fig. 2)

**Female:** Body slightly curved ventrally and swollen. Lip region low, flat. Stylet with small knobs. Median bulb elongate fusiform with valve, basal bulb elongate pyriform, not overlapping. Excretory pore situated at anterior part of basal bulb, sometimes at base of basal bulb. Lateral field with 4 incisures. Intestinal lumen broad. Ovary outstretched, well developed,

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Table 1. Measurement of *Ditylenchus citri* from *Cinidium officinale*

	Female(n=20)		Male(n=5)	
	Range	Mean $\pm$ SD	Range	Mean $\pm$ SD
	Measurements in $\mu\text{m}$			
Body length	862-995	902.3 $\pm$ 43.6	852-870	861 $\pm$ 9
Body width	18-22	20 $\pm$ 1.3	21	21
Head to excretory pore	103-117	109 $\pm$ 4.7	97-109	103 $\pm$ 6
Head to hemizonid	98-110	104.7 $\pm$ 3.8	103-106	104.5 $\pm$ 1.5
Oesophagus length	123-141	130.3 $\pm$ 7	115-136	125.5 $\pm$ 10.5
Corpus	39-58	50.6 $\pm$ 6.4	47-53	50 $\pm$ 3
Isthmus	42-55	50.5 $\pm$ 4.3	44-51	47.5 $\pm$ 3.5
Stylet length	8-9	8.5 $\pm$ 0.5	8.5-9	8.8 $\pm$ 0.3
Tail length	77-81	79.5 $\pm$ 1.5	71-72	71.5 $\pm$ 0.5
Ratio a	40-50	45.3 $\pm$ 4	47.3-54.3	50.8 $\pm$ 3.5
Ratio b	6.3-7.2	6.9 $\pm$ 0.3	6.2-7.5	6.9 $\pm$ 0.6
Ratio c	11-12.4	11.3 $\pm$ 0.5	12	12
Ratio c'	5.1-6.7	5.9 $\pm$ 0.5		
Post uterine sac	80-81.3	30 $\pm$ 4.7		
V%	80-81.3	80.5 $\pm$ 0.5		
G1%	30-47	38.7 $\pm$ 5.5		
Dorsal gland opening	1-1.5	1.3 $\pm$ 0.2	1	1
T%			38.3-39	38.7 $\pm$ 0.4
Spicule length			21	21
Gubernaculum length			6-7	6.5 $\pm$ 0.5

Table 2. Measurement of *Ditylenchus citri* from *Rehmannia glutinosa*

	Female(n=20)		Male(n=5)	
	Range	Mean $\pm$ SD	Range	Mean $\pm$ SD
	Measurements in $\mu\text{m}$			
Body length	827 - 962	898.3 $\pm$ 38.6	845 - 962	892.3 $\pm$ 50.3
Body width	16 - 22	19.2 $\pm$ 1.8	20 - 24	21.7 $\pm$ 1.7
Head to excretory pore	105 - 114	109.4 $\pm$ 3.3	97 - 107	101.3 $\pm$ 4.2
Head to hemizonid	100 - 110	105.4 $\pm$ 3.1	18 - 19	18.3 $\pm$ 0.5
Oesophagus length	137 - 157	144.7 $\pm$ 6	133 - 152	141 $\pm$ 8
Corpus	47 - 56	53.5 $\pm$ 2.4	49 - 60	53 $\pm$ 5
Isthmus	46 - 59	52.9 $\pm$ 3.9	45 - 52	49.7 $\pm$ 3.3
Stylet length	8 - 10	9 $\pm$ 0.4	8 - 9	8.3 $\pm$ 0.5
Tail length	71 - 90	81.1 $\pm$ 5.7	72 - 85	79 $\pm$ 5.4
Ratio a	3.7 - 56.5	47.8 $\pm$ 3.4	45.7 - 46.9	46.3 $\pm$ 0.5
Ratio b	5.4 - 6.9	6.1 $\pm$ 0.5	6.1 - 6.2	6.2 $\pm$ 0.0
Ratio c	10.1 - 13.2	11.1 $\pm$ 0.9	10.2 - 10.9	10.6 $\pm$ 0.3
Ratio c'	5.2 - 7	6.3 $\pm$ 0.6		
Post uterine sac	28 - 40	35.6 $\pm$ 4		
V%	77.9 - 80.7	79.6 $\pm$ 0.9		
G1%	27.6 - 38.8	32.2 $\pm$ 3.7		
Dorsal gland opening	1.0 - 1.6	1.3 $\pm$ 0.3		
T%			25.5 - 30.7	27.6 $\pm$ 2.2
Spicule length			20 - 24	21.7 $\pm$ 1.7
Gubernaculum length			6 - 7	6.7 $\pm$ 0.5

Table 3. Measurement of *Ditylenchus equalis* from *Liriope platyphylla*

	Female(n=20)		Male(n=5)	
	Range	Mean ± SD	Range	Mean ± SD
	Measurements in $\mu\text{m}$			
Body length	630 - 750	690.9 ± 28.6	547 - 675	614.4 ± 43.5
Body width	19 - 27	23 ± 1.9	17.5 - 19	18.2 ± 0.6
Head to excretory pore	82 - 95	87.3 ± 2.9	70 - 96	85.2 ± 10.6
Head to hemizonid	78 - 88	83.1 ± 2.8	75 - 91	83 ± 8
Oesophagus length	93 - 115	102 ± 4.6	94 - 111	102 ± 7
Head to median bulb	32 - 44	39.7 ± 3.1	35 - 46	40 ± 4.5
Percentage of median bulb	32.6 - 44.4	38.5 ± 3.2	37.2 - 41.4	39.1 ± 1.7
Stylet length	5 - 7	5.7 ± 0.6	4.5 - 5	4.8 ± 0.2
Tail length	34 - 51	43.8 ± 4.2	38 - 45	40.5 ± 2.7
Ratio a	25.7 - 33.5	29 ± 2	28.5 - 35.5	32.5 ± 2.4
Ratio b	6.2 - 9	6.8 ± 0.6	6.0 - 7.5	6.6 ± 0.6
Ratio c	14 - 20.2	15.9 ± 1.8	14.2 - 15.1	14.8 ± 0.3
Ratio c'	2.9 - 3.9	3.4 ± 0.29		
Vulva to anus	57 - 79	68.4 ± 5.6		
Post uterine sac	21 - 32	25.8 ± 3.1		
V%	80.9 - 85	82.6 ± 1.1		
G1	49.2 - 70.7	59 ± 6.4		
T%			58.6 - 66.6	63.2 ± 2.9
Spicule length			15 - 20	17.7 ± 2.1
Gubernaculum length			5 - 6	5.3 ± 0.5
Cloaca to end of bursa			28 - 32	30 ± 2
Bursa/tail percent			70 - 71	70.5 ± 0.5

sometimes reaching nearly anterior of intestine. Oocytes in single file, spermatheca elongate, tubular with sperm. The columella with four rows of four cells. Posterior uterine branch longer than vulval body width. Tail two third as long as vulva-anus distance. Tail bent, arcuate to pointed terminus.

**Male:** General body shape similar to female but more slender than female. Tail arcuate to pointed terminus and bent.

**Discussion:** This population was identified as *Ditylenchus microdens* THORNE and MALEK, 1968. As Brzesik(1991) considers it to be a specing. We preferred to use *D. equalis* as species name. There are, however, some differences in measurements; 1. Stylet is shorter 5.7 $\mu\text{m}$ (in *D. equalis* 8  $\mu\text{m}$ ). 2. Oesophagus is shorter 93-115  $\mu\text{m}$ (in *D. equalis* 114-134  $\mu\text{m}$ ). 3. Body length is shorter L=630-750  $\mu\text{m}$ (in *D. equalis* 822-885  $\mu\text{m}$ ).

**Host plant and locality:** Soil around *Liriope platyphylla* at Daebong-ru, Namyang-myon, Cheongyang-gun, Ch'ungcheong-nam-do.

#### *Psilenchus iranicus* Kheiri, 1970

(Fig. 3)

**Female:** Lip region with five to seven fine transverse striae and continuous with body contour, tapering anteriorly. Stylet slender, without basal knobs, slightly swollen. Anterior portion shorter than half of the shaft. Dorsal oesophageal gland orifice about 7-9  $\mu\text{m}$ , one third to one half of stylet length behind spear base. Median bulb situated at 57-59.6% of oesophagus. Oesophago-intestinal valve distinct. Excretory pore 121-140  $\mu\text{m}$  from anterior end. Hemizonid from one annul anterior to just posterior to excretory pore, 120-138  $\mu\text{m}$  from anterior end. Body 27-30  $\mu\text{m}$  wide. Tail 140-175  $\mu\text{m}$  long, 7-8 times

Table 4. Measurement of *Psilenchus iranicus* from *Aconitum carmichaeli*

	Female(n=14)		Male(n=11)	
	Range	Mean±SD	Range	Mean±SD
	Measurements in $\mu\text{m}$			
Body length	1065 - 1525	1252.4 ± 108.1	900 - 1235	1049.2 ± 97.1
Body width	27 - 30	28.6 ± 1.2	22.5 - 30.0	24.7 ± 2.1
Head to excretory pore	121 - 140	129.9 ± 6.3	112 - 135	124.5 ± 6.8
Head to hemizonid	120 - 138	127.8 ± 5.7	112 - 130	123.2 ± 5.5
Oesophagus length	150 - 175	160.1 ± 7.2	145 - 166	153.9 ± 6.4
Head to median bulb	88 - 101	93.6 ± 3.9	82 - 95	89.9 ± 4.4
Percentage of median bulb	57.1 - 59.6	58.5 ± 0.8	56.6 - 60.5	58.8 ± 1.1
Stylet length	14 - 17	15.3 ± 1.0	13 - 17	15 ± 1.1
Base of stylet to DGO	7 - 10	8.3 ± 0.9	6 - 9	7.5 ± 1
Tail length	148 - 182	159.5 ± 11.3	132 - 178	154.6 ± 14.7
Anal body width	19 - 30	21.9 ± 2.7		
Ratio a	38 - 46.9	42.2 ± 2.2	40 - 48.4	44.2 ± 2.6
Ratio b	6.8 - 9.2	7.8 ± 0.6	6.2 - 8.2	6.9 ± 0.6
Ratio c	6.8 - 8.5	7.7 ± 0.5	6.1 - 7.4	6.8 ± 0.4
Ratio c'	6 - 8	7.2 ± 0.5		
V%	47.7 - 50.4	49.4 ± 0.7		
G1%	24.8 - 35.2	27.6 ± 2.7		
G2%	24.1 - 29.7	26.8 ± 1.7		
Spicule length			25 - 30	27.7 ± 2
Gubernaculum length			7 - 11	9.2 ± 1.1
Cloaca to end of bursa			30 - 41	35.4 ± 3.9

anal body width. Phasmid situated at 1.8-2.6 times behind anal body width from anus level.

**Male:** General shape similar to female. Bursa finely creanated, extending one to two spicule length behind the cloaca.

**Host plant and locality:** Soil around *Aconitum carmichaeli* at Seogdong-ri, Nami-myon, Kumsan-gun, Ch'ungcheongnam-do.

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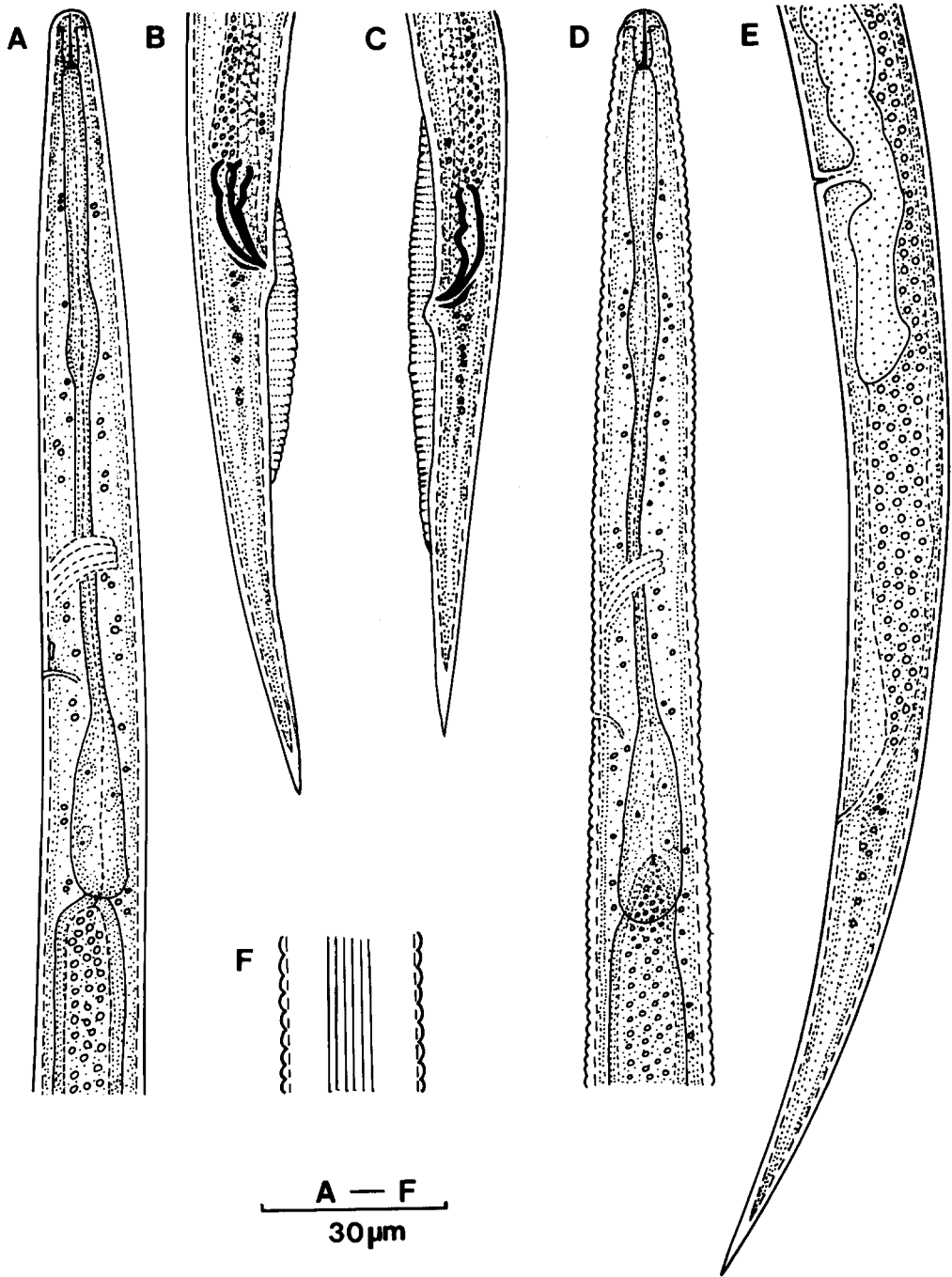


Fig. 1. *Ditylenchus citri*. A: Anterior part of male, B,C: Male tail, D: Anterior part of female, E: Posterior part of female, F: Lateral field.

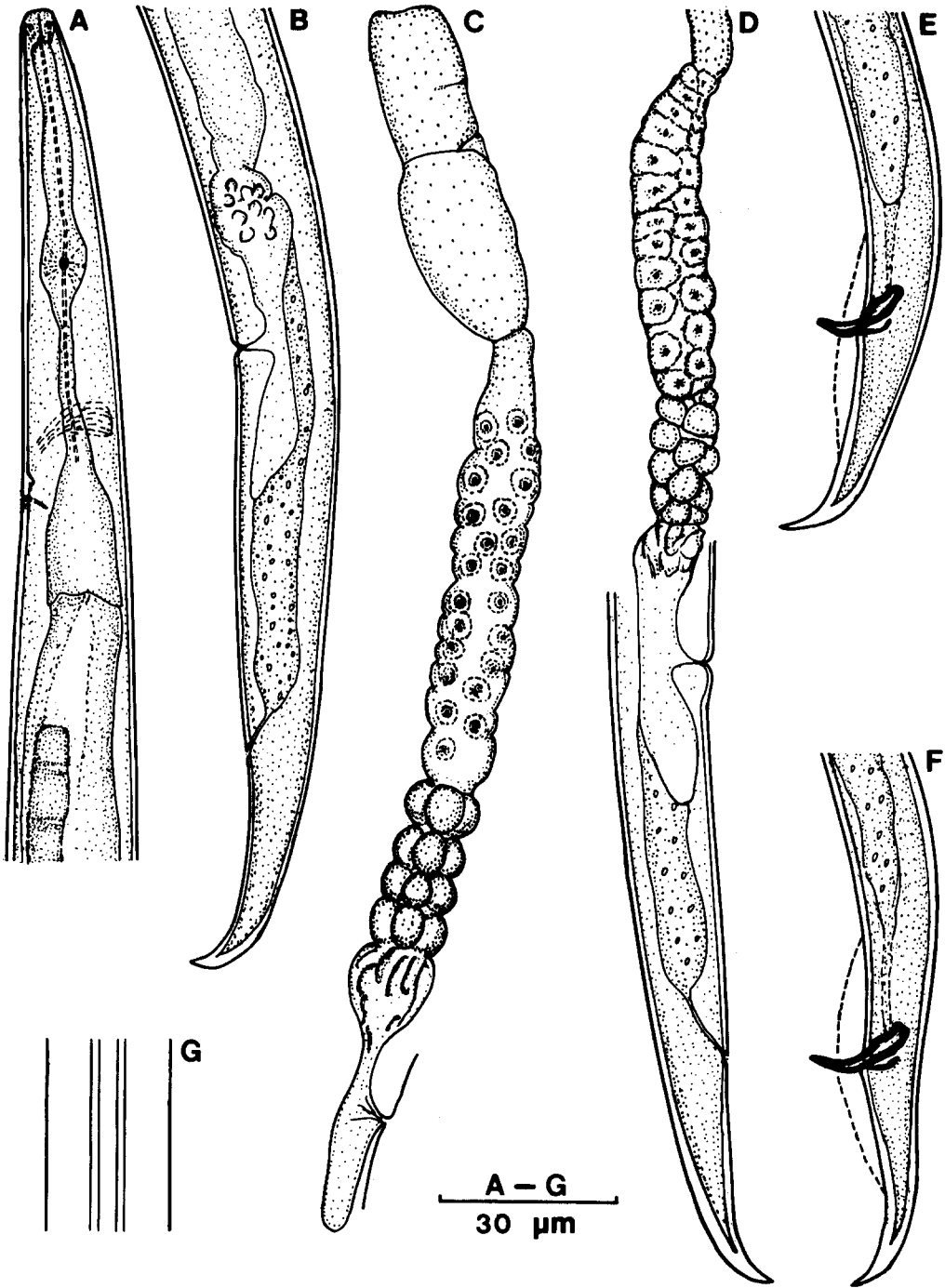


Fig. 2. *Ditylenchus equalis*. A: Anterior part of female, B,D: Posterior part of female, C: Female reproductive system, E,F: Mail tail.

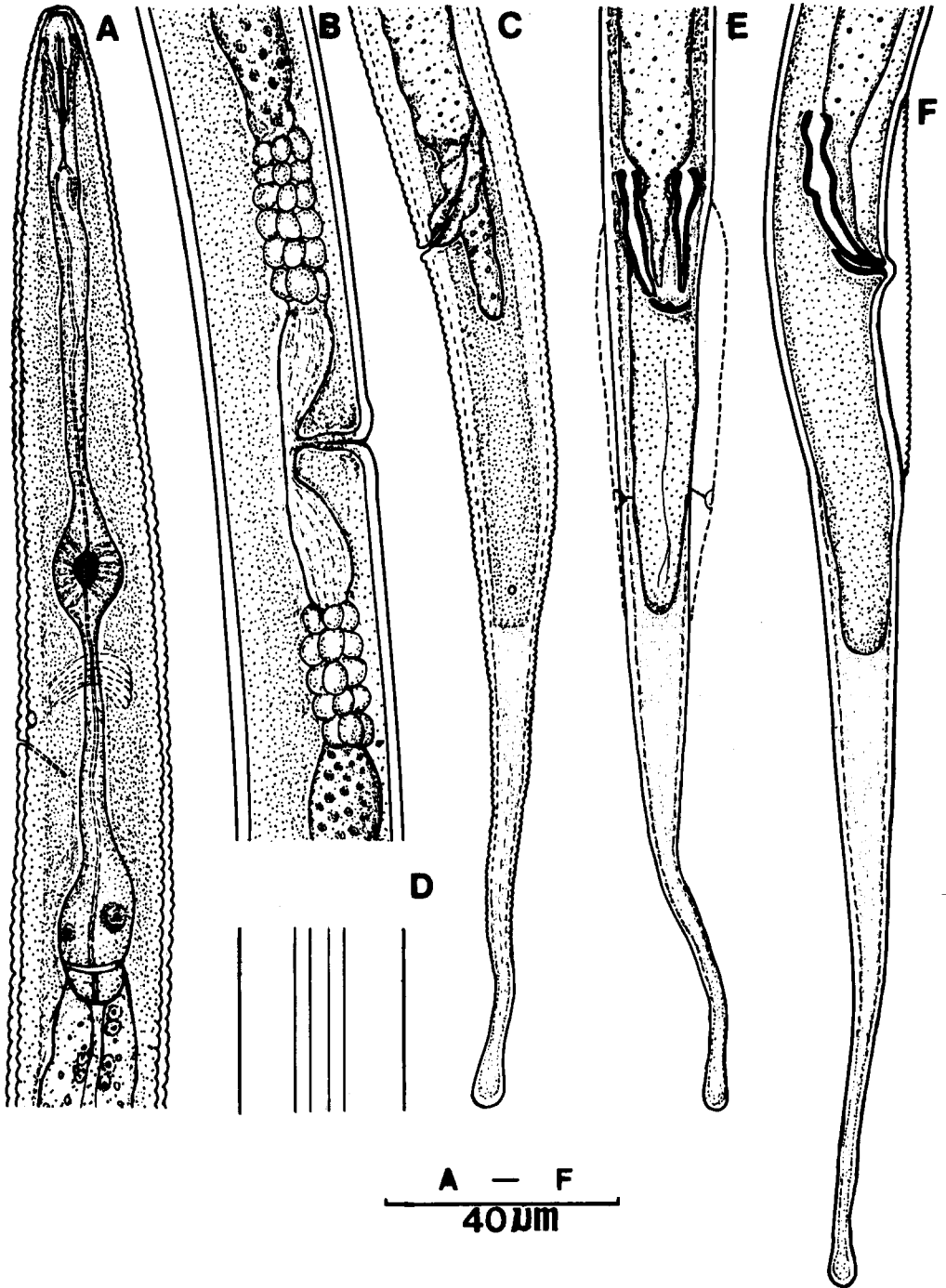


Fig. 3. *Psilenchus iranicus*. A: Anterior part of female, B: Vulva region, C: Posterior part of female, D: Lateral field, E: Ventral view of male posterior part, F: Posterior part of male.