

## Two new species of Plectidae from India (Nematoda : Araeolaimida)

Qudsia TAHSEEN, Irfan AHMAD and M. Shamim JAIRAJPURI

Section of Nematology, Department of Zoology, Aligarh Muslim University, Aligarh-202002, India.

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**Summary** – Two new plectid species are described and illustrated. *Tylocephalus palmatus* n. sp. has L = 0.47-0.61 mm, a = 14-18; b = 3.6-4.3, c = 13.1-13.9 and V = 42-49. It is close to *T. auriculatus* (Bütschli, 1873) Anderson, 1966 and *T. andinus* Zell, 1993. *Plectus refusus* n. sp. has L = 0.38-0.44 mm, a = 18-26; b = 3.08-3.93; c = 6.26-8.65 and V = 41-53 %. It is close to *P. geophilus* de Man, 1880.

**Résumé** – Deux nouvelles espèces de Plectidae sont décrites et illustrées. *Tylocephalus palmatus* n. sp. présente les caractères suivants : L = 0,41-0,61 mm; a = 14-18; b = 3,6-4,3; c = 13,1-13,9; V = 42-49. Cette nouvelle espèce est proche de *T. auriculatus* (Bütschli, 1873) Anderson, 1966 et de *T. andinus* Zell, 1993. *Plectus refusus* n. sp. présente les caractères suivants : L = 0,38-0,44 mm; a = 18-26; b = 3,08-3,93; c = 6,25-8,65; V = 41-53. Cette nouvelle espèce est proche de *P. geophilus* de Man, 1880.

**Key-words** : Araeolaimida, *Tylocephalus*, *Plectus*, SEM, nematodes.

While screening samples of sewage slurry and organic debris collected from Aligarh, two new species of Plectidae – *Tylocephalus palmatus* n. sp. and *Plectus refusus* n. sp. – were found. This paper deals with their detailed descriptions as supplemented with SEM observations.

The soil samples were processed by sieving and decantation and modified Baermann's funnel technique. The nematodes were fixed, dehydrated and then mounted in anhydrous glycerin. For scanning electron microscopy the nematodes were processed by glutaraldehyde and osmium tetroxide fixation, dehydrated in the graded acetone series and critical-point dried. Specimens coated with gold were observed in a Hitachi S-2300 SEM at 15 kV.

### *Tylocephalus palmatus* n. sp.

(Figs 1, 2)

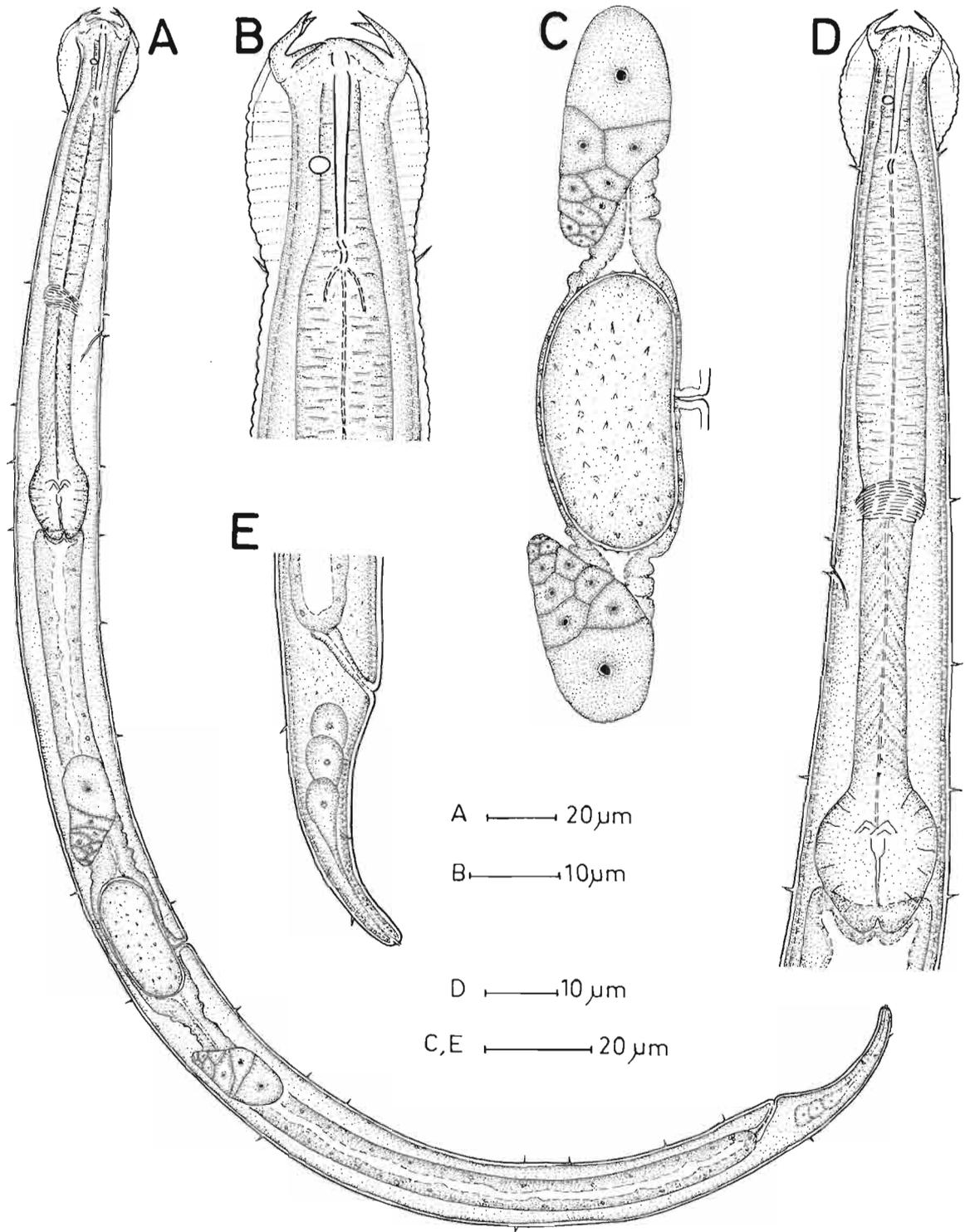
#### MEASUREMENTS

*Females* (Paratype; n = 9) : L = 0.47-0.61 (0.53 ± 0.05) mm; a = 14-18 (15.8 ± 1.9); b = 3.6-4.3 (3.9 ± 0.8); c = 13.1-13.9 (13.5 ± 0.4); c' = 2.3-2.8 (2.4 ± 0.2); V = 42-49 (46 ± 2.9); ABD = 15-17 (16 ± 0.9) µm; stoma = 21-23 (22.1 ± 0.9) µm; oesophagus = 103-173 (146 ± 25.2) µm; tail = 36-48 (41 ± 4.7) µm.

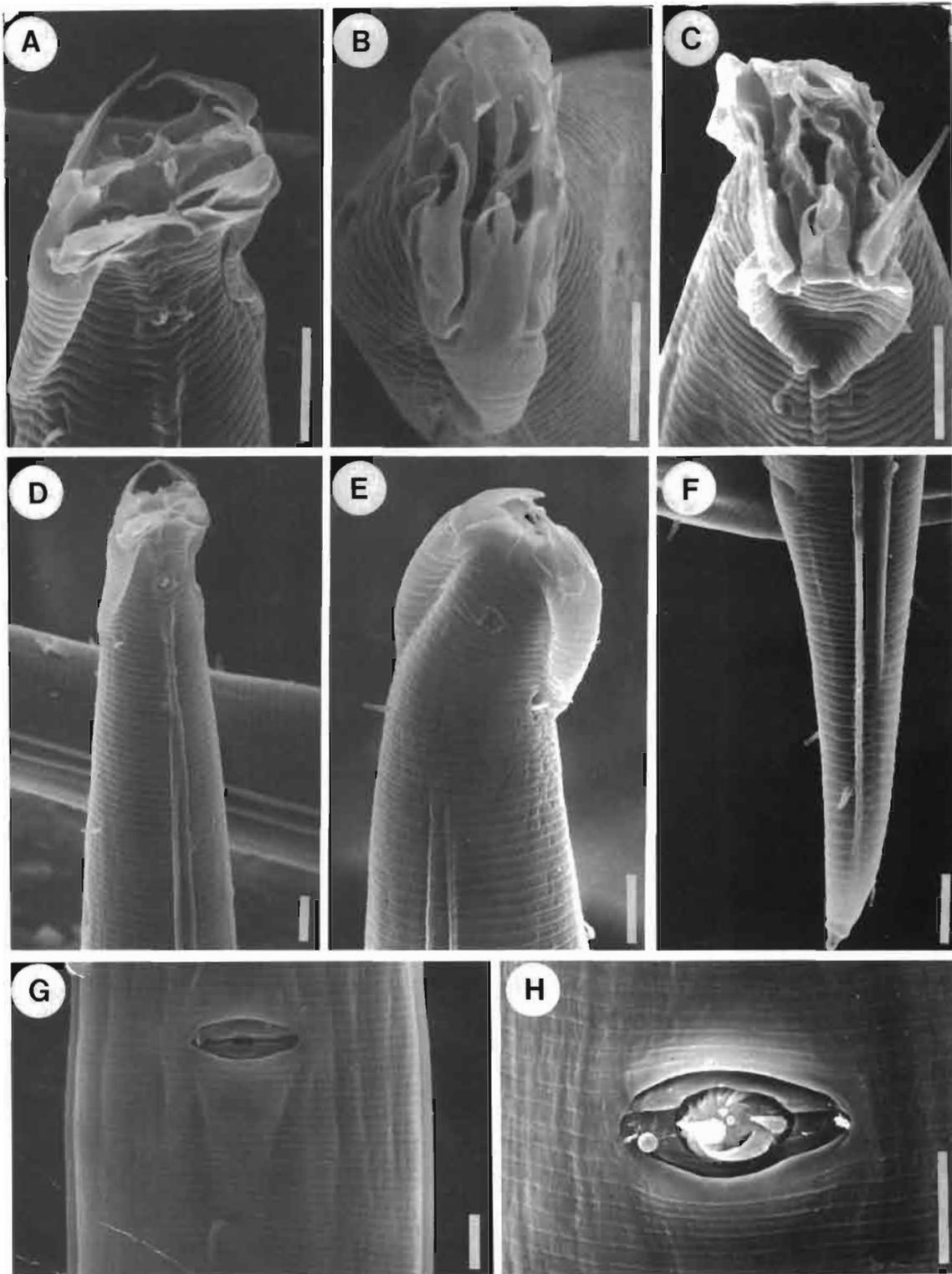
*Holotype* (female) : L = 0.60 mm; a = 16.3; b = 3.7; c = 13.5; c' = 2.7; V = 49; stoma = 22 µm; oesophagus = 166 µm; tail = 45 µm; ABD = 16.5 µm.

#### DESCRIPTION

*Female* : Body small, robust, tapering more towards posterior extremity. Cuticle finely transversely striated, striae about 1 µm at midbody. Lateral alae paired, occupying 1/4 – 1/5 of body width at midbody, originating some distance below base of cervical alae and terminating unequally, the dorsal in middle and ventral near the tip of tail. Cervical expansion 15-21 µm long, relatively flat, about 4-4.5 times longer than wide. Maximum neck width in the region of cervical expansion 18-20 µm. Cervical expansion annulated in posterior part, number of annules ranges from 12-13, anterior part of cervical expansions arch over the stoma, each extension with a ridge flanked by tines. Cornua large and prominent, cornual plates not clearly distinguishable under LM. Submedian lamellae prominent sandwiching between them a mid-lateral sensilla. Oral aperture somewhat diamond-shaped when mouth is partly open. Four submedian perioral flaps present, more clearly defined when the oral aperture is open. Lips modified into cuticular folds. Lips 7-9 µm wide and 4-5 µm high. Cheilostom cuticularized, expanded. Protostom cylindroid, narrower posteriorly, protohabdions not demarcated, telorhabdions obscure. Amphidial apertures elliptical, located in the middle or slightly anterior to middle of stoma. Oesophageal procorpus cylindrical, muscular, 65-85 µm long; isthmus almost as broad as corpus, not well demarcated, 40-70 µm long. Nerve ring encircling the corpus-isthmus junction, 67-85 µm from anterior end. Excretory pore with prominent excretory duct 82-91 µm from anterior end, slightly posterior to nerve



**Fig. 1.** *Tylocephalus palmatus* n. sp. A : Entire female; B : Anterior end; C : Reproductive system; D = Oesophageal region; E = Tail.



**Fig. 2.** *Tylocephalus palmatus* n. sp. SEM graphs. A-C: En face view; D, E: Anterior region; F: Tail; G, H: Vulva (Scale bar = 5  $\mu$ m).

ring. Hemizonid small, anterior to excretory pore. Basal bulb of oesophagus well developed,  $21-26 \times 18-20 \mu\text{m}$ . Cardia conoid,  $6-7 \mu\text{m}$  long. Intestine granular. Rectum  $12-15 \mu\text{m}$  long or slightly shorter than the anal body diameter. Gonads amphidelphic, ovaries reflexed. Eggs oval, shell with claw-like spines. Vulva a transverse slit, 4-5 annules across, with inner vulval flaps. Rectum  $12-14 \mu\text{m}$  long. Tail ventrally arcuate, tip with well developed spinneret. Caudal setae six: two mid-dorsals, slightly below the level of anus and near tail tip; one subventral pair just below middle of tail and one subdorsal pair at two thirds of tail length from anus. Terminal caudal seta  $13-15 \mu\text{m}$  anterior to spinneret tip. Three caudal glands arranged in tandem leading to exterior through a duct orifice at the tail terminus. Body setae numerous.

*Male*: Not found.

#### TYPE SPECIMENS

*Holotype* (female) on slide *Tylocephalus palmatus* n. sp./1 deposited in the Nematode Collection, Department of Zoology, Aligarh Muslim University, Aligarh. *Paratypes*: Seven females on slides *Tylocephalus palmatus* n. sp./3-5 deposited at Aligarh Muslim University. Two females on slide *Tylocephalus palmatus* n. sp./2 deposited at Muséum National d'Histoire Naturelle, Paris, France.

#### TYPE HABITAT AND LOCALITY

Debris from a cavity in the trunk of bottle-neck palm, Zoology Department, Aligarh Muslim University, Aligarh.

#### DIAGNOSIS AND RELATIONSHIP

*T. palmatus* n. sp. is characterized by a long stoma, diamond-shaped oral aperture with four perioral flaps and six caudal setae.

The new species resembles most *T. andinus* Zell, 1993 in most of the morphometric and allometric details but differs in having a relatively flat cervical expansion with larger number of annules, longer stoma, broader lateral alae and different arrangement of caudal setae (cervical expansion with nine annules, stoma =  $16-17 \mu\text{m}$ , lateral alae  $1/5 - 1/6$  of body width and six caudal setae; one pair latero-ventral near mid tail, one pair latero-dorsal below anus and two dorso-median setae close to the terminus in *T. andinus*).

*T. palmatus* also resembles *T. auriculatus* (Bütschli, 1873) Anderson, 1966 but differs in having a longer stoma, incompletely annulated cervical expansion and larger number and different arrangement of caudal setae (stoma =  $14-21 \mu\text{m}$ , cervical expansion completely annulated, caudal setae 5: one pair latero-ventral near mid tail, one pair latero-dorsal near terminus and one dorso-median below anus in *T. auriculatus*). It further differs from *T. auriculatus* in many of the SEM characteristics as given by Sauer and Annells (1982) such as oral aper-

ture diamond-shaped *vs* double diamond-shaped in open mouth condition; inner vulval flaps *vs* outer vulval flaps.

### *Plectus refusus* n. sp.

(Figs 3, 4)

#### MEASUREMENTS

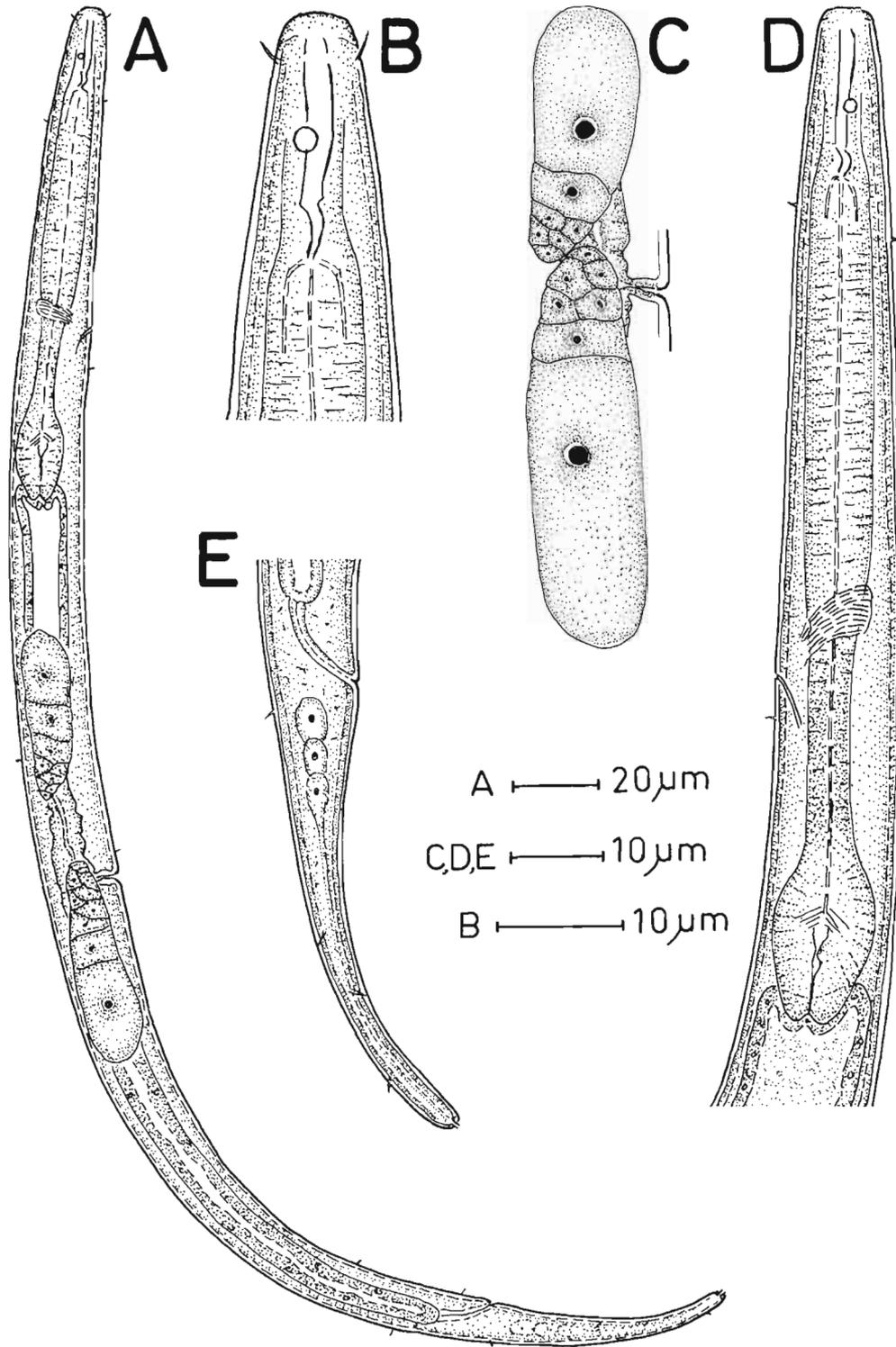
*Females* (Paratype;  $n = 5$ ):  $L = 0.38-0.44$  ( $0.41 \pm 0.02$ ) mm;  $a = 18-26$  ( $20 \pm 2.5$ );  $b = 3.1-3.9$  ( $3.4 \pm 0.4$ );  $c = 6.3-8.7$  ( $7.5 \pm 0.8$ );  $c' = 4.6-5.8$  ( $5.1 \pm 0.7$ );  $ABD = 10-12$  ( $10.9 \pm 0.8$ )  $\mu\text{m}$ ;  $V = 41-53$  ( $46 \pm 6.2$ );  $\text{stoma} = 19-21$  ( $20 \pm 0.7$ )  $\mu\text{m}$ ;  $\text{oesophagus} = 105-125$  ( $112.8 \pm 8.91$ )  $\mu\text{m}$ ;  $\text{tail} = 50-56$  ( $52.5 \pm 3.1$ )  $\mu\text{m}$ .

*Holotype* (Female):  $L = 0.43$  mm;  $a = 24.3$ ;  $b = 3.8$ ;  $c = 8.6$ ;  $c' = 4.8$ ;  $V = 51$ ,  $\text{stoma} = 19.5 \mu\text{m}$ ;  $\text{oesophagus} = 115.5 \mu\text{m}$ ;  $\text{tail} = 51 \mu\text{m}$ ;  $ABD = 10.5 \mu\text{m}$ .

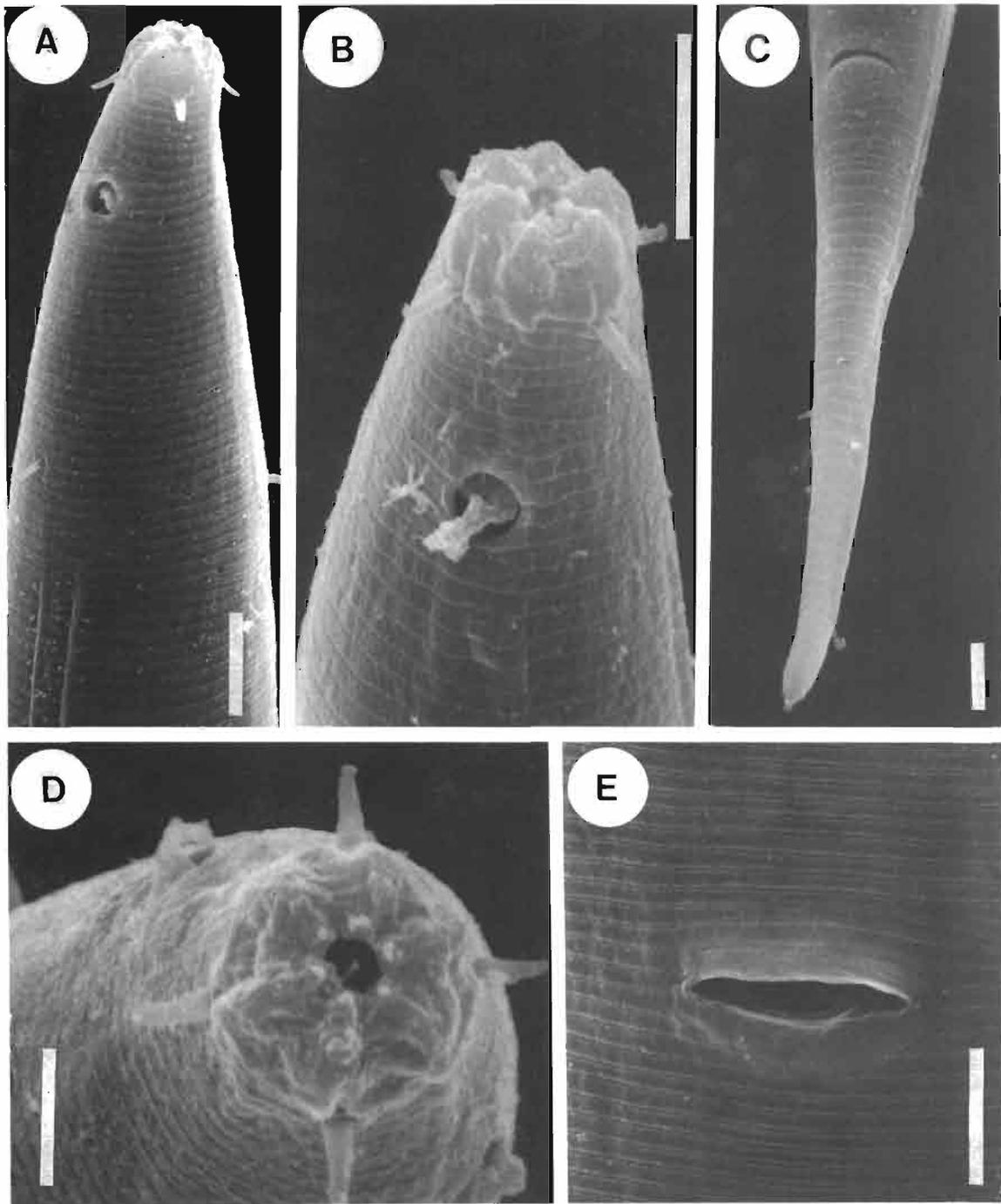
#### DESCRIPTION

*Female*: Body slightly arcuate in the posterior region, regularly tapering towards extremities, more posteriorly than anteriorly. Cuticle with fine transverse striations usually not visible in LM. In SEM transverse striae appear  $0.50-0.75 \mu\text{m}$  wide at midbody. Lateral alae paired, occupying  $1/7-1/8$ th of body width at midbody. Lip region continuous with main body contour, two or three times broader than high. Lips prominently elevated, partially amalgamated,  $6-8 \mu\text{m}$  wide and  $2.5-3 \mu\text{m}$  high. Six inner labial sensilla prominent, perioral. Cephalic sensilla setose,  $2.0-2.5 \mu\text{m}$  or about  $1/3-1/4$  of lip-width long. Amphidial apertures circular, about three annules or  $1/4-1/5$ th of the corresponding neck width in diameter, located  $9-11 \mu\text{m}$  from anterior end or at about middle of stoma. Stoma  $2.5-3.0$  times as long as the lip-width, cheilostome cuticularized. Nerve ring  $63-68 \mu\text{m}$  from anterior end. Excretory pore slightly posterior to nerve ring. Basal oesophageal bulb oval,  $15-17 \times 11-13 \mu\text{m}$ , provided with denticulate valve plates; cardia  $5-6 \mu\text{m}$  long. Intestine with fine granules. Rectum  $10-12 \mu\text{m}$  long or equal to anal body diameter. Gonad amphidelphic, ovaries reflexed, anterior on left and posterior on right side of the intestine. Vulva slit-like about two annules across, with raised lips, vagina extending  $1/3-1/4$  of the body-width. Uterine eggs  $38-40 \times 18-22 \mu\text{m}$  with smooth egg shell. Vulva-anus distance three times the tail length. Tail cylindrical, arcuate, regularly tapering, about  $4.5-5.8$  anal body-widths long. Four to six caudal setae: two mid-dorsal below level of anus and near tail tip, and one subventral pair at  $1/3$  of tail length from anus; in some specimens an additional subventral or subdorsal pair of setae located near middle of tail; terminal caudal seta located  $10 \mu\text{m}$  anterior to spinneret tip. Caudal glands arranged in tandem, spinneret about  $1 \mu\text{m}$  long.

*Male*: Not found.



**Fig. 3.** *Plectus refusus* n. sp. A : Entire female; B : Anterior end; C : Reproductive system; D : Oesophageal region; E : Tail.



**Fig. 4.** *Plectus refusus* n. sp. SEM graphs. A, B : Anterior end; C : Tail; D : En face view; E : Vulva (Scale bars : A, B, C, E = 5 µm; D = 10 µm).

## TYPE SPECIMENS

*Holotype* (female) on slide *Plectus refusus* n. sp/1 deposited in the Nematode Collection, Department of Zoology, Aligarh Muslim University, Aligarh; *Paratypes*: three females on slides *Plectus refusus* n. sp./3-4 deposited at Aligarh Muslim University. Two females on slide *Plectus refusus* n. sp/2 deposited at Muséum National d'Histoire Naturelle, Paris, France.

## TYPE HABITAT AND LOCALITY

Sewage slurry from, the Department of Zoology, Aligarh Muslim University, Aligarh.

## DIAGNOSIS AND RELATIONSHIP

*P. refusus* n. sp. is characterized by a small body, amphids in middle of stoma, small cephalic setae and vulva-anus distance three times the tail length.

*P. refusus* n. sp. resembles most with *P. geophilus* de Man, 1880 in most of the morphometric details provided by Zell, 1993 but differs from the latter in having longer stoma, relatively smaller distance of vulva-anus in relation to tail and relatively anterior position of terminal caudal seta [stoma length = 9.5-15.5  $\mu\text{m}$ , vulva-anus distance 3-5 times the tail length and terminal caudal seta 6.5-9  $\mu\text{m}$  anterior to tip of spinneret in *P. geophilus* de Man, 1880 (see: Zell, 1993)].

*P. refusus* n. sp. shows similarity with several small species of *Plectus* viz., *P. fragilis* Zell, 1993, *P. exinocaudatus* Truskova, 1976 and *P. intorticaudatus* Truskova, 1976. It differ from *P. fragilis* in having longer stoma, smaller  $c'$  value, larger vulva-anus distance in relation to tail and relatively anterior position of terminal caudal seta; from *P. intorticaudatus* in having longer stoma, larger "a" and "c", values and relatively posterior position of terminal caudal seta; from *P. exinocaudatus* in

having longer stoma, smaller  $c'$  value and larger vulva-anus distance with relation to tail (stoma length = 12-17  $\mu\text{m}$ ,  $c' = 5.9-11.9$ , vulva-anus distance 1.5-2.9 times the tail length, terminal caudal seta 12-17  $\mu\text{m}$  anterior to tip of spinneret in *P. fragilis*; stoma length = 11.5-16  $\mu\text{m}$ ,  $a = 15.5-17$ ,  $c' = 3.6-3.7$ , terminal caudal seta 3.5-5  $\mu\text{m}$  anterior to spinneret in *P. intorticaudatus* Truskova, 1976; stoma length = 10-14.5  $\mu\text{m}$ ,  $c' = 6.2-10.4$ , vulva-anus distance 1.9-2.8 times the tail length in *P. exinocaudatus*. The new species also resembles *P. chengmohliangi* Hoeppli & Chu, 1932 now considered as *species inquirenda* by Zell (1993).

## Acknowledgements

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