Nematol. medit. (1995), 23: 203-210

Institute of Agriculture, Shafi House, Qila Road A.M.U., Aligarh-202002, India
** Department of Zoology, A.M.U., Aligarh-202002, India*

HEMICRICONEMOIDES VARIABILIS SP. N. AND TWO KNOWN SPECIES OF *HEMICRICONEMOIDES* FROM INDIA

by
P. F. RAHAMAN and I. AHMAD*

Summary. *Hemicriconemoides variabilis* sp. n. is characterized by 142-154 body annules, two lip annules, labial plate modified into semicircular projections, stylet 85-95 µm long and conical tail. Measurements of various populations and SEM illustrations are provided for *Hemicriconemoides cocophilus* and *H. mangiferae*.

Hemicriconemoides cocophilus (Loos, 1949) Chitw. *et* Birchfield, 1957 and *H. mangiferae* Siddiqi, 1961 occur frequently in soil samples in India. In this article additional morphometric features of these two species, and the description of *H. variabilis*, in our opinion a hitherto undescribed species, are provided.

Materials and methods

Specimens for light microscopy were killed and fixed in hot 4% formalin, dehydrated by the slow method and mounted in anhydrous glycerine. Measurements were made with an ocular micrometer. For scanning electron microscopy, formalin fixed specimens were processed by Eisenback's (1985) method; some glycerine infiltrated specimens were processed by the method of Sher and Bell (1975). Specimens were coated with 30 nm gold and observed in a Hitachi S-2300 scanning electron microscope at 15 kV.

Descriptions

HEMICRICONEMOIDES VARIABILIS sp. n.

(Figs. 1 and 2)

Holotype female: L = 440 µm; a = 17.4; b = 4.2; c = 12.9; c' = 2.8; V = 86.5; stylet = 84 µm; conus = 72 µm; tail = 34.5 µm; R = 144; Rst = 29; Roes = 36; Rex = 42; RV = 18; Rvan = 6; Ran = 12; VL/VB = 2.85; st%L = 18.9

Paratype females (n=10): L = 390-450 (430±20) µm; a = 16.0-17.5 (17.1±0.6); b = 3.9-4.2 (3.9±0.14); c = 9.7-12.9 (11.0±1.7); c' = 2.0-3.0 (2.4±0.16); V = 86.0-88.0 (87.2±0.47); stylet = 85.0-95.0 (89.0±4.0) µm; conus = 72.0-85.0 (77.5±4.7) µm; tail = 33.0-46.5(39.4±4.3) µm; R = 142-154; Rst = 28-32; Roes = 34-43; Rex = 40-44; RV = 17-21; Rvan = 5-6; Ran = 12-16; VL/VB = 2.4-2.9 (2.7±0.18); st%L = 18.9-20.8 (20.0±0.8).

Paratype male: L = 370 µm; a = 27.5; b = 4.7; c = 9.5; c' = 3.0; tail = 36.0 µm; spicules = 30.0 µm; gubernaculum = 4.5 µm.

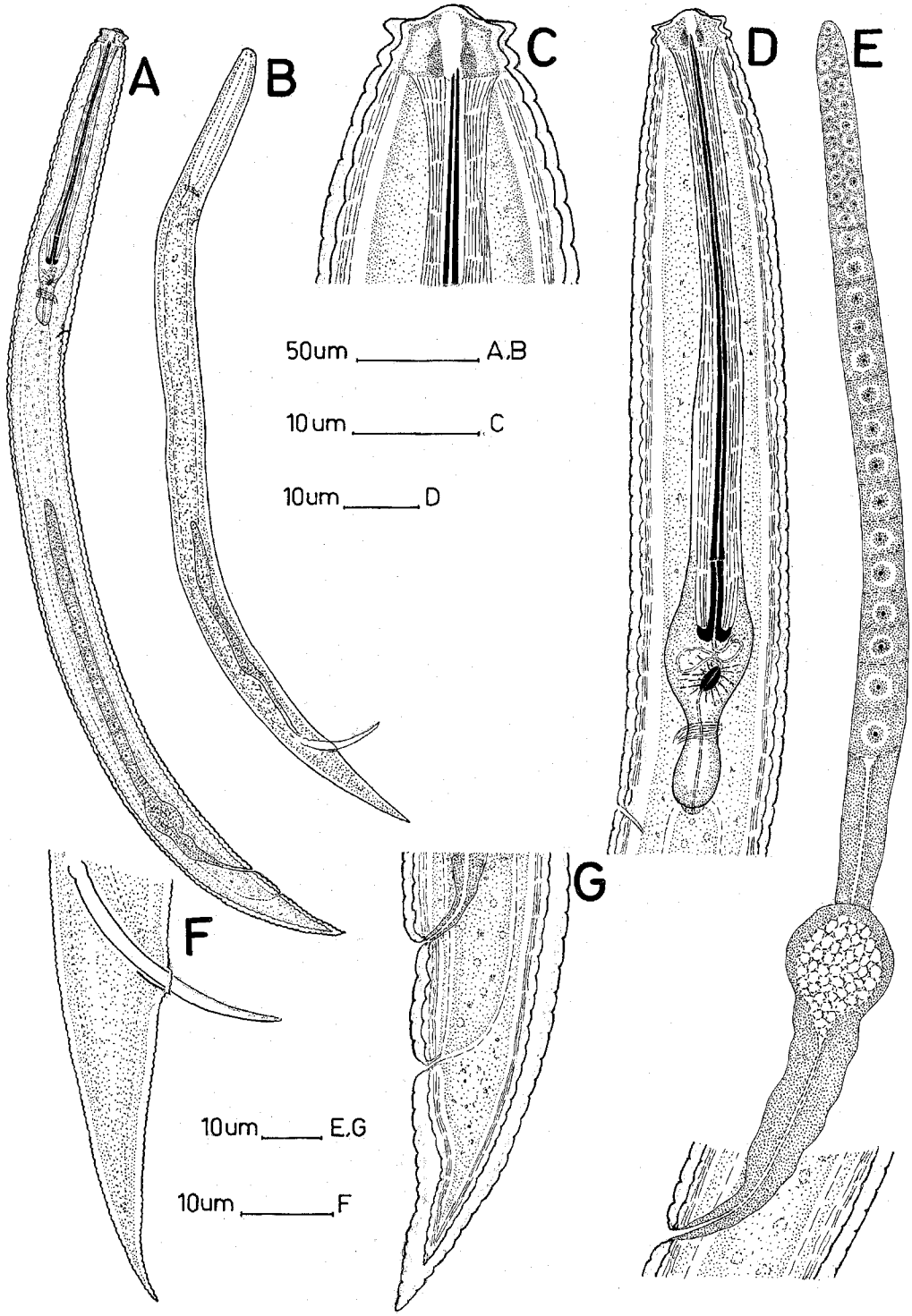

Fig. 1 - *Hemicriconemoides variabilis* sp. n., A, entire female; B, entire male; C, female anterior end; D, female oesophageal region; E, female gonad; F, male tail; G, female posterior end.

Female body curved ventrally upon fixation, tapering towards extremities, posteriorly terminating as elongate conoid tail. Cuticular sheath closely fitting body, sometimes detached in tail region. Annules flat, 3-4 µm apart at midbody. Lip region slightly offset with two annules, 6 µm high. First lip annule ovoid, depressed laterally, 12 µm long, 9 µm wide. Second lip annule round, 9 µm diam. Labial region oval, oral disc dorsoventrally elongate with slit-like oral aperture. Labial plate extending as two lateral hemispherical projections on lateral sides of oral disc. Amphidial apertures slit-like located behind oral disc. Cephalic framework moderately sclerotized. Stylet well developed; metenchium slender, 85-89% of stylet length long; telenchium 12 µm long. Basal knobs anchor-shaped, 3 µm long, 6-7 µm wide. Dorsal oesophageal gland opening 3-4 µm from spear base. Oesophagus 106-121 µm long. Prometacorpus muscular, 96-108 µm long, 15 µm wide with 7.5-9 µm long valve plates. Isthmus 3-4.5 µm-long. Basal bulb saccate, 10.5-13.5 µm long, 9 µm wide. Nerve ring 98-110 µm from anterior end. Excretory pore 114-128 µm from anterior end. Hemizonid one annule wide located anterior to excretory pore. Oocytes arranged in double row at tip and posteriorly in single row. Vulva a transverse slit, vagina 10.5-12 µm long. Spermatheca spherical, 19-22.5 µm diam with sperms. Anus pore-like, less than one vulval body diam from vulva. Tail elongate-conoid, 1.7-2.8 times vulva-anus long, tip finely rounded.

Male vermiform, ventrally arcuate upon fixation. Lip region continuous with body. Lateral fields indistinct. Spear absent. Oesophagus degenerate. Hemizonid distinct, 78 µm from anterior end. Excretory pore 83 µm from anterior end. Spicules arcuate, 30 µm long. Gubernaculum trough-shaped, 4.5 µm long. Bursa rudimentary. Tail elongate conoid with pointed tip.

Type habitat and locality. Rhizosphere of peach (*Prunus persica* Stokes) from Haflong, Assam, India.

Type material. Holotype female and paratype male on slide *Hemicriconemoides variabilis* n. sp./1 deposited in the nematode collection of the Department of Zoology, Aligarh Muslim University, Aligarh. Paratype females on slides *Hemicriconemoides variabilis* sp. n./2-8 deposited in the nematode collection of the Department of Zoology, Aligarh Muslim University, Aligarh. A paratype female on slide *Hemicriconemoides variabilis* sp. n./9 deposited at the Istituto di Nematologia Agraria, C.N.R., Bari, Italy.

Differential diagnosis and relationship. Hemicriconemoides variabilis sp. n. is characterized by two lip annules, labial plate modified to semi-circular sheath-like projections, stylet 85-95 µm long, tail conical with finely rounded terminus, R = 142-154.

The new species resembles *H. chitwoodius* Esser, 1960; *H. varionodus* Choi *et* Geraert, 1972; *H. gaddi* (Loos, 1949) Chitwood *et* Birchfield, 1957 and *H. alexis* Vovlas, 1980 in having two lip annules, equal number of body annules and similar type of tail. However, it differs from them in having an oval lip region with modified labial plate. It also differs from the closely related *H. chitwoodius* in having a shorter body, in the shape of first lip annule and stylet knobs, and larger number of post-vulval annules (L = 480-590 µm, labial disc elevated and round at tip, labial plate not modified, stylet knobs round, post-vulval body with 12-15 annules in *H. chitwoodius*). It differs from *H. varionodus* in having differently shaped lip region, slender metenchium, in the shape of spear knobs, anteriorly located vulva and larger number of annules in post-vulval region (lip region with round annules, labial disc slightly elevated or inconspicuous, labial plate not modified, spear knobs with sloping anterior surfaces, V = 91-93; post-vulval annules 11-15 in *H. varionodus*). It differs from *H. alexis* in having a smaller body, longer stylet and greater number of annules in oesophageal region (L = 480-560 µm, labial disc elevated, labial plate not modified, stylet 65-77 µm long and Roes = 26-28 in *H. alexis*). The

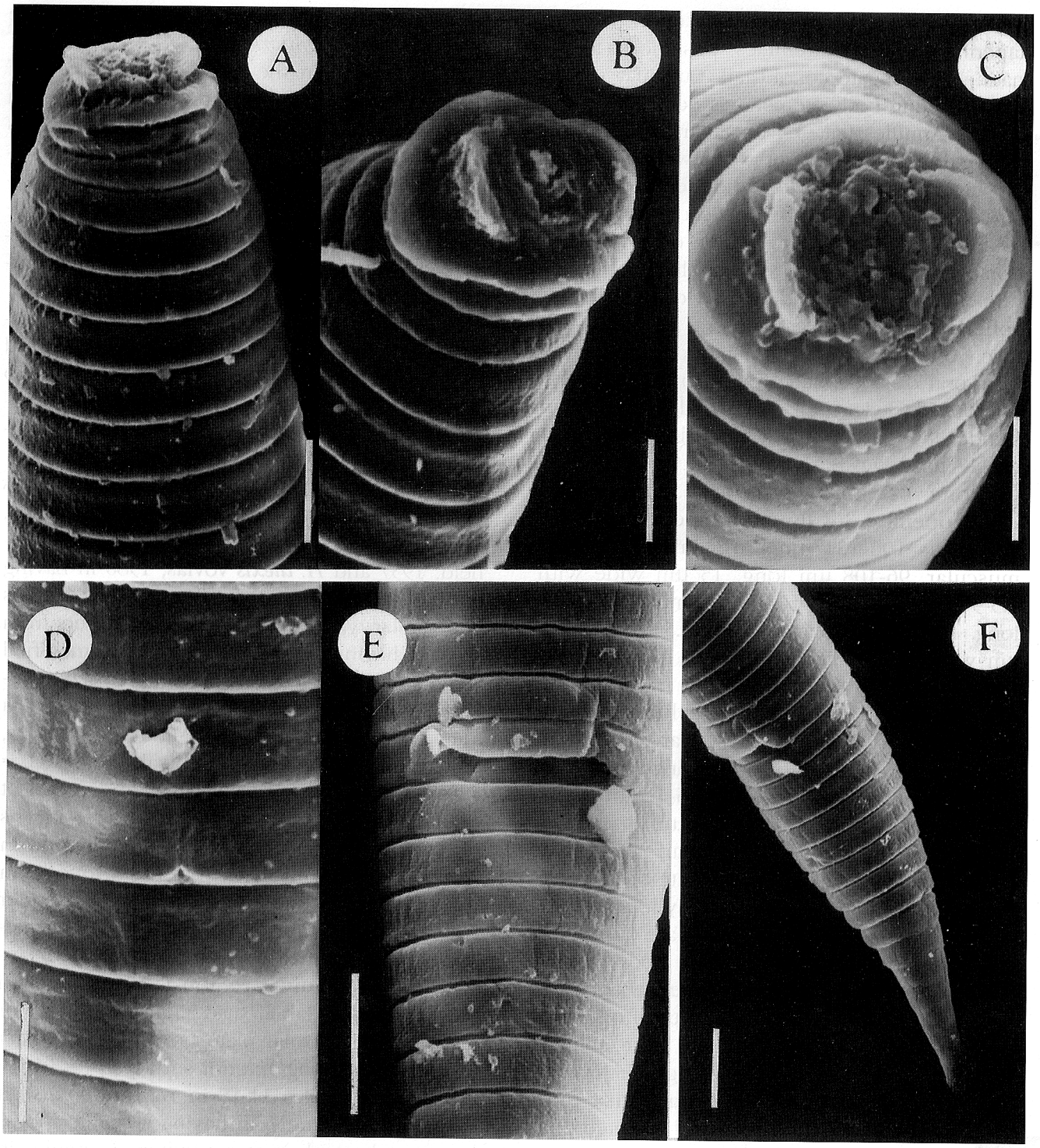

Fig. 2 - SEM micrographs of *H. variabilis* sp. n., A and B, anterior ends; C, enface view; D, excretory pore; E, vulva and anal region; F, female posterior end (Scale: bar = 10 µm in A, E, F; 3 µm in B and C; 4 µm in D).

new species can be differentiated from *H. gaddi* in having a partially set off lip region, labial plate modification and a more slender tail (lip region continuous, labial region round with slightly elevated labial disc, labial plate not modified and tail conoid in *H. gaddi*).

Remarks. Decraemer and Geraert (1992) described four types of lip regions in the genus *Hemicriconemoides*. The present species represents a fifth type with a narrow, dorso-ventrally located oral disc, two slit-like amphidial apertures below the oral disc and labial plate with two semicircular projections laterally.

HEMICRICONEMOIDES COCOPHILUS (Loos, 1949) Chitw. *et* Birchfield, 1957 (Fig. 3)

Kurnool, Andhra Pradesh population

Females (n=18): L = 330-380 (360±20) µm; a = 13.0-14.5 (13.9±0.5); b = 4.0-4.5 (4.3±0.19); c = 13.0-19.4 (16.9±2.1); V = 92.0-93.9 (92.7±0.71); stylet = 45-51 (49.2±2.4) µm; conus = 37.5-43.5 (41.1±2.0) µm; tail = 18.0-25.5 (21.6±2.6) µm; R = 122-138; Rst = 16-18; Roes = 25-30; Rex = 25-35; RV = 9-10; Rvan = 1-2; Ran = 8-9; VL/VB = 1.0-1.4 (1.2±0.14); st%L = 12.7-15.3 (13.6±0.9).

Saharanpur, Uttar Pradesh population

Females (n=20): L = 380-470 (410±28) µm; a = 14-17 (15.7±0.99); b = 4.4-5.3 (4.9±0.34); c = 15-23 (18.6±2.5); V = 89-94 (91.2±1.5); stylet = 49-63 (57.5±4.4) µm; conus = 42-58 (51.5±5.4) µm; tail = 20.0-27.5 (24.7±2.4) µm; R = 100-120; Rst = 16-17; Roes = 22-26; Rex = 21-31; RV = 8-10; Rvan = 1; Ran = 7-9; VL/VB = 1.3-1.7 (1.5±0.13); st%L = 13.5-16.4 (15.4±0.88).

Jalna, Maharashtra population

Females (n=15): L = 350-420 (387±24) µm; a = 15-18 (16.6±0.95); b = 4.5-5.6 (4.9±0.34); c = 14-18 (15.9±1.4); V = 92-94 (93.0±0.74); stylet = 53-58 (56.0±1.6) µm; conus = 48-53 (50.3±1.78) µm; tail = 22-30 (25.6±2.4) µm; R = 115-128; Rst = 15-17; Roes = 23-26; Rex = 27-31; RV = 10-11; Rvan = 1-3; Ran = 7-9; VL/VB = 1.4-1.7 (1.5±0.96); st%L = 12.0-14.5 (13.2±0.87).

Host and localities. Rhizosphere of sun flower (*Helianthus annuus* L.) from Kurnool, Andhra Pradesh; guava (*Psidium guajava* L.) from Saharanpur, Uttar Pradesh; sweet pea (*Pisum sativum* L.) from Jalna, Maharashtra, India.

Remarks. Loos (1949) first described this species from Sri Lanka. Decraemer and Geraert (1992) redescribed it with the help of SEM observations. The present specimens closely agree with the previous descriptions and measurements. SEM observations showing a round labial region, circular, raised oral disc with a fine rim-like collar, a slit-like oral aperture and slit-like amphidial apertures behind oral disc without protruding plugs as indicated by Decraemer and Geraert (1992).

HEMICRICONEMOIDES MANGIFERAE Siddiqi, 1961 (Fig. 4)

Chikmagalur, Karnataka population

Females (n=15): L = 400-470 (450±20) µm; a = 16.0-18.7 (17.0±0.8); b = 4.1-5.3 (4.8±0.4); c = 18.4-22.8 (20.5±1.2); V = 91.6-92.9 (92.2±0.45); stylet = 61.5-69.0 (65.0±3.1) µm; conus = 52.5-60.0 (57.0±2.8) µm; tail = 19.5-24.0 (21.7±1.3) µm; R = 157-166; Rst = 21-23; Roes = 28-34; Rex = 30-36; RV = 12-13; Rvan = 4-5; Ran = 8; VL/VB = 1.3-1.6 (1.4±0.08); st%L = 13.9-15.4 (14.5±0.53).

Siddharth Nagar, Uttar Pradesh population

Females (n=15): L = 470-610 (530±40) µm; a = 17.6-21.6 (19.3±1.3); b = 4.4-5.3 (4.9±0.3); c = 15.2-24.1 (19.2±2.6); V = 91.1-93.0 (92.1±0.7); stylet = 67.5-75.0 (71.3±2.1) µm; co-

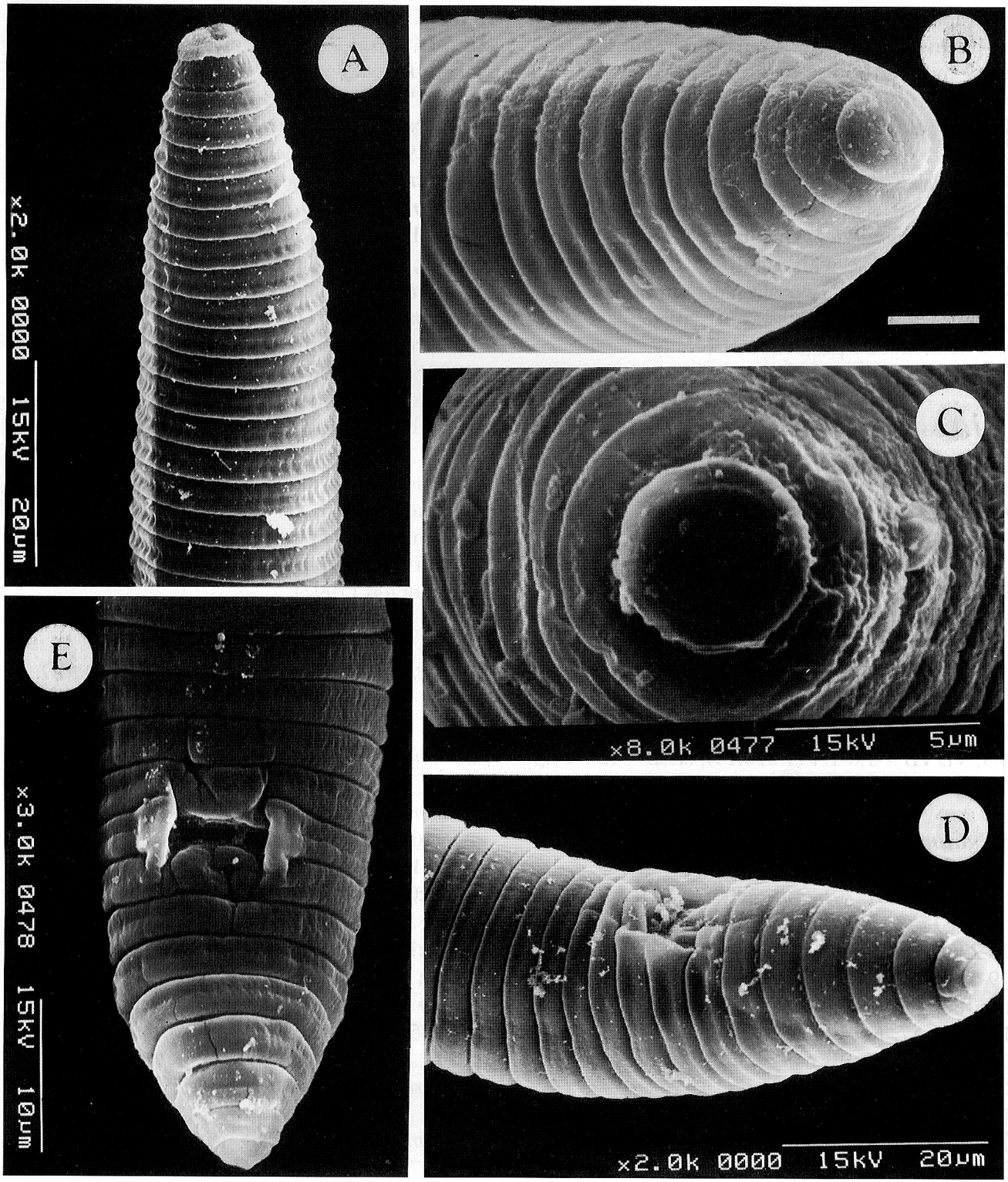

Fig. 3 - SEM micrographs of *H. cocophilus*, A and B, anterior ends; C, enface view; D and E, tail ends (Scale: bar = 5 µm in B).

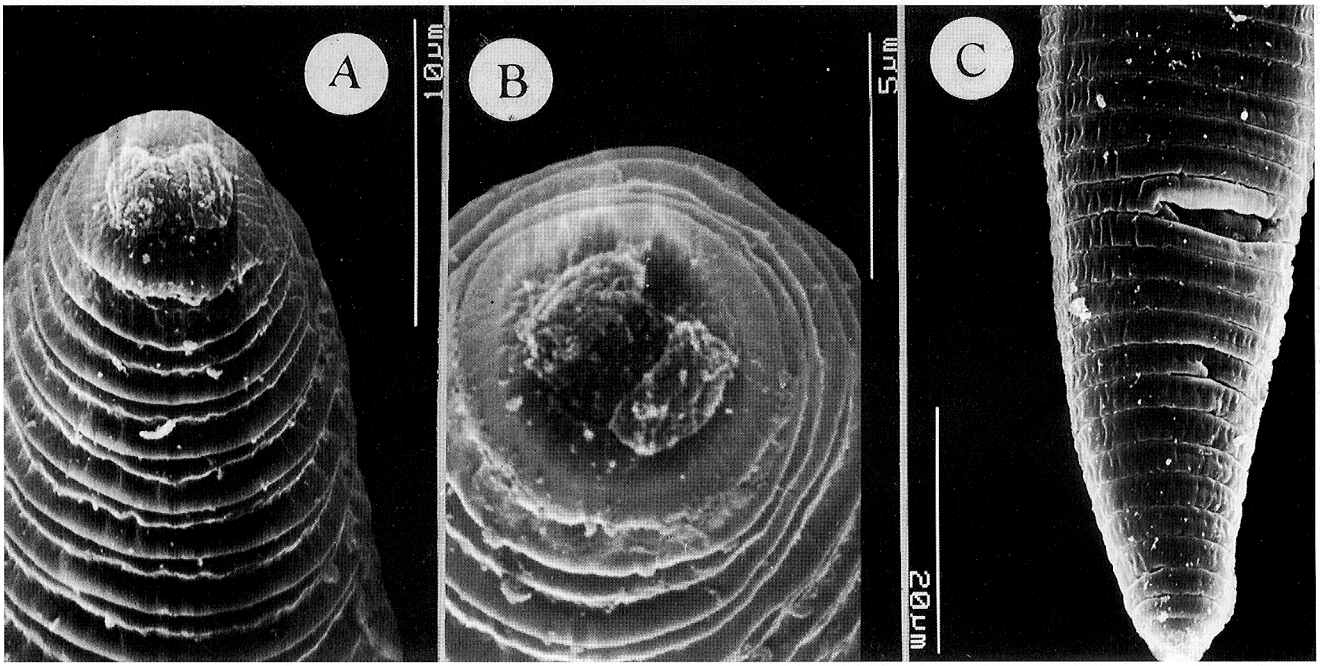

Fig. 4 - SEM micrographs of *H. mangiferae*, A, anterior end; B, enface view; C, posterior end.

nus = 60-64 (62.7±1.7) µm; tail = 24-30 (28.5±3.0) µm; R = 148-165; Rst = 23-24; Roes = 31-37; Rex = 30-34; RV = 13-16; Rvan = 3-5; Ran = 9-12; VL/VB = 1.37-1.91 (1.7±0.17); st%L = 12.1-15.1 (13.2±0.98).

Rishikesh, Uttar Pradesh population

Females (n=20): L = 460-550 (497±28) µm; a = 17.0-19.5 (18.2±0.8); b = 4.5-5.3 (4.8±0.2); c = 18.2-22.3 (19.9±1.3); V = 92-93 (92.5±0.38); stylet = 63-77 (70.5±4.0) µm; conus = 56-65 (60.7±2.9) µm; tail = 21.0-28.5 (24.6±2.4) µm; R = 124-148; Rst = 17-20; Roes = 25-32; Rex = 31-37; RV = 11-15; Rvan = 3-5; Ran = 7-10; VL/VB = 1.8-2.7 (2.2±0.34); st%L = 13.0-14.5 (13.6±0.5).

Host and localities. Rhizosphere of coffee (*Coffea arabica* L.) from Chikmagalur, Karnataka; guava (*Psidium guajava* L.) from Siddharth Nagar, Uttar Pradesh; plum (*Prunus communis* Huds.) from Rishikesh, Uttar Pradesh, India.

Remarks. SEM observations of *H. mangiferae* show similarities in structure of tail shape and vulva and annules between vulva and anus as given by Vovlas *et al.* (1990) and Decraemer and Geraert (1992). The labial structures showing a rectangular oral disc directed posteriad on dorsal and ventral sides with slit-like aperture, two kidney-shaped plugs on amphidial apertures located on lateral sides of oral disc, circular labial plate and round first head annule are as described by Decraemer and Geraert (1992).

Acknowledgements. This work was supported by research grants from CSIR and UGC, New Delhi, India.

Literature cited

DECRAEMER W. and GERAERT E., 1992. Description of *Hemicriconemoides parataiwanensis* sp. n. (Criconematidae) and four other *Hemicriconemoides* species from Papua New Guinea with a consideration of variability in the genus. *Nematologica, 38*: 267-295.

EISENBACK J. D., 1985. Techniques for preparing nematodes for scanning electron microscopy. In *An advanced treatise* on *Meloidogyne*, vol. II: *Methodology*. (Eds. Barker, K. R., Carter, C. C. & Sasser, J. N.). North Carolina State Graphics, Raleigh, pp. 79-106.

LOOS C. A., 1949. Notes on free living and plant parasitic nematodes of Ceylon. 4. *J. Zool. Soc. India, 1*: 17-22.

SHER S. A. and BELL A. H., 1974. Scanning electron micrographs of the anterior region of some species of Tylenchoidea (Tylenchida: Nematoda). *J. Nematol., 7*: 70-82.

VOVLAS N., CIANCIO A. and TORRES E. C., 1990. Criconematids from Peru with a description of *Ogma andense* sp. n. *Nematol. medit., 18*: 243-252.

Accepted for publication on 24 April 1995.