

## New and Known Species of *Pratylenchus* Filipjev, 1936 (Nematoda: Pratylenchidae) from Haryana, India, with Remarks on Intraspecific Variations<sup>1</sup>

HARISH K. BAJAJ AND D. S. BHATTI<sup>2</sup>

**Abstract:** Two new monosexual and one bisexual species *Pratylenchus* Filipjev, 1936 collected from Haryana state of India are described and illustrated. The primary distinguishing features of these species are *Pratylenchus microstylus* n. sp.: L = 331-458  $\mu$ m, spear = 11 or 12  $\mu$ m; *Pratylenchus cruciferus* n. sp.: L = 648-793  $\mu$ m, central core of lateral fields with oblique lines, hemizonid 2-8 annules anterior to excretory pore; *Pratylenchus ekrami* n. sp.: spear = 11-13  $\mu$ m, spermatheca oblong, post vulval uterine sac with differentiated cells, tail with 26-40 annules, males abundant. Studies on intraspecific variations of *P. cruciferus*, *P. ekrami*, and *P. coffeae* (Zimmermann, 1898) Goodey, 1951 revealed that spear length and value of 'V' are the least variable characters. Body length and size of post vulval uterine sac varies to varying degrees in different species. Shape of median bulb in *P. ekrami*, number of incisures in *P. coffeae*, and tail shape in *P. ekrami* and *P. coffeae* exhibit the greatest amount of intraspecific variations. *P. zaeae* Graham, 1936 and *P. thornei* Sher & Allen, 1953 are the other species collected during the present studies.

**Key words:** taxonomy, morphology, *Pratylenchus microstylus*, *P. cruciferus*, *P. ekrami*.

---

Six species of *Pratylenchus* Filipjev, 1936 were found to occur commonly in various districts of Haryana State in association with several crops. Taxonomic studies on these

species revealed three new species which are described here. The three other species are *P. zaeae* Graham, 1951, *P. thornei* Sher & Allen, 1953, and *P. coffeae* (Zimmermann, 1898) Goodey, 1951. Intraspecific variations in *P. coffeae*, *P. cruciferus* n. sp., and *P. ekrami* n. sp. were also studied to clarify the extent of variability of morphologic and morphometric characters.

The specimens were killed and fixed in hot 4% formalin and processed to anhydrous glycerine by the slow method.

---

Received for publication 5 August 1983.

<sup>1</sup> The authors thank Dr. H. Hirschmann, Department of Plant Pathology, North Carolina State University, Raleigh, North Carolina, for reviewing the manuscript and for valuable suggestions.

<sup>2</sup> Assistant taxonomist and professor and head, respectively, Department of Nematology, Haryana Agricultural University, Hissar-125 004, India.

*Pratylenchus microstylus* n. sp.

(Fig. 1A-I)

MEASUREMENTS: *Holotype* (female): L = 402  $\mu$ m; a = 23; b = 6.4; b' = 3.9; c = 18; V = 76; spear = 11  $\mu$ m; c' = 2.0.

*Paratypes* (11 females): L = 388 (331-458)  $\mu$ m; a = 22 (19-26); b = 6.0 (5.3-6.4); b' = 3.8 (3.1-4.4); c = 18 (16-22); V = 76 (75-77); spear = 11 or 12  $\mu$ m; c' = 2.1 (1.9-2.3).

DESCRIPTION: *Female*: Body short and stout, assuming 'c' shape upon fixation. Lateral lines four, occupying  $\frac{1}{4}$  of midbody width and extending to tail tip. Head region low, almost continuous with rest of body, with three annules. Cephalic framework sclerotized. Spear 11-12  $\mu$ m long with anteriorly flattened knobs. Corpus constricted near its junction with oval median bulb located at 40-42% of esophageal length. Esophageal gland lobe two to three corresponding body widths or 28-46  $\mu$ m long. Opening of dorsal esophageal gland 3 or 4  $\mu$ m from spear base. Nerve ring encircles isthmus just below the median bulb. Excretory pore 59-64  $\mu$ m from anterior extremity, or 3  $\mu$ m anterior or 7  $\mu$ m posterior to esophago-intestinal valve. Hemizonid just anterior to excretory pore. Spermatheca indistinct. Tricolumella well developed. Post vulval uterine sac length less than one body width at vulva. Vulva a transverse slit located at 75-77% of body length. Egg in one specimen 53  $\times$  17  $\mu$ m. Intestine overlapping rectum dorsally. Anal body diameter 7-12  $\mu$ m. Tail usually conoid, striated, with rounded smooth terminus. Tail in one specimen with a terminal process (Fig. 1H). Phasmids near middle of tail.

*Male*: Not found.

TYPE HOST AND LOCALITY: Soil and roots of *Sorghum halepense* (L.) Pers. from H.A.U. Campus, Hissar, India.

TYPE SPECIMENS: Holotype mounted on slide No. 1, *Pratylenchus microstylus* n. sp.; paratypes on slides Nos. 2-4. Holotype and nine paratypes deposited with Department of Nematology, H.A.U., Hissar, India; two paratypes with National Nematode Collection, Division of Nematology, I.A.R.I., New Delhi, India.

DIFFERENTIAL DIAGNOSIS: *Pratylenchus microstylus* n. sp. is similar to *P. mulchandi* Nandkumar & Khera, 1970, from which it

differs in being smaller, having a shorter spear and post vulval uterine sac, and overlapping of rectum. L = 440-580  $\mu$ m; spear = 16-20  $\mu$ m; post vulval uterine sac more than 1.5 vulval body widths long; intestine not overlapping rectum in *P. mulchandi*.

*Pratylenchus cruciferus* n. sp.

(Fig. 2A-F)

MEASUREMENTS: *Holotype* (female): L = 758  $\mu$ m; a = 34; b = 8.3; b' = 5.8; c = 24; V = 78; spear = 16  $\mu$ m; c' = 2.5.

*Paratypes* (20 females): See Table 1.

DESCRIPTION: *Female*: Body long and cylindrical becoming 'c' shaped upon fixation. Lateral field occupying  $\frac{1}{4}$  or  $\frac{1}{5}$  of midbody width with four incisures, central core of lateral field with oblique striations (Fig. 2D). Head region flat, continuous with body, with three annules. Cephalic framework extending laterally up to 2-3 body annules. Spear 15-16  $\mu$ m long, anterior surfaces of spear knobs concave. Corpus narrower at its junction with rounded to oval median bulb. Esophageal gland lobe 31-51  $\mu$ m long, overlapping intestine for about two corresponding body widths. Opening of dorsal esophageal gland 3-4  $\mu$ m from spear base. Nerve ring at mid-isthmus. Excretory pore 90-104  $\mu$ m from anterior end or 3-19  $\mu$ m posterior to esophago-intestinal valve. Hemizonid 2-8 annules anterior to excretory pore. Spermatheca and columella indistinct. Vulva a transverse slit located at 76-81%. Post vulval uterine sac 18-30  $\mu$ m or 0.7-1.4 vulval body widths long. Anal body diameter 10-14  $\mu$ m. Tail subcylindrical to cylindrical with smoothly rounded to truncated terminus, 2.1-3.0 anal body widths long. Phasmids near middle of the tail.

*Male*: Not found.

TYPE HOST AND LOCALITY: Soil around the roots of mustard, *Brassica campestris* L. from village Patanwas of Bhiwani district.

TYPE SPECIMENS: Holotype mounted on slide No. 1 *Pratylenchus cruciferus* n. sp.; paratypes on slides Nos. 2-6. Holotype and 18 paratypes deposited with Department of Nematology, H.A.U., Hissar, India. Rest of the paratypes with National Nematode Collection, Division of Nematology, I.A.R.I., New Delhi, India.

DIFFERENTIAL DIAGNOSIS: *Pratylenchus cruciferus* n. sp. is similar to *P. thornei* Sher

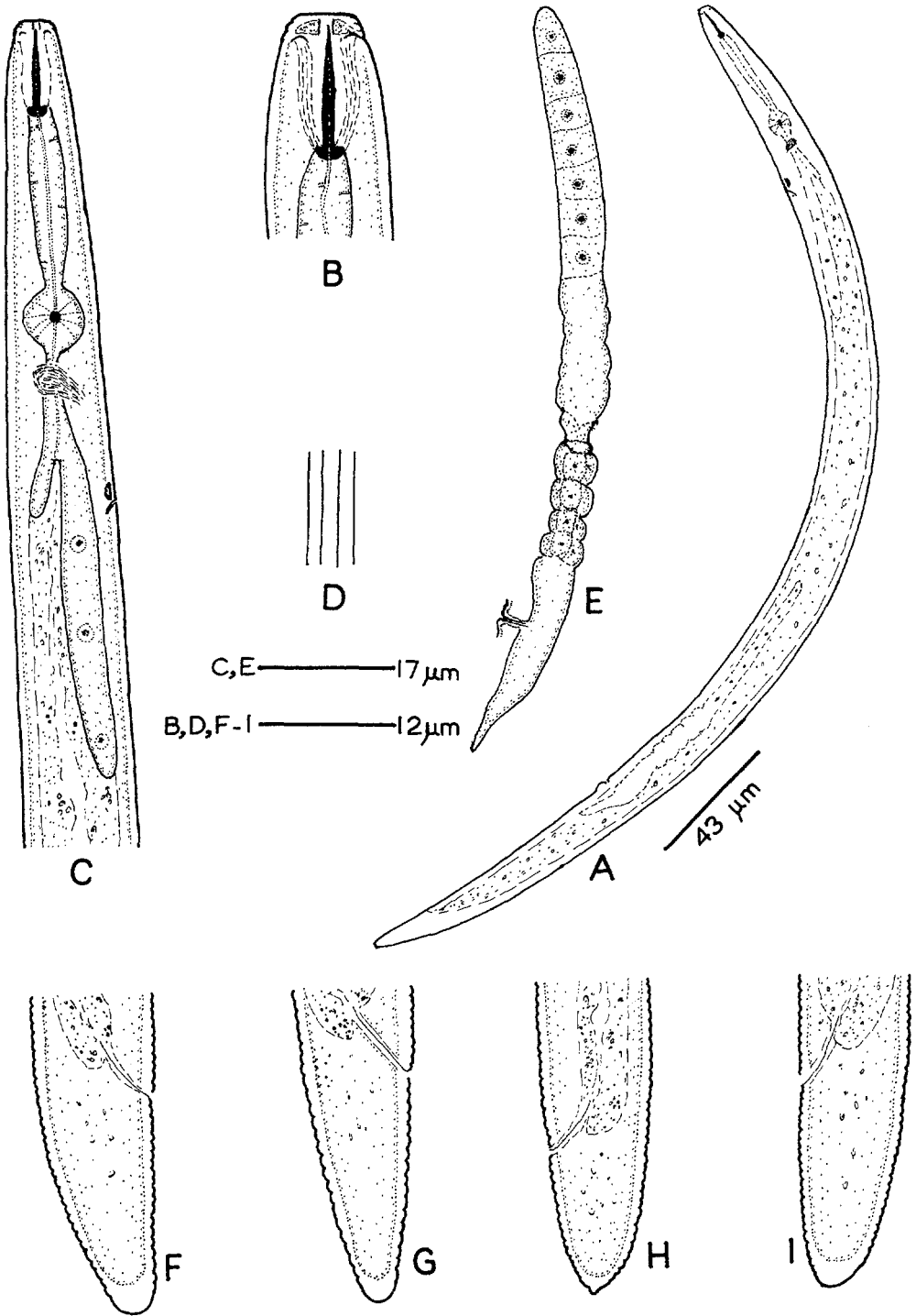


FIG. 1. *Pratylenchus microstylus* n. sp. female. A) Entire. B) Head. C) Esophageal region. D) Lateral field. E) Genital tract. F-I) Tails.

TABLE 1. Dimensions of females of *Pratylenchus cruciferus* n. sp., *P. ekrami* n. sp., and *P. coffeae*.

| Characters                         | <i>P. cruciferus</i> n. sp, 20 ♀ paratypes |         |      |      | <i>P. ekrami</i> n. sp., 22 ♀ paratypes |         |      |      | <i>P. coffeae</i> , n = 30 ♀ |         |     |      |
|------------------------------------|--------------------------------------------|---------|------|------|-----------------------------------------|---------|------|------|------------------------------|---------|-----|------|
|                                    | $\bar{X}$                                  | Range   | SD   | CV   | $\bar{X}$                               | Range   | SD   | CV   | $\bar{X}$                    | Range   | SD  | CV   |
| Length ( $\mu\text{m}$ )           | 730                                        | 648–793 | 40.9 | 5.6  | 533                                     | 429–632 | 52   | 9.8  | 615                          | 552–703 | 44  | 7.1  |
| Body width ( $\mu\text{m}$ )       | 22                                         | 18–27   | 2.1  | 9.6  | 18                                      | 15–24   | 2.5  | 14.2 | 24                           | 15–27   | 3.6 | 16.1 |
| a                                  | 33                                         | 26–40   | 3.2  | 10.0 | 29                                      | 20–39   | 4.3  | 14.8 | 28                           | 23–38   | 4.9 | 17.5 |
| b                                  | 8.2                                        | 7.3–9.2 | 0.6  | 6.8  | 6.5                                     | 5.0–7.8 | 0.55 | 8.5  | 7.3                          | 6.1–7.8 | 0.5 | 6.6  |
| b'                                 | 5.8                                        | 5.0–7.0 | 0.5  | 8.9  | 4.5                                     | 3.6–5.0 | 0.36 | 8.0  | 4.8                          | 4.0–5.5 | 0.6 | 13.5 |
| c                                  | 22                                         | 19–28   | 2.2  | 10.0 | 21                                      | 17–30   | 2.9  | 13.4 | 20                           | 17–26   | 2.1 | 10.1 |
| V                                  | 77                                         | 76–81   | 1.2  | 1.6  | 80                                      | 79–83   | 1.3  | 1.6  | 81                           | 79–84   | 1.2 | 1.4  |
| Spear ( $\mu\text{m}$ )            | 15.6                                       | 15.6    | —    | —    | 12                                      | 11–13   | 0.53 | 4.4  | 15                           | 14–17   | 0.4 | 2.6  |
| Post uterine sac ( $\mu\text{m}$ ) | 23                                         | 15–30   | 3.8  | 16.4 | 32                                      | 30–37   | 3.0  | 9.2  | 27                           | 18–37   | 4.8 | 17.7 |
| Tail ( $\mu\text{m}$ )             | 31                                         | 27–35   | 2.0  | 6.4  | 25                                      | 16–27   | 2.7  | 10.8 | 30                           | 24–39   | 3.7 | 12.2 |
| Tail annules                       | —                                          | —       | —    | —    | 32                                      | 26–40   | 3.5  | 10.9 | 24                           | 21–32   | 1.6 | 6.7  |

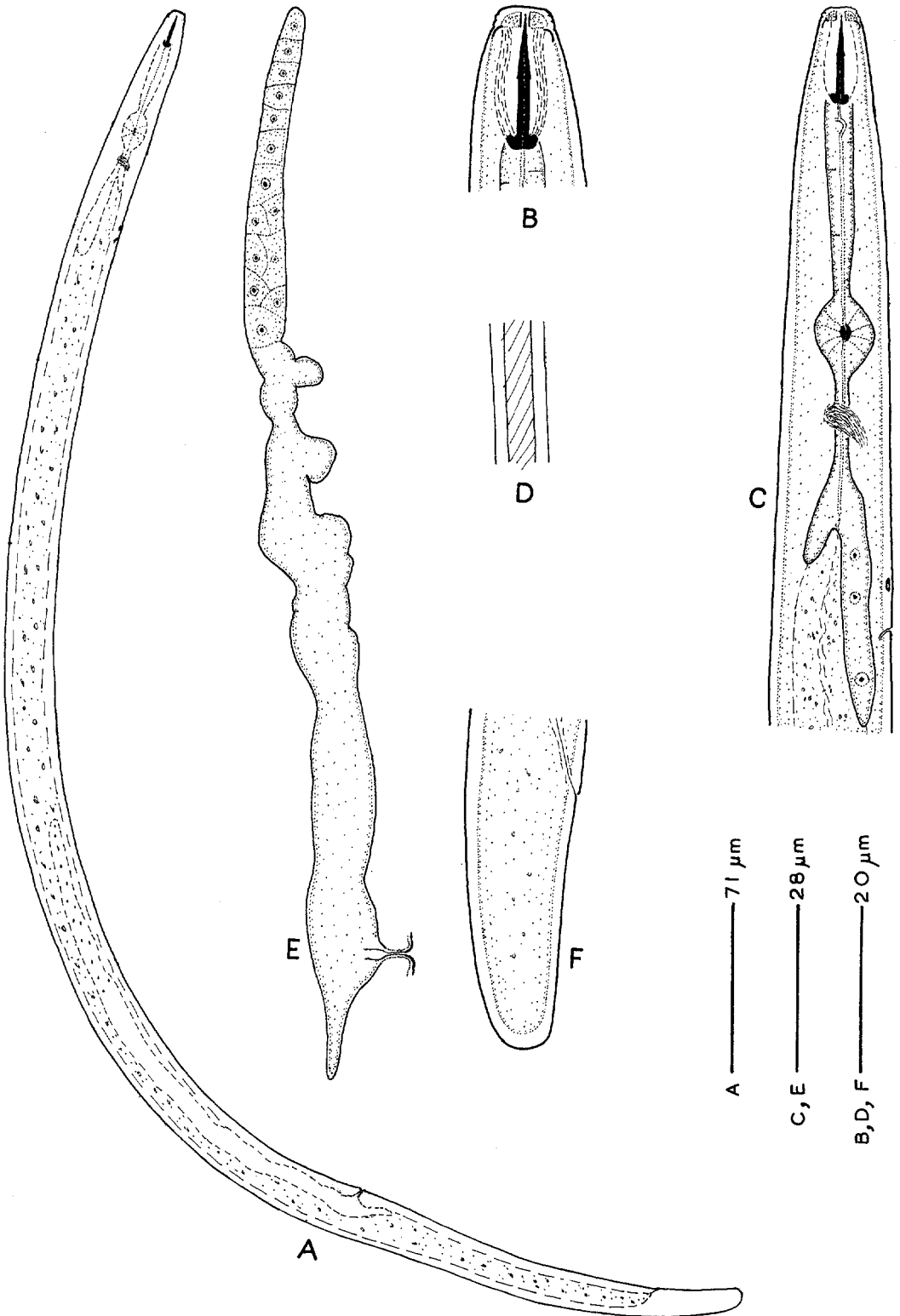


FIG. 2. *Pratylenchus cruciferus* n. sp. female. A) Entire. B) Head. C) Esophageal region. D) Lateral field. E) Genital tract. F) Tail.

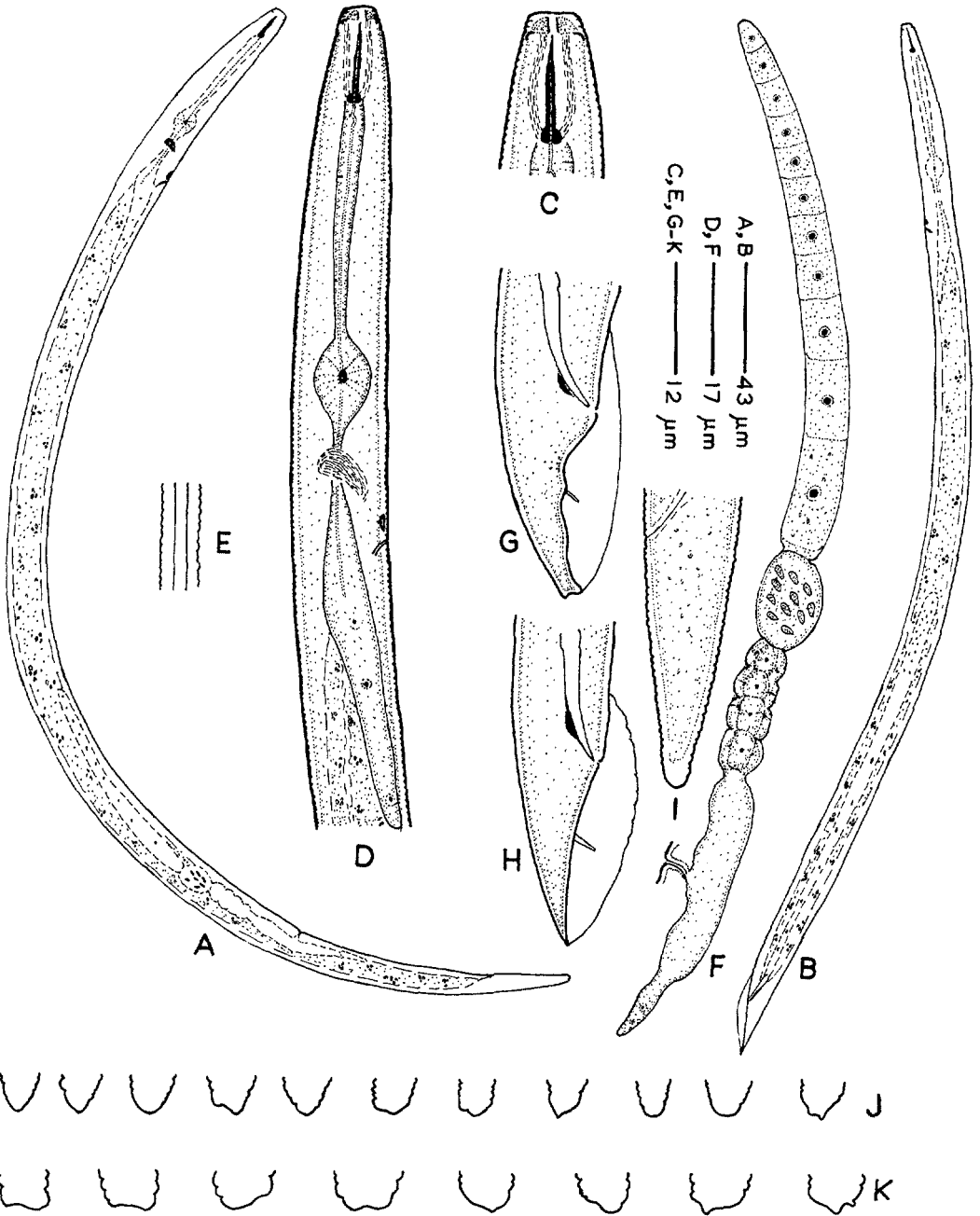


FIG. 3. *Pratylenchus ekrami* n. sp. A) Entire female. B) Entire male. C) Female head. D) Female esophageal region. E) Female lateral field. F) Female genital tract. G, H) Male tails. I, J) Female tail and tail tips. K) *P. coffeae* (Zimmermann) tail tips.

& Allen, 1953 from which it differs in the shape of lip region, total body length, presence of oblique lines in the central zone of lateral fields, and position of hemizonid.

Lip region high; L = 470–580 μm; central zone of lateral fields without oblique lines; hemizonid adjacent to excretory pore in *P. thornei*.

*Pratylenchus ekrami* n. sp.

(Fig. 3A-I)

MEASUREMENTS: *Holotype* (female): L = 602  $\mu$ m; a = 39; b = 6.9; b' = 4.0; c = 25; V = 83; spear = 12  $\mu$ m; c' = 2.9.

*Paratypes* (8 males): L = 402–536  $\mu$ m; a = 29–34; b = 5.2; b' = 4.0; c = 19–26; spear = 12  $\mu$ m; c' = 1.9–2.2.

*Paratypes* (22 females): See Table 1.

DESCRIPTION: *Female*: Body open 'c' shaped upon fixation, tapering abruptly behind vulva. Lateral lines four, extending to tail terminus, outer ones crenate. Lateral fields occupying about  $\frac{1}{3}$  mid body width. Head region continuous with rest of body, truncated anteriorly, with three annules. Cephalic framework sclerotized, extending posteriorly up to two body annules. Spear 11–13  $\mu$ m long with rounded sloping knobs. Corpus long, almost cylindrical. Median bulb usually post equatorial, its shape variable from narrow oval, large rounded to bilobed. Esophageal gland lobe 36–55  $\mu$ m long, overlapping intestine up to 2–3 body widths behind cardia. Opening of dorsal esophageal gland 3–4  $\mu$ m from base of spear. Nerve ring at mid isthmus. Excretory pore 74–97  $\mu$ m from anterior extremity or up to 8  $\mu$ m anterior or 8  $\mu$ m posterior to esophago-intestinal junction. Hemizonid just anterior to excretory pore. Spermatheca elongate oval, 18–37  $\times$  10–15  $\mu$ m, usually filled with sperm. Tricolumella well developed. Vulva a transverse slit located at 77–83% of body length. Post vulval uterine sac 30–37  $\mu$ m long, occupying 27–36% of vulva–anus distance, usually with 2–3 differentiated cells. Anal body diameter 9–14  $\mu$ m. Tail elongated conoid to subcylindrical, 1.9–3.0 anal body widths long with 26–40 tail annules. Tail tip narrowly to broadly rounded, may be truncated or with a mucron-like process or bifid (Fig. 1J). Phasmids anterior to middle of tail.

*Male*: Spicules 15  $\mu$ m long. Gubernaculum trough-shaped, 7–8  $\mu$ m long. Phasmids extending into smooth or crenate caudal alae. Tail tip pointed to bifid.

TYPE HOST AND LOCALITY: Soil and roots of *Pyrus malus* L. from horticultural farm, Dept. of Horticulture, H.A.U., Hissar, India.

TYPE SPECIMENS: Holotype mounted on slide No. 1, *Pratylenchus ekrami* n. sp.; para-

types on slides Nos. 2–8. Holotype and 18 female and 6 male paratypes deposited with Department of Nematology, H.A.U., Hissar; rest of the paratypes with National Nematode Collection, Division of Nematology, I.A.R.I., New Delhi.

DIFFERENTIAL DIAGNOSIS: *Pratylenchus ekrami* n. sp. is similar to *P. vulnus* Allen & Jensen, 1951 from which it differs in shape of lip region, number of lip annules, spear size, shape of spear knobs and median bulb, details of lateral lines, and number of tail annules. Lip region high, lip annules usually 3–4 on one side and 4 on the other, spear 14–18  $\mu$ m long, spear knobs rounded, central band of lateral lines narrower than outer ones, median bulb oval, relatively narrow in *P. vulnus*.

*Pratylenchus coffeae* (Zimmermann, 1898)

Goodey, 1951

(Fig. 3K)

MEASUREMENTS: See Table 1.

DESCRIPTION: *Female*: Head region low with two annules. Lateral lines four, outer ones crenate, six in one specimen and areolated. Spermatheca variable in size, always rounded or broadly rounded, usually full of sperm. Tail elongated conoid with 21–32 annules, tail tip smooth, variable in shape (Fig. 3K), being flat or rounded, bifid, and may bear one or more mucro-like projections.

*Male*: Abundant.

TYPE HOST AND LOCALITY: Collected from soil around the roots of citrus orchards of Sirsa district.

## DISCUSSION

*Pratylenchus cruciferus*: Spear length and value of 'V' were the least variable characters studied (CV less than 2.0). Body length, value of 'b,' and tail length were moderately variable with CV values being 5.6, 6.8, and 6.4, respectively. Rest of the characters were most variable (CV value 8.9 or more).

*Pratylenchus ekrami*: In this species, spear length and value of 'V' were least variable (CV 4.4 and 1.6, respectively). All the other characters studied had high CV values ranging from 8.0 to 14.0.

*Pratylenchus coffeae*: Spear length and value of 'V' were found to be quite constant in their values as their CV were 2.6 and 1.4, respectively. Body length, number

of tail annules, and value of 'b' were moderately variable with CV of 7.1, 6.7, and 6.6, respectively. Length of post vulval uterine sac, body width, and value of 'a' were the most variable characters (CV 17.7, 16.1, and 17.5, respectively).

It can be inferred from the above observations that, while spear length and value of 'V' were relatively stable in three species examined, other characters were more variable, depending on the species; e.g., body length was least variable in *P. cruciferus* but highly variable in *P. ekrami*. Similarly, length of post vulval uterine sac, which varied relatively little in *P. ekrami* (CV = 9.2), was most variable in *P. coffeae* (CV = 17.7).

The least variability observed in spear length and value of 'V' conform with the findings of Taylor and Jenkins ('V' only) (5) for *P. penetrans* (Cobb, 1917) Filipjev & Sch. Stek., 1941, *P. hexincisus* Taylor & Jenkins, 1957, *P. subpenetrans* Taylor & Jenkins, 1957, and *P. zaeae*; Roman and Hirschmann (3) for *P. penetrans*, *P. vulnus*, *P. coffeae*, *P. scribneri* Steiner, 1943, *P. zaeae*, and *P. brachyurus* (Godfrey, 1929) Filipjev & Sch. Stek., 1941; Rashid and Khan (2) for *P. coffeae*; and Singh and Khan (4) for *P. thornei*. Further, they support Loof's (1) view that spear length is of great importance in the taxonomy of this genus. Body length was least variable in *P. cruciferus* and slightly more in *P. coffeae* which is in agreement with the observations of Rashid and Khan (2), Singh and Khan (4), and Roman and Hirschmann (3). *P. ekrami* n. sp. seems to be unique in having a comparatively less variable post vulval uterine sac length which

was highly variable in *P. coffeae* in the present study as well as in the study by Rashid and Khan (2) for this species and Singh and Khan (4) for *P. thornei*.

Number of head annules, shape of spear knobs, position of hemizonid in relation to excretory pore, and shape of spermatheca (when full of sperm) were constant and not so variable as reported by Roman and Hirschmann (3). Number of incisures was consistent in all the species except for *P. coffeae* in which one aberrant specimen with six lateral lines was observed. This again does not agree with the findings of Roman and Hirschmann (3). Tail shape, which was similar in all the specimens of *P. cruciferus* studied, exhibited greatest variations in *P. ekrami* and *P. coffeae* as was the case with *P. vulnus* (3) and *P. zaeae* (5).

#### LITERATURE CITED

1. Loof, P. A. A. 1978. The genus *Pratylenchus* Filipjev, 1936 (Nematoda: Pratylenchidae): A review of its anatomy, morphology, distribution, systematics and identification. Uppsala, Sweden, Swedish University of Agricultural Sciences, Research Information Centre, Växtskyddsrapporter 5.
2. Rashid, A., and A. M. Khan. 1976 (publ. 1978). Morphometric studies on *Pratylenchus coffeae* with description of *Pratylenchus typicus* Rashid, 1974. Indian Journal of Nematology 6:63-72.
3. Roman, J., and H. Hirschmann. 1969. Morphology and morphometrics of six species of *Pratylenchus*. Journal of Nematology 1:363-386.
4. Singh, D. B., and E. Khan. 1981. Morphological variations in populations of *Pratylenchus thornei* Sher & Allen, 1953. Indian Journal of Nematology 11:53-60.
5. Taylor, D. P., and W. R. Jenkins. 1957. Variation within the nematode genus *Pratylenchus*, with the descriptions of *P. hexincisus* n. sp. and *P. subpenetrans* n. sp. Nematologica 2:159-174.