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LONGIDORIDAE (NEMATODA: DORYLAIMIDA) FROM SUDAN

by
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Summary. Five species of Longidoridae belonging to the genera *Longidorus* and *Xiphinema* were found, described and illustrated, i.e., *Longidorus africanus*, *L. pisi*, *Xiphinema basiri*, *X. elongatum* and *X. simillimum*. All species are recorded for the second time from Sudan. *L. africanus* possesses a small amphidial aperture, appearing as a minute slit both under light microscope and SEM.

Five species belonging to the genus *Longidorus* have previously been reported from Sudan, namely: *L. africanus* Merny, 1966; *L. siddiqii* Aboul-Eid, 1970 (now *L. pisi* Edward, Misra et Singh, 1964); *L. laevicapitatus* Williams, 1959; *L. brevicaudatus* Schuurmans Stekhoven, 1951 and *Longidorus* sp. (Yassin, 1967, 1972, 1974, 1975, 1986; Yassin et al., 1971; Elamin and Siddiqi, 1970; Decker et al., 1980).

Five *Xiphinema* species have also been reported from Sudan, i.e., *X. basiri* Siddiqi, 1959; *X. ebriense* Luc., 1958; *X. elongatum* Schuurmans Stekhoven et Teunissen, 1938; *X. simillimum* Loof et Yassin, 1971 and *Xiphinema* sp. (Yassin, 1972, 1974, 1975, 1986; Loof and Yassin, 1971; Yassin et al., 1971; Elamin and Siddiqi, 1970; Decker et al., 1980).

From over a hundred soil samples collected from the rhizosphere of various plants in different localities in Central Sudan, 29 contained longidorid nematodes. The species were *L. africanus*, *L. pisi*, *X. basiri*, *X. elongatum* and *X. simillimum*. The morphometrics and some aspects of morphology of the populations of each species are described here.

Descriptions

LONGIDORUS AFRICANUS Merny, 1966 (Figs 1 A-H and 2 A-E)

Measurements:

Abu Haraz population:

Females (n = 10): L = 4.15 mm ± 0.39 (3.57-4.93), a

= 97 ± 8 (83-105), b = 10.5 ± 0.9 (9.4-12.3), c = 88 ± 10 (81-105), c' = 1.7 ± 0.1 (1.5-1.9), V % = 49 ± 1 (48-51); tail = 47 µm ± 4 (40-53); odontostyle = 88 µm ± 3 (82-92); odontophore = 41 µm ± 3 (38-48); stylet = 129 µm ± 3 (124-133).

Males: not found.

Juveniles:

J1 (n = 4): L = 1.20 mm (1.17-1.24), a = 61 (55-63), b = 5.1 (4.8-5.2), c = 30 (28-32), c' = 2.8 (2.6-3.0); tail = 40 µm (37-42); odontostyle = 52 µm; odontophore = 27 µm (24-29); stylet = 79 µm (76-81); replacement odontostyle = 64 µm (60-69).

J2 (n = 5): L = 1.65 mm (1.42-1.81), a = 67 (64-74), b = 5.7 (4.9-5.8), c = 38 (36-40), c' = 2.5 (2.2-2.9); tail = 43 µm (40-46); odontostyle = 63 µm (61-65); odontophore = 30 µm (25-33); stylet = 93 µm (86-97); replacement odontostyle = 71 µm (68-75).

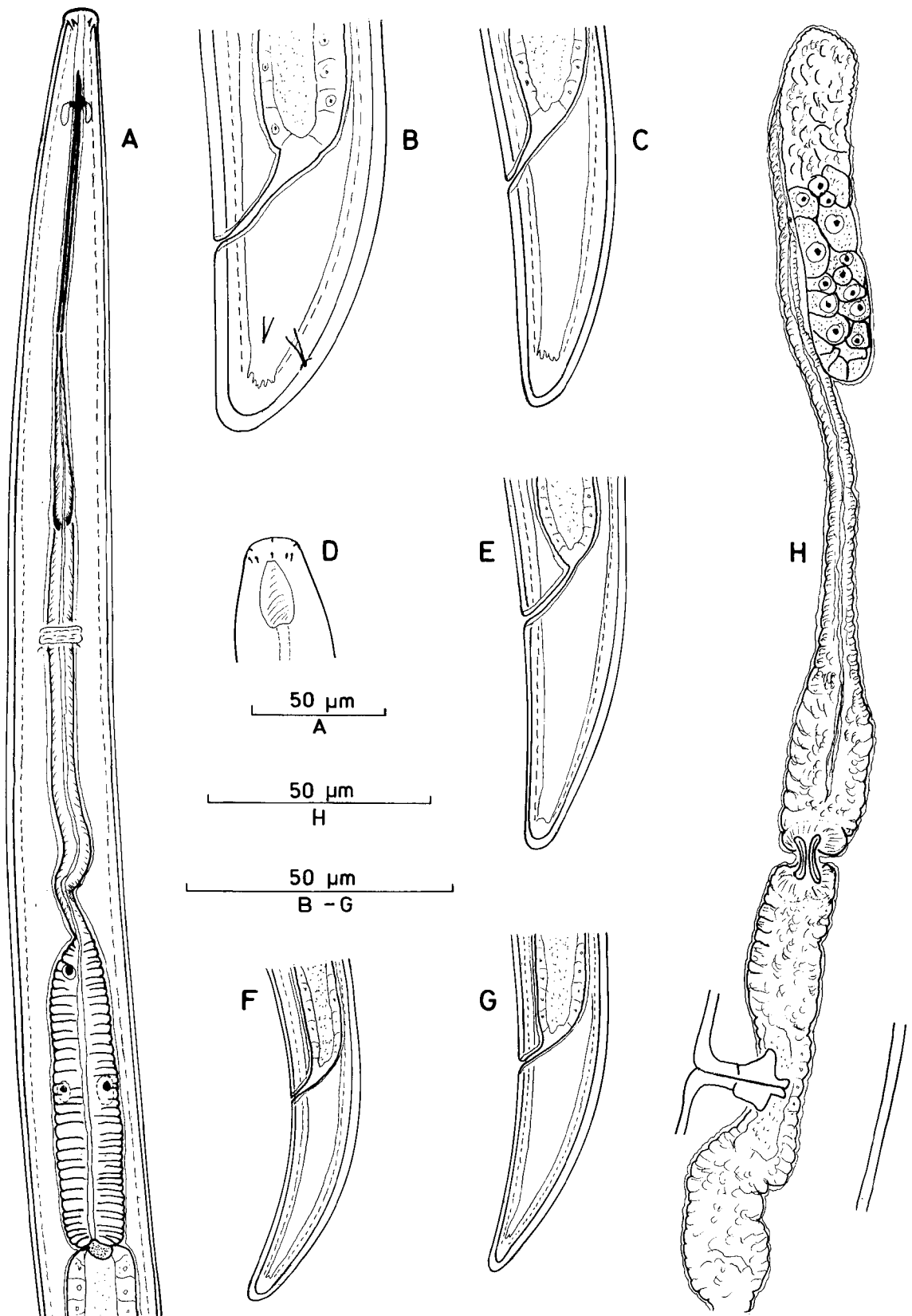
J3 (n = 3): L = 2.03 mm (1.98-2.06), a = 67 (58-75), b = 6.6 (6.3-7.0), c = 41 (39-43), c' = 2.5 (2.3-2.8); tail = 50 µm (46-53); odontostyle = 64 µm (62-67); odontophore = 31 µm (28-34); stylet = 96 µm (91-98); replacement odontostyle = 77 µm (75-78).

J4 (n = 3): L = 3.30 mm (2.81-3.21), a = 80 (74-88), b = 6.9 (5.8-8.8), c = 69 (68-71), c' = 1.9 (1.7-2.1); tail = 43 µm (40-45); odontostyle = 74 µm (70-78); odontophore = 36 µm (33-38); stylet = 110 µm (107-116); replacement odontostyle = 86 µm (83-88).

South of Wadmedani population:

Females (n = 6): L = 4.05 mm ± 0.25 (3.81-4.43), a = 96 ± 8 (87-106), b = 10.0 ± 0.4 (9.2-10.5), c = 101 ± 10 (83-111), c' = 1.5 ± 0.1 (1.3-1.7), V % = 50 ± 1 (49-52); tail = 41 µm ± 3 (38-46); odontostyle = 92 µm

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± 2 (89-94); odontophore = $39 \mu\text{m} \pm 3$ (33-43); stylet = $131 \mu\text{m} \pm 4$ (127-137).

Males: not found.

Females (description based on population from Abu Haraz): long, rather slender nematodes showing C- or spiral shapes when relaxed. Cephalic region rounded, continuous with body contour, $12 \mu\text{m} \pm 0.5$ (11-13) wide and $5.5 \mu\text{m} \pm 0.5$ (5-6) high. Amphids fairly large, pouch-like, slightly bilobed posteriorly with a small slit-like aperture (almost $0.7 \mu\text{m}$). Stylet typical; guiding ring situated at $30 \mu\text{m} \pm 3$ (23-33) from anterior body end; odontophore with slight basal swellings. Neck $396 \mu\text{m} \pm 39$ (344-454) long. Intestine followed by $416 \mu\text{m} \pm 94$ (278-549) long pre-rectum.

Female genital system typical with $G_1 = 6\% \pm 2$ (4.5-10) and $G_2 = 5.5\% \pm 1$ (4.5-7.5); uterus short, separated by prominent sphincter from oviduct; no sperm cells observed; tail broadly conoid, with two pairs of caudal pores and rounded tip; curvature more pronounced dorsally.

Juveniles: all stages resemble females in body shape.

Habitat and locality:

Abu Haraz population: ten females and sixteen different juvenile stages, collected from the rhizosphere of ornamental shrubs and trees of *Acalypha indica*, *Ficus elastica*, *Moria* sp., *Phoenix dactylifera* and *Washingtonia* sp. on the campus of Abu Haraz College of Agriculture and Natural Resources, Central Sudan, in June 1987.

South of Wadmedani population: six females collected from the rhizosphere of *Azadirachta indica* and *Poinciana* sp. trees in a garden at the South of Wadmedani, Central Sudan, in June 1987.

Discussion

L. africanus was first described by Merny (1966) from soil around the roots of sugar cane in Chirundu, Zimbabwe. Later, it was reported from Israel (Cohn and Mordechai, 1969), Zimbabwe, Somaliland, Egypt, Sudan, Israel, California (USA) and Mexico (Lamberti, 1969), Egypt (Aboul-Eid, 1970), USSR (Ivanova, 1972), Sudan (Yassin, 1974, 1975, 1986 and Decker *et al.*, 1980), Greece (Kolipanos and Vovlas, 1977), India (Vadivelu and Muthukrishnan, 1987) and South Africa (Jacobs and Heyns, 1987).

Our specimens agree morphometrically with described populations; morphologically some slight differences could be observed such as:

— Some specimens from Sudan were not as strongly

ventrally curved upon relaxation as those from South Africa.

— Amphidial apertures were reported as pore-like in populations from South Africa and Egypt whereas a small slit-like aperture was observed in our specimens under the light microscope. This was confirmed by SEM (Fig. 2 A).

LONGIDORUS PISI Edward, Misra *et* Singh, 1964 (Fig. 3 A-G)

Measurements:

South of Wadmedani population:

Females (n = 6): L = $3.76 \text{ mm} \pm 0.15$ (3.49-3.91), a = 141 ± 9 (125-151), b = 11.3 ± 1.3 (8.9-12.5), c = 96 ± 8 (83-104), c' = 2.3 ± 0.3 (1.9-2.8), V % = 49-50; tail = 39 ± 4 (36-47); odontostyle = $69 \mu\text{m} \pm 2$ (68-72); odontophore = $45 \mu\text{m} \pm 1$ (44-47); stylet = $114 \mu\text{m} \pm 2$ (112-117).

Male (n = 1): L = 2.97 mm, a = 124, b = 8.8, c = 76, c' = 2.1, T % = 33; tail = $39 \mu\text{m}$; odontostyle = $67 \mu\text{m}$; odontophore = $47 \mu\text{m}$; stylet = $114 \mu\text{m}$; spicules = $28 \mu\text{m}$; lateral guiding piece = $8.5 \mu\text{m}$.

Abu Haraz population:

Females (n = 8): L = $3.26 \text{ mm} \pm 0.27$ (2.93-3.57), a = 104 ± 4 (98-111), b = 10.0 ± 1.0 (8.3-11.2), c = 95 ± 7 (84-104), c' = 1.8 ± 0.1 (1.6-2.0), V % = 51 ± 1 (49-53); tail = $35 \mu\text{m} \pm 2$ (33-38); odontostyle = $69 \mu\text{m} \pm 2$ (67-73); odontophore = $41 \mu\text{m} \pm 4$ (34-49); stylet = $111 \mu\text{m} \pm 6$ (101-115).

Males: not found.

Hantoub population:

Females (n = 8): L = $3.79 \text{ mm} \pm 0.40$ (3.27-4.28), a = 123 ± 7 (109-130), b = 10.5 ± 0.9 (8.8-11.6), c = 92 ± 11 (69-110), c' = 2.2 ± 0.4 (1.9-2.9), V % = 50 ± 1 (48-51); tail = $42 \mu\text{m} \pm 4$ (39-49); odontostyle = $73 \mu\text{m} \pm 4$ (65-78); odontophore = $44 \mu\text{m} \pm 3$ (38-47); stylet = $117 \mu\text{m} \pm 7$ (103-124).

Males: not found.

Females (description based on population from South of Wadmedani): long, slender nematodes showing J- body shape when relaxed (specimens from Abu Haraz and Hantoub with C- or spiral shapes). Cephalic region expanded, slightly raised, knob-like and offset, $8.0 \mu\text{m} \pm 0.5$ (7.5-9) wide and about 4-4.5 μm high. Amphids large, pouch-like, bilobed with indistinct apertures,, most probably pore-

like. Stylet with typical shape; guide ring situated at $38 \mu\text{m} \pm 2$ (37-42) from anterior body end; odontophore with slight basal swellings. Neck $332 \mu\text{m} \pm 39$ (300-407) long. Intestine followed by $333 \mu\text{m} \pm 39$ (344-600) long pre-rectum, filled with large globules with granular appearance in specimens from South of Wadmedani and Abu Haraz while they appear as highly refractive bodies in the specimens from Hantoub (Fig. 3 G and F).

Female reproductive system typical with $G_1 = 6.5\% \pm 1.5$ (5.5-8.5) and $G_2 = 6\% \pm 1.5$ (3.0-7); uterus long,

separated by prominent sphincter from oviduct; no sperm seen. Tail elongate, conoid with two pairs of caudal pores and a rounded terminus.

Male: anterior body structure similar to that of female. Tail shorter than that of female, with four pairs of caudal pores and rounded terminus; the dorsal curved side slightly indented. Copulatory musculature well developed; spicules and lateral guiding pieces very distinct. Supplementary papillae consisting of an adanal pair and six single, medioventral ones.

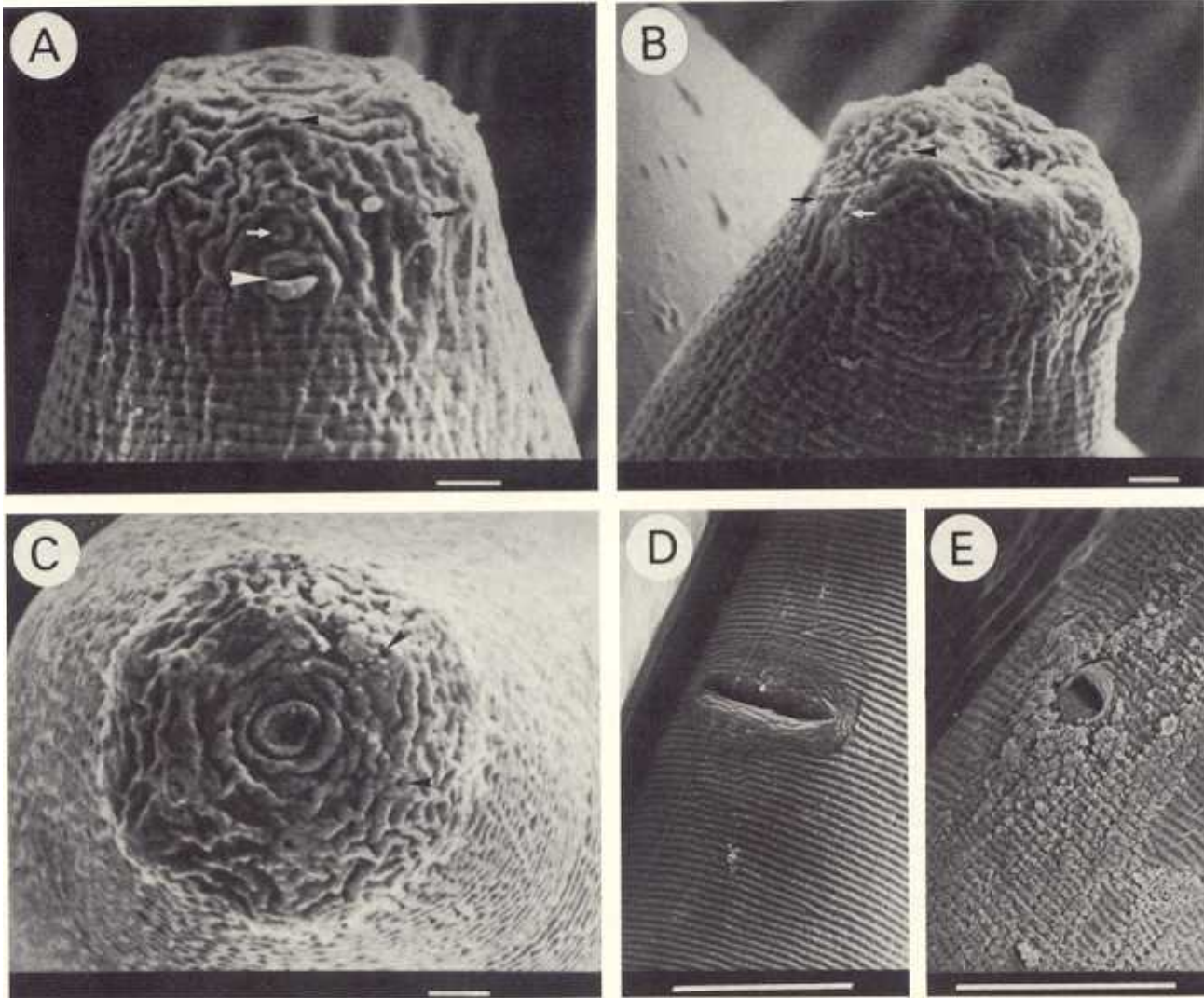
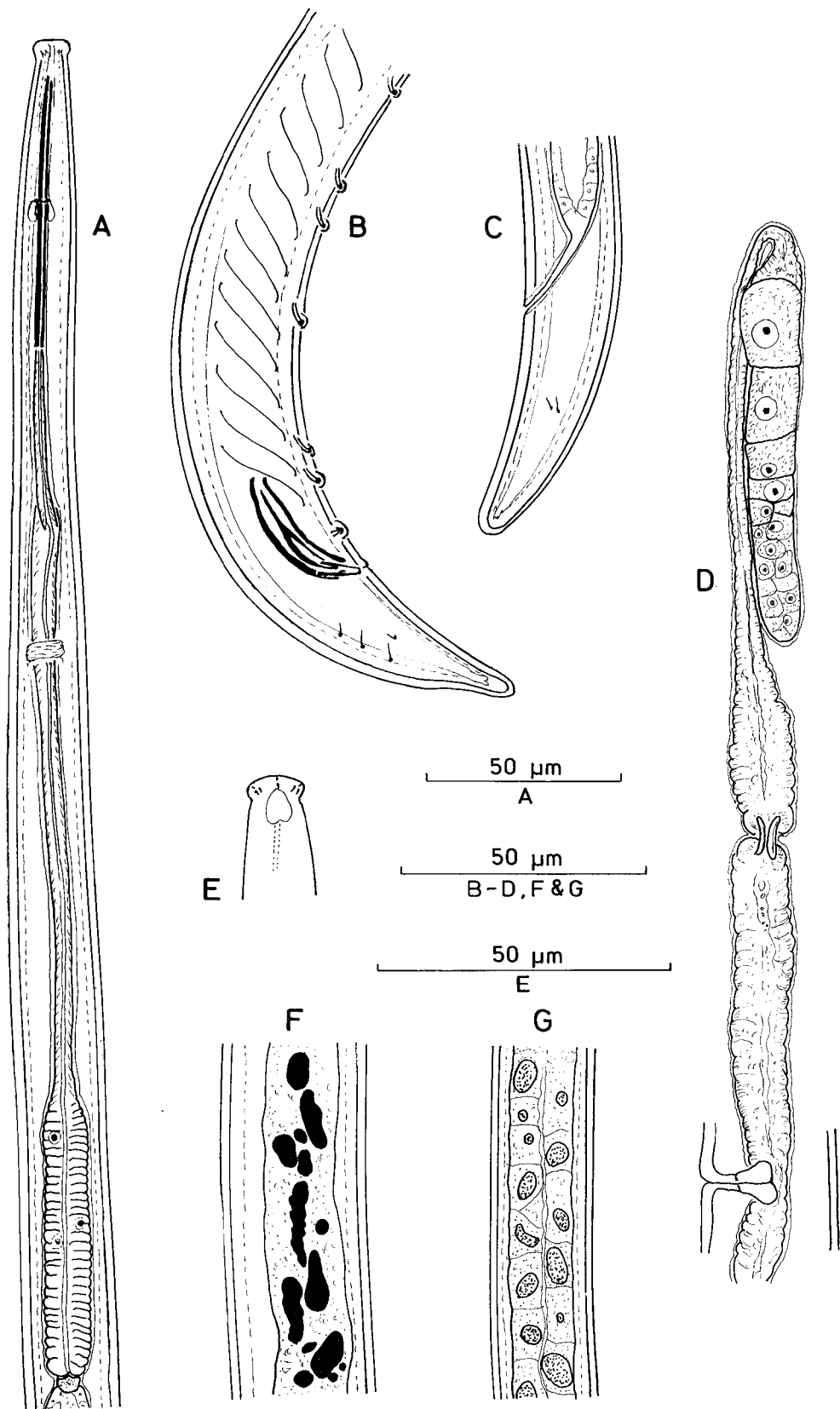
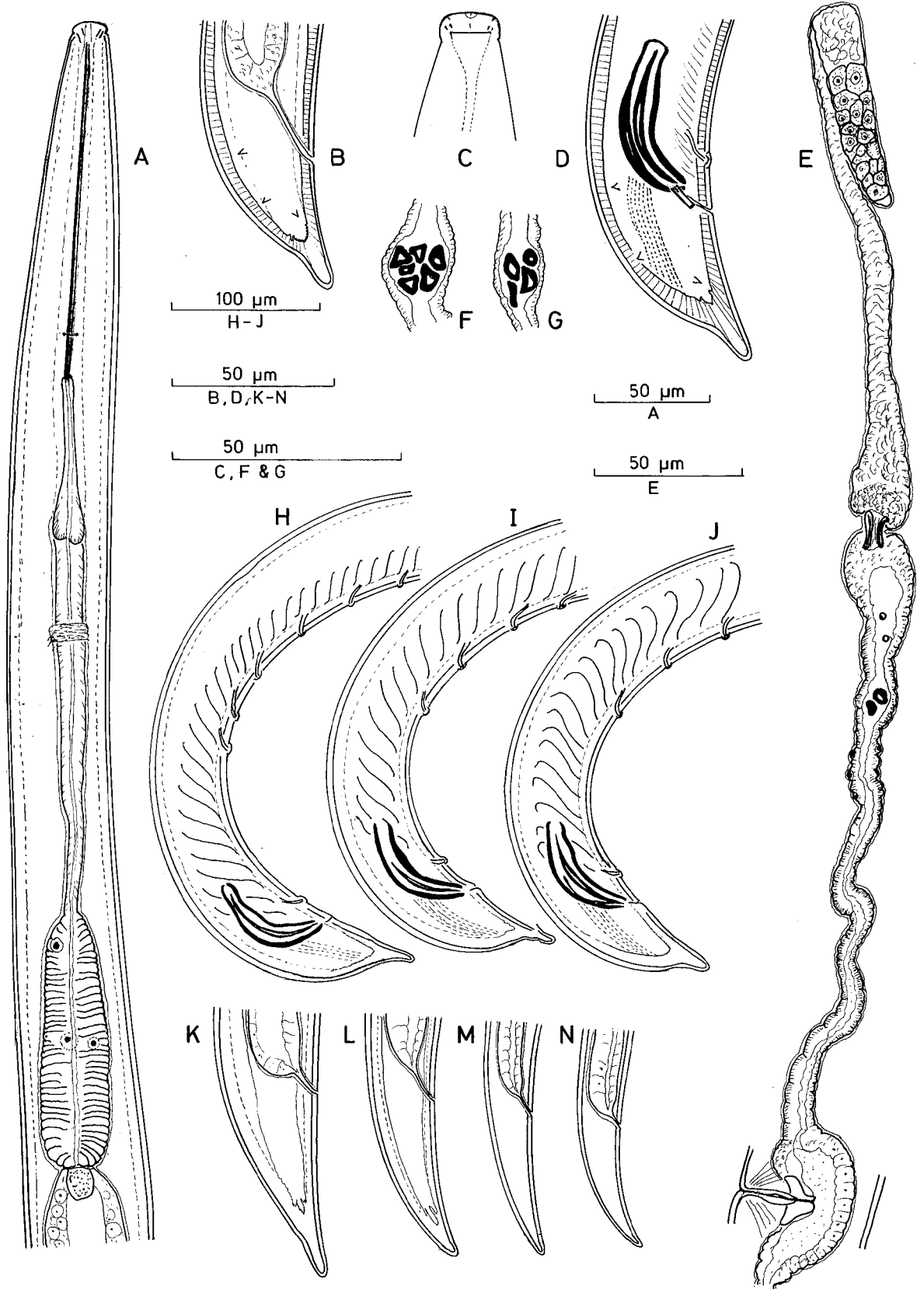


Fig. 2 - *L. africanus*: A, lip region of J4 in lateral view; B, lip region of female in dorso-ventral view; C, lip region of J4 «en face»; D, vulva; E, anus. (scale bar: $1 \mu\text{m}$ in A-C, $10 \mu\text{m}$ = in D and E). Large white arrowhead indicates amphid aperture; small black arrowhead indicates an inner labial papilla; white arrow points to an outer labial papilla and black arrow points to cephalic papilla.

Fig. 3 (Front page) - *L. pisi*: A, female anterior body end; B and C, male and female tail regions; E, head end in surface view showing anterior sensilla; F and G, prerectal inclusions; D, female genital system, anterior branch.





Habitat and locality:

South of Wadmedani population: six females and one male from soil samples collected from the rhizosphere of two *Poinciana* sp. trees in a garden at South of Wadmedani, Central Sudan, in June 1987.

Abu Haraz population: eight females from soil samples collected from the rhizosphere of *Russolia* sp. and *Nerium oleander* ornamental shrubs on the campus of Abu Haraz College of Agriculture and Natural Resources, Central Sudan, in June 1987.

Hantoub population: eight females from soil samples collected from the rhizosphere of *Citrus limon* and *Solanum melongena* in Gway fruit orchard near Hantoub, Central Sudan, in June 1987.

Discussion:

L. pisi was first described by Edward *et al.* (1964) from females only from the rhizosphere of *Pisum sativum* from Uttar Pradesh, India. Later, Brown *et al.* (1982) described a single male from the rhizosphere of sugar cane at Nchalo, Malawi.

Siddiqi (1959) described *Xiphinema brevicaudatum* from soil around the roots of sugar cane in Aligarh, India which was transferred to the genus *Longidorus* by Aboul-Eid (1970) as a new species, *L. siddiqii*. In 1978, Khan synonymized it with *L. pisi*. This synonymization was accepted by Brown *et al.* (1982) who considered the populations described by Chavez and Geraert (1977) from Cameroon, and by Prabha (1973) and Siddiqi (1959) from India, as *L. pisi*. Jacobs and Heyns (1982) described a population of females and a single male of *L. siddiqii* from Natal, South Africa and compared it with females from the populations described by Siddiqi (1959) and Prabha (1973) from India and to the male described by Cohn and Martelli (1964) from Israel; in a footnote they referred to the synonymization of *L. siddiqii* with *L. pisi* by Khan (1978) and the acceptance of it by Brown *et al.* (1982) but they did not state whether they accepted the synonymy or not.

Females of our populations agree morphometrically and morphologically with most previous descriptions.

The prerectal inclusions first reported by Jacobs and Heyns (1982) are probably typical for the species and are apparently variable in shape and composition.

Our male agrees with those described by Cohn and Martelli (1964), Edward *et al.* (1982) and Jacobs and Heyns (1982), but a slight difference, namely:

— the number of medioventral supplements in our male is six concurring with that of Cohn and Martelli (1964), but different from that of Brown *et al.* (1982) and

Jacobs and Heyns (1982) which was reported as four, but their Fig. 1 B of Brown *et al.* (1982) shows five; this confusion may be due to «some folding of the cuticle between the papillae» drawn and reported by Brown *et al.* (1982).

XIPHINEMA BASIRI SIDDIQI, 1959

(Fig. 4 A-N)

Measurements:

Abu Haraz population:

Females (n = 28): L = 3.13 mm ± 0.18 (2.88-3.52), a = 66 ± 6 (56-75), b = 6.7 ± 1.0 (4.2-8.0), c = 68 ± 5 (58-77), c' = 1.5 ± 0.1 (1.4-1.7), V % = 50 ± 1 (49-53); tail = 46 µm ± 3 (39-54); odontostyle = 125 µm ± 4 (120-132); odontophore = 64 µm ± 4 (54-70); stylet = 189 µm ± 7 (180-197).

Males (n = 3): L = 3.17 mm (3.08-3.30), a = 66 (57-73), b = 6.0 (5.6-6.3), c = 62 (59-66), c' = 1.4-1.5, T % = 57 (n = 1); tail = 51 µm (50-52); odontostyle = 125 µm (124-126); odontophore = 65 µm (64-66); stylet = 190-191 µm; spicules = 61 µm (60-63); lateral guiding piece = 11.0 µm (10.5-11.5).

Center of Wadmedani population:

Females (n = 12): L = 3.15 mm ± 0.23 (2.80-3.50), a = 63 ± 6 (53-73), b = 6.9 ± 1.0 (4.5-8.5), c = 71 ± 8 (59-85), c' = 1.4 ± 0.1 (1.2-1.6), V % = 50 ± 1 (48-52); tail = 45 µm ± 5 (38-51); odontostyle = 129 µm ± 7 (123-144); odontophore = 64 µm ± 5 (56-75); stylet = 192 µm ± 8 (183-204).

Males: not found.

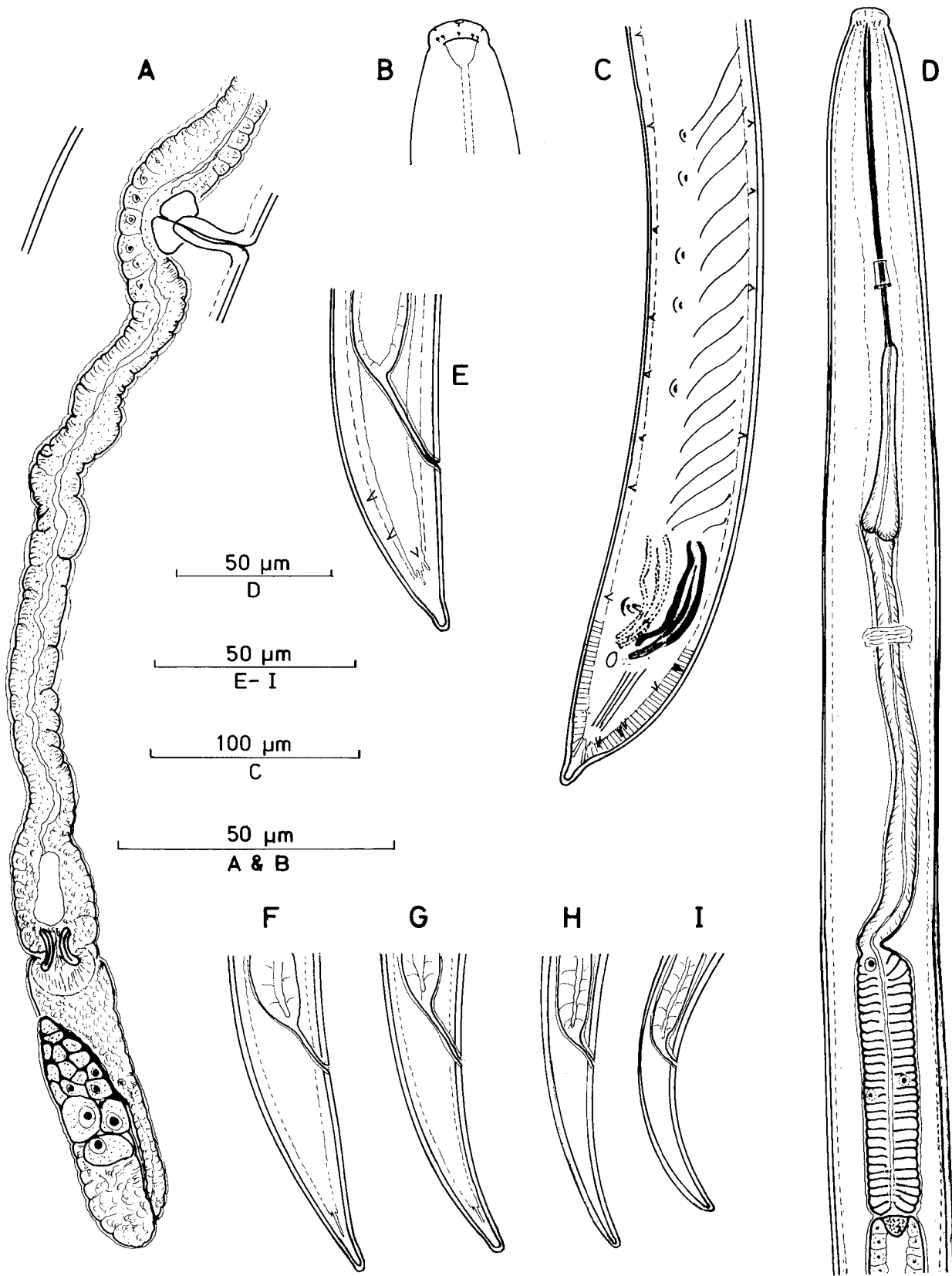
Juveniles:

J1 (n = 3): L = 0.825 mm (0.788-0.870), a = 41 (37-46), b = 4.1 (3.3-4.7), c = 19 (18-20), c' = 3.6 (3.0-3.9), tail = 43 µm (42-45); odontostyle = 47 µm (45-49); odontophore = 31 µm (30-32); stylet = 77 µm (74-81); replacement odontostyle = 64 µm (60-66).

J2 (n = 3): L = 1.13 mm (1.09-1.17), a = 45 (42-50), b = 4.4 (4.0-4.6), c = 23-24, c' = 3.1 (2.9-3.4); tail = 48 µm (46-52); odontostyle = 66 µm (63-69); odontophore = 42 µm (39-45); stylet = 108-109 µm; replacement odontostyle = 86 µm (84-87).

J3 (n = 3): L = 1.70 mm (1.63-1.82), a = 49 (47-51), b = 5.3-5.4, c = 31 (29-32), c' = 2.5 (2.4-2.6); tail = 56 µm (52-62); odontostyle = 84 µm (83-86); odontophore = 50 µm (48-52); stylet = 134 µm (131-136); replacement odontostyle = 105 µm (102-107).

Fig. 4 (Front page) - *Xiphinema basiri*: A, female anterior body end; B, female tail; C, head end in surface view showing anterior sensilla; D, male tail; E, female genital system, anterior branch; F and G, Z-differentiation; H-J, male posterior body region; K-N, tails of juveniles (K = J4, L = J3, M = J2, N = J1).



J₄ (n = 3): L = 2.30 mm (2.16-2.46), a = 59 (56-60), b = 6.3 (5.1-7.5), c = 43 (40-49), c' = 2.1 (1.9-2.3); tail = 54 μm (47-61); odontostyle = 100 μm (95-105); odontophore = 57 μm (56-60); stylet = 157 μm (151-165); replacement odontostyle = 127 μm (124-132).

South of Wadmedani population:

Females (n = 11): L = 3.29 mm ± 0.32 (2.82-3.92), a = 65 ± 5 (59-74), b = 6.8 ± 0.7 (5.6-8.3), c = 70 ± 8 (64-82), c' = 1.5 ± 0.1 (1.3-1.7), V % = 50 ± 1 (48-53); tail = 47 μm ± 4 (43-53); odontostyle = 130 μm ± 4 (120-133); odontophore = 66 μm ± 3 (61-73); stylet = 194 μm ± 7 (181-206).

Males: not found.

Females (description based on population from Abu Haraz): long, thick nematodes showing spiral or J-shapes when relaxed. Lip region rounded, slightly offset, 13 μm ± 0.5 (12-14.5) wide and 5 μm ± 0.5 (4.5-6) high. Amphids large, stirrupshaped with slit-like apertures occupying about two thirds or more of the lip region width. Stylet typical with strongly developed flanges; guide ring at 117 μm ± 7 (104-133) from anterior end. Neck 477 μm ± 97 (385-508) long.

Female genital tract typical with G₁ = 10 % ± 2 (7.5-14.5) and G₂ = 9 % ± 2 (6-15.5); uteri long, tube-like with Z-differentiation containing highly refractive inclusions varying in shape, size and number; oviduct separated from uterus by prominent sphincter. No sperm cells seen. Tail conoid, digitate; provided with three pairs of caudal pores.

Males (from Abu Haraz): anterior body shape and structure and tail similar to those of females. Copulatory musculature very distinct; spicules and lateral guiding pieces typical. Supplementary papillae comprising an adanal pair and a medioventral series of three to six single ones (Fig. 4 H-J).

Juveniles (from the Center of Wadmedani): all stages resemble females, but show only J- body shape. Tails increase in length from stage to stage; tail of J₄ resembles that of females.

Habitat and locality:

Abu Haraz population: twenty eight females and three males collected from the rhizosphere of *Gardinia* sp., *Poinciana* sp., *Thuja orientalis* and *Phoenix dactylifera* ornamental shrubs and trees from the campus of Abu Haraz College of Agriculture and Natural resources, Central Sudan, in June 1987.

Center of Wadmedani population: twelve females and twelve different stage juveniles collected from the rhizo-

sphere of *Citrus sinensis*, *Psidium guajava* trees, *Mangifera indica* trees, *Tamarindix indica* and *C. limon* in a garden at the centre of Wadmedani, Central Sudan, in June 1987.

South of Wadmedani population: eleven females collected from the rhizosphere of *Bougainvillea* sp., *Azadirachta indica*, *Citrus limon* and *C. paradisi* trees in a garden South of Wadmedani, Central Sudan, in June 1987.

Discussion

X. basiri was first described by Siddiqi (1959) from soil around the roots of oranges in Aligarh, India. Later, it was described from Sudan (Loof and Yassin, 1971); Nigeria, India, Sri Lanka, Mexico and Rhodesia (Cohn and Sher, 1972) and also from India (Bajaj and Jairajpuri, 1979). Sharma and Saxena (1981) and Javed (1983) described *X. cobbi* and *X. hayati*, respectively, which were both synonymized with *X. basiri* by Loof and Luc (1990).

Females of our populations agree morphologically and morphometrically almost in every aspect reported for type and other populations. Our males also agree in most aspects except for a slight difference in the length of the lateral guiding pieces which measure 10.5-11.5 μm for our three males compared to 16 μm for the four males reported by Bajaj and Jairajpuri (1979).

XIPHINEMA ELONGATUM

Schuermans Stekhoven *et* Teunissen, 1938

(Fig. 5 A-I)

Measurements:

South of Wadmedani population:

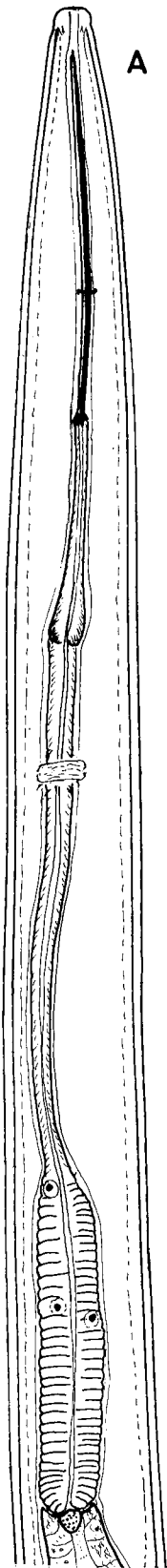
Females (n = 12): L = 2.06 mm ± 0.13 (1.87-2.35), a = 51 ± 2 (44-58), b = 5.7 ± 0.6 (4.8-6.6), c = 41 ± 3 (36-46), c' = 2.1 ± 0.2 (1.9-2.4), V % = 46 ± 2 (43-49); tail = 49 μm ± 5 (44-55); odontostyle = 106 μm ± 3 (103-110); odontophore = 61 μm ± 5 (54-69); stylet = 168 μm ± 6 (156-175).

Male (n = 1): L = 2.03 mm, a = 51, b = 6.2, c = 45, c' = 1.4, T % = 59; tail = 45 μm; odontostyle = 112 μm; odontophore = 62 μm; stylet = 171 μm; spicules = 46 μm; lateral guiding piece = 13 μm.

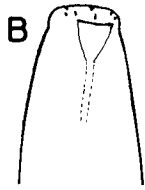
Abu Haraz population:

Females (n = 4): L = 2.38 mm (2.33-2.41), a = 56 (51-65), b = 6.0 (5.0-7.0), c = 44 (41-46), c' = 2.1 (1.9-2.2), V % = 44 (43-45); tail = 54 μm (51-57); odontostyle = 107 μm (104-110); odontophore = 62 μm (61-64); stylet = 170 μm (165-174).

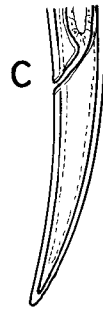
Fig. 5 (Front page) - *X. elongatum*: A, female genital system, posterior branch; B, head end in surface view showing anterior sensilla; C and E, male and female tail region; D, female anterior body end; F-I, tails of juveniles (F = J₄, G = J₃, H = J₂, I = J₁).



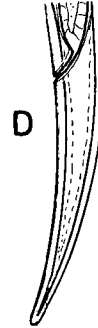
A



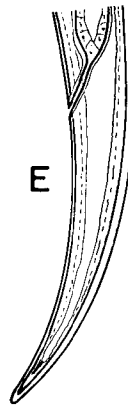
B



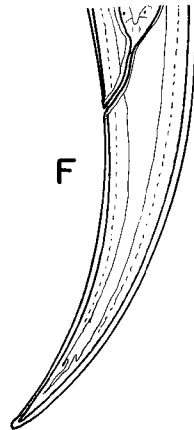
C



D



E

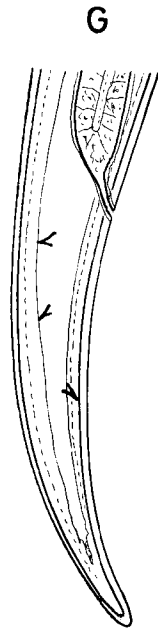


F

50 μ m
A, C - F

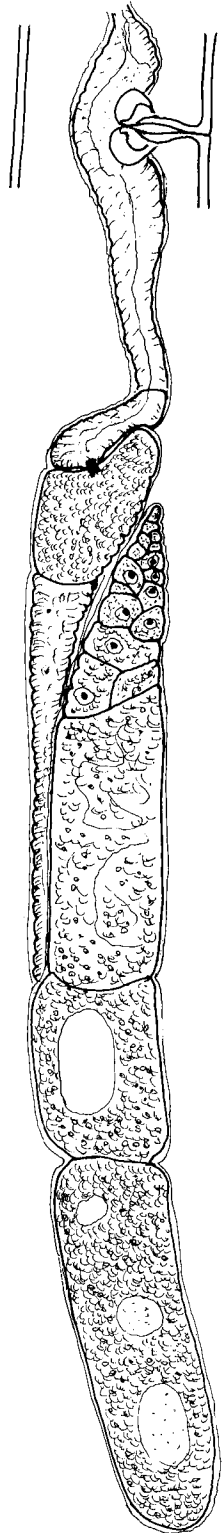
50 μ m
G & H

50 μ m
B



G

H



Males: not found.

Juveniles:

J1 (n = 2): L = 0.58, 0.63 mm; a = 32, 35; b = 3.4, 3.3; c = 14, 15; c' = 4.1, 3.9; tail = 43 μ m; odontostyle = 34, 38 μ m; odontophore = 26, 29 μ m; stylet = 63, 67 μ m; replacement odontostyle = 49, 51 μ m.

J2 (n = 1): L = 0.96 mm, a = 38, b = 3.9, c = 18, c' = 3.5; tail = 52 μ m; odontostyle = 52 μ m; odontophore = 39 μ m; stylet = 91 μ m; replacement odontostyle = 73 μ m.

J3 (n = 1): L = 1.61 mm, a = 54, b = 5.8, c = 29, c' = 2.7, tail = 56 μ m; odontostyle = 81 μ m; odontophore = 44 μ m; stylet = 125 μ m; replacement odontostyle = 102 μ m.

J4 (n = 3): L = 1.65 mm (1.64-1.67), a = 53 (52-54), b = 4.6 (4.3-4.9), c = 29, c' = 2.6-2.7; tail = 57 μ m; odontostyle = 89 μ m (87-90); odontophore = 54 μ m (52-56); stylet = 143 μ m (141-146); replacement odontostyle = 109 μ m (108-110).

Females (description based on population from South of Wadmedani): showing C-, J- or slightly ventrally arcuate body shapes when relaxed. Lip region rounded, slightly offset from body contour, 11.5 μ m \pm 0.5 (10.5-12.5) wide and 4 μ m \pm 0.5 (3.4-4.5) high. Amphids relatively large, stirrup-shaped, with slit-like apertures occupying about half of the lip region width. Stylet typical with well developed flanges; guide ring at 93 μ m \pm 7 (87-102) from anterior end. Neck 364 μ m \pm 44 (307-428) long.

Female reproductive system typical with G₁ = 10.5 % \pm 2 (8.5-13.5) and G₂ 10.0 % \pm 2.0 (7.5-14.5); uteri long, tube-like, without any differentiation; a prominent sphincter separates each uterus from the corresponding oviduct. No sperm cells seen. Tail moderately long, conical with three pairs of caudal pores and subdigitate terminus.

Male (from the South of Wadmedani): anterior body shape and structure similar to that of females. Copulatory muscles very distinct; spicules and lateral guiding pieces typical. Supplementary papillae with distinct adanal pair and five single medioventral ones. Tail with four pairs of caudal pores.

Juveniles (description based on population from Abu Haraz): resembling females, but with narrower, conical and shorter tails in J₁, J₂ and J₃; tails of J₄, more or less, resemble those of females.

Habitat and locality:

South of Wadmedani population: twelve females and one male collected from the rhizosphere of *Azadirachta indica*

trees in a garden in South of Wadmedani, Central Sudan, in June 1987.

Abu Haraz population: four females and seven different stage juveniles collected from the rhizosphere of the ornamental shrub, *Quisqualis* sp., in the campus of Abu Haraz college of Agriculture and Natural Resources, Central Sudan, in June 1987.

Discussion

X. elongatum was first described from a single female by Schuurmans Stekhoven and Teunissen (1938) from Rutshuru, Zaire (host plant unknown) and redescribed by Taranjan and Luc (1963).

X. elongatum is widely distributed and has been reported from many tropical and subtropical countries. This prompted Luc and Southey (1980) to make a comprehensive study of the species comparing the females of twenty two populations. This showed a very wide range of variations for almost every measurement taken.

A male from the Burundi described by Coomans *et al.* (1990) resembles our male in most measurements, but has a longer tail with longer and narrower terminus (53 μ m compared to 48 μ m for our male).

XIPHINEMA SIMILLIMUM Loof *et* Yassin, 1971
(Fig. 6 A-H)

Measurements:

Females (n = 11): L = 2.23 mm \pm 0.11 (2.13-2.46), a = 57 \pm 2 (56-60), b = 6.1 \pm 0.4 (5.4-6.7), c = 23 \pm 1 (21-25), c' = 4.4 \pm 0.4 (3.9-4.9), V % = 30 \pm 1 (29-31); tail = 96 μ m \pm 8 (89-113); odontostyle = 102 μ m \pm 3 (98-107); odontophore = 63 μ m \pm 1 (61-66); stylet = 165 μ m \pm 1 (160-173).

Males: not found.

Juveniles:

J1 (n = 5): L = 0.73 mm (0.67-0.77), a = 35 (32-38), b = 3.6 (3.2-4.1), c = 12 (11-13), c' = 5.4 (5.2-5.6); tail = 61 μ m (58-63); odontostyle = 40 μ m (39-42); odontophore = 34 μ m (33-35); stylet = 74 μ m (73-77); replacement odontostyle = 51 μ m (48-54).

J2 (n = 4): L = 1.01 mm (0.97-1.07), a = 41 (39-42), b = 3.4 (3.1-3.7), c = 14 (13-15), c' = 5.2 (5.0-5.4); tail = 74 μ m (69-80); odontostyle = 56-57 μ m; odontophore = 42-43 μ m; stylet = 99 μ m (98-100); replacement odontostyle = 72 μ m.

J3 (n = 2): L = 1.23, 1.43 mm; a = 51, 46; b = 3.8, 4.3; c = 16; c' = 5.1, 4.8; tail = 77, 91 μ m; odontostyle = 73, 75 μ m; odontophore = 52, 50 μ m; stylet = 125 μ m; replacement odontostyle = 86, 90 μ m.

Fig. 6 (Front page) - *X. simillimum*: A, female anterior body end; B, head end in surface view showing anterior sensilla; C-F, tails of juveniles (C = J1, D = J2, E = J3, F = J4); G, female tail; H, female genital system, posterior branch.

J₄ (n = 5): L = 1.92 mm (1.75-2.10), a = 49 (46-54), b = 4.8 (4.1-5.8), c = 21 (19-22), c' = 4.2 (3.9-4.5); tail = 94 μm (86-99); odontostyle = 91 μm (88-92); odontophore = 59 μm (58-60); stylet = 108 μm (107-109); replacement odontostyle = 149 μm (148-150).

Females: assuming J-body shape when relaxed. Lip region flatly rounded, slightly offset from body contour, 10.5 μm ± 0.5 (9.5-11.5) wide and 4 μm ± 0.5 (3.5-4.5) high. Amphid large, slightly elongated, stirrup-shaped with slit-like apertures, occupying about two thirds of lip region width. Stylet typical with well developed flanges. Guide ring at 86 μm ± 6 (80-101) from anterior end. Neck 350 μm ± 39 (320-407) long.

Female reproductive system typical but with the anterior branch shorter in most females: G₁ = 6.5 % ± 2 (2.5-8.5) and G₂ = 11.5 % ± 2.5 (8.5-16). Uteri short separated from oviduct by prominent sphincter. No uterine differentiations or sperm cells were seen. Tail elongate, conoid with narrow, rounded terminus and three pairs of caudal pores.

Males: not found.

Juveniles: all stages resemble the females in the anterior body shape but have shorter tails which increase gradually to the J₄ where the tail resembles that of the females.

Habitat and locality: eleven females and sixteen different stage juveniles collected from the rhizosphere of *Quisqualis* sp. and *Lagrestromia* sp. in the campus of Abu Haraz College of Agriculture and Natural Resources, Central Sudan, in June 1987.

Discussion

X. simillimum was first described by Loof and Yassin (1971) from soil around the roots of *Citrus sinensis* and *Rosa* sp. in Gezira, Sudan. The only record from outside Sudan, is that from Cameroon by Chavez and Geraert (1977). The Type population was reexamined by Luc (1981) who reported that the anterior branch of the genital system is complete comprising uterus, oviduct and ovary, but reduced in size compared to the posterior branch.

Our population agrees morphometrically with every aspect reported; morphologically, it agrees with most features with the exception of the shape of the amphid which was drawn as a conical structure compared to ours which is slightly elongated.

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