

The genus *Ditylenchus* Filip'ev, 1936 from Cameroon (Nematoda : Anguinidae)

Pierre N. SAKWE * and Étienne GERAERT

Instituut voor Dierkunde, Universiteit Gent, Ledeganckstraat 35, 9000 Gent, Belgium.

Accepted for publication 1st December 1992.

Summary – A survey of plant-parasitic nematodes of Cameroon yielded five species of *Ditylenchus* Filip'ev, 1936, namely, *D. obesus* Thorne & Malek, 1968; *D. anchiliposomus* (Tarjan, 1958) Fortuner, 1987; *D. medicaginis* Wasilewska, 1965; *D. myceliophagus* Goodey, 1958 and *D. triformis* Hirschmann & Sasser, 1955. Scanning electron micrographs of the anterior ends of *D. medicaginis* and *D. obesus* show fine annuli on their lip regions which appeared smooth under the light microscope. In addition, lateral fields which were obscure under the light microscope in both species (except *D. obesus* male) are clearly illustrated in the micrographs. The lateral field is marked by four incisures in *D. obesus* and six incisures in each of the other four species. *D. obesus* is reported here for the first time since its original description, its male for the first time. All five species are recorded for the first time in Cameroon; *D. obesus* and *D. medicaginis* are first records from the continent of Africa.

Résumé – Le genre *Ditylenchus* Filip'ev, 1936 au Cameroun (Nematoda : Anguinidae) – Une enquête sur les nématodes phytoparasites du Cameroun a permis de récolter cinq espèces de *Ditylenchus* Filip'ev, 1936 : *D. obesus* Thorne & Malek, 1968, *D. anchiliposomus* (Tarjan, 1958) Fortuner, 1987, *D. medicaginis* Wasilewska, 1965, *D. myceliophagus* Goodey, 1958 et *D. triformis* Hirschmann & Sasser, 1955. Des photographies en microscopie électronique à balayage ont montré que la région labiale de *D. medicaginis* et *D. obesus* était finement annelée alors qu'elle apparaissait lisse en microscopie optique. De plus, le champ latéral, très peu visible en microscopie optique chez les deux espèces (sauf chez les mâles de *D. obesus*), est très clairement perceptible en MEB : il comporte quatre incisures chez *D. obesus* et six chez les autres espèces. *D. obesus* est observé ici pour la première fois depuis sa description; le mâle en était encore inconnu. Les cinq espèces sont signalées pour la première fois au Cameroun; *D. obesus* et *D. medicaginis* sont nouveaux pour l'Afrique.

Key-words : Nematodes, *Ditylenchus*, Cameroon.

The first two papers (Sakwe & Geraert, 1991, 1992) of the series on plant-parasitic nematodes of Cameroon dealt with the morphology and systematics of ten tylenchs recovered from soil samples collected in northern Cameroon. During April–November, 1991, a survey was undertaken by the first author as a continuation of this study. Soil and root samples were collected from several different crop plants in different localities in the West and North West Provinces of Cameroon. The present paper is concerned with the morphology of five species of *Ditylenchus* Filip'ev, 1936 found in those samples.

Materials and methods

Nematodes were extracted from the soil by the centrifugal sugar-flotation technique (Caveness & Jensen, 1955) modified by Jenkins (1964). They were killed and fixed in hot (85 °C) 4 % formalin, dehydrated following De Grisse's (1969) modification of Seinhorst's (1959) rapid glycerine-ethanol method, and mounted in pure glycerine on aluminium double-coverslip slides. Glycerine-embedded specimens were used for scanning electron microscopy (SEM).

Besides V and T, other abbreviations used in the text and tables include : VBW = vulval body width; ABW = anal body width; Oes. = oesophagus length; St. = stylet length; MB = distance from anterior end to centre of median bulb expressed as % of total oesophagus length; PUS = post-uterine sac; VAN = vulva-anus distance; Tail = tail length; Sp. = spicule length measured along central axis; Gub. = gubernaculum length.

Voucher specimens

The specimens studied are deposited in the nematode collections of the Instituut voor Dierkunde, Ledeganckstraat 35, 9000 Gent, Belgium and the Department of Plant Protection, University Centre, P.O. Box 110, Dschang, Cameroon.

Ditylenchus obesus Thorne & Malek, 1968

(Figs 1, 2)

MEASUREMENTS

See Table 1.

* On study leave from the Department of Plant Protection, University Centre, P.O. Box 110, Dschang, Cameroon.

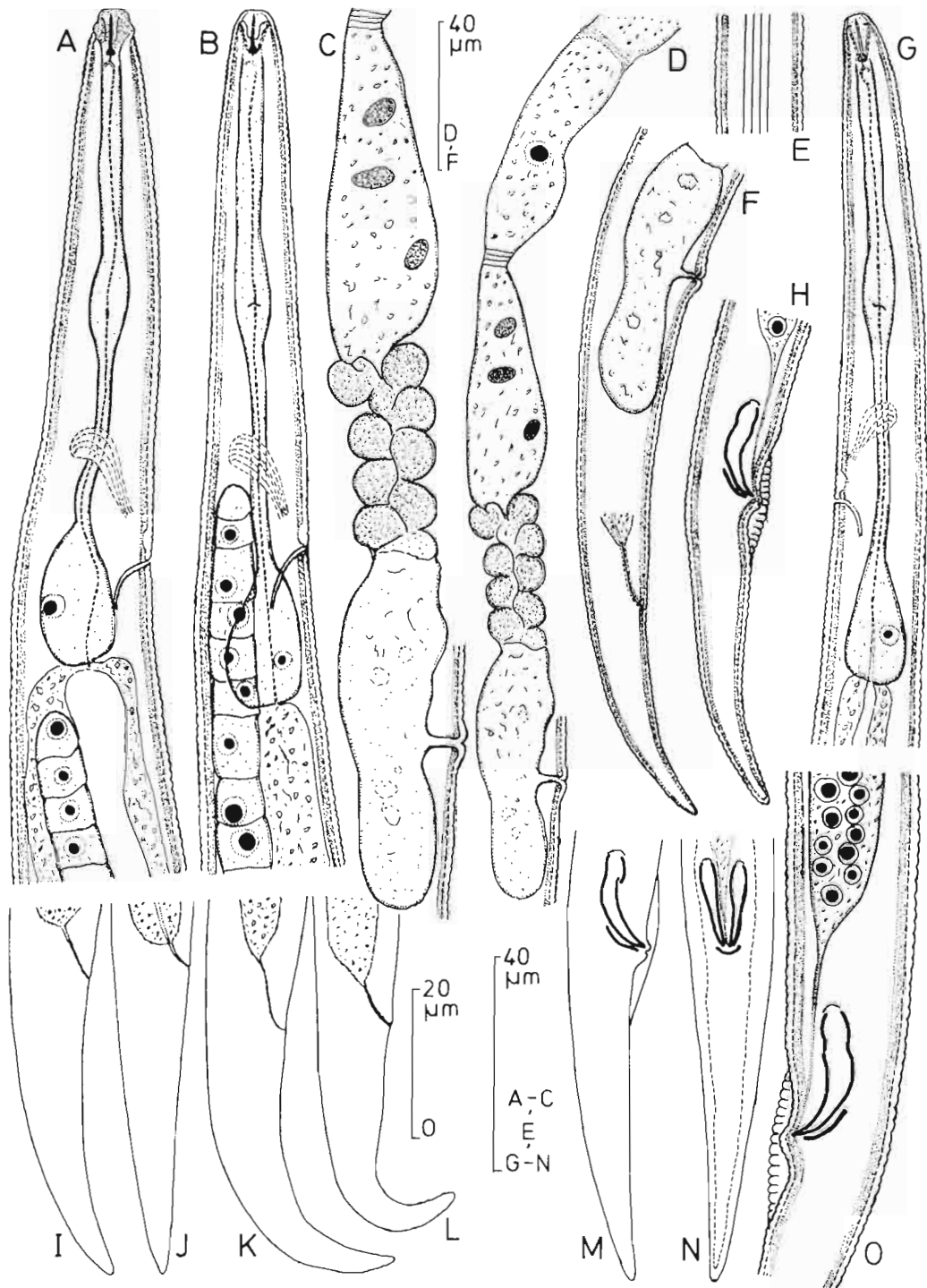


Fig. 1. *Ditylenchus obesus*. – Female. A, B: Oesophageal region; C, D: Vulval region, quadricolumella, and spermatheca; F: Post-vulval region; I-L: Tails. – Male. E: Lateral field; G: Oesophageal region; H, M: Tail, lateral view; N: Tail, ventral view; O: Cloacal region.

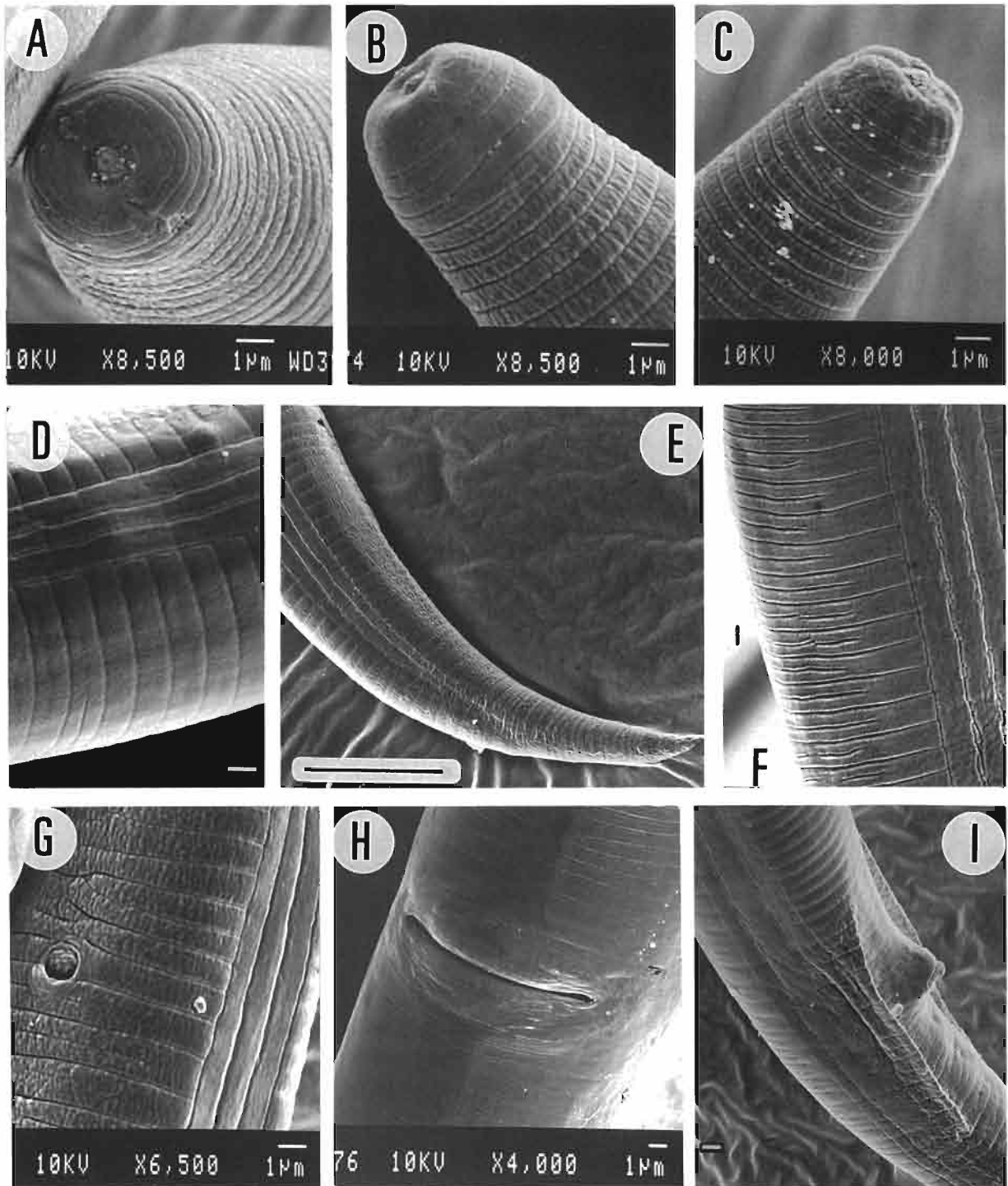


Fig. 2. *Ditylenchus obesus*. SEM micrographs. – Female. A : Lip region, *en face* view; B : Lip region, lateral view; D, F : Lateral field; E : Tail; G : Anus; H : Vulva. – Male. C : Lip region, lateral view; I : Cloacal region. (Bar equivalent = 1 µm, except E = 10 µm.)

Table 1. Comparison of measurements (in μm) of *Ditylenchus obesus* from tomato in Santa Mbu, Cameroon, with those of the type population (Thorne & Malek, 1968).

Character	Tomato population		Type population Holotype
	Females	Males	
n	16	10	1
L	780 \pm 35.2 (705-830)	645 \pm 31.1 (590-710)	1 000
Vulval body width	28.3 \pm 2.3 (25-32)	-	-
Oesophagus length	125.5 \pm 4.9 (115-132)	125 \pm 5.2 (117-136)	-
Tail length	61.5 \pm 4.8 (53-70)	59.6 \pm 4.5 (52-67)	-
Anal body width	15	14.7 \pm 0.5 (14-15)	-
Styilet length	7.5 \pm 0.4 (7.5-8.0)	7.4 \pm 0.7 (6.5-8.0)	10
PUS length	36.3 \pm 2.6 (32-41)	-	-
Vulva-anus dist.	103.8 \pm 7.3 (92-115)	-	-
a	27.6 \pm 1.8 (24.2-30.7)	44 \pm 2.1 (41.0-47.4)	28
b	6.2 \pm 0.3 (5.8-6.8)	5.1 \pm 0.2 (4.9-5.3)	8
c	12.7 \pm 0.9 (11.3-14.5)	11.0 \pm 0.8 (9.5-12.2)	12.5
c'	4.1 \pm 0.3 (3.5-4.7)	4.1 \pm 0.4 (3.5-4.8)	4.3
V or T	77.5 \pm 1.6 (74-80)	63 \pm 3.9 (56-70)	79
MB	43.1 \pm 1.3 (40-45)	43 \pm 0.8 (42-44)	-
PUS/VBW	1.3 \pm 0.1 (1.1-1.5)	-	>1
PUS/VAN (%)	35 \pm 3.3 (30-41)	-	-
VAN/Tail	1.7 \pm 0.1 (1.5-1.9)	-	1.75
Nerve ring	85.7 \pm 3.9 (78-95)	78.6 \pm 5.3 (75-89)	-
Hemizonid	97.3 \pm 4.6 (89-105)	89.4 \pm 4.4 (83-98)	-
Excr. pore	101.1 \pm 4.8 (93-108)	92.8 \pm 4.8 (85-101)	-
Spicule length	-	20.5 \pm 0.8 (19-21.8)	-
Gubernaculum	-	7.5 \pm 0.6 (6.5-8.0)	-

DESCRIPTION

Female: Body obese but not swollen, tapering slightly at anterior end, more so from vulva to rounded posterior end, ventrally arcuate, occasionally almost straight or C-shaped upon fixation. Cuticle marked by faint, shallow annuli which are about 1.3 μm wide at midbody region. Lateral field obscure under light microscope, apparently obliterated by stretching of cuticle during growth, but under SEM four distinct incisures visible, occupying about 25 % body width. Lip region low, anteriorly flattened, appearing smooth under light microscope; SEM shows three to four faint annuli; continuous with body contour; cephalic framework weak, with slightly refractive arches. SEM of *en face* view of head end shows small labial disc surrounding minute oral aperture at centre of undivided first annulus; amphidial apertures small slits in lateral margin of first annulus, directed towards oral opening. Cephalic and labial sensillae not observed. Styilet delicate, cone shorter than cylindrical shaft; basal knobs small, rounded, sloping backwards; dorsal oesophageal gland outlet very close to styilet base. Procorpus cylindrical; median bulb fusiform, poorly developed, with very small valve which is indiscernible in some specimens, situated in anterior half of oesophagus; isthmus slender, encircled by nerve ring at about midway; basal bulb short, pyriform, offset from intestine, with large dorsal gland nucleus and distinct oesophageal lumen. Hyaline cells of anterior intestine observed in cardia position in some specimens. Excretory pore and tube prominent, sclerotized, varying in position from opposite posterior end of isthmus to anterior end of basal bulb; hemizonid well developed, two to three annuli long, immediately to one annulus anterior to excretory pore. Vulva a transverse slit, with conspicuously raised lips. Vagina perpendicular to body axis, not thickened, short, occupying 29.6 \pm 4.0 (24-39) % body width. Spermatheca long, axial, empty or containing just a few sperm cells. Ovary well developed, outstretched, extending into oesophageal region in most specimens, its oocytes in single row, filling a large portion of body cavity. Eggs 65.2 \pm 2.7 (61-69) \times 25.3 \pm 1.8 (24-29) μm . Post-vulval part of body 10.9 \pm 0.7 (9.7-11.7) ABW long. Tail elongate-conoid, straight or with posterior third slightly ventrally bent or sharply bent, tapering gradually to a narrowly-rounded terminus.

Male: Essentially similar to female in gross morphology, but generally slimmer with a shorter body. Lateral field marked by four distinct incisures, 4.5 \pm 0.8 (3.6-5.5) μm wide in midbody region, occupying 26.3 \pm 3.1 (22-29) % body width. Spicules ventrally arcuate, with slightly expanded head. Gubernaculum simple, trough-shaped. Cloacal lips protruding. Bursa adanal, low, with crenate margin, originating posterior to proximal end of spicules, length 23 \pm 7.9 (21-30) μm , or 1.7 \pm 0.2 (1.4-

2.0) ABW, extending about equally anterior to and posterior to anus and covering 22.1 ± 3.9 (18-27) % tail length.

DISCUSSION

D. obesus was first described by Thorne and Malek (1968) from a grain field, 10 miles south of Madison, Nebraska. There has been no other report of it since then. Specimens of the population from Cameroon morphologically fit the original description except in body and stylet lengths, median bulb musculature, and the presence of males. The holotype female is longer than our specimens, 1.0 mm compared with 780 ± 35.2 (705-830) μm ; the stylet is also longer, about $10 \mu\text{m}$ vs 7.5 ± 0.4 (7.5-8.0) μm in our population. Thorne and Malek's drawing shows a strongly muscular median bulb with sclerotized valve plates; in our specimens the median bulb is rather poorly developed, weak, and with only little thickenings of lumen walls. Males were abundant in our population; there were no males in the type population. However, vulval position, PUS length, c and c' values are very similar to those given by Thorne and Malek (1968).

***Ditylenchus anchilisposomus* (Tarjan, 1958)
Fortuner, 1987**
(Fig. 3)

MEASUREMENTS

See Table 2.

DESCRIPTION

(Based on cabbage population from Babungo)

Female: Body ventrally arcuate upon fixation. Cuticle with faint transverse striae which are almost invisible on most of the body, averaging $1.3 \mu\text{m}$ apart in midbody region; subcuticle finely striated. Lateral field marked by six distinct incisures, 5.1 ± 0.9 (4.5-6.4) μm wide in midbody region, occupying about one quarter body width. Lip region low, anteriorly flattened, unstriated, continuous with body contour. Stylet delicate; cone about half total length or shorter; basal knobs small, rounded, posteriorly directed; dorsal oesophageal gland outlet about $1.5 \mu\text{m}$ posterior to stylet base. Median bulb oval, muscular; basal portion of oesophagus a broadly-spatulate, massive lobe overlapping intestine laterally, with a large dorsal gland nucleus posterior to oesophago-intestinal junction. Excretory pore varying in position from opposite posterior part of isthmus to anterior part of glandular lobe; hemizonid prominent, two annuli long, immediately to one annulus anterior to excretory pore. Vulva very posterior. Vagina perpendic-

ular to body axis, extending one quarter to one third of the way into the body. Ovary outstretched, its oocytes in single row. Post-vulval part of body 10.2 ± 1.4 (8.6-12.0) ABW long. Tail elongate-conoid, tapering gradually through a slightly ventrally bent posterior third to a narrowly-rounded terminus.

Male: Similar to female in general morphology except for cuticle being more distinctly striated. Bursa leptodera, well developed, with crenate margin, length 31.4 ± 6.1 (25-42) μm or 2.8 ± 0.5 (2.3-3.8) ABW, extending along 51.4 ± 10.3 (36-64) % tail length.

DISCUSSION

D. anchilisposomus was first described from soil around grass roots in California, U.S.A. as *Pseudhahlenchus anchilisposomus* by Tarjan (1958). Zeidan and Geraert (1991) reported it from Sudan. We found no striking differences between our specimens and previous descriptions.

***Ditylenchus medicaginis* Wasilewska, 1965**
(Figs 4, 5)

MEASUREMENTS

See Table 3.

DESCRIPTION

Female: Body almost straight to only slightly ventrally arcuate upon fixation. Cuticle with faint transverse striae. Lateral field marked by six incisures. Lip region bearing three to four faint annuli which are indiscernible under light microscope but visible with SEM. Median oesophageal bulb oval, muscular (MB = 36 % in one specimen); isthmus very slender, markedly narrower than procorpus; basal bulb short, pyriform, offset from intestine. Excretory pore opposite posterior half of isthmus. Post-vulval part of body 15.3 ± 3.1 (13.4-22.0) ABW long. Tail elongate-conoid, tapering to a sharply-pointed terminus.

DISCUSSION

D. medicaginis was first described from Poland (Wasilewska, 1965); Brzeski (1991) recently studied twelve populations from Poland and one population each from Bulgaria, Syria and Mexico. It has also been found in Central Asia and the Republic of South Africa (Brzeski, personal communication). Males have been reported only from Poland. Specimens in the two populations from Cameroon fit all previous descriptions.

***Ditylenchus myceliophagus* Goodey, 1958**
(Fig. 6.)

MEASUREMENTS

See Table 4.

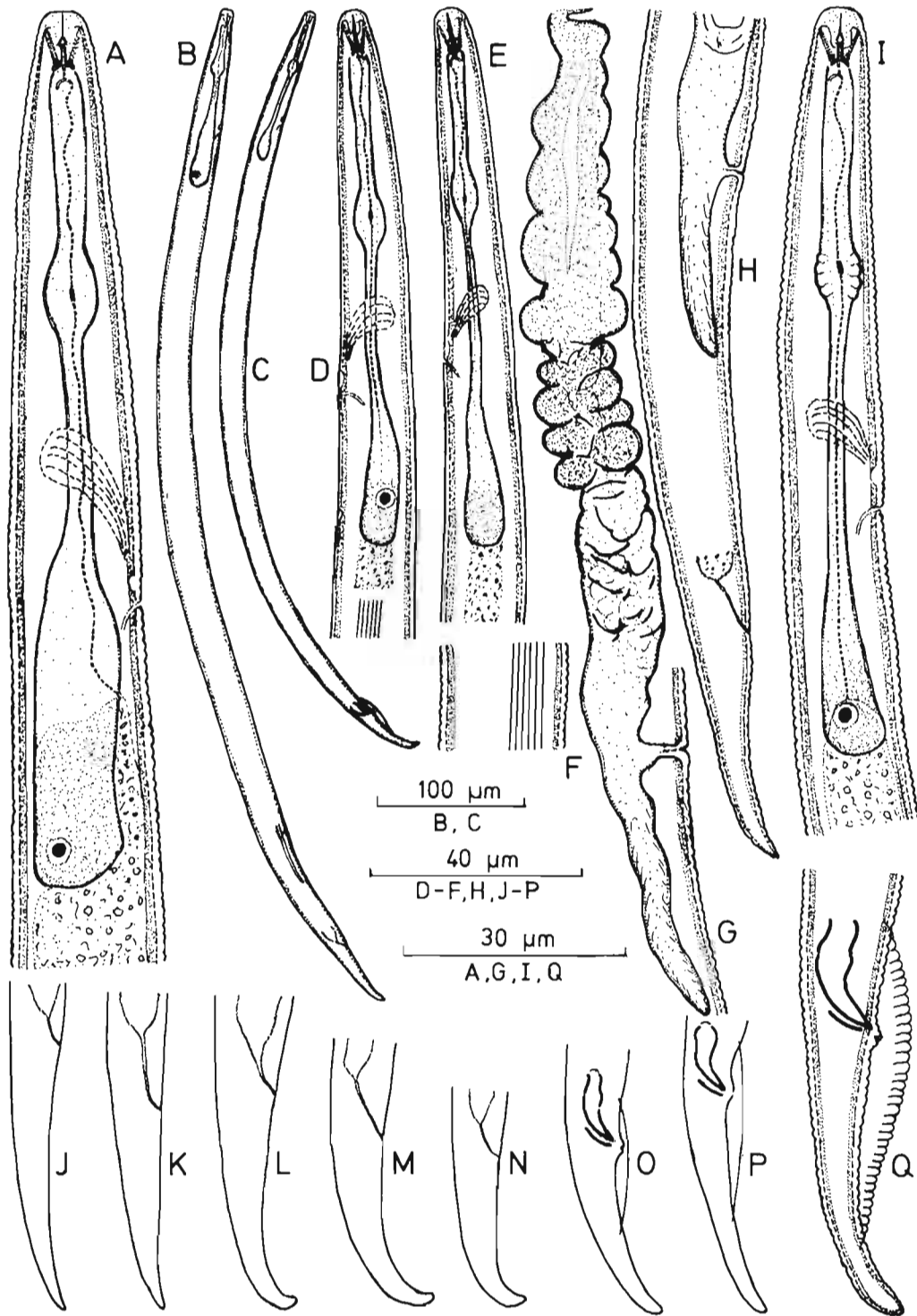


Fig. 3. *Ditylenchus anchilispomus*. – Female. A, D, E: Oesophageal region; B: Entire view; F: Lateral field; G: Vulva, quadricolumella, and spermatheca; H: Post-vulval region; J-N: Tails. – Male. C: Entire view; I: Oesophageal region; O-Q: Tails.

Table 2. Comparison of measurements (in μm) of *Ditylenchus anchiliposomus* populations from cabbage, cassava, and sweet potato in Babungo, okra in Dschang, and soybean in Santa Mbei, Cameroon, with those of the type population (Tarjan, 1958).

Character	Cabbage population		Type population		Cassava population	Sweet potato population		Okra population		Soybean pop.
	Females	Males	Females	Males	Females	Females	Males	Females	Males	Females
n	3	5	19	5	4	2	3	3	1	2
L	635 \pm 75.8 (530-715)	495 \pm 30.5 (470-555)	624 (487-728)	584 (428-678)	600 \pm 79.2 (475-675)	595, 570	575 \pm 22.5 (550-605)	515 \pm 37.2 (485-560)	475	525, 595
VBW	19.0 \pm 2.9 (15-22)	-	-	-	14.7 \pm 0.5 (14-15)	15, 18	-	14 \pm 0.8 (13-15)	-	14, 15
Oes*	109.3 \pm 6.9 (101-118)	96.0 \pm 4.2 (89-102)	-	-	106.7 \pm 6.2 (100-115)	110, 103	102, 91 (n = 2)	101 \pm 3.3 (97-105)	99	110, 101
Tail	42.0 \pm 3.6 (37-45)	35.4 \pm 2.1 (33-39)	-	-	44.5 \pm 6.1 (35-52)	47, 38	42.3 \pm 3.9 (37-46)	37.7 \pm 4.6 (33-44)	37	38, 53
ABW	11	11.4 \pm 1.4 (10-14)	-	-	10.5 \pm 1.1 (9-12)	9, 10	9.7 \pm 0.9 (9-11)	9.3 \pm 0.5 (9-10)	10	9, 10
St.	7.3, 8.2 (n = 2)	7.6 \pm 0.4 (7.3-8.2)	8.8 (7.6-10.8)	8.3 (6.2-9.9)	7.5	7.5, 7.5	7.5	8 \pm 0.4 (7.5-8.0)	7.5	7, 7.5
PUS	30.3 \pm 4.7 (27-37)	-	32 (20-41)	-	33.3 \pm 10.3 (17-45)	34, 29	-	26 \pm 3.6 (21-29)	-	25, 20
VAN	70.3 \pm 13.6 (57-89)	-	-	-	66.8 \pm 12.2 (48-82)	60, 64	-	55.7 \pm 6.6 (47-63)	-	57, 59
a	33.6 \pm 1.3 (32.5-35.5)	44 \pm 5.0 (35.4-50.5)	34 (30.6-39.9)	44.1 (38.6-48.4)	39.3 \pm 4.3 (33.9-44.3)	39.7, 31.5	60 \pm 3.7 (55-64)	37.4 \pm 4.4 (32.4-43.0)	47.3	37, 39.7
b	5.8 \pm 0.4 (5.3-6.1)	5.1 \pm 0.2 (4.8-5.4)	4.7 (4.1-5.1)	4.3 (3.8-5.1)	5.4 \pm 0.4 (4.8-5.8)	5.4, 6.0	5.2 \pm 0.4 (5-5.3)	5.2 \pm 0.4 (4.8-5.8)	4.8	4.8, 5.9
c	15.1 \pm 0.8 (14.4-16.2)	14 \pm 0.3 (13.6-14.4)	12 (11.1-13.2)	9.9 (7.8-11.4)	13.6 \pm 0.8 (12.8-14.9)	12.7, 14.9	13.8 \pm 1.8 (12.5-16.4)	13.9 \pm 0.9 (12.7-14.7)	12.8	13.8, 11.2
c'	3.8 \pm 0.3 (3.4-4.1)	3.2 \pm 0.2 (2.8-3.5)	-	-	4.2 \pm 0.3 (3.9-4.6)	4.7, 3.5	4.4 \pm 0.7 (3.4-5.0)	4.0 \pm 0.3 (3.7-4.4)	3.7	4.2, 5.3
V or T	81 \pm 1.4 (80-83)	52 \pm 7.3 (38-58)	81 (78-83)	49 (41-57)	81 \pm 1.1 (79-82)	82, 80	38.7 \pm 7.4 (32-49)	81	42	80, 80
MB	32 \pm 35 (n = 2)	37.2 \pm 1.5 (35-39)	-	-	35 \pm 0.8 (34-36)	35, 35	34 \pm 2.9 (30-37)	36 \pm 0.8 (35-37)	37	34, 40
PUS/VBW	1.6 \pm 0.2 (1.4-1.8)	-	1.5-2.5	-	2.2 \pm 0.7 (1.3-3.0)	2.3, 1.6	-	1.9 \pm 0.3 (1.4-2.2)	-	1.8, 1.3
PUS/VAN	43.7 \pm 2.5 (42-47)	-	-	-	48.8 \pm 7.6 (36-55)	57, 45	-	45.3 \pm 0.5 (45-49)	-	44, 34
VAN/Tail	1.6 \pm 0.3 (1.4-2.0)	-	-	-	1.5 \pm 0.1 (1.4-1.6)	1.3, 1.7	-	1.5 \pm 0.09 (1.4-1.6)	-	1.5, 1.1
Hemzd.	76.3 \pm 3.7 (72-81)	65 \pm 4.5 (62-74)	-	-	75.7 \pm 4.2 (70-80)	75, 65	69 \pm 2.4 (66-72)	70.7 \pm 8.0 (65-82)	58	61, 69
Ex. pore	79.7 \pm 3.3 (76-84)	67.8 \pm 4.1 (65-76)	-	-	79 \pm 4.3 (73-83)	79, 66	72 \pm 2.9 (68-75)	72.7 \pm 8.7 (64-85)	64	64, 73
Spicules	-	16 \pm 1.4 (14.5-18.0)	-	18.5 (17-20.5)	-	-	16.3 \pm 1.4 (15.5-18.0)	-	13.5	-
Gubern.	-	5.5 \pm 0.6 (4.5-6.5)	-	6.3 (5.5-7.0)	-	-	5.5	-	4.5	-

* Measured from ant. end to base of α soph. lobe.

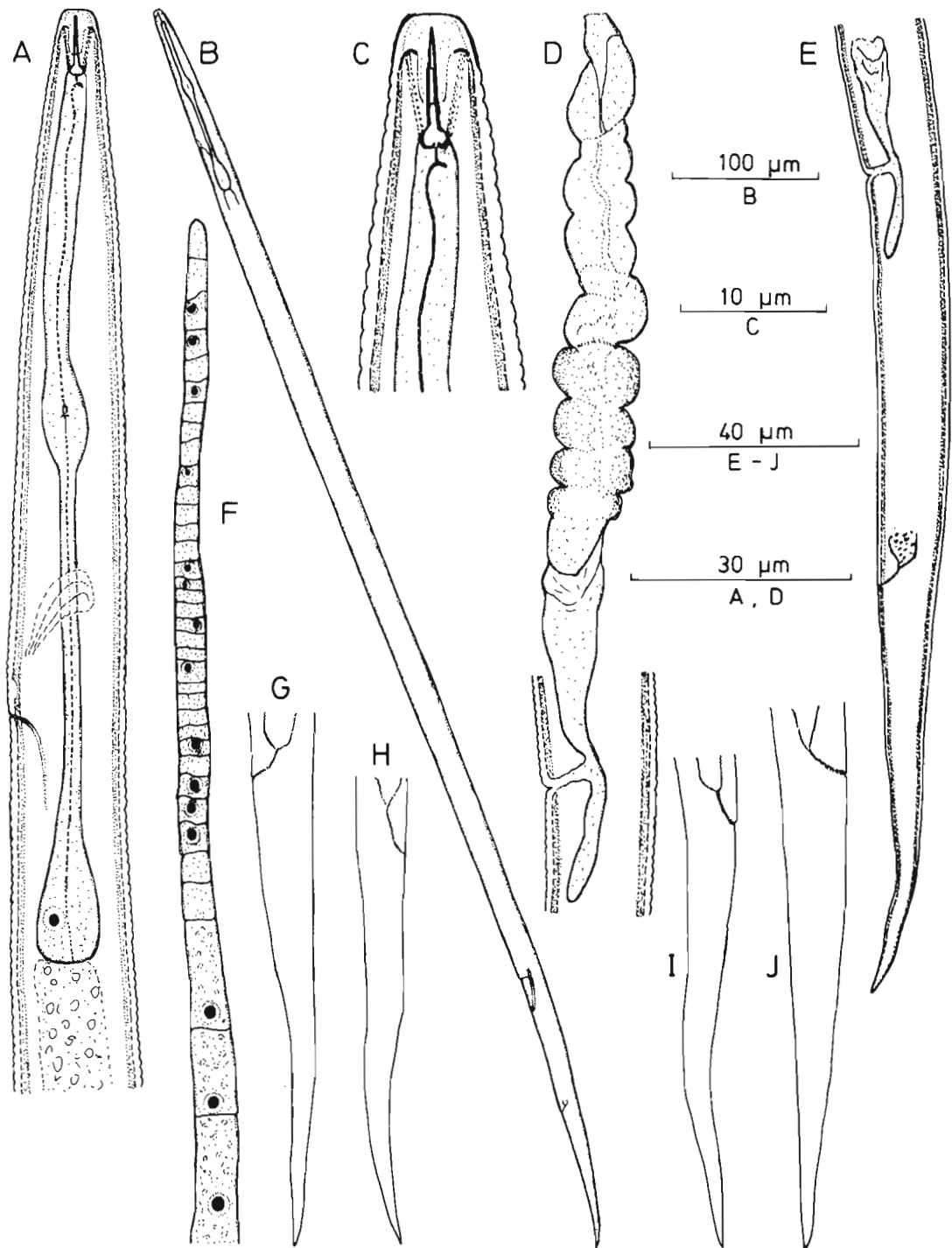


Fig. 4. *Ditylenchus medicaginis*. Female. A : Oesophageal region; B : Entire view; C : Anterior region; D : Vulva, quadricolumella, and spermatheca; E : Post-vulval region; F : Ovary; G-J : Tails.

Table 3. Comparison of measurements (in μm) of *Ditylenchus medicaginis* from cabbage in Santa Mbei and cassava in Nkwen, Cameroon, with those of the type population (Wasiłowska, 1965).

Character	Cabbage population	Cassava population	Type population
	Females	Females	Females
n	6	1	13
L	780 \pm 94.2 (635-905)	645	720 (650-680)
Vulval body width	16.3 \pm 1.4 (15-19)	16	-
Oesophagus length	121.5 \pm 9.8 (105-133)	114	-
Tail length	81.7 \pm 7.2 (71-92)	82	-
Anal body width	12 \pm 1.5 (9-14)	10	-
Stylet length	8 \pm 0.8 (7-9)	7.5	8.2-8.8
Vulva-anus dist.	98.2 \pm 15.2 (82-127)	105	-
a	48.6 \pm 8.6 (33.5-60.3)	40.3	34
b	6.5 \pm 0.6 (5.5-7.4)	5.7	6.1 (5.4-7.1)
c	9.6 \pm 1.1 (7.9-10.8)	7.9	11.2 (10.1-12.5)
c'	6.9 \pm 0.6 (6-7.9)	8.2	4-5
V	77 \pm 3 (72-80)	71	77 (76-81)
V'	86 \pm 3.1 (81-89)	-	-
MB	42 \pm 2.6 (40-47)	39	41-44
PUS/VBW	1.9 \pm 0.7 (1.1-2.9)	2.4	> 2.2-2.5
PUS/VAN (%)	30.5 \pm 10.3 (20-47)	36	50
VAN/Tail	1.2 \pm 0.3 (1-1.8)	1.3	-
Nerve ring	75.6 \pm 7 (63-82)	66	-
Hemizonid	85.8 \pm 6.6 (75-91)	74	-
Exc. pore	89.2 \pm 7.2 (77-95)	77	99

DESCRIPTION

(Based on population from Santa Ndjong)

Female : Body almost straight or open C-shaped upon fixation. Cuticle with fine but faint annuli which are more marked just below lip region. Lateral field marked by six incisures. Median bulb fusiform, muscular; basal portion of oesophagus a long, broadly-spatulate lobe overlapping intestine laterally, with a large dorsal gland nucleus. Excretory pore varying in position from opposite posterior end of isthmus to anterior half of oesophageal lobe; hemizonid prominent. Post-vulval part of body 10.8 \pm 1.2 (9.2-12.0) ABW long. Tail elongate-conoid, tapering gradually to a slimmer, often slightly or sharply ventrally bent posterior part; terminus rounded or broadly pointed (dull).

DISCUSSION

D. myceliophagus was first described by Goodey (1958) from a mushroom culture supplied to him from the USA by Cairns. Since then it has been reported from mushroom-growing temperate countries throughout the world (Sturhan & Brzeski, 1991); Ivory Coast (Fortuner, 1982); and Sudan (Decker *et al.*, 1980; Zeidan & Geraert, 1991). Specimens from Cameroon fit previous descriptions (Fortuner, 1982; Brzeski, 1991; Zeidan & Geraert, 1991); however, those from pineapple are slightly shorter than those from peanut. Both Fortuner (1982) and Brzeski (1991) observed that abutting and overlapping basal oesophageal glandular lobes can and do exist in any one population of *D. myceliophagus*. However, we did not observe abutting lobes in any of our populations.

***Ditylenchus triformis* Hirschmann & Sasser, 1955**
(Fig. 7)

MEASUREMENTS

See Table 5.

DESCRIPTION

(Based on population from Babungo)

Female : Body almost straight to slightly ventrally arcuate, usually with a slight ventral bend in the vicinity of the vulva, when killed by gentle heat. Cuticle with distinct transverse striae, averaging 1.5 μm apart at mid-body. Lateral field marked by six incisures, about 5 μm wide, occupying one third body width. Lip region low, rounded, continuous with body contour, unstriated. Stylet delicate, cone about one third total length; knobs small, rounded, well separated, posteriorly directed; dorsal oesophageal gland outlet about 1.0 μm posterior to stylet base. Median bulb ovoid, muscular; basal portion of oesophagus a long or broadly-spatulate lobe

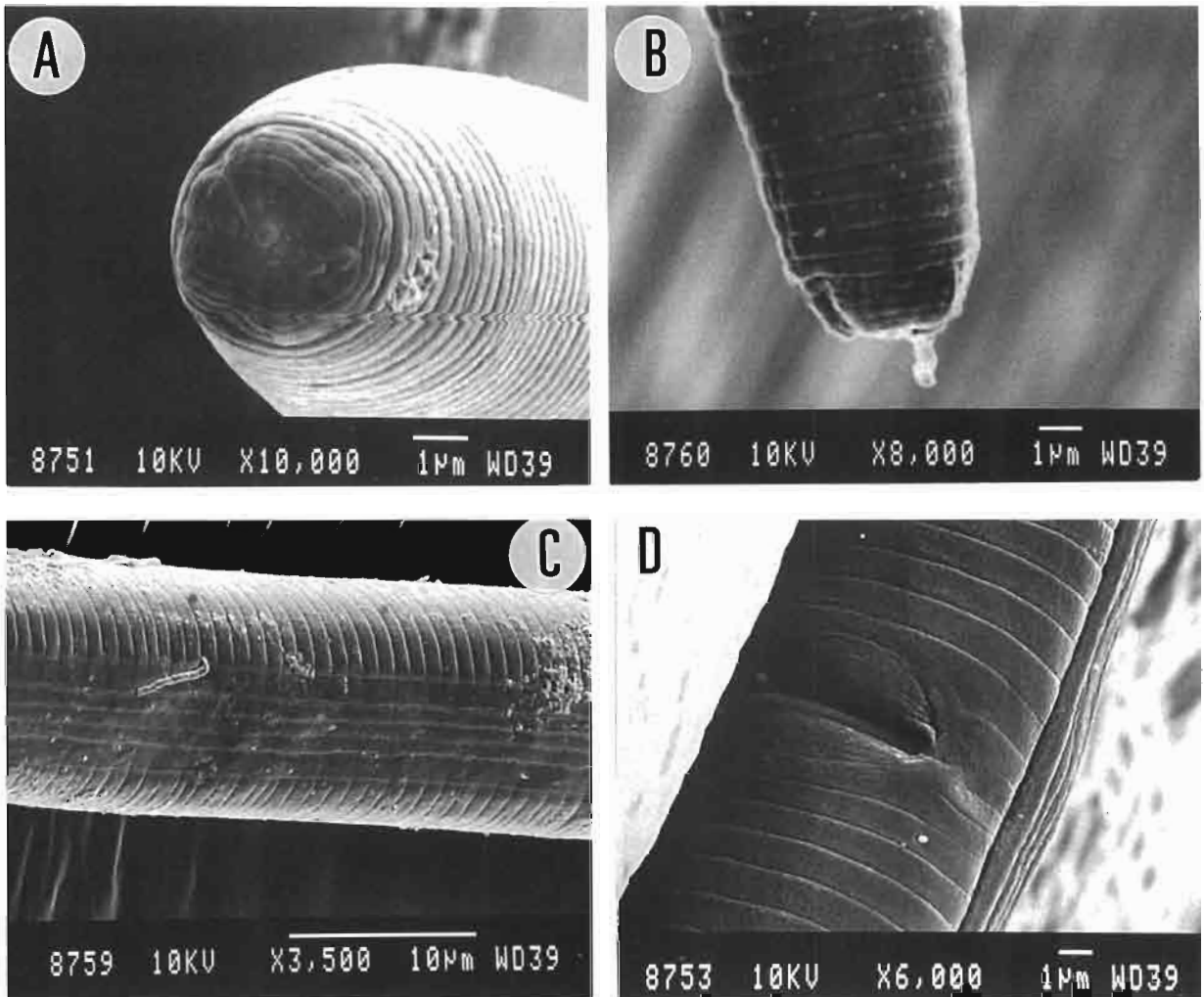


Fig. 5. *Ditylenchus medicaginis*. Female. SEM micrographs. A : Lip region, *en face* view; B : Lip region lateral view; C : Lateral field; D : Vulval region.

overlapping anterior end of intestine laterally for a short distance. Excretory pore varying in position from opposite posterior half of isthmus to anterior end of glandular lobe; hemizonid prominent, three annuli long, immediately anterior to excretory pore. Vagina short, occupying 32 ± 5.3 (24-38) % body width. Ovary outstretched, its oocytes in single row. Post-vulval part of body 14.4 ± 1.5 (12.0-16.5) ABW long. Tail elongate-conoid, tapering evenly or with a slimmer, slightly ventrally bent posterior part; terminus rounded or bluntly-conoid.

Male : Similar to female in general morphology. Bursa adanal, with crenate margin, extending along 36.3 ± 9.1 (28-49) % of tail length.

DISCUSSION

D. triformis was first described from soil around roots of gladiolus near Wellington, North Carolina, USA (Hirschmann & Sasser, 1955). Zeidan and Geraert (1991) recently reported it from Sudan. Specimens from all three Cameroon populations largely fit previous descriptions. However, ours differ from the type specimens in their *i*) smooth lip region *vs* lip region bearing two striae in type specimens, *ii*) slightly more anterior vulva ($V = 72-76$ compared with 75-82 in the type specimens), and *iii*) longer spicules, 15.7 ± 1.8 (13.6-18.2) μm *vs* 13.4-14.9 μm in the type specimens.

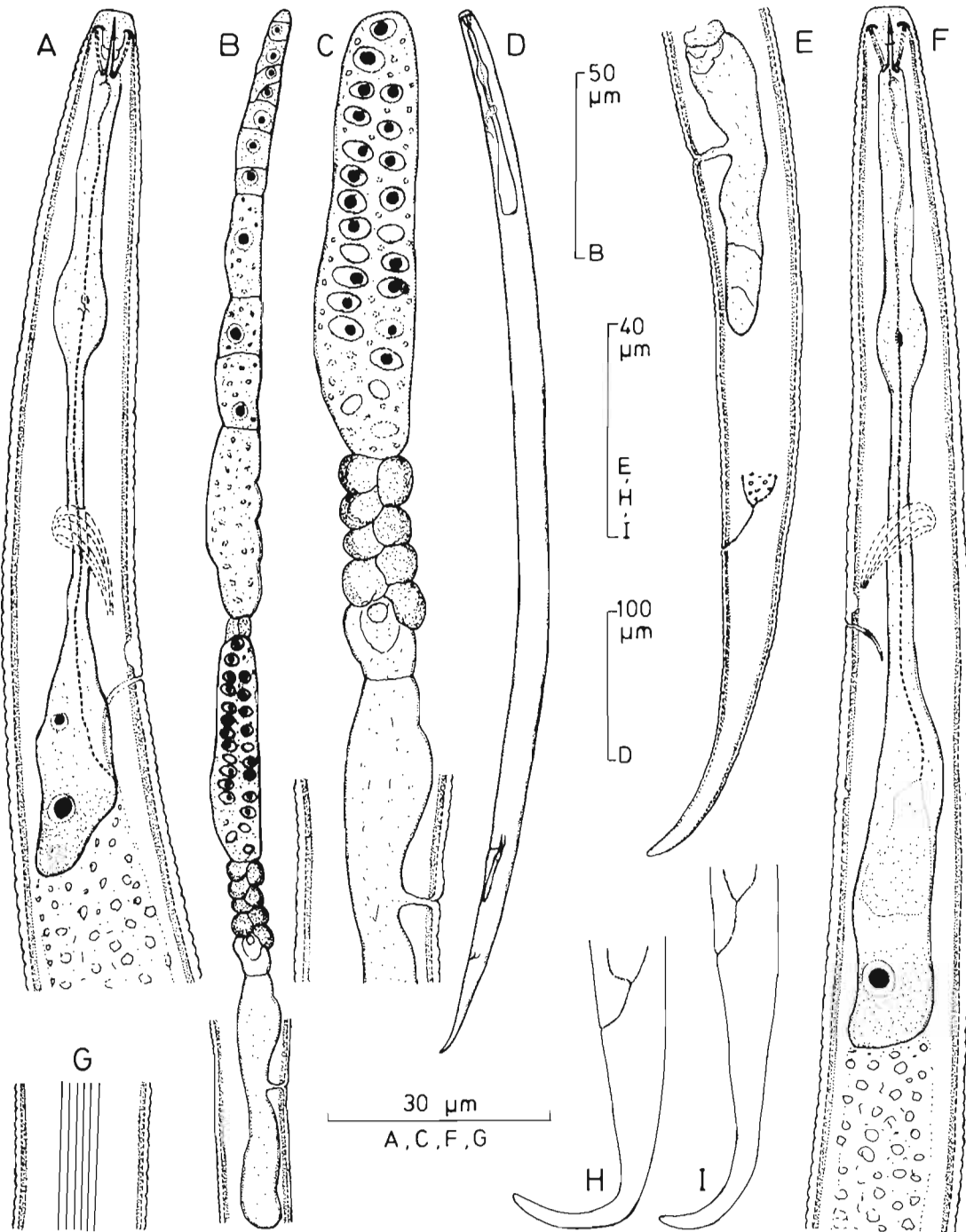


Fig. 6. *Ditylenchus myceliophagus*. Female. A, F : Oesophageal region; B : Genital tract; C : Vulva, quadricolumella, and spermatheca; D : Entire view; E : Post-vulval region; G : Lateral field; H, I : Tails.

Table 4. Comparison of measurements (in μm) of *Ditylenchus myceliophagus* from pineapple in Santa Ndjong, peanut in Babungo* and Foubot**, Cameroon, with those of the type population (after Brzeski, 1991).

Character	Pineapple	Peanut *	Peanut **	Type population
	Females	Females	Females	Females
n	3	1	1	8
L	685 \pm 50.5 (615-725)	825	820	878 (800-920)
VBW	18.3 \pm 1.7 (16-20)	17	121	-
Oes. (valve)	105, 105 (n = 2)	105	108	114 (104-118)
Oes. (lobe)	141, 136 (n = 2)	123	116	128 (115-137)
Tail length	63.7 \pm 4.6 (59-70)	61	61	56 (50-62)
ABW	12.7 \pm 0.5 (12-13)	14	14	-
Stylet	8, 7.5 (n = 2)	7.5	7.5	7 (6.5-7.5)
PUS length	37 \pm 5.1 (32-44)	46	49	-
VAN dist.	72.3 \pm 9.2 (60-82)	102	98	-
a	37.8 \pm 5.1 (32.3-44.6)	48.4	38.9	33 (30-35)
b	6.9, 6.8 (n = 2)	7.8	7.6	7.7 (7.1-8.9)
b'	5.2, 5.3 (n = 2)	6.7	7.1	6.9 (6.5-8.0)
c	10.8 \pm 0.5 (10.4-11.5)	13.5	13.4	15.6 (14.4-17.0)
c'	5 \pm 0.4 (4.5-5.4)	4.4	4.4	3.6 (3.1-4.0)
V	79 \pm 1.2 (78-81)	79	81	84 (82-86)
MB	43, 49 (n = 2)	37	37	41 (36-50)
PUS/VBW	2.1 \pm 0.5 (1.7-2.8)	2.7	2.3	-
PUS/VAN	51.3 \pm 3.1 (47-54)	45	50	-
VAN/Tail	1.1 \pm 0.1 (1.0-1.3)	11.7	1.6	1.5 (1.2-1.9)
Nerve ring	70, 69 (n = 2)	68	71	-
Hemizonid	75 \pm 5.4 (68-81)	85	85	-
Exc. pore	78.3 \pm 6.2 (70-85)	90	91	103 (93-111)

Acknowledgements

The first author expresses his gratitude to the Belgian Administration for Development Cooperation (AGCD/ABOS) for the financial support provided during this study. He is also thankful to Dr. J. Foko, Head of Department of Plant Protection, University Centre, Dschang, Cameroon, for logistical support and laboratory space, Prof. Dr. A. Coomans, Instituut voor Dierkunde, Universiteit Gent, for laboratory facilities and supplies, Ms. Rita Van Driessche for the SEM, and Mrs Rose-Marie Servaes for the photographs.

References

- BRZESKI, M. W. (1991). Review of the genus *Ditylenchus* Filipjev, 1936 (Nematoda: Anguinidae). *Revue Nématol.*, 14 : 9-59.
- CAVENESS, F. E. & JENSEN, H. J. (1955). Modification of the centrifugal-flotation technique for the isolation and concentration of nematodes and their eggs from soil and plant tissue. *Proc. helminth. Soc. Wash.*, 22 : 87-89.
- DECKER, H., YASSIN, A. M. & EL AMIN, E. M. (1980). Plant nematology in the Sudan. *Z. angew. Zool.*, 1/80 : 1-20.
- DE GRISSE, A. (1969). Redescription ou modification de quelques techniques utilisées dans l'étude des nématodes phytoparasitaires. *Meded. Rijksfak. LandbWetensch. Gent*, 34 : 351-369.
- FORTUNER, R. (1982). On the genus *Ditylenchus* Filipjev, 1936 (Nematoda: Tylenchida). *Revue Nématol.*, 5 : 17-38.
- GOODEY, J. B. (1958). *Ditylenchus myceliophagus* n. sp. (Nematoda: Tylenchidae). *Nematologica*, 3 : 91-96.
- HIRSCHMANN, H. & SASSER, J. N. (1955). On the occurrence of an intersexual form in *Ditylenchus trififormis* n. sp. (Nematoda: Tylenchida). *Proc. helminth. Soc. Wash.*, 22 : 115-123.
- JENKINS, W. R. (1964). A rapid centrifugal-flotation technique for separating nematodes from soil. *Pl. Dis. Repr.*, 48 : 692.
- SAKWE, P. N. & GERAERT, E. (1991). Some plant-parasitic nematodes from Cameroon with a description of *Cricone-mella pelerentsi* sp. n. (Tylenchida: Criconematidae). *Nematologica*, 37 : 263-274.
- SAKWE, P. N. & GERAERT, E. (1992). Plant-parasitic nematodes from Cameroon: Criconematidae, Belonolaimidae, and Hoplolaimidae (Nematoda: Tylenchida). *Meded. Fac. LandbWetensch. Univ. Gent*, 57 : 857-877.
- SEINHORST, J. W. (1959). A rapid method for the transfer of nematodes from fixative to anhydrous glycerine. *Nematologica*, 4 : 67-69.
- STURHAN, D. & BRZESKI, M. W. (1991). Stem and bulb nematodes, *Ditylenchus* spp. In: Nickle, W. R. (Ed.). *Manual of agricultural nematology*. New York, Basel & Hong Kong, Marcel Dekker, Inc. : 423-464.

Table 5. Comparison of measurements (in μm) of *Ditylenchus triformis* populations from cabbage in Babungo, potato in Bansa, and yam in Santa Mbei, Cameroon, with those of the type population (Hirschmann & Sasser, 1955).

Character	Cabbage population		Potato pop.	Yam population		Type population	
	Females	Males		Females	Males	Females	Males
n	7	3	1	1	1	?	?
L	680 \pm 64 (560-740)	545 \pm 72.3 (460-635)	850	825	740	640-830	610-710
VBW	15.9 \pm 1.7 (14-19)	-	15	16	-	-	-
Oes.	116.7 \pm 8.8 (103-131)	107.3 \pm 15.6 (87-125)	142	129	95	-	-
Tail	79 \pm 8 (65-89)	48.3 \pm 3.1 (44-51)	81	84	73	-	-
ABW	11.6 \pm 1.4 (10-14)	10.3 \pm 1.2 (9-12)	12	13	12	-	-
Stylet	7.5 \pm 0.4 (7-8)	7.5	8	7.5	6.5	7.5-9.5	7.4-8.1
PUS	30.7 \pm 5.3 (20-38)	-	45	41	-	-	-
VAN	86.1 \pm 7.7 (77-99)	-	128	118	-	-	-
a	43 \pm 3.5 (38.5-49.0)	52.8 \pm 1.4 (51.0-54.5)	56.7	51.7	61.8	33.5-42.5	32.8-42.7
b	5.8 \pm 0.4 (5.3-6.4)	5.1 \pm 0.2 (4.9-5.3)	6	6.4	7.8	5.2-7.3	5.0-6.9
c	8.6 \pm 0.3 (8.4-9.2)	11.4 \pm 1.5 (9.2-12.5)	10.5	9.8	10.2	9.6-11.9	9.3-10.8
c'	6.9 \pm 0.5 (6.3-7.9)	4.8 \pm 0.6 (4.3-5.6)	6.8	6.5	6.1	-	-
V or T	74 \pm 1.3 (72-76)	44 \pm 5.1 (39-51)	74	75	42	75-82	-
MB	39 \pm 1.3 (37-41)	37 \pm 4.3 (33-43)	34	37	49	-	-
PUS/VBW	1.9 \pm 0.3 (1.4-2.5)	-	3	2.6	-	-	-
PUS/VAN	35.7 \pm 6.6 (26-44)	-	35	35	-	25-33	-
VAN/Tail	1.1 \pm 0.1 (0.9-1.2)	-	1.6	1.4	-	1.2-2.0	-
N. ring	69.7 \pm 3.7 (63-76)	60.3 \pm 6.2 (55-69)	79	73	66	-	-
Hemizd.	80 \pm 6.5 (71-87)	68.3 \pm 4.7 (65-75)	88	85	88	-	-
Ex. pore	84 \pm 5.7 (75-91)	71 \pm 4.9 (67-78)	92	89	92	-	-
Spicules	-	15.5 \pm 1.8 (13.5-18.0)	-	-	15.5	-	13.4-14.9
Gubernac	-	6.7 \pm 1.1 (5.5-8.0)	-	-	4.5	-	5.1-5.9

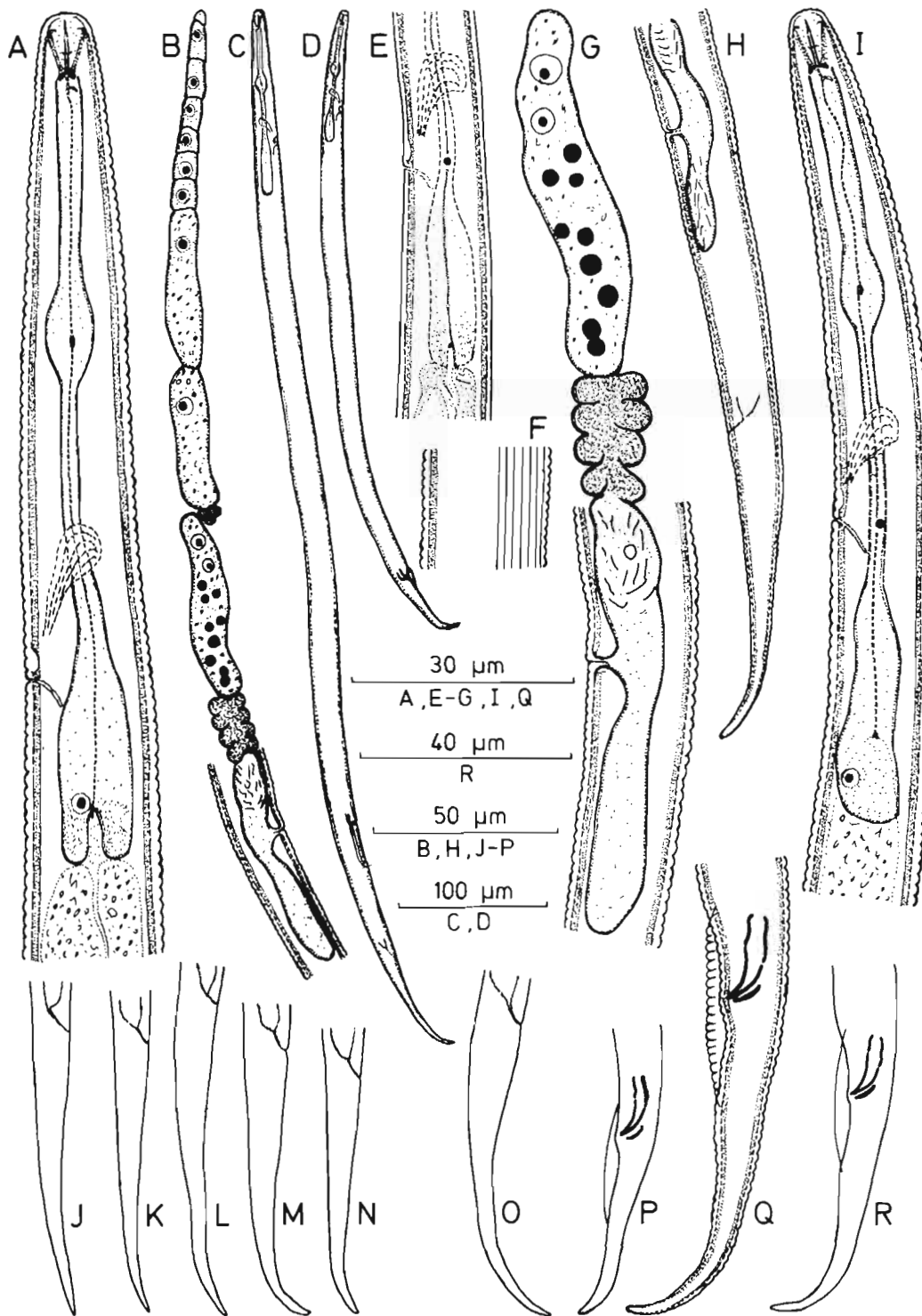


Fig. 7. *Ditylenchus trififormis*. – Female. A : Oesophageal region; B : Genital tract; C : Entire view; E : Excretory pore region, with deirid; F : Lateral field; G : Vulva, PUS, quadricolumella, and spermatheca; H : Post-vulval region; J-O : Tails. – Male. D : Entire view; I : Oesophageal region; P R : Tails.

- TARJAN, A. C. (1958). A new genus, *Pseudhalenchus* (Tylenchinae : Nematoda), with descriptions of two new species. *Proc. helminth. Soc. Wash.*, 25 : 20-25.
- THORNE, G. & MALEK, R. B. (1968). *Nematodes of the Northern Great Plains. Part I. Tylenchida (Nemata : Secernentea)*. Brookings, S. Dakota St. Univ. agric. Exp. Statn., Techn. Bull. 31, 111 p.
- WASILEWSKA, L. (1965). *Ditylenchus medicaginis* sp. n., a new parasitic nematode from Poland (Nematoda : Tylenchidae). *Bull. Acad. pol. Sci., Cl. II., Sér. Sci. biol.*, 13 (1964) : 167-170.
- ZEIDAN, A. B. & GERAERT, E. (1991). The genus *Ditylenchus* Filip'ev, 1936 in Sudan (Nematoda : Tylenchida). *Afro-Asian J. Nematol.*, 1 : 5-14.