

Two New Species of *Tylenchorhynchus* Cobb, 1913 (Nematoda: Belonolaimidae) from Sudan

Elbadri G.A.A.¹, Il Sung Moon², Dong Woon Lee³ and Ho Yul Choo*

*Department of Applied Biology and Environmental Sciences, Institute of Agriculture and Life Science,
Gyeongsang National University, Jinju, 660-701, Gyeongnam, Korea

¹Agricultural Research Cooperation, Crop Protection Research Center, P.O. Box 126, Wad Medani, Sudan

²Korea Forest Research Institute, Dongdaemun-gu, 130-712, Seoul, Korea

³Department of Applied Biology, Kyungpook National University, Sangju, 742-711, Kyungpook, Korea

수단산 위축선충과(참선충목) 두 신종에 대한 보고

Elbadri G.A.A.¹ · 문일성² · 이동운³ · 추호열*

경상대학교 응용생물환경학과, 농업생명과학연구원,

¹Agricultural Research Cooperation, Crop Protection Research Center, Wad Medani, Sudan,

²국립산림과학원, ³경북대학교 생물응용학과

ABSTRACT: Two new species of *Tylenchorhynchus* Cobb, 1913 from sugar cane fields in Sudan, *T. sudanensis* and *T. elamini* are described and illustrated. *T. sudanensis* is characterized by rather medium body size female, L= 0.692 mm long with rather medium stylet length of 20 - 23 μ m. While *T. elamini* is characterized by medium body size female, L = 0.61 - 0.78 mm long, medium stylet length of 16 -19 μ m. Different characters of two new species are discussed. In addition, vital measurements and brief descriptions of two species are presented.

Key words: Sudan, Sugarcane, *Tylenchorhynchus sudanensis* n. sp., *Tylenchorhynchus elamini* n. sp.

초 록: 수단의 사탕수수 재배지에서 발견된 네줄위축선충속(*Tylenchorhynchus* Cobb, 1913)의 두 신종 *T. sudanensis* (수단위축선충) 와 *T. elamini* (엘라민위축선충)을 기술하고 도해한다. *T. sudanensis* 암컷성충의 체장은 0.692 mm이고 구침길이는 20 - 23 μ m이다. *T. elamini* 암컷성충의 체장은 0.61 - 0.78 mm이고 구침길이는 16 -19 μ m이다. 그리고 두 신종의 중요 측정치와 간단한 기술을 제공한다.

검색어: 뒤영벌, 수단, 사탕수수, *Tylenchorhynchus sudanensis*, *Tylenchorhynchus elamini*

The stunt nematodes that described within the genus *Tylenchorhynchus* including *T. brevilineatus*; *T. martini*, and *T. mashhoodi* were found especially in association with stunted sugarcane at the site of Sennar, Guneid and Gezira Research Station from Sudan (Yassin, 1992).

Two new species in the genus *Tylenchorhynchus* were identified in the course of studying on sugar cane nematodes.

The new species, *Tylenchorhynchus sudanensis* and *T. elamini* belonging to the family Belonolaimidae are

described and figured. The vital measurements and brief description of two new species were presented. The key provided by Handoo (2002) was consulted for the identification of the species of *Tylenchorhynchus*.

Materials and Methods

Soil samples were brought from Guneid Sugar Cane State in March, 2005. Soil samples were taken from the fields at a depth of 10 - 15 cm. They were labeled and put in plastic bags, and brought to the laboratory. Soil samples were washed for nematode extraction using

*Corresponding author: hychoo@gnu.ac.kr
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modified Baermann funnel technique for overnight (Schlinder, 1961). The extracted nematodes were killed and fixed in hot formalin (4% with 1% glycerol), processed in anhydrous glycerol (Seinhorst, 1959), and mounted on aluminum slides with double cover slips. Measurements were done by the light microscope after being calibrated with stage micrometer. Drawings were made with drawing tube attached to light microscope and photographs were taken using Olympus camera.

All the measurements presented herein are in μm except for total length of the body in mm. The dimensions and ratios of the specimens are presented as mean \pm standard deviation (range).

Description of *Tylenchorhynchus sudanensis* n. sp. 수단위축선충

Measurements

Holotype female: L = 0.7 mm; a = 40; b = 5.9; b' = 5.0; c = 16.1; c' = 3.2; V = 57.1; Stylet = 22 μm .

Paratype females (n = 26) 0.6 - 0.76 mm (692.5 \pm 45.6 μm); a = 31.3 - 42.2 (36.9 \pm 2.9); b = 5.4 - 7.9 (6.4 \pm 0.7); b' = 4.6 - 6.5 (5.3 \pm 0.5); c = 12.8 - 22.4 (16.4 \pm 1.9); c' = 2.8 - 3.8 (3.3 \pm 0.3); V = 53.2 - 65.4 (56.9 \pm 2.5); Stylet = 20 - 23 (21.9 \pm 0.8) μm .

Description of females (Fig. 1)

Female body (n = 26): Ventrally arcuate, close to C shape after treatment. Maximum body width 17 - 24 (18.8 \pm 1.5) μm . Lateral field with 4 incisures. They are not aerolated (Fig. 1). Annules at mid body, 0.75 - 1.0 (0.84 \pm 0.12) μm wide. Head hemispherical in shape and continuous with the body contour with 4.5 - 6.5 (5.5 \pm 0.6) μm high \times 2.5 - 4.0 (3.6 \pm 0.6) μm wide, smooth without annulation. Labial framework weakly sclerotized. Stylet = 20 - 23 (21.9 \pm 0.8) μm long, with conus = 12.5 - 9.5 (10.8 \pm 0.73) μm long. Stylet with stylet guiding sheath. Stylet knobs elongated with depression arterially, 3 - 6.5 (4.9 \pm 0.8) μm wide. Opening of the DGO at 1.5 - 4.0 (2.9 \pm 0.8) μm from stylet base. Metacarpus bulb rounded with 10.5 - 16.5 (13.7 \pm 0.1.6) μm high

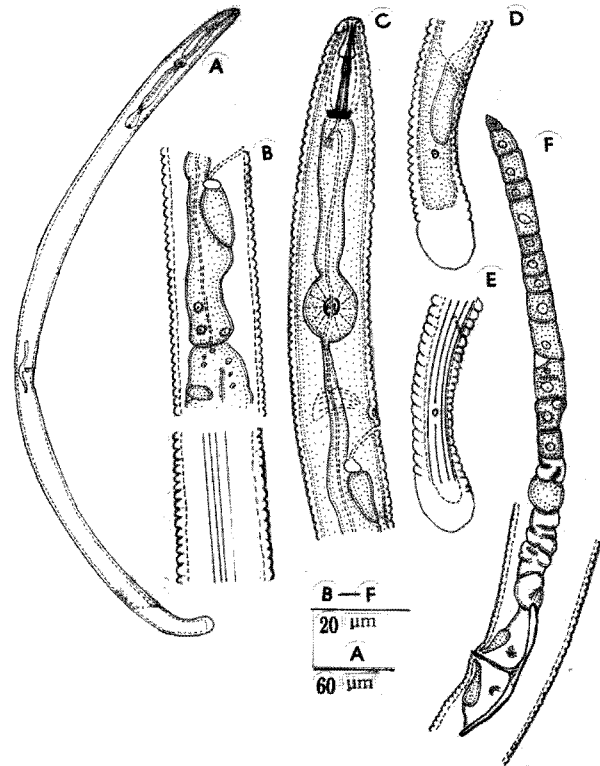


Fig. 1. *Tylenchorhynchus sudanensis* n. sp. Female. A: General body; B: Oesophagus region; c: Head and median bulb region; D & E tail region; F; female reproductive system.

and 8.0 - 11.5 (9.8 \pm 0.8) μm wide. Valvular apparatus well developed. Hemizonid is located 87 - 100 (92.6 \pm 3.8) μm from the anterior head. Excretory pore located 1 - 2 annules from hemizonids. Deirids absent. Basal bulb saccate. Oesophagus 92.5 - 123 (109.5 \pm 8.4) μm long. Some body inclusions present in the oesophagus and the beginning of the intestine region.

Reproductive system didelphic. Ovaries well developed outstretched and with oocytes in single row. Spermatheca rounded without sperms.

Tail clavate 33.5 - 53.5 (42.7 \pm 4.3) μm long bearing 49 - 17 smooth annules. Phasmid located 23 - 34.5 (27.5 \pm 2.9) μm from the tail end. Hyaline present 10 - 17.5 (13.6 \pm 1.8) μm at the tail terminus.

Males: Not found.

Type habitat and locality. Collected in March, 2005 from soil around sugar cane rhizosphere in Guneid sugar cane factory field. The scheme lies on the eastern bank of the Blue Nile at Butana province, Gezira state, Sudan.

Table 1. Comparative morphometric data (in μm except L in mm) of closely related species

Species character	<i>T. sudanensis</i>	<i>T. cynodoni</i>	<i>T. neoclavicaudatus</i>
L	0.6 - 0.76	0.63-0.68	0.59 -0.72
Stylet length	20 - 23	13 - 15	20-23
Stylet knob inclination	ANT	ANT	POS
Lip annules	0	0	2-3
Tail annule	17 - 49	20 - 26	32-50
Tail shape	CLA	CLA	CLA
Tail termination	HEM	HEM	HEM
c'	2.8	4.3	2.7-3.6

ANT= Anterior; POS= Posterior; CLA = Clavate; HEM = Hemispherical.

Type specimens. 26 female specimens were deposited in USDA laboratory.

Diagnosis

T. sudanensis is characterized by rather medium body size of female, L= 0.692 mm long, with rather medium stylet length of 20 - 23 μm long. With stylet guiding sheath. Head hemispherical in shape and continuous with the body contour smooth without annulation. Our population is similar to *T. cynodoni* Kumar 1981 (Kumar, 1981) in general morphological characters but different from it in short stylet (20 - 23 vs. 13 - 15 μm). With stylet guiding sheath. *T. cynodoni* vulva depressed, but vulva of our population is protruded. *T. cynodoni* has 20 - 26 annules vs. 17 - 49 annules in our population (Table 1).

Description of *Tylenchorhynchus elamini* n. sp. 엘라민위축선충

Measurements

Holotype female: L = 0.67 mm; a = 33.3; b = 6.6; b' = 5.6; c = 13.4; c' = 3.9; V = 56.3; Stylet = 18.5 μm .

Description of females (Fig. 2)

Paratype females (n = 8): Body ventrally arcuate, almost straight to C shape after treatment. Maximum body width 19.5 - 25.5 (22.4 \pm 2.1) μm . Lateral field with 4 incisures, only the outer lines are aerolated they continue separately till close to the end tail where they fused. Head hemispherical in shape and continuous with the body contour with 7 - 8 (7.4 \pm 0.3) μm high and 3.5 - 5 (4.1 \pm 0.4) μm wide with 1 - 2 annules. Labial framework not sclerotized. Stylet = 16 - 19 (17.9 \pm 1.0) μm long, with conus = 8.5 - 11

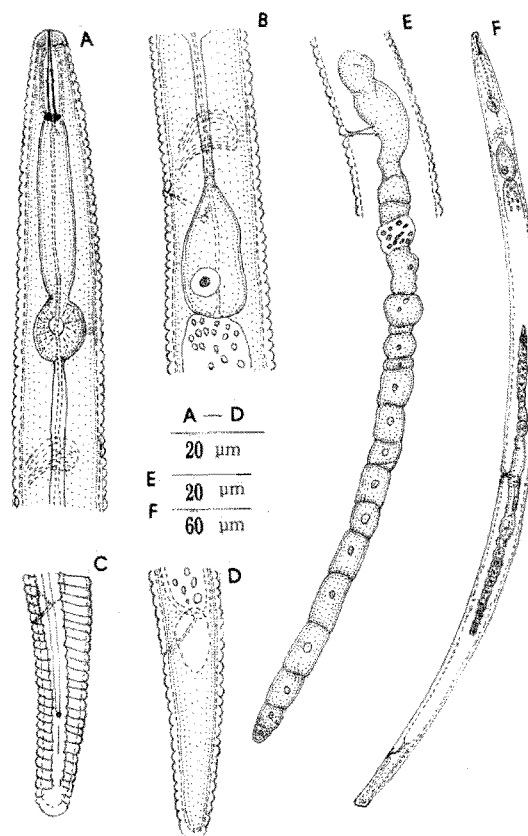


Fig. 2. *Tylenchorhynchus elamini* n. sp. Female. A: Head and median bulb region; B: Oesophagus region; C&D: Tail region; E; Female reproductive system; F: General body.

(10.1 \pm 0.8) μm long. Stylet knobs almost rounded with 3 - 4.5 (3.5 \pm 0.6) μm wide. Opening of the DGO at 2 - 3.5 (2.6 \pm 0.4) μm from stylet base. Metacarpus bulb rounded with 12 - 19.5 (14.4 \pm 2.5) μm high and 9.5 - 11 (10.1 \pm 0.6) μm wide. Valvular apparatus well developed. Hemizonid is located 92 - 105 (98.7 \pm 4.3) μm from the anterior head. Excretory pore located 0 - 1 annule from hemizonids. Deirids absent. Basal bulb saccate. It has one big dorsal gland nuclei.

Table 2. Comparative morphometric data (in μm except L in mm) of *T. elamini* with *T. musae* and *T. mashhoodi*

Species character	<i>T. elamini</i>	<i>T. musae</i>	<i>T. mashhoodi</i>
L	0.61 - 0.78	0.58-0.65	0.49-0.76
Stylet length	16 -19	18-19	17-18
Stylet knob inclination	Rounded	Elongated, ANT	POS
Spicule length	Male not found	-	22-24
Gubernaculum length	Male not found	-	12-13
Lip annules	1 - 2	1-2	3-4
Lip region	CNT	Slightly set-off	CNT
Tail annule	17 -25	16 - 20	13-16
Tail shape	SCYL	SCYL	CYL
Tail termination	R	BLP	BLP
c'	3.9	2.8	2.5-4.0
Dorsal gland nuclei	One big dorsal gland	-	-

CNT = Continous; SCYL = Sub Cylindrical; BLP = Bluntly pointed and R= Rounded.

Reproductive system didelphic. Ovaries well developed outstretched and with oocytes in single row with rounded spermatheca.

Tail shape subcylindrical with rounded tail terminus and tail tip annulation is smooth. Tail length = 45 - 52 (47.9 \pm 2.5) μm long bearing 17 - 25 coarse annules. Phasmid located at 22.5 - 35 (29 \pm 4.0) μm from tail end.

Etymology: *T. elamini* named after Professor Tigani M. Elamin, the pioneer nematologist in Sudan.

Males: Not found.

Type habitat and locality: Collected in March, 2005 from soil around sugar cane rhizosphere in Guneid sugar cane factory field. The scheme lies on the eastern bank of the Blue Nile at Butana province, Gezira state, Sudan.

Type specimens: 5 female specimens were deposited in USDA laboratory.

Diagnosis

T. elamini is characterized by small body size of female, L = 0.61 - 0.78 mm long, medium stylet length 16 -19 μm long. Head hemispherical in shape and continuous with the body contour with 1.7 - 2 μm high and 3.1- 4.0 μm wide with 1 - 2 annules. Labial framework not sclerotized. This population is similar to *T. musae* Kumar 1981 (Kumar, 1981) in general morphological characters but different from it that *T. musae* basal plates of the cephalic framework extended back into the sides of the body, while in this population not. Lip region in *T. musae* is slightly set-off,

while in *T. elamini* is continuous. Stylet knobs almost rounded compared to *T. musae*, which were elongated and anteriorly directed. *T. musae* has 16 - 20 vs. 17 -25 annules in our population. This population is also characterized by one big visible dorsal gland nuclei (Table 2).

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