

TWO NEW *Aphelenchoides* FISCHER, 1894 (NEMATODA: TYLENCHINA) FROM MANIPUR, NORTHEAST INDIA

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ABSTRACT

Two new nematode species of *Aphelenchoides* discovered from different localities of Manipur, North East India had been described in the present study. *Aphelenchoides longistylus* sp. nov. has a long stylet and four lateral lines which are gradually merged into two at the tail region. *Aphelenchoides neominoris* sp. nov. has a small body and short tail with a stylet length of 8.6 μm .

Keywords: *Aphelenchoides longistylus* sp. nov., *Aphelenchoides neominoris* sp. nov., Manipur, North-East India

INTRODUCTION

Aphelenchoides spp. are soil dwelling nematodes and often found in decaying plant materials. Their characteristic features include slender stylet with narrow lumen and usually with small basal knobs or swellings with presence of post uterine sac. Female tails are of medium length, conoid, with a tip pointed or rounded and often mucronate terminus. Most important characteristics of males include paired spicule, separate, rose thorn-shaped or derived from them with absence of gubernaculum.

A number of *Aphelenchoides* spp. have been reported from India and from throughout the world. But description of new species of the genus is increasing due to intensive survey from different parts of the world including the biodiversity hot spot areas of North East India. The present manuscript deals with descriptions of two new species of *Aphelenchoides* spp. from Manipur, North East India. The discovery of the specimens is an added asset to the knowledge of the rich biodiversity of the region.

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MATERIALS AND METHODS

Nematodes were extracted from collected soil samples by Baermann funnel technique. Collected nematodes were fixed in TAF (triethanolamine, formaldehyde and water) and processed by glycerol-ethanol method of Seinhorst (1959). Specimens were mounted in dehydrated glycerine. After slide preparation, measurements were taken using an ocular micrometer fixed on Nikon, Trinocular Research Microscope, model ECLIPSE E200 and diagrams were drawn under a drawing tube attached to the same microscope.

RESULTS AND DISCUSSION

Aphelenchoides longistylus sp. nov.

Table 1. Morphometric data of species of *Aphelenchoides longistylus* sp. nov.

Characters	Holotype ♀	Paratypes ♀s	Paratype ♂s
n	1	12	4
Stylet	24.22	24.22	24.22
Length	0.59	0.59 – 0.66 (0.625±27.79)	0.562 – 0.620 (0.59 ±0.02)
a	34.4	34.4 - 35.85 (35.02±0.61)	38.2 – 42.02 (40.11±1.91)
b	8.6	8.33 – 9.81(9.08±0.52)	7.24 –8.33 (7.78±0.54)
b'	6.03	6.03 – 6.49 (6.27±0.18)	3.25 – 5.603 (4.42±1.17)
c	14.33	13.67 – 14.58 (14.19±0.38)	13.54 – 17.45 (15.22±1.43)
c'	6.00	5.6 – 6.14 (5.91±0.22)	4 – 6.2 (4.92±0.86)
G ₁	40.69	39.39 – 43.08(41.05±1.52)	-
V	69.76	67.78 – 69.76 (69.08±0.92)	-
PVS/ V-A%	11.25	11.25 – 12.25(11.71±0.41)	-
T	-	-	92.61 – 102.84 (97.56±3.66)
Max. body width	17.3	17.3 – 19.03(17.87±0.815)	13.38
Lip diameter	5.19	5.19	5.13
Lip height	1.73	1.73	1.73
Oesophagus	98.61	98.61 – 102.07 (99.76±1.63)	-
Median bulb length	13.84	13.84	13.84 – 15.57 (14.55±0.73)
Median bulb diam.	10.38	8.65 - 10.38 (9.51±0.86)	8.65 – 10.38 (9.53±0.70)
Ovary length	242.2	242.2- 285.45 (257.35±19.88)	-
Testis	-	-	335.62 – 342.45 (339.14±1.91)
Sperm theca	48.44	48.44	-
PUS	15.57	8.65 – 18.65 (16.74±1.35)	-
PUS/VBD	0.9	0.9 – 1.07 (0.96±0.07)	-
Rectum	6.92	6.92	-
Spicule	-	-	24.22
Tail	41.52	41.52 – 48.44 (44.16±3.05)	41.52 – 46.23 (43.89±1.91)
ABD	6.92	6.92 – 8.65 (7.49±0.81)	10.32

Note: All measurements are in µm except Length is in mm

Description

Female: Body is straight to curved ventrally upon fixation, 0.59 - 0.66 (0.62±27.79) mm in length and about 34.4 - 35.85 (35.02±0.61) times greatest body width long. Cuticle is finely annulated which is about 0.7 µm wide. Lateral fields with 4 longitudinal lines which merge into 2 lines at around tail regions. Cephalic region is indistinctly set off from body, appearing smooth and with 6 equal lips. Stylet is 24.22 µm long with indistinct basal knobs. Cylindrical portion of the stylet is slightly longer than anterior conical section. Procorpus is wider anteriorly, gradually narrowing at posterior part, 48.44 - 59.1 (52.48±4.15) µm long. Median bulb is spherical to pyriform in shape and occupying four-fifth of body width, 13.84 µm in length and 8.65 - 10.38 (9.51±0.86) µm in diameter. Oesophageal glands forms a non overlapping lobe with intestine, about 34.6 - 38.06 (36.60±1.28) µm in length. Nerve ring is about one-half of body width behind median bulb, encircling the anterior end of oesophageal glands. Excretory pore is at base of median bulb, 74.39 - 83.04 (78.33±3.22) µm long from anterior body region forming a lobe at dorsal side of nerve ring. Hemizonid, deirids and phasmids were not seen. Vulva is a transverse slit, two-fifth of body width long and is located approximately at one-half body length from anterior end. Genital tract is monoprodelphic, outstretched, usually extending up to the oesophageal gland lobe. Oocytes are arranged in a single row, post uterine sac about 2.15 - 2.31 (2.21±0.07) µm times anal body diameter long. Tail is 5.6 - 6.2 (5.9±0.22) µm times anal body diameter long, tapering gradually into a cylindrical tube terminating in a ventral prong tip.

Male: Found in abundance as is female, is slightly smaller than female and is more straight upon fixation. Cephalic region, stylet and oesophagus are as described for females. Tail is slender with a single terminal mucro. Spicules are about 24.22 µm long. Testis is single, 335.62 - 342.45 (339.14±2.51) µm long.

Type habitat and locality: Collected in December 2012 from soil around rhizospheric regions of coconut plant, *Cocos nucifera* Linn. at Ninghsing Khul, Jiri, Imphal West District, Manipur, India.

Type material: Holotype female on the slide FSB - A₃-1/♀ *Aphelenchoides longistylus* sp. nov., paratype females on the slides FSB - A₃ - 2- 12/♀ *Aphelenchopides longistylus* sp. nov., paratype males on the slides FSB - A₃ - 1- 4/♂ *Aphelenchoides longistylus* sp. nov. and deposited in the Nematode collection center of Parasitology Section, Department of Life Sciences, Manipur University, Canchipur - 795003, Manipur, India.

Differential diagnosis:

Aphelenchoides longistylus sp. nov. differs from all other species of *Aphelenchoides* Fischer, 1894 in possession of the longest stylet and 4 lateral lines which gradually merged into 2 at the tail regions.

However, it comes close to *Aphelenchoides absari* (Hussain & Khan 1967); *Aphelenchoides chalonus* (Chawla & Khan 1979); *Aphelenchoides lanceolatus* (Tandon & Singh 1974) and *Aphelenchoides sacchari* (Hooper 1958).

Aphelenchoides longistylus sp. nov. differs from *A. absari* (Hussain & Khan 1967) in having 4 lateral lines throughout body length, longer body length, larger values of a, b, c', stylet and longer spicule; smaller values of c, V and indistinct stylet knobs (lateral lines = 3, body length = 0.39 - 0.45, a = 30 - 33, b = 4 - 4.5, c' = 3, stylet = 11 - 13, spicule = 15 - 19, c = 16 - 20, V = 69 - 77 and presence of stylet knobs in *A. absari* (Hussain & Khan 1967).

Aphelenchoides longistylus sp. nov. comes close to *A. chalonus* (Chawla & Khan 1979) in having similar range of a, b, c and V values. But, it differs from *A. chalonus* (Chawla & Khan 1979) in having 4 lateral lines gradually merging into 2, larger values of body length, c value, stylet length and absence of stylet knobs (Lateral lines = 3, body length = 0.4 - 0.5 mm, stylet = 10 - 11 μ m and presence of stylet knobs in *A. chalonus* (Chawla & Khan 1979).

Aphelenchoides longistylus sp. nov. also comes close to *A. lanceolatus* (Tandon & Singh 1974) in having similar range of body length, a, b, c values and spicule length. But, it differs from *A. lanceolatus* Tandon & Singh, 1974 in having larger value of c', smaller value of V, longer stylet and 4 lateral lines which merged into 2 and indistinct stylet knobs (c' = 2.9, V = 71 - 73, stylet = 11 - 14 μ m, 4 lateral lines and presence of stylet knobs in *A. lanceolatus* (Tandon & Singh 1974).

Similarly, *Aphelenchoides longistylus* sp. nov. comes close to *A. sacchari* (Hooper 1958) in having similar range of body length, a, b, c and V values. But it differs from *A. sacchari* (Hooper 1958) in having 4 lateral lines, smaller values of b and longer stylet with indistinct stylet knobs and larger values of spicules (Lateral lines = 3, b = 10 - 14, stylet = 11 μ m, spicules = 15 - 20 μ m and presence of stylet knobs in *A. sacchari* (Hooper 1958).

***Aphelenchoides neominoris* sp. nov.**

Description

Female: Body is finely annulated, tapering towards both extremities, straight and slightly curved ventrally on the tail region upon relaxation. Lateral fields have 4 incisures. Cephalic framework is smooth, set off from the body, about 5.19 μ m wide and 2.53 μ m high. Stylet is prominent with distinct stylet guards, 8.65 μ m in length with distinct stylet knobs. Oesophagus has zig-zagly coiled procorpus, has strongly developed and rounded corpus with median sclerotised plates and elongated gland lobe overlying the intestine dorsally at a distance behind the bulb which is equal to about 3 - 4 times body width long. Neither deirids nor phasmids were seen. Excretory pore is close behind the nerve ring. Vulva is prominent, protruding both lips with vagina inclined. Large and elongated spermatheca, about 65.74 - 70.24 (67.99 \pm 2.25) μ m long, oocytes are arranged in single row reaching up to the oesophageal bulb. Post-vulval uterine sac is about one-half vulval body width and is empty. Anterior lip of anus is protruding, tail is bluntly rounded, 12.11 - 25.95 (19.03 \pm 6.92) μ m in length with a small hair like mucro.

Male: Not found.

Type habitat and locality: Collected in September 2013 from soil around the rhizospheric regions of orange plant, from Sibilong, Chandel District, Manipur, India.

Type material: Holotype female on the slide FSB-A₄ - 2/ ♀ *Aphelenchoides neominoris* sp. nov., paratype females on the slides FSB - A₄ - 1, 3 - 10/♀ *Aphelenchoides neominoris* sp. nov. and deposited at the Nematode collection center of Parasitology Section, Department of Life Sciences, Manipur University, Canchipur - 795003, Manipur, India.

Differential diagnosis:

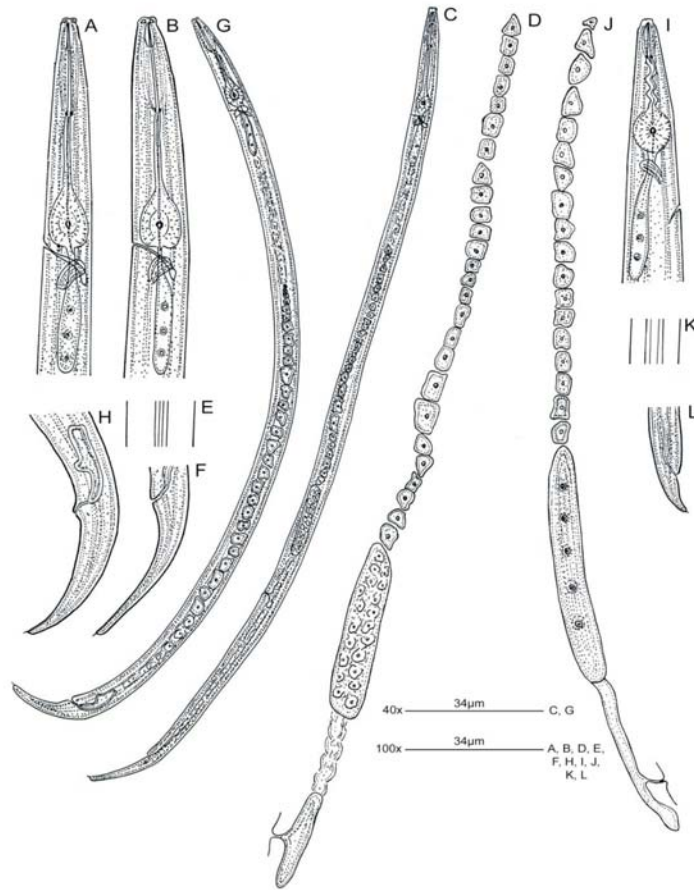
Aphelenchoides neominoris sp. nov. differs from all other species of *Aphelenchoides* Fischer, 1894 in having the shortest body length. But, it comes close to *Aphelenchoides minoris* (Ebsary 1991); *Aphelenchoides absari* (Hussain & Khan 1967) and *Aphelenchoides vaughani* (Masleen 1979) in several other characters.

Table 2. Morphometric data of female species of *Aphelenchoides neominoris* sp. nov.

Characters	Holotype	Paratypes
n	1	10
Stylet	8.65	8.65
Length	0.439	0.351 – 0.439 (383.48 ± 39.71)
a	36.29	36.29 – 40.6 (38.44 ± 2.16)
b	6.51	4.23 – 6.51 (5.37 ± 1.14)
b'	6.03	6.03 – 6.49 (6.27 ± 0.18)
c	36.29	13.53 – 36.29 (24.90 ± 11.37)
c'	1.75	1.75 – 3.75 (2.75 ± 1)
G ₁	50	41.87 – 50.0 (45.93 ± 4.06)
V	71.65	69.95 – 71.65 (70.8 ± 0.85)
Lip width	5.19	5.19
Lip height	2.53	2.53
Oesophagus	67.47	67.47 – 83.04 (75.25 ± 7.78)
Median bulb width	8.65	6.92 – 8.63 (7.49 ± 0.81)
Ovary	219.71	147.05 – 219.71 (183.38 ± 36.33)
Spermatheca	65.74	65.74 – 70.24 (67.99 ± 2.25)
PUS	15.57	12.11 – 15.57 (13.84 ± 1.73)
PUS/VBD	1.28	1.28 – 1.4 (1.34 ± 0.06)
Rectum	5.19	5.19
Tail	12.11	12.11 – 25.95 (19.03 ± 6.92)
ABD	6.92	6.92

Note: All measurements are in µm except Length is in mm

Figure 1: A H. *Aphelenchoides longistylus* sp.nov.



Legends to figures

- A - Female anterior body
- B - Male anterior body
- C - Female entire body
- D - Female reproductive system
- E - Female lateral lines
- F - Female tail region
- G - Male entire body
- H - Male tail region
- I - *L. Aphelenchoides neominoris* sp. nov.
- I - Female anterior body
- J - Female reproductive system
- K - Female lateral lines and
- L - Female tail region.

Aphelenchoides neominoris sp. nov. comes close to *Aphelenchoides minoris* (Ebsary 1991) in having smaller body length and a ventral mucro. But, it differs from *Aphelenchoides minoris* (Ebsary 1991) in having 4 lateral lines, larger values of a, c; smaller values of b, PUS, stylet and indistinct stylet knobs (lateral lines = 3, a= 26 - 29, b= 8- 9, c= 15, PUS= 5 VBD, stylet= 10 μ m and presence of stylet knobs in *A. minoris* (Ebsary 1991).

Aphelenchoides neominoris sp. nov. comes close to *A. absari* (Hussain & Khan 1967) in having almost similar body length, 4 lateral lines and presence of ventral mucro. But, it differs from *A. absari* Hussain & Khan, 1967 in having larger values of a, b and c but smaller values of c', stylet length, presence of post uterine sac and indistinct stylet knobs (a= 30 - 33, b= 4.0 - 4.5, c= 16 - 20, c'=3, stylet = 11- 13 μ m, absence of post uterine sac and presence of stylet knobs in *A. absari* (Hussain & Khan 1967).

Aphelenchoides neominoris sp. nov. is similar to *Aphelenchoides vaughani* (Masleen 1979) in having almost similar body length, presence of 4 lateral lines and ventral mucros. But, the species differs from *A. vaughani* (Masleen 1979) in having larger values of a, c and G₁, and smaller values of b, stylet length, tail length and in having a simple ventral mucro (a= 24- 31, b= 6.3 - 9.2, c= 12.1 - 16.9, G₁ = 32 - 44, stylet = 9.5 - 11 μ m, tail = 23.5 - 38.5 μ m with a ventral mucro minutely multi-papillate at its tip in *A. vaughani* (Masleen 1979).

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