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Description of *Loffienema dhanoriensis* gen. n., sp. n. (Nematoda: Rhabditidae) from Jammu and Kashmir State, India

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Abstract

A new genus, *Loffienema dhanoriensis* **gen. n., sp. n**. is described and illustrated from soil mixed with mature compost of Biodiversity Park, Baba Ghulam Shah Badshah (BGSB) University, Rajouri, Jammu and Kashmir, India. It is characterized by medium-sized body, slightly offset labial region, weakly developed, isoglottoid stegostom, amphidelphic reproductive system, slender and separate spicules, spathulate gubernaculum and reduced bursa with eight pairs of bursal rays. Its relationship and distinguishing features with other closely related genera are discussed.

Key words: *Loffienema,* new genus, reduced bursa, spathulate gubernaculum, taxonomy

Introduction

While surveying Jammu and Kashmir State for nematodes, some very interesting specimens were collected from soil mixed with mature compost, BGSB University campus, Rajouri. These specimens resembled *Stegorhabditis* (Shah, Hussain, Vaid & Ahmad, 2015) and *Rhabditella* (Cobb, 1929) Chitwood, 1933. However, detailed examination revealed that they do not fit any known genera of Rhabditidae Örley, 1880.

The family Rhabditidae was proposed by Örley (1880), who placed the family in the higher category "Rhabditiformae", which he considered as the connecting link between parasitic and free-living nematodes. The foundation of modern systematics of Rhabditidae was laid by Osche (1952). Followed by Osche's contribution, Sudhaus (1974a, 1974b, 1974c, 1976a, 1976b, 1977, 1978) covered major areas on studies of rhabditid nematodes including taxonomy, morphology, biology, ecology and physiology.

The family Rhabditidae was further divided into three subfamilies; Rhabditinae Micoletzky, 1922, Cylindrolaiminae and Bunonematinae Micoletzky, 1922 (Baylis & Daubney 1926). In addition, Andrássy (1976) proposed ten subfamilies under the family Rhabditidae.

Dujardin (1845) established the genus *Rhabditis* and Bütschli (1873) analyzed the genus in detail. Örley (1880) placed the genus in the family Rhabditidae. Later Cobb (1929) proposed *Rhabditella* as a subgenus under the genus *Rhabditis.* Shah *et.al.* (2015) described the genus *Stegorhabditis* which is closely related to the genera *Rhabditonema* Körner, 1954 and *Stomachorhabditis*, Andrássy, 1970.

The present paper provides a description of the BGSB University specimens and, on account of their peculiar features, we propose a new genus and species, *Loffienema dhanoriensis* **gen. n., sp. n.** to accommodate them.

Material and methods

The collected samples were processed using modifications of Cobb's (1918) sieving and decantation and Baermann's (1917) funnel techniques. Extracted nematodes were simultaneously killed and fixed in hot FA (4:1)

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and dehydrated in glycerine–alcohol (5 parts glycerine + 95 parts 30% alcohol). The dehydrated specimens were mounted in anhydrous glycerine. Morphological features were studied using an Olympus BX51 DIC microscope, and line drawings were made with the help of an attached drawing tube and photomicrographs were taken with an Olympus DP25 digital camera.

Taxonomy

Loffienema dhanoriensis gen. n., sp. n.

(Figures 1 & 2; Table 1)

Description. *Female.* Body less than 1 mm long, straight to slightly arcuate upon fixation, tapering at both ends, more so at posterior end. Cuticle finely, annulated transversely and striated longitudinally. Lateral fields with four lines. Labial region 8-9µm wide, symmetrical, set off by a constriction, wider than adjoining body. Lips six, separate, labial papillae small, not well differentiated. Amphidial apertures postlabial, 1.2–1.3 lip diameters behind the labial region. Stoma long, tubular, evenly cuticularized, 1.8–1.9 lip diameters long. Cheilostom simple, not cuticularized; gymnostom long with parallel walls. Stegostom isoglottoid, weakly developed, each plate with a pair of setose denticles. Pharyngeal collar tissue covering 52–56% of stoma. Procorpus well-developed, muscular; median bulb 19–21 µm wide or 2–2.1 lip diameters wide. Isthmus cylinder and muscular. Terminal bulb well developed, 2.4–2.5 lip diameters wide. Corpus 57–60% of pharyngeal length. Nerve ring encircling isthmus 100–108µm from anterior end or at 65–66% of pharyngeal length. Excretory pore at level of middle of isthmus 114–116µm from anterior end, 69–70% of pharyngeal length. Cardia small. Intestine granulated, with wide lumen. Reproductive system amphidelphic; anterior branch on right and posterior on left side of the intestine. Ovaries reflexed, oocytes arranged in two or more rows in the germinal zone. Oviduct simple. Spermatheca not differentiated. Uterus well developed with glandular and muscular parts. Vagina simple, less than half body diameter long. Vulva a transverse slit. Rectum 1.1–1.3 anal-body diameter long, anteriorly dilated. Tail long, filiform, 5–6.7 anal body diameter long. Phasmids 1.6–1.8 anal body diam. behind anus.

Males: Morphology similar to females, but smaller in size. Body slender, arcuate, curved in posterior region upon fixation. Testis single, dorsally reflexed. Spicules slender, separate, almost straight. Gubernaculum spathulate, proximally broad with blunt distal tip, 55–58% of spicule length. Bursa leptoderan, reduced, barely discernible. Caudal papillae eight pairs, three pairs pre-and five pairs post-cloacal. The first pair lies well anterior to the spicules; the seventh pair of caudal papillae are dorsally curved. Caudal papillae are arranged in a 1+1+1/1+1+1+2 pattern. Tail short and conoid.

Type material: Holotype: Female on slide *Loffienema dhanoriensis* gen. n., sp. n./1; deposited in the nematode collection of the Centre for Biodiversity Studies, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University, Rajouri, Jammu and Kashmir, India.

Paratypes: Females and males on slide *Loffienema dhanoriensis* gen. n., sp. n./2-5; deposited in the nematode collection of Centre for Biodiversity Studies, School of Biosciences and Biotechnology, Baba Ghulam Shah Badshah University, Rajouri.

Habitat and Locality: From soil mixed with mature compost, Biodiversity Park, BGSB University, Rajouri, Jammu and Kashmir, India.

Etymology: The genus name is derived from its spathulate shape of gubernaculum (German word “löffel (spoon)” for “spathulate”). The species name refers to the type locality, Dhanore.

Loffienema gen. n.

Diagnosis: Body medium-sized, less than 1 mm in length. Cuticle finely transversely annulated and longitudinally striated. Lips well-developed, separate, labial papillae small, not well differentiated. Amphidial apertures postglacial. Stoma long, tubular, evenly cuticularized. Cheilostom simple not cuticularized, gymnostom with parallel walls. Stegostom isoglottoid, weakly developed, with a pair of setose denticles on each plate. Pharyngeal collar present, covering about 52% of stoma. Pharyngeal corpus muscular, swollen to form median bulb. Female

reproductive system amphidelphic, vulva pre-median. Spicules slender, separate, almost straight. Gubernaculum spathulate, proximally broad and with blunt tip distally. Bursa reduced. Caudal papillae eight pairs. Female tail filiform.

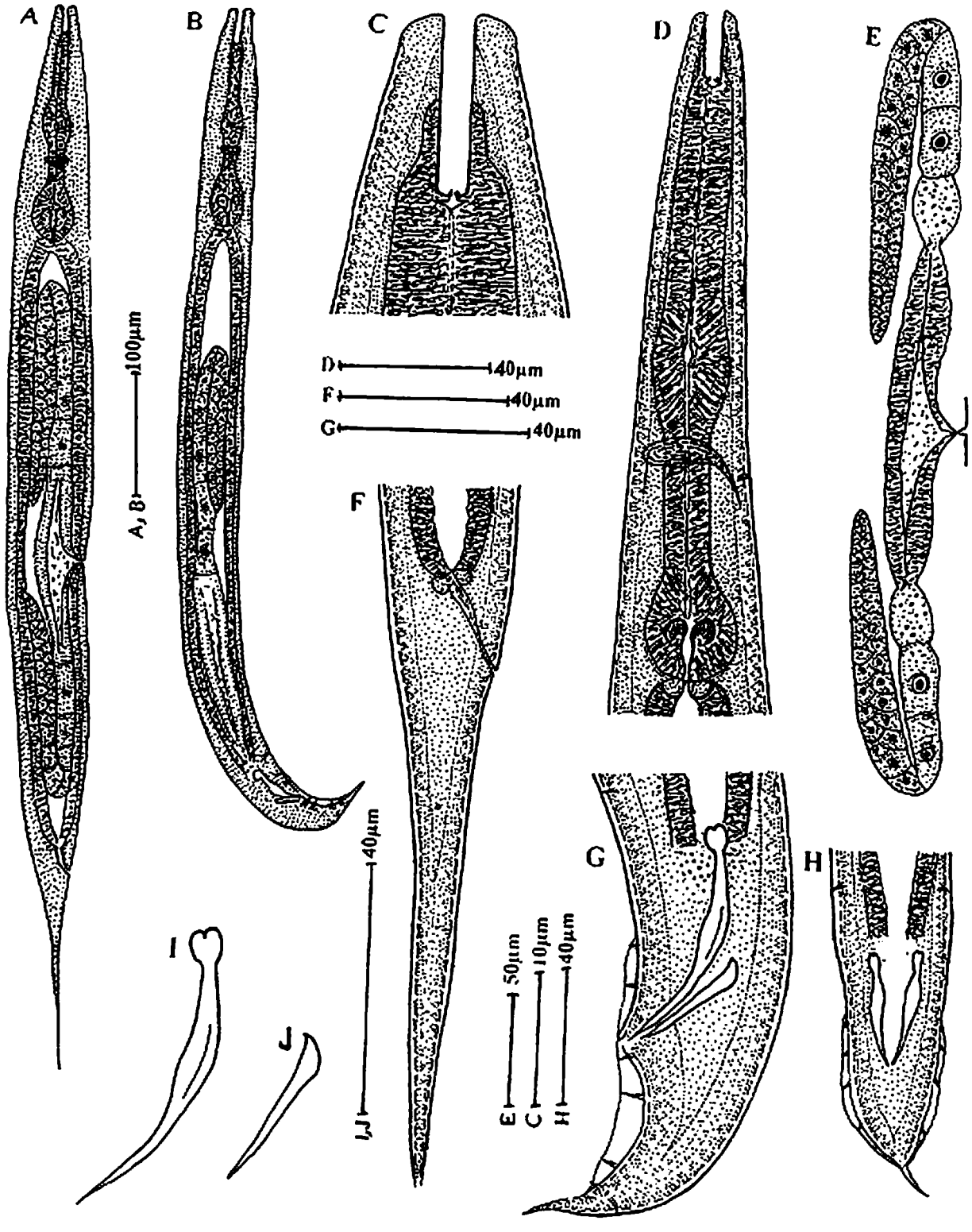

FIGURE 1: *Loffienema dhanoriensis* **gen. n., sp. n.** (A) Entire male, (B) Entire female, (C) Anterior end, (D) Pharyngeal region, (E) Female genital tract, (F) Female posterior region, (G) Male posterior region (lateral) & (H) Male tail (dorsoventral).

Relationships: The new genus resembles *Stegorhabditis* in having postlabial amphidial apertures, weakly developed stegostom, amphidelphic reproductive system, and in the shape of spicules. These two genera can be distinguished by the shape of the labial region, cheilostom, shape of gubernaculum, presence of bursa, number of caudal papillae and male tail: labial region offset in *Loffienema vs* not well differentiated, cheilostom simple *vs* cuticularised, gubernaculum spathulate *vs* wedge shaped, bursa present *vs* absent, eight pairs of caudal papillae *vs* six pairs, and short conoid male tail vs filiform in *Stegorhabditis*.

The new genus also resembles *Rhabditella* in having slightly offset labial region, simple cheilostom, free spicules, rudimentary bursa and amphidelphic reproductive system. However, it can be differentiated from the latter genus by the position of amphids, glottoid apparatus, shape of spicules and gubernaculum, and number of bursal papillae: amphids postlabial *vs* in labial region, reduced *vs* well developed glottoid apparatus, spicules without dorsal arm *vs* with dorsal arm, gubernaculum spoon shaped *vs* simple, and eight pairs of bursal papillae vs nine.

Type and only species: *Loffienema dhanoriensis* **gen. n., sp. n**.

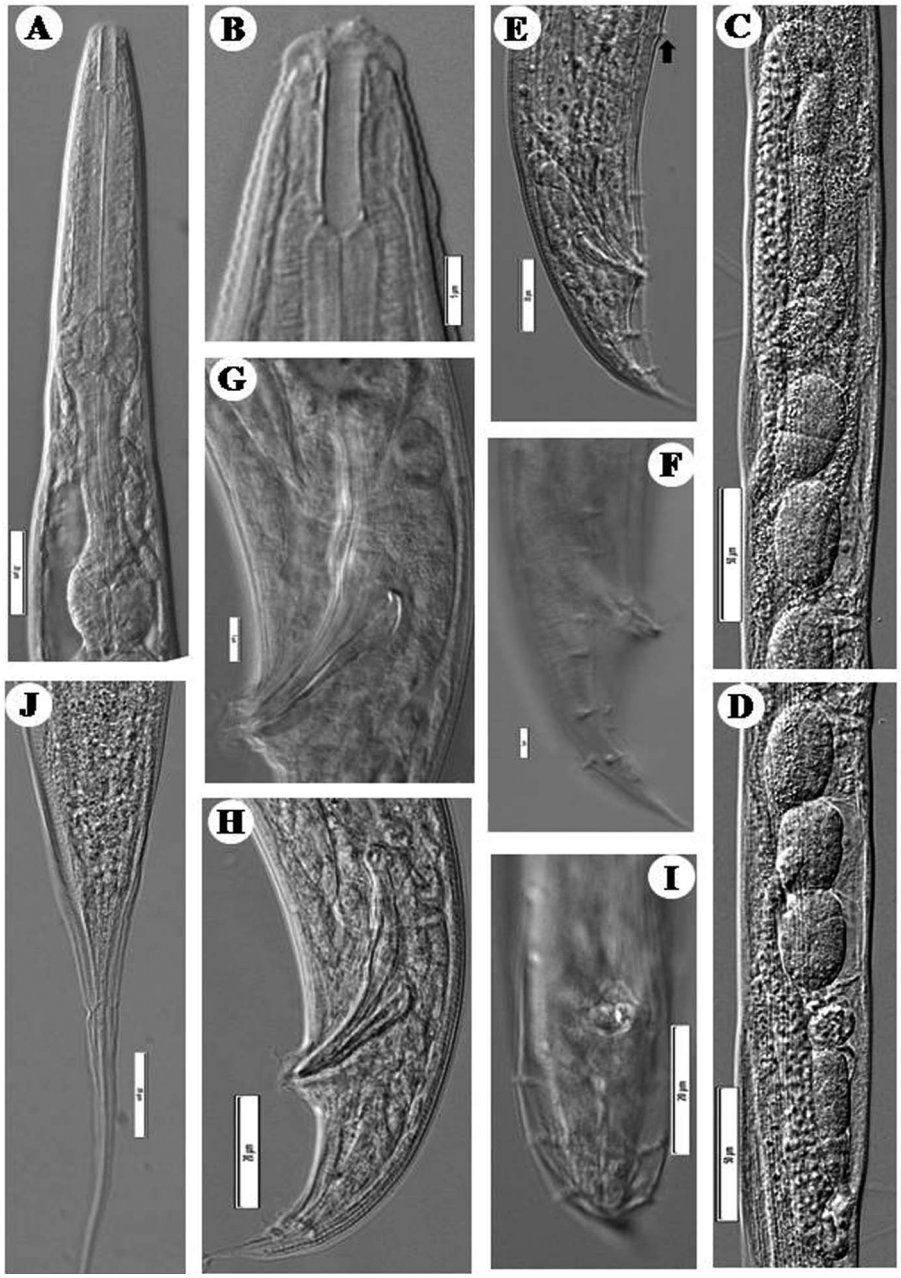

FIGURE 2: *Loffienema dhanoriensis* **gen. n., sp. n.** (A) Pharyngeal region, (B) Stoma, (C) & (D) Female genital tract, (E) & (F) Male posterior region showing bursal rays, (G) & (H) Male posterior region showing gubernaculum and spicule, (I) Male tail (dorsoventral) & (J) Female tail.

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TABLE 1: Measurements and morphometrics of *Loffienema dhanoriensis* **gen. n., sp. n.**

Characters	Holotype female	Paratype females (n=3)	Paratype males (n=2)
L	841	784-802 (793.2±12.3)	773, 792 (782.3±13.7)
a	15.9	20.0-20.1 (20.0±0.1)	18.8, 19.2 (19.0±0.28)
b	5.1	4.8-5.2 (5.0±0.2)	5.0, 5.1 (5.1±0.1)
c	7.0	6.6-8.2 (7.4±1.1)	14.6, 16.2 (15.3±1.1)
c’	6.7	5.0-6.3 (5.6±0.9)	1.7, 1.8 (1.8±0.0)
V	50.9	51.7-52.3 (52.0±0.4)	-
Maximum body diam.	55	39-40 (39.5±0.7)	40, 42 (41.0±1.4)
Lip region width	10	9-10 (9.2±0.6)	11, 12 (11.2±0.7)
Lip region height	4	4 (4-4±0)	4, 5 (4.4±0.7)
Stoma length	18	17-19 (17.5±1.3)	21, 23 (21.9±2.1)
Anterior pharynx	96	92-95 (93.3±2.1)	85, 91 (87.9±4.2)
Posterior pharynx	70	60-67 (63.5±5.5)	64, 67 (65.0±2.1)
Pharynx	166	152-162 (156.9±7.6)	152, 162 (156.9±7.6)
Excretory pore position (from anterior end)	113	113-114 (113.9±0.7)	126, 130 (128.0±2.8)
Nerve ring (from anterior end)	108	101-105 (102.6±2.7)	98, 106 (101.7±5.5)
Median bulb	22	19-20 (19.3±0.4)	15, 16 (15.1±0.7)
Isthmus	40	35-39 (37.2±2.7)	37, 39 (38.0±1.3)
Basal Bulb	25	22-22(21.9±0.6)	20, 21 (20.0±0.7)
Anterior gonad	225	196-215 (205.3±13.7)	-
Posterior gonad	201	190-215 (202.4±17.7)	-
VBD	50	41-50 (45.4±6.2)	-
Vulva–anus distance	280	245-275.7 (260.1±22.0)	-
Rectum	23	21-22 (21.4±1.3)	-
Tail	119	98-117 (107.5±13.7)	49, 53 (50.8±2.7)
ABD	18	19-20 (19.0±0.7)	28, 29 (28.8±0.7)
Testis	-	-	381, 421 (400.7±27.9)
Spicules	-	-	46, 47 (46.4±0.7)
Gubernaculum	-	-	25, 27 (26.3±1.3)
Bursa	-	-	44, 47 (45.4±2.0)
Caudal papillae	-	-	8

Measurements are in μm. Mean and S.D. given in parentheses.

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