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Description of *Metarhabditis andrassyana* gen. n., sp. n. (Nematoda: Rhabditidae) from India

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Abstract. *Metarhabditis andrassyana* gen. n., sp. n. from cow dung in India is described and illustrated. The new genus is characterised by medium- to large-sized body; slightly setoff lip region; six lips forming three doublets; rhabditoid stoma with cluster of knobbed setose denticles on metastegostomal swellings; uniformly cylindrical pharyngeal corpus; well developed didelphic gonad with proximally dilated oviducts; ovoid, setoff spermathecae; vulva with epiptygma and vulval flaps; rectum with rectal glands; sexual dimorphism in tail with females having long filiform and males with shorter tails; stout spicules with dorsal arm; a pseudopeloderan bursa; eight bursal papillae and copulatory muscle bands. The new genus resembles *Rhabditella* (Cobb, 1929) Chitwood, 1933 in the structure of spicules (with dorsal arms) but differs in having larger and greater number of metastomal denticles, a remarkably weak pharyngeal corpus, lesser number of genital papillae, a well developed bursa and presence of copulatory muscle bands.

Keywords. Description, India, *Metarhabditis andrassyana*, new genus, new species, Rhabditidae, taxonomy.

INTRODUCTION

Rhabditid nematodes have been found to live in a wide range of habitats. They have been reported from rotting bark (Steiner, 1929) and cucumber (Cobb, 1929), tunnels of moths (Osche, 1952), in lepidopteran insects on sugar cane (Sudhaus, 1976) and in compost soil (Kiontke, 1999). Most of them commonly associate themselves with soil invertebrates, are ingested as third stage dauer juveniles into the body of host, and do not complete their development until the host dies.

During the screening of the cow dung manure samples, as part of an ongoing project, a new genus of subfamily Rhabditinae was isolated. The samples were processed through sieving and decantation and modified Baermann's funnel techniques. Extracted nematodes were heat killed and fixed in FA, dehydrated by slow evaporation method and mounted in anhydrous glycerine. The drawings were made using drawing tube attachment on Olympus BX-51 DIC microscope and the LM photographs were taken using Samsung 200 VCD digital camera.

DESCRIPTIONS

Metarhabditis gen. n.

Diagnosis: Rhabditidae. Rhabditinae. Body slender, slightly ventrally curved, tapering gradually towards extremities.

Cuticle transversely and longitudinally striated. Lateral fields inconspicuous. Lip region slightly setoff from adjoining body, lips globular, grouped in doublets forming three sectors around triangular oral aperture. Stoma with inconspicuous cheilostom; gymnostom about half of stomal length. Metastegostom with a cluster of knobbed, setose denticles born on each plate. Pharyngeal collar surrounding posterior half of stoma. Pharynx with remarkably weak, uniformly cylindroid corpus, narrow isthmus and round, valvate basal bulb. Female reproductive system amphidelphic, vulva equatorial. Male reproductive system devoid of ejaculatory glands. Spicules stout with dorsal arm, free, not fused distally; gubernaculum an ovoid curved plate. Bursa pseudopeloderan, bursal papillae eight pairs. Female tail long, filiform. Male tail conoid with terminal spike and copulatory muscle bands.

Etymology: The genus name is based on the character of metastom, which has knobbed setose denticles in cluster.

Type and only species: *Metarhabditis andrassyana* gen. n., sp. n.

Relationship: The genus *Metarhabditis* gen. n. can be differentiated from all genera of Rhabditidae in general and Rhabditinae in particular, in having cluster of knobbed setose denticles born on metastegostomal plates; very narrow, faintly differentiated, cylindroid pharyngeal corpus and copulatory muscle bands. The genus is closely related to

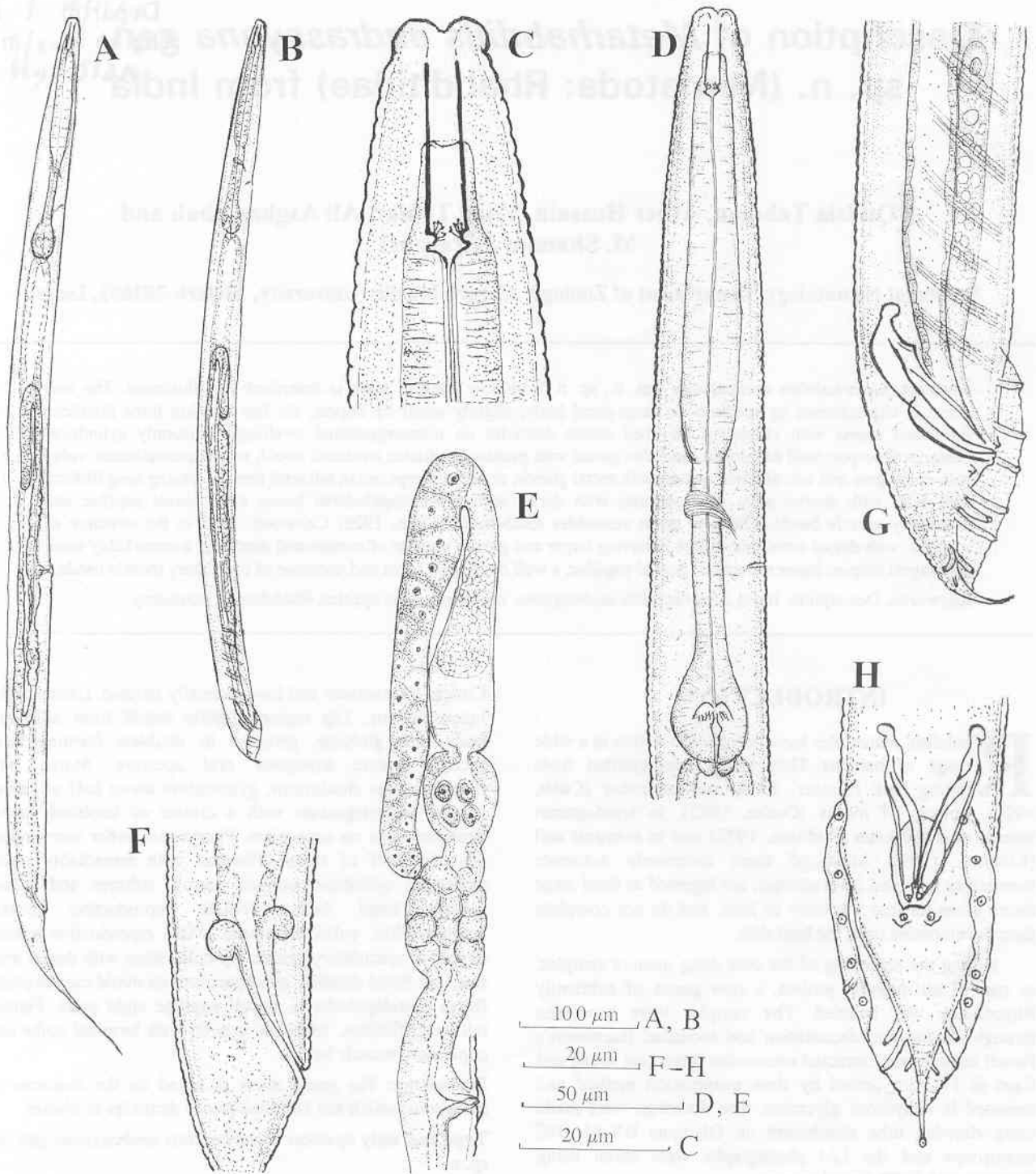


Fig 1. *Metarhabditis andrassyana* gen. n., sp. n. A. Entire female; B. Entire male; C. Anterior end; D. Pharyngeal region; E. Female reproductive tract (anterior); F. Female rectum; G. Male posterior region (lateral); H. Male posterior region (ventral)

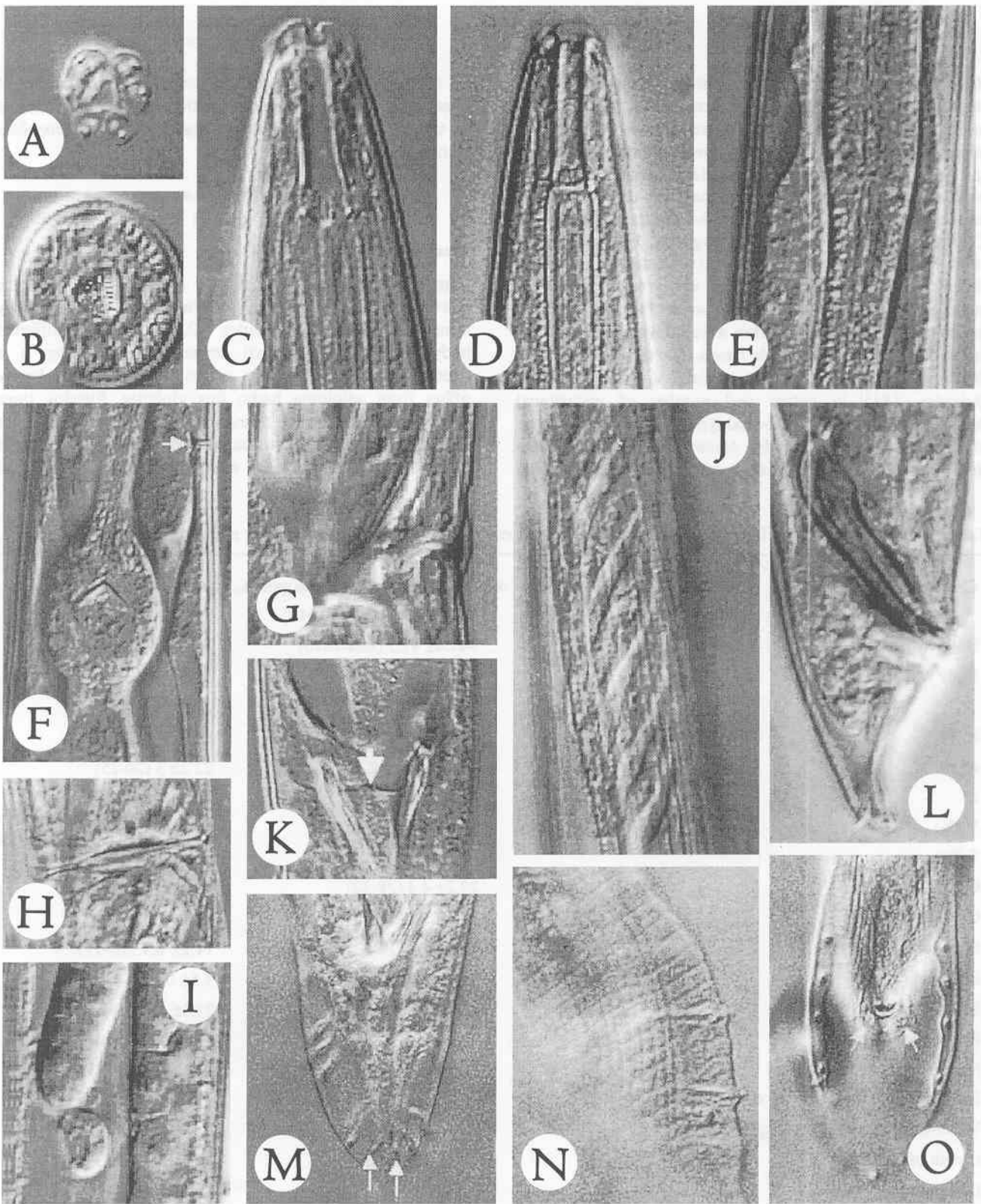


Fig. 2. *Metarhabditis andrassyana* gen. n., sp. n. A. *En face* view; B. Section through metastegostome; C-D Anterior ends; E. Pharyngeal corpus; F. Posterior part of pharynx; G. Vulval region (lateral); H. Vulval region (ventral); I. Distal end of testis showing pseudocoelomocyte; J. Copulatory muscle bands; K. Spicules with transverse connective; L. Male posterior region (lateral); M. Bursa with genital papillae (arrows indicate phasmids); N. Bursal markings; O. Bursa with folded margins (ventral).

Rhitis Andrassy, 1982 in having setose metastomal denticles, stout and free spicules, curved gubernaculum, but differs in having greater number of knobbed setose denticles on metastomal plates; a remarkably weak pharyngeal corpus; spicules with dorsal arms; considerably well developed bursa, lesser number of genital papillae and copulatory muscle bands. It resembles with *Rhabditella* (Cobb, 1929) Chitwood, 1933 and *Curviditis* (Dougherty, 1953) Andrassy, 1983 in the structure of spicules (with dorsal arms) but differs from both in having larger and greater number of metastomal denticles, a remarkably weak pharyngeal corpus, lesser number of genital papillae, a well developed bursa and presence of copulatory muscle bands. The new genus shows differences from the highly variable genus *Rhabditis* Dujardin, 1845 in nature and number of metastomal denticles, spicule structure, bursal type as well as in presence of copulatory muscle bands. *Metarhabditis* gen. n. also shows a superficial resemblance with cephalobid genera in

lip morphology (lips grouped to form three sectors) and of pharyngeal corpus. The setose denticles appear to be similar to those reported in a panagrolaimid *Baujardia mirabilis* Bert *et al.*, 2003

***Metarhabditis andrassyana* gen. n., sp. n.**

(Figs 1, 2)

Measurements. See Table 1.

Female: Body straight to slightly arcuate, tapering at the extremities more towards posterior end. Cuticle finely transversely annulated, annules 1-2.5 μm wide in different body regions; longitudinal striae present giving it a chequered appearance. Lip region continuous or faintly offset from adjoining body; lips globular, forming three sectors, arranged around triangular oral aperture in doublets (Fig. 2A). Inner labial sensilla bordering oral aperture; outer labial sensilla on outer lip margins. Amphids with small

Table 1. Morphometric data for *Metarhabditis andrassyana* gen. n., sp. n. Measurements in μm ; mean \pm SD (range).

Character	<i>Metarhabditis andrassyana</i> gen. n., sp. n.		
	Holotype female	Paratype females (n=13)	Paratype males (n=12)
Body length	1003	947.4 \pm 41.3 (882-1010)	767.4 \pm 72.5 (632-853)
Body width	40	40.3 \pm 3.7 (36-47)	36 \pm 4.2 (30-44)
a	25	23.6 \pm 1.9 (20-26)	21.4 \pm 1.7 (18-23)
b	5.1	4.61 \pm 0.30 (4.11-5.04)	4 \pm 0.3 (3.5-4.5)
c	6.1	7.2 \pm 0.5 (6.5-8.1)	22.2 \pm 3 (20-25)
c'	7.9	6.1 \pm 0.6 (5-7)	1.6 \pm 0.1 (1.5-2)
V (%)	48.7	50.8 \pm 0.8 (48-52)	
T (%)			60.6 \pm 2.9 (54-65)
G ₁ (%)	28.1	29.2 \pm 4.4 (28-32)	
G ₂ (%)	27	28.1 \pm 3.8 (24-30)	
Lip width	11	11.2 \pm 0.8 (10-12)	11.2 \pm 0.7 (10-12)
Lip height	4	3.6 \pm 0.2 (2-4)	3.5 \pm 0.6 (3-4)
Stoma length	21	22.6 \pm 1.1 (21-25)	21.3 \pm 1.2 (20-23)
Pharyngeal length	195	206.5 \pm 5.3 (201-222)	190.8 \pm 9.1 (180-205)
Nerve ring from anterior end	132	135.9 \pm 4.2 (130-148)	128.8 \pm 6.5 (117-137)
Excretory pore from anterior end	147	157.6 \pm 6.1 (150-172)	151.8 \pm 6.6 (137-160)
Vulva-anus distance / tail length	2.1	2.3 \pm 0.8 (2.1-2.5)	
Length of rectum	28	29.3 \pm 2.9 (27-32)	30.4 \pm 3.4 (24-32)
Length of tail	165	130.9 \pm 10.4 (115- 149)	35.2 \pm 6.2 (24-46)
Anal body diameter	21	21.7 \pm 1.7 (19-25)	22.2 \pm 1.9 (19-25)
Spicule length			36 \pm 2.2 (31-39)
Gubernaculum length			15.4 \pm 1.3 (15-18)

elliptical apertures at the base of lateral lips. Stoma rhabditoid type. Cheilostom inconspicuous, not cuticularised; gymnostom cuticularised, almost equal to stegostom. Each metastegostomal plate bearing 7-8 knobbed, setose denticles (Fig. 2B-D). Telostegostom isoglottoid. Pharynx differentiated into anterior uniformly cylindrical corpus (Fig. 2E), slightly narrower isthmus and a round, valvate basal bulb, 26-30×19-24 µm in dimension. Nerve ring at 64-67% of pharyngeal length. Excretory pore slightly anterior to basal bulb, about 74-80% of pharyngeal length, with duct cuticularised distally (Fig. 2F) for a small length (2-4 µm). Hemizonid not observed. Cardia small, conoid, 4-6 µm long. Intestine thin-walled with distinctly wide lumen.

Reproductive system amphidelphic. Ovaries well developed, dorsally reflexed; anterior and posterior ovaries right and left side of intestine. Usually a small round pseudocoelomocyte observed in close proximity to distal tip of ovary. Oviducts dilated proximally, connected to offset, ovoid spermathecae containing sperms. Eggs present in different embryonic stages within uterine. Some females showed hatched juveniles within the body causing disruption of body organs. Vagina thick walled, at right angle to longitudinal body axis, about 1/3rd of vulval body diameter with two sets of cross-shaped muscle bands. Vulva a wide transverse slit almost covering vulval body diameter (Fig. 2G), with epiptygma and distinct vulval flap (Fig. 2H). Rectum about as long as anal body diameter provided with three rounded rectal glands at its junction with the intestine. Tail long, filiform; phasmids tubular at base of conical part of tail.

Male: Body slender, arcuate, more curved posteriorly. Morphological characters similar to females. Testis single, reflexed ventrally, on the left side of intestine. Usually a small pseudocoelomocyte found in close proximity to distal tip of testis (Fig. 2I). Vas deferens a broad tube, filled with sperms, without demarcation of seminal vesicle. Ejaculatory glands absent. Tail conoid with spicate terminus. Circum-cloacal papillae comprising of a median sensillum on anterior cloacal lip and paired sub ventral post-cloacal sensilla (Fig. 2O). Spicules stout, 34-39 µm long, with dorsal arm (Fig. 2L), a membranous transverse connective observed to extend between two spicules, about half of their lengths (Fig. 2K), in some specimens; gubernaculum curved, boat-shaped with flat distal end. Bursa well developed, open pseudopeloderan type leaving small tail spike free. Bursal cuticle with prominent longitudinal and transverse markings (Fig. 2N). Bursal edges folded inward anteriorly (Fig. 2O). Bursal papillae 8 pairs in 1+1+1+3+2 configuration: GP1, GP2 spaced, pre-cloacal; GP3 ad-cloacal; of six post-cloacal pairs- GP4, GP5, GP6 grouped together; GP7, GP8 anterior to phasmids with G7 pointing dorsally (Fig. 2M). Phasmids open at the terminal end of bursa like small narrow tubes. Copulatory muscles well developed with 6-paired bands extending anteriorly beyond spicular range (Fig. 2J).

Type habitat and locality: Samples containing *Metarhabditis andrassyana* gen. n., sp. n., were obtained from cow dung manure spread in the flower beds of Department of Zoology, Aligarh Muslim University, Aligarh, India.

Type specimens: Holotype female and ten female paratypes on slide '*Metarhabditis andrassyana* sp. n. /1-7' deposited to the Nematode Collection of the Department of Zoology, Aligarh Muslim University, Aligarh, India. Two paratype females on slide '*Metarhabditis andrassyana* sp. n. /8' deposited at the Laboratory of Nematology, Wageningen University and Research Center (WUR), 6700 ES Wageningen, The Netherlands.

Etymology: The species is named in honour of Prof. I. Andrassy of Hungary.

Remarks: *Metarhabditis andrassyana* gen. n., sp. n. is unique in the character of metastomal denticles which are numerous and reported to be knobbed or club-shaped for the first time in any rhabditid. *Metarhabditis andrassyana* gen. n., sp. n. shows resemblance with *Rhabditella* (Cobb, 1929) in the structure of spicules and phasmidial position in relation to genital papillae. However, gubernaculum in the former is distinctly different in having a flat distal end compared to the gubernaculum having ovoid or conical end in species of *Rhabditella* *apud* Kiontke, 1999. The presence of strongly developed copulatory muscle bands is also a rare feature for rhabditids though commonly found in other groups specially dorylaims and mononchs. *Metarhabditis andrassyana* gen. n. sp. n. is an ovoviviparous species with amphimictic mode of reproduction. Males were observed in the ratio of 40:60 in the cultures. The life cycle is completed in 2¹/₂-3 days. The gravid females became obese accommodating about 15-20 eggs which embryonated and produced juveniles within uteri.

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