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DESCRIPTION OF *MYLONCHULUS CAPSICUMI* N. SP., WITH OBSERVATION ON *M. POLONICUS* AND *M. MARITIMUS* (MONONCHIDA: MYLONCHULIDAE) FROM PAKISTAN

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ABSTRACT

During present research study of soil nematode fauna, an undescribed and described species of *Mylonchulus* Cobb, 1916 were encountered from soil rhizosphere of chillies (*Capsicum annum* L.) in Karachi, Sindh, Pakistan. *Mylonchulus capsicum* n. sp., is distinguished by its smaller body size (0.55-0.66) mm; robust body (a=16.4-18.5); buccal cavity with 6-7 transverse rows of ventro-sublateral denticles; lip region prominently set off from body contour; apex of dorsal tooth located at 77-85% of buccal cavity length from base of stoma; tail 24-26µm long with spinneret opening subdorsally; caudal glands are arranged in tandem. Furthermore, two other mononchid species namely *Mylonchulus maritimus* Jimenez Guirado & Murillo-Navarro, 2008 and *M. polonicus* (Stefanski, 1915) Cobb, 1917 were also recovered as a first account of these species from Pakistan. Morphometrics along with line drawing and photomicrographs are also incorporated herein.

Keywords: Mononchida, morphology, *Mylonchulus capsicum* n.sp., *M. maritimus*, *M. polonicus*, Pakistan.

INTRODUCTION

The members of order Mononchida commonly known as mononchs are a group of predatory nematodes having large buccal cavities usually armed with teeth (Andrássy, 1993). The mononchs are largely terrestrial nematodes, with very few species inhabiting freshwater or marine habitats. Some species are cosmopolitan in distribution while others prefer relatively specific habitats (Andrássy, 2006).

Mononchs can easily be recognized by their stout body, with thick body cuticle, strongly sclerotized, well developed and large barrel shaped buccal cavity which is armed with teeth for capturing the prey.

In Pakistan a total of seventeen species belonging to six genera of mononchids have so far been reported by different scientists of Pakistan (Shahina *et al.*, 2019). Khan, 1975 described a new species *Mylonchulus*

rosensis from soil rhizosphere of rose in Karachi. The genus *Pakmylonchulus* was proposed by Khan and Saeed, (1987), and reported *M. amurus* Jairajpuri and Khan, (1979) but Andrassy, (1992) synonymized the genus with *Mylonchulus*. Khan and Saeed, (1987), also reported *M. brachyuris* Butschli, (1873), *M. nainitalensis* Jairajpuri, 1970 and *M. sigmaturus* (Cobb, 1916; Altherr, 1953) from Pakistan. A new species *Anatonchus valitangiensis* described by Khan and Saeed, (1987). Akhtar and Hussain, 1968 reported *Mononchus papillatus* Bastian 1865, from soil around the roots of citrus from Punjab province. Gul and Saifullah, (1991) reported this species from decaying waste in Khyber Pakhtunkhwa province, and Saeed *et al.* (1986) reported this species from tobacco (*Nicotiana tabacum*) in Karachi nursery. *Miconchus dalhousiensis* Jairajpuri, (1969), *Mylonchulus minor* (Cobb, 1893; Andrassy, 1958), and *Miconchus paitensis* Yeates, (1992) were all found in sugarcane fields in Sindh, according to Tabassum *et al.* (2001). *Mylonchulus contractus* Jairajpuri, (1970), *Mylonchulus lacustris* (Cobb, 1915; Andrassy, (1958), *Clarkus papillatus* (Bastian, 1865; Jairajpuri, 1970) and *Mononchus aquaticus* (Coetzee, 1968; Ishaq *et al.*, 2021)

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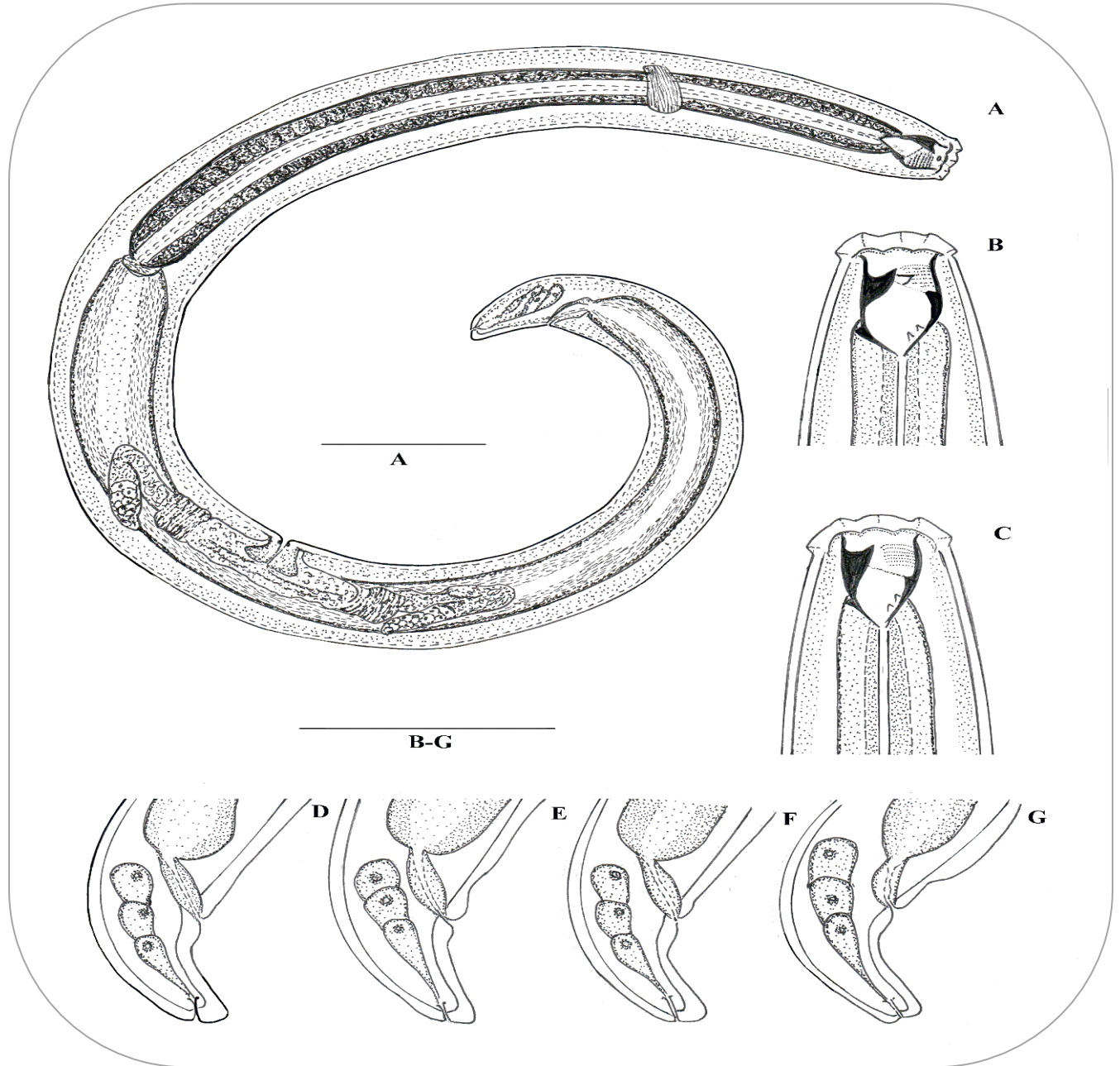
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provide a full description of *Oionchus sindhicus* n. sp., *Oionchus paraobtusus* Jairajpuri and Khan, (1982) and *Oionchus obtusus* Cobb, (1913) both of which are new and reported species of *Oionchus* (Cobb, 1913). The present study provides the morphological and morphometric characterization of some mononchid nematodes, encountered from soil rhizosphere of chillies during survey of Karachi, Sindh, Pakistan.

MATERIALS AND METHODS

Cobb's (1918) sieve and decantation, as well as modified Baermann's (1917) funnel procedures, were used to

remove the nematodes. The nematodes were extracted, fixed in TAF, dehydrated using the slow evaporation procedure (Seinhorst, 1959), and mounted in anhydrous glycerin (Siddiqi, 1986). Nikon Eclipse E400 measurements and images were taken under a compound microscope. Photomicrographs were obtained with a Nikon DS-Fi1 camera, which was connected to the same microscope, and Adobe Photoshop was used to edit them. The mononchs were identified using Ahmad and Jairajpuri's classification system (2010).



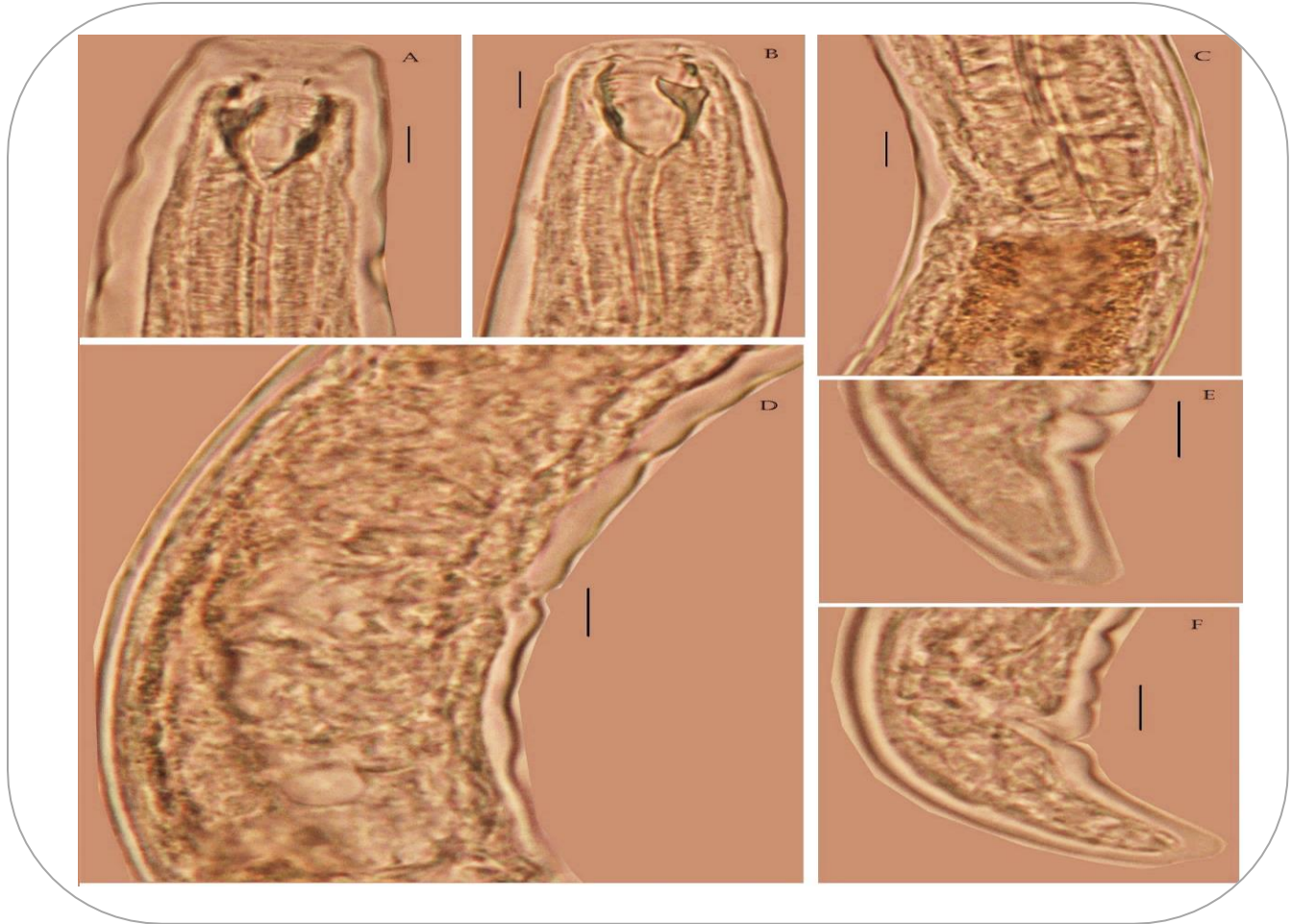


Figure 1 A-G; Fig.2 A-F: *Mylonchulus capsicum* n.sp.

Description:

Female: Body length of nematodes less than 1 mm long, curved ventrally. C-shaped after fixation. Small transverse striations, often obscure, at outer cuticle. Inner cuticle layer 2-3 µm wide at middle of the body and tail region. Lip region prominently set off, a little wider than adjoining body, 3.3-40 times as wide as high, distinct and prominent labial and cephalic papillae, interfering with head contour. Lateral chord inhabiting 30-35% of mid body width. Amphidial fovea cup-shaped, opening just behind the labial constriction and extending 21-23% of lip region width, situated 8-10 µm from anterior end of body. Amphidial canal and fusus are not visible. Buccal cavity in the shape of a funnel, tapering at the base, 1.8-2.0 times as long as wide, with cuticularized vertical sides 1-2 m thick, 12 m from head end, and 6-7 rows of ventro-sublateral denticles, with prominent submedian teeth. Dorsal tooth is big, obliquely forward-directed, and has a strongly pointed tip at 77-85 percent of the length of the buccal cavity

measured from the base. Dorsal tooth measuring 7-8 m in length and 4-5 m in width, located in the front portion of the buccal cavity. In the buccal cavity's basal plates, there are two ventro-sublateral foramine openings. The base of the buccal cavity is surrounded by a cylindroid and muscular pharynx. At 28-41 percent neck length from the anterior end, there is a nerve ring. The excretory pore is tiny and placed behind the nerve ring at 38-53 percent of the length of the neck. The pharyngo-intestinal junction is non-tuberculous. Gonads have been matched. The ovary is short and compact, with a reflexed proximal end that does not reach the oviduct-uterus junction. A limited number of oocytes. At the oviduct-uterus junction, there is a sphincter. The uterus is rather short, with the vagina extending 39-45 percent of the body's width inward. Small drop-like sclerotized chunks 1-2 m long and 2.5-3 m broad. Pars refrigens vaginae is 14-16 m long with small drop-like sclerotized parts 1-2 m long and 2.5-3 m wide. Vulva is a transverse slit in the skin. There are no papillae on the avulval surface. Short

tail with obliquely rounded terminal, convex-conoid, ventrally curved. Caudal glands are paired, and the spinneret has a subdorsal entrance. Caudal pores are not visible.

Male: Unknown.

Type specimens: Female holotypes and paratypes are held in the National Nematological Research Centre-Nematode Collection at the University of Karachi in Karachi, Pakistan.

Type habitat and locality: Nematode specimens were gathered from the rhizosphere of chilies (*Capsicum annum* L.) in the soil of Karachi, Sindh, Pakistan.

Differential Diagnosis: According to the key of *Mylonchulus* given by Ahmad & Jairajpuri, (2010)

Mylonchulus capsicumi n. sp., comes close to *Mylonchulus doliolarius* Andrassy, 1992 and *M. contractus* Jairajpuri, (1970) in having spinneret subdorsally i.e., situated on the dorsal side of tail tip, and in smaller body, but differs from the former in the longer tail length (24-26 vs 15-19 μ m), in lower ratios 'a' and 'c' (a= 16-18 vs 18-20; c=21.5-26.9vs 35-39) in wider lip region (19-21 vs 17 μ m), longer buccal cavity (20-22 vs 16-17 μ m) and in dorsal tooth apex (30-36 vs 23-24%) of stoma. From *M. contractus* it can be distinguished by its lower 'a' and 'c' ratio (a=16-18 vs 19-23; c= 21.5-26.9 vs 30-38), greater apex of dorsal tooth (17-18 vs 12-15 μ m) from base of stoma and longer tail (24-26 vs 15-22 μ m).



Figure 3 A-J. *Mylonchulus maritimus* Jaimenez Guirand & Murillo-Navarro (2008)

Table 1. Morphometric data of *Mylonchulus capsicumi* n. sp., *M. polonicus* and *M. maritimus*. All measurements are in μm except L and in the form: Mean \pm SD (range).

Characters	<i>Mylonchulus capsicumi</i> n.sp.	Paratypes ♀♀	<i>M. polonicus</i>	<i>M. maritimus</i>
	Holotype ♀	(n=10)	(n=5) ♀♀	(n=2) ♀♀
L	0.64	0.60 \pm 0.03 (0.55-0.66)	1.87 \pm 0.03 (1.84-1.91)	1.110, 1.112
a	18.5	17.6 \pm 0.85 (16.4-18.5)	32.3 \pm 2.98 (27-34.7)	25.2, 24.7
b	3.0	2.1 \pm 3.3 (2.76-0.41)	3.8 \pm 0.13 (3.6-3.9)	3.3, 3.4
c	26.9	24.6 \pm 1.67 (21.5-26.9)	18.1 \pm 1.59 (16-20.6)	48.2, 50.4
c'	1.0	1.12 \pm 0.06 (1.0-1.2)	2.65 \pm 0.25 (2.3-3.0)	0.62, 0.63
V	60.3	58.9 \pm 3.10 (52.7-61.2)	63.5 \pm 1.15 (62-64.3)	62.1, 61
Buccal cavity length	20	21.0 \pm 0.83 (20-22)	34.5 \pm 1.11 (33-36)	27, 28
Buccal cavity width	12	11.0 \pm 0.76 (10-12)	20.1 \pm 0.73 (19-21)	16, 17
Pharynx length	214	222 \pm 32.6 (167-264)	428.75 \pm 9.0 (470-495)	330, 320
Body diam. at lip region	20	20.2 \pm 0.71 (19-21)	30 \pm 0.70 (29-30)	26, 27
Body diam. at base of pharynx	35	34.9 \pm 0.78 (34-36)	58.5 \pm 0.61 (58-60)	42, 44
Body diam. at mid body	35	34.5 \pm 0.42 (34-35)	59 \pm 6.36 (55-70)	44, 45
Body diam. at anus	23	21.6 \pm 1.01 (20-23)	39.5 \pm 1.11 (38-41)	35, 36
Rectum length	16	16.8 \pm 0.79 (16-18)	29.5 \pm 1.11 (28-32)	21, 22
Tail length	24	24.7 \pm 0.75 (24-26)	98 \pm 6.96 (93-110)	22, 23

Description:

Female: Medium size nematodes, Body ventrally curved, Small transverse striations at outer cuticle, often obscure. Width of inner cuticle layer: 2-3 μm at anterior region, 3-4 μm at middle of the body and 6-7 μm at posterior region. Lip region prominently set off, to some extent wider than adjoining body, 2.7-3.6 times as wide as high. Distinct and prominent labial and cephalic papillae, interfering with head contour. Lateral chord inhabiting 33-36% of mid body width. Amphidial fovea cup-shaped, opening just behind the labial constriction and extending 10.3-13.3% of lip region width, situated 12-14 μm from anterior end of body, amphidial canal and fusus inconspicuous. Funnel shaped buccal cavity tapering at base, 1.71-1.78 times as long as wide with strongly cuticularized vertical walls 2-3 μm thick with prominent submedian teeth,

11-12 μm from head end and 6-7 rows of ventro-sublateral denticles. Dorsal tooth large, obliquely forward directed, with sharply pointed apex located at 75-79.4% of buccal cavity length measured from base. Dorsal tooth located in the anterior half of buccal cavity, 13-14 μm long and 6-7 μm wide. A pair of ventro-sublateral foramine opening in the basal plates of buccal cavity. Cylindroid and muscular pharynx, surrounding base of buccal cavity. Nerve ring situated at 21-25% neck length from head end. Excretory pore small, located behind the nerve ring at 29-30% of neck length. Pharyngo-intestinal junction non-tuberculate. Genital system didelphic-amphidelphic. Ovary well developed with eggs, its proximal end not reaching the oviduct-uterus junction. Sphincter present at the oviduct-uterus junction. Uterus short, vagina extending inward 24-27% of the body diameter. Pars refrigens

vaginae 16-18 μm long with small drop like sclerotized pieces 3-4 μm long and 2-3 μm wide. Vulva a short transverse slit. Advulval papillae absent. Tail long convex-conoid, ventrally curved with short rounded terminus. Caudal glands tandem, spinneret with terminal opening. Caudal pores inconspicuous.

Male: Not found.

Remarks: The Pakistani specimens are similar to Khan & Araki's 2002 morphology and measurements of *Mylonchulus polonicus*, but with a shorter rectum length of 28-31 vs 37-41 m; nerve ring and excretory pore located more anteriorly 100-125 vs 133-145 and 140-150 vs 155-165 m, respectively; submedian teeth 12-13 vs 15-18 m from anterior end; tooth ap This is the first time this species has been found in Pakistan.

Description:

Female: Nematodes have a sturdy body and a length ranging from short to medium. On thermal relaxation, the body forms a C shape. Finely annulated cuticle with a smooth appearance under a light microscope, measuring 2-3 m broad at the mid-body and tail regions. Lip region is noticeably set out, slightly wider than the bordering body, and 3.3-4.0 times the height. Labial and cephalic papillae are distinct and prominent, interfering with head contour. The lateral chord occupies 31-32 percent of the mid-body width. Cup-shaped amphidial fovea, opening directly behind the labial constriction and extending 14.2-15.3 percent of the lip region width, located 10-11 m from the head end of the body, amphidial canal and fusus inconspicuous. Buccal cavity globet-shaped, tapering at base, 1.6-1.7 times as long as wide, cuticularized vertical walls, 1-2 m thick with visible submedian teeth, 18 m from head end, and 6-7 rows of ventro-sublateral denticles, and 6-7 rows of ventro-sublateral denticles, and 6-7 rows of ventro-sublateral denticles, and 6-7 rows The dorsal tooth is large, obliquely forward-directed, and has a sharply pointed tip that measures 80-81 percent of the length of the buccal cavity measured from the base. Dorsal tooth, 11-12 m long and 6-7 m wide, located in the front region of the buccal cavity. In the buccal cavity's basal plates, there are two ventro-sublateral foramine openings. The base of the buccal cavity is bordered by a cylindroid and muscular pharynx. The nerve ring is located 23-25 percent of the way down the neck from the head end. Excretory pore is a tiny pore located behind the nerve ring at 28-29

percent of the length of the neck. Non-tuberculate pharyngo-intestinal junction. Gonads have been matched. The oviduct-uterus junction is not reached by the proximal end of the ovary, which is tiny and compact. Oocytes 7-8 in number. Sphincter present at the oviduct-uterus junction. Uterus relatively short, vagina extending inward 30-35% of the body diameter. Small drop-like sclerotized portions 3-4 m long and 1-2 m wide. Pars refrignes vaginae is 14-16 m long with small drop-like sclerotized chunks 3-4 m long and 1-2 m wide. Vulva is a transverse slit in the skin. There are no avulval papillae. The tail is short, convex-conoid, and bluntly rounded at the end. Spinneret aperture is at the end of the caudal glands. Pores in the caudal region obscure.

Male: Not found.

Remarks: Longer buccal cavity and pharynx lengths 26, 27 vs. 20-22 and 320,330 vs 241-306m, respectively; nerve ring located more anteriorly 76-80 vs 90-119 m; lower ratios b and c' (b= 3.3,3.4 vs 3.4-3.9; c'= 0.62, 0.63 vs 0.7-0.9); and amphid extending 14.2-15.3 percent vs 19-23 This is Pakistan's first record of this species.

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Uzma Ishaque	:	Conduct experiments
ErumY. Iqbal	:	Supervised the study
Nasira Kazi	:	Wrote manuscript
Shahnaz Dawar	:	Make statistical analysis
Saboochi Raza	:	Helped in manuscript write up