

Study of some mononchids (Nematoda: Mononchida) from Iran

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Abstract

The survey of soil nematodes of the West Azarbaijan province of Iran revealed the presence of predatory nematodes of the order Mononchida. A total of 36 soil samples were collected in the summer of 2014 from the rhizosphere of stone fruits in different areas of the province. Soil analysis results in the identification of 5 species of mononchid nematodes viz., *Anatonchus kashmirensis*, *A. tridentatus*, *Clarkus papillatus*, *Mylonchulus brachyuris* and *M. paitensis*. Among them, *A. kashmirensis* is recorded for the first time in Iran.

Keywords: Predatory nematodes, *Anatonchus kashmirensis*, new record, West Azarbaijan

The Mononchida (Jairajpuri, 1969) commonly known as mononchids, are predatory animals. They are found in a wide variety of habitats viz., terrestrial and aquatic (Ahmad & Jairajpuri, 2010). These predatory nematodes are relatively large about 0.6-7 mm long; some are known to be bacterial-feeding in some stages and also indicators of soil biological conditions (Yeates, 1987).

Ahmad & Jairajpuri (2010) provided the detailed review of the order Mononchida. Farahmand *et al.*, (2009a,b); Shokoohi *et al.*, (2013) and Kookhan *et al.*, (2014) studied this group from Iran and reported many species of the genera *Mononchus* Bastian, 1865, *Mylonchulus* Cobb, 1916 and some other genera of the order.

So far 20 nematode species of mononchids have been reported from Iran (Kookhan *et al.*, 2014). Very little is known about the soil-inhabiting nematode fauna of this region, therefore, the present survey was carried out. During the course of the present study, a total of five species of mononchids, representing three genera viz., *Anatonchus*, *Clarkus* and *Mylonchulus* were identified. A brief description of a new record,

Anatonchus kashmirensis Jairajpuri & Khan, 1982 along with morphometrics of some known species are provided in this paper.

Materials and Methods

Nematodes were extracted from soil samples by the centrifugal-flotation technique or extraction tray method, then fixed in TAF and mounted in anhydrous glycerin (Seinhorst, 1959). Measurements were taken by an ocular micrometer. Drawings were made using a drawing tube attached to an Olympus CH-2 microscope.

Results and Discussion

In the present study, five species belonging to three genera of order Mononchida were identified. These include two species of the genus *Anatonchus* (Cobb, 1916) De Coninck, 1939, a single species of the genus *Clarkus* Jairajpuri, 1970 and two species belong to the genus *Mylonchulus* (Cobb, 1916) Altherr, 1953. Identified species of these genera are *A. kashmirensis* Jairajpuri & Khan, 1982, *A. tridentatus* (De Man, 1876) De Coninck, 1939,

C. papillatus (Bastian, 1965) Jairajpuri, 1970, *M. brachyuris* and *M. paitensis*. The species *A. kashmirensis* reported for the first time from Iran. *A. tridentatus*, *C. papillatus*, *M. brachyuris* (Butschli, 1873) Cobb, 1917 and *M. paitensis* Yeates, 1992 have been reported earlier from Iran. A total of 20 nematode species of mononchids have so far been described or redescribed from the country (Table 1).

***Anatonchus kashmirensis* Jairajpuri & Khan, 1982**

(Fig. 1 A-H, Fig. 2 A, B; Table 2)

Female: Body almost cylindrical, ventrally curved after fixation. Cuticle smooth, 3-4 μm thick at midbody. Lip region offset. Amphidial openings oval, apertures 15% of lip region width. Buccal cavity broad, flattened at base, spherical, as wide as long, with heavily cuticularized vertical walls, 2 μm thick. Dorsal and subventral teeth almost equal in size and similar in position, located in the anterior half of the buccal cavity. Two foramina present at the base of buccal cavity lying close to each other. Nerve ring located at 35-37% of neck length, excretory pore at 40-42% of neck length. Tubercles prominent and well developed. Cardia conoid.

Reproductive system didelphic-amphidelphic, ovaries more or less straight, reflexed and with a single or two rows of oocytes; Sphincter at the oviduct-uterus junction well developed. Vulva not protruding and located near midbody at 66.3% of body length, advulval papillae not observed. Rectum 0.7-0.8 times anal body diameter. Tail conical elongated with rounded terminus, ventrally curved, 3.5 to 4.5 times anal body diameter. Caudal glands in tandem, spinneret opening terminal.

Male: Not found.

Remarks: The nematode specimens were collected from Uromieh, West Azarbaijan Province, Iran from the rhizosphere of stone

fruit. The genus *Anatonchus* belongs to family Anatonchidae Jairajpuri, 1969. Morphometrics data and general morphology of examined specimens agreed well with the original description given by Jairajpuri & Khan (1982) with minor differences in some measurements viz., greater length and b value ($L = 1.7\text{-}2.1$ vs 1.8 mm; $b = 4.0\text{-}4.5$ vs 3.6). This is the first report of *A. kashmirensis* from Iran.

***Anatonchus tridentatus* (de Man, 1876) De Coninck, 1939**

(Fig. 2 C, D; Table 3)

Remarks: Nematode specimens were collected from the same locality and host plant as above. Morphological characteristics and morphometric data of these specimens are quite similar to *A. tridentatus* given by De Coninck (1939) except in shorter body length ($L = 2.2\text{-}2.7$ vs. $2.8\text{-}3.6$ mm). The species was previously reported by Loof *et al.*, 1990; Barooti, 1997; Kookhan *et al.*, 2014 from Iran.

***Clarkus papillatus* (Bastian, 1965) Jairajpuri, 1970**

(Fig. 3 E, F; Table 3)

Remarks: The specimens of *Clarkus papillatus* belong to family Mononchidae Filipjev, 1934 and were collected from the West Azarbaijan Province, Iran. Morphometric data and morphological features of the present populations agreed well with the description and measurements of Jairajpuri (1970). This species was earlier reported by many researchers from Iran (Loof *et al.*, 1990; Olia *et al.*, 2004; Farahmand *et al.*, 2009b; Kookhan *et al.*, 2014).

***Mylonchulus brachyuris* (Butschli, 1873) Cobb, 1917**

(Fig. 3 G, H; Table 3)

Remarks: Specimens of *Mylonchulus brachyuris* of the family Mylonchulidae Jairajpuri, 1969 were collected from the same

Table 1. Reported species of Order Mononchida.

Family	Species	References	
Anatonchidae	<i>Anatonchus kafii</i> Olia, Choudhary, Ahmad & Jairajpuri, 2004	Olia <i>et al.</i> , 2004	
	<i>A. tridentatus</i> (De Man, 1876) De Coninck, 1939	Loof <i>et al.</i> , 1990 Barooti, 1997 Kookhan <i>et al.</i> , 2014	
	<i>Miconchus studeri</i> (Steiner, 1914) Andrassy, 1958	Barooti & Nowruzi, 2000 Kookhan <i>et al.</i> , 2014	
Mononchidae	<i>Clarkus papillatus</i> (Bastian, 1965) Jairajpuri, 1970	Loof <i>et al.</i> , 1990 Olia <i>et al.</i> , 2004 Farahmand <i>et al.</i> , 2009b Kookhan <i>et al.</i> , 2014	
	<i>Coomansus parvus</i> (De Man, 1880) Jairajpuri & Khan, 1977	Loof <i>et al.</i> , 1990 Farahmand <i>et al.</i> , 2009b	
	<i>Mononchus aquaticus</i> Coetzee, 1968	Farahmand <i>et al.</i> , 2009a Kookhan <i>et al.</i> , 2014	
	<i>M. pulcher</i> Andrassy, 1993	Farahmand <i>et al.</i> , 2009a Kookhan <i>et al.</i> , 2014	
	<i>M. truncatss</i> Bastian, 1865	Farahmand <i>et al.</i> , 2009a Olia <i>et al.</i> , 2004 Shokoohi <i>et al.</i> , 2013 Kookhan <i>et al.</i> , 2014	
	<i>Prionchulus iranicus</i> Farahmand, Eskandari, Viciguerra, Orselli & Karegar, 2009	Farahmand <i>et al.</i> , 2009b	
	<i>P. muscorum</i> (Dujardin, 1845) Wu & Hoeppli, 1929	Loof <i>et al.</i> , 1990	
	<i>P. punctatus</i> Cobb, 1917	Loof <i>et al.</i> , 1990	
	Mylonchulidae	<i>Mylonchulus brachyuris</i> (Butschli, 1873) Cobb, 1917	Loof <i>et al.</i> , 1990 Farahmand <i>et al.</i> , 2009a Kookhan <i>et al.</i> , 2014
		<i>M. cf. hawaiiensis</i> (Cassidy, 1931) Goodey, 1951	Shokoohi <i>et al.</i> , 2013
<i>M. kermaniensis</i> Shokoohi, Mehrabi-Nasab, Mirzaei & Peneva, 2013		Shokoohi <i>et al.</i> , 2013	
<i>M. lacustris</i> (Cobb in Cobb, 1915) Andrassy, 1958		Kookhan <i>et al.</i> , 2014	
<i>M. minor</i> (Cobb, 1893) Cobb, 1916		Loof <i>et al.</i> , 1990 Nowruzi & Barooti, 1997	
<i>M. nainitalensis</i> Jairajpuri, 1970		Olia <i>et al.</i> , 2004	
<i>M. paitensis</i> Yeates, 1992		Farahmand <i>et al.</i> , 2009a Kookhan <i>et al.</i> , 2014	
<i>M. signaturellus</i> (Cobb, 1917) Mulvey, 1961		Loof <i>et al.</i> , 1990 Nowruzi & Barooti, 1997	
<i>M. simaturus</i> Cobb, 1917		Loof <i>et al.</i> , 1990 Nowruzi & Barooti, 1997 Farahmand <i>et al.</i> , 2009a Kookhan <i>et al.</i> , 2014	

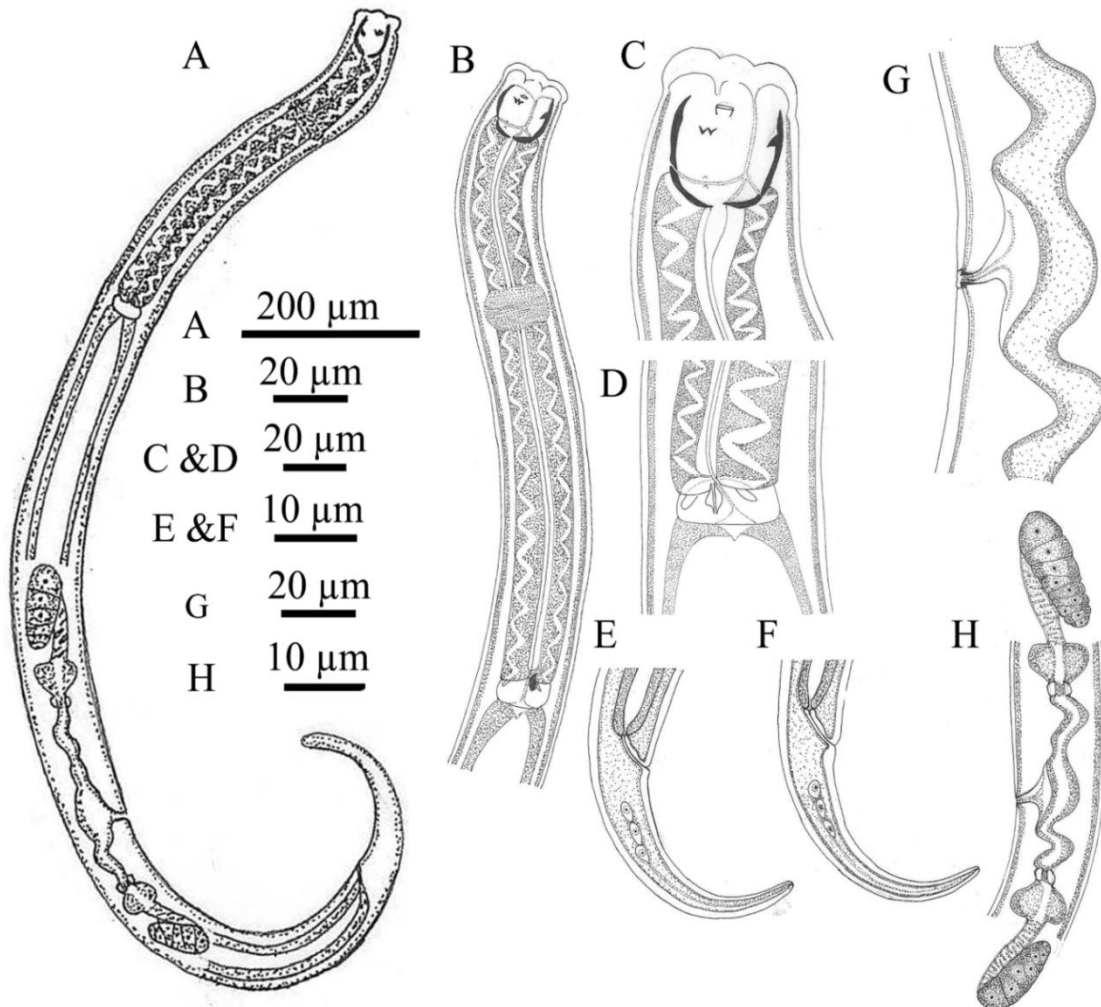


Fig. 1. (A-H). *Anatonchus kashmirensis* Jairajpuri & Khan, 1982. A. Entire female; B. Oesophageal region; C. Anterior end; D. Cardia; E, F. Female tail; G. Valvul region; H. Female reproductive system.

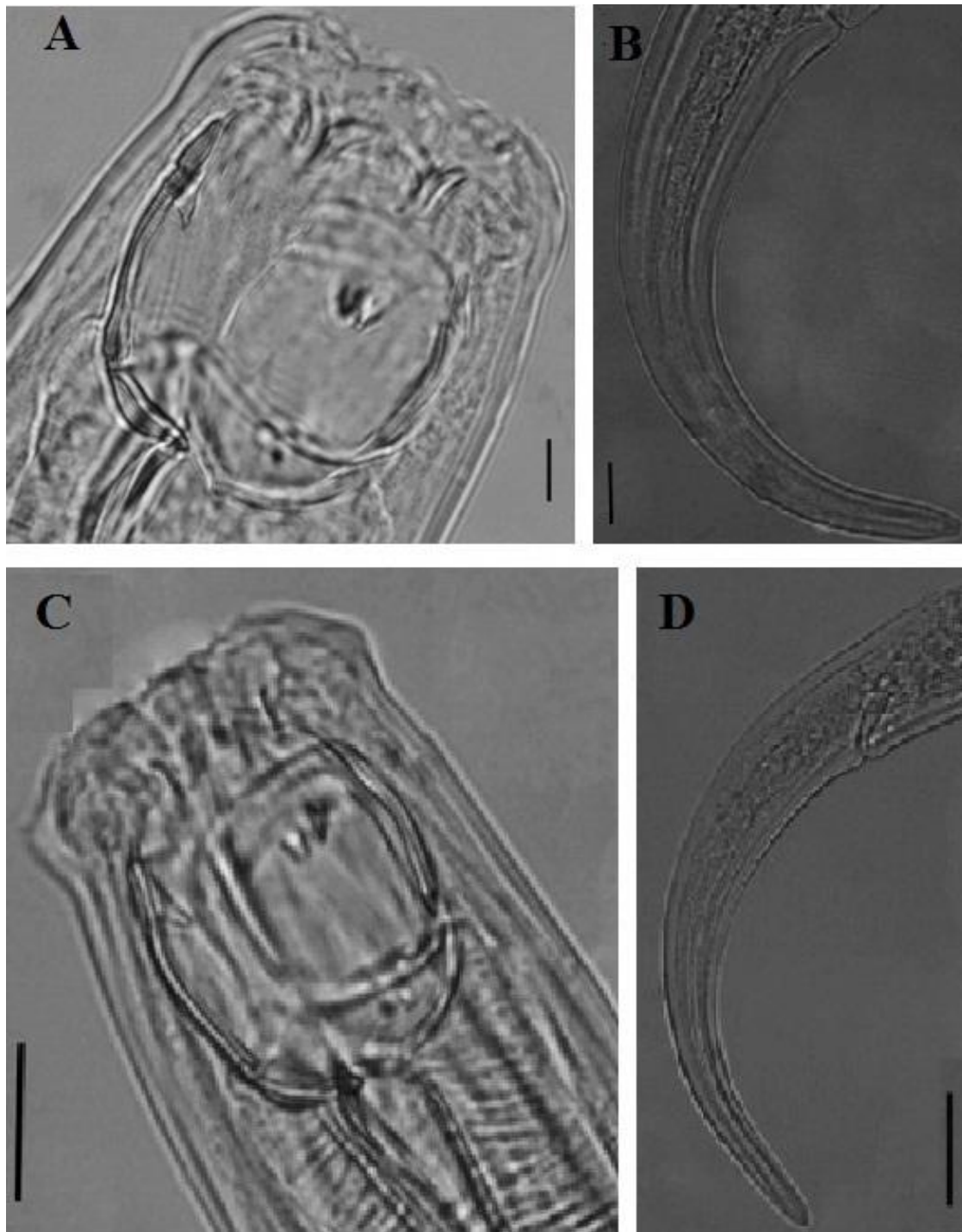


Fig. 2. *Anatonchus kashmirensis* (A, B): A. Anterior region; B. Posterior region; *Anatonchus tridentatus* (C, D): C. Anterior region; D. Posterior region.

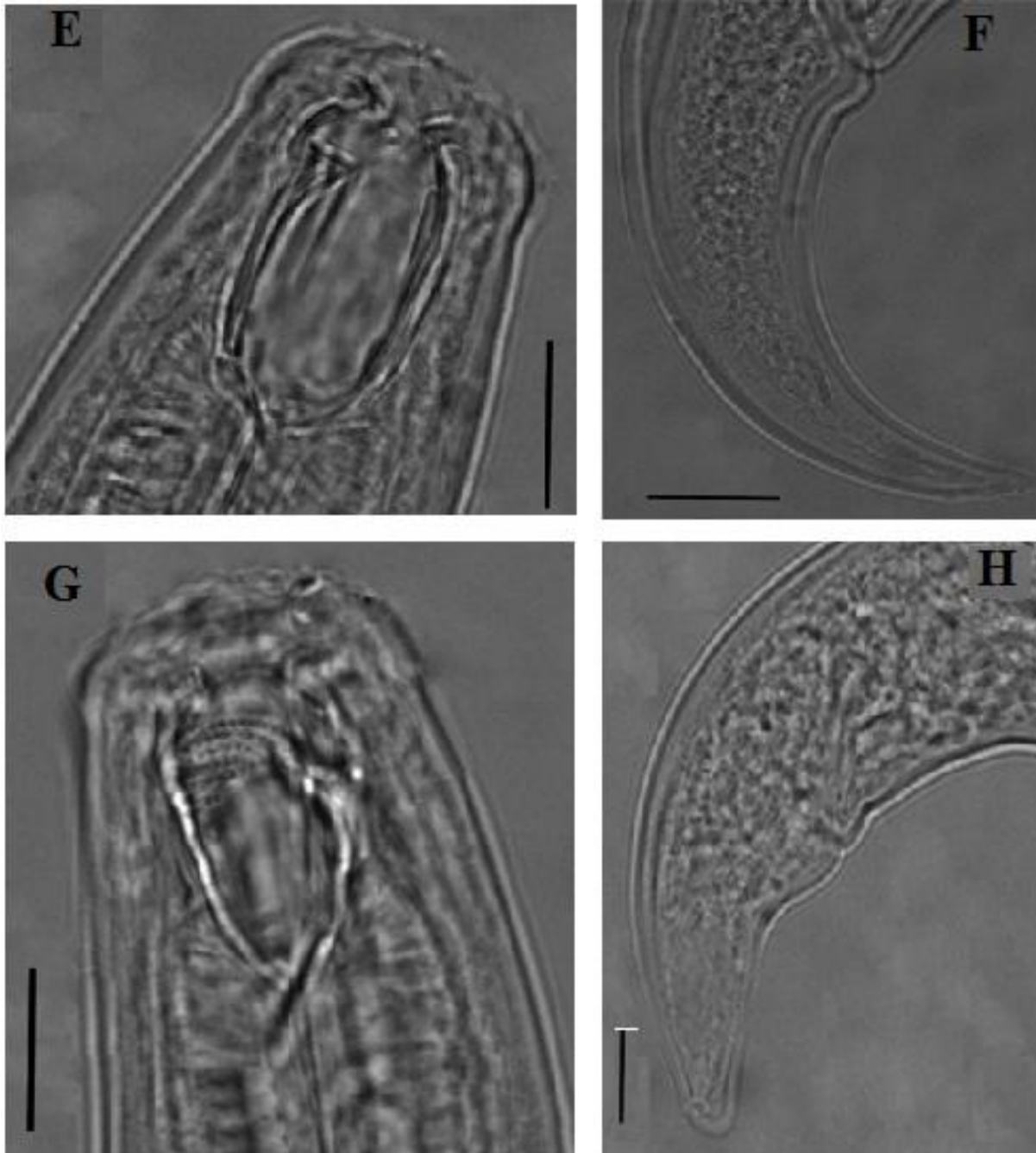


Fig. 3. *Clarkus papillatus* (E, F): E. Anterior region; F. Posterior region; *Mylonchulus brachyuris* (G, H): G. Anterior region; H. Posterior region.

Table 2. Comparative measurements of *Anatonchus kashmirensis* Jairajpuri & Khan, 1982. All measurements are in μm and represent mean \pm SD (range).

Characters	<i>A.kashmirensis</i>	<i>A.kashmirensis</i>
	Iran-West Azarbaijan Uromieh	India-Srinagar Jammu and Kashmir
N	5	-
L	1973.2 \pm 174.3 (1725-2134)	1800
a	28.4 \pm 2.6 (24.6-31.1)	30
b	4.2 \pm 0.2 (4.0-4.5)	3.6
c	10.3 \pm 0.9 (9.2-11.2)	11
c'	4.0 \pm 0.4 (3.5-4.7)	-
V	66.3 \pm 3.8 (62.6-72.2)	67
G ₁	18.2 \pm 2.9 (14.7-22.5)	-
G ₂	14.3 \pm 0.6 (13.7-15.3)	-
Lip region width	52 \pm 4.3 (47-57)	48
Lip region height	16.8 \pm 2.0 (15-20)	-
Amphidial aperture diameter	7.6 \pm 1.1 (6.0-9.0)	-
Buccal cavity length	41.6 \pm 2.4(39-45)	40
Buccal cavity width	38.8 \pm 3.1 (35-42)	35
Dorsal tooth from buccal cavity	35.4 \pm 2.6 (33-39)	-
Excretory pore from anterior end	199.6 \pm 18.6 (181-228)	-
Nerve ring from anterior end	172.4 \pm 12.1 (156-187)	-
Pharynx length	450.8 \pm 31.2 (414-497)	-
Cardia length	13.2 \pm 3.3 (10-18)	-
Cardia diameter	44 \pm 2.8 (41-47)	-
Anterior genital branch	362.8 \pm 85 (275-480)	-
Posterior genital branch	281.6 \pm 31.9 (247-323)	-
Vulva from anterior end	1310.8 \pm 165.3 (1080-1466)	-
Body width at neck base	52.6 \pm 3.5 (47-56)	-
Body width at mid body	69.6 \pm 5.8 (60-75)	-
Body width at anus	48 \pm 3.7 (43-53)	-
Rectum length	36.8 \pm 3.5 (33-41)	-
Tail length	191 \pm 7.7 (183-202)	185

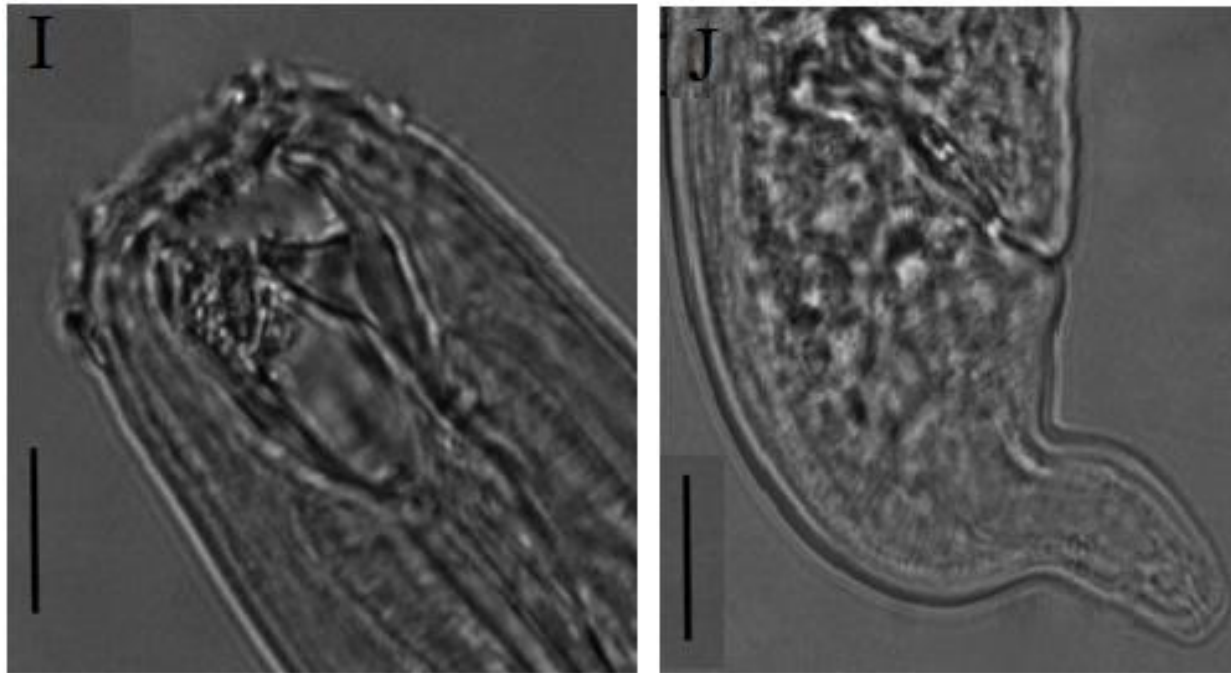


Fig. 4. (I-J). *Mylonchulus paitensis*: I. Anterior region; J. Posterior region.

province of Iran. Morphometrics and other morphological characters fits very well with the measurements given by many other researchers (Farahmand *et al.*, 2009; Ahmad & Jairajpuri, 2010). This species was also reported earlier by Loof *et al.*, 1990; Farahmand *et al.*, 2009a; Kookhan *et al.*, 2014.

***Mylonchulus paitensis* Yeates, 1992**

(Fig. 4 I, J; Table 3)

Remarks: Measurements of the specimens of *M. paitensis* come close to the original measurements given by Yeates (1992) with some variations that was due to ecological differences (buccal cavity length = 24-25 vs. 28-29 μm ; buccal cavity width = 15-16 vs. 17-18 μm). This species was reported before by Farahmand *et al.*, 2009a; Koohkan *et al.*, 2014 from Iran.

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