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A New Species of *Parahadronchus* Mulvey, 1978 from Mizoram, India

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ABSTRACT

Background: Order mononchida represents predatory nematodes feeding on phytophagous nematodes and bacteria. The present study is aimed to know the diversity of mononchid nematodes in Mizoram.

Methods: Various soil samples were collected from various parts of Mizoram. The samples were processed by sieving and decanting method followed by funnelling technique. Specimens were fixed and dehydrated using glycerine method.

Result: Analysis of the soil samples revealed the diversity of mononchid nematodes in Mizoram. A new species of the genus *Parahadronchus* Mulvey, 1978 was identified after thorough analysis of the samples. *Parahadronchus divendentus* sp.n. could be distinguished from *P. siroii* and *P. marami* with its smaller body (female body length= 2.19-2.48 mm), two ridges of ventral buccal wall with two ventral denticles, group caudal glands with subterminal spinneret. Tail is long, filiform and about 10-12 anal body width. Male have a body length of 2.19 mm, spicule length= 68.02 µm, supplements= 11, lateral guiding piece= 12.35 µm in the new species.

Key words: Nematode, Mononchida, *Parahadronchus*.

INTRODUCTION

Jairajpuri (1969) described the order Mononchida as nematodes with robust bodies, sclerotized feeding apparatus and cylindrical pharynx. Mononchida includes the families Mononchidae Filipjev, 1934, Mylonchulidae Jairajpuri, 1969, Iotonchidae, Jairajpuri, 1969, Cryptonchidae Chitwood, 1937, Bathyodontidae Clark, 1961 and Mononchulidae De Conninck, 1965.

The genus *Parahadronchus* was for the first time recognised by Mulvey, 1978 with *P. andamanicus* (Jairajpuri, 1969) Mulvey, 1978 as type species. *Parahadronchus* Mulvey, 1978 had been categorised in the family Iotonchidae Jairajpuri, 1969 and subfamily Hadronchinae Khan and Jairajpuri, 1980 owing to its subventral teeth. Renubala and Dhanachand (1992) described *Parahadronchus siroii* from Manipur along with *Parahadronchus marami*. Sushilkumar *et al*. (2021) reported *Parahadronchus siroii*, *Parahadronchus marami* and *Parahadronchus shakili* from Mizoram.

MATERIALS AND METHODS

During the month of September and October, 2019 several soil samples of various depth were collected from around the roots of *Ananas* sp. from Lungleng, 23°39′31.9″N 92°40′43.1″E, *Vigna* sp. from Tlang roadside, 23°43′04.2″N 92°41′04.4″E, unknown grass from lungleng, 23°39′56.6″N 92°39′40.8″E of Aizawl district and from around the roots of *Ageratum* sp. from Lunglei, 22°39′34.6″N 92°40′04.5"E, Lunglei district, Mizoram, India. The samples were then transported and processed in the Parasitology laboratory, Department of Zoology, Manipur University during November and December, 2019. The samples were decanted using Cobb's (1918) sieving and decanting method. The sample was then transferred into funnel using modified Baermann's funnel technique (Thorne, 1961). Specimens were collected after 48 hours and fixed in warm FA. For dehydration, rapid Seinhorst(1959) technique was used. Photographs, measurements and camera lucida diagrams were taken using Nikon Eclipse E200 equipped with Y-IDT drawing tube and Y-TV55 camera.

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RESULTS AND DISCUSSION

The present study describes a new species of the genus *Parahadronchus* Mulvey, 1978 from different regions of Aizawl district, Mizoram.

***Parahadronchus divendentus* sp.n. (Table 1, Fig 1 and 2)**

Description

Female

Body medium size, ranging between 2.19-2.48 (2.3±0.11) mm. Cuticle smooth between 2.11-2.79 (2.45±0.27) µm. Lip region not set off with size ranging between 40.25-46.09 (43.25±2.38) µm in width and 11.67-12.87 (12.34±0.5) µm in height. Buccal cavity is large and tubular ranging between

Table 1: Dimensions of *Parahadronchus divendentus* sp.n.

Character	Holotype	Paratype	Male
N		3	1
L	2.33	2.19-2.48 (2.3±0.11)	2.19
a	25.57	25.13-33.16 (27.95±3.68)	24.71
b	4.24	3.95-4.61 (4.26±0.27)	4.38
c	4.11	4.11-4.57 (4.34±0.18)	5.48
c'	10.37	10.30-11.95 (10.87±0.76)	7.15
G_1	12.80	12.80-17.51 (14.63±2.05)	
G_2	12.06	12.06-17.21 (14.08±2.18)	
V	54.68	54.68-56.81 (55.65±0.87)	
Body width	91.27	66.21-99.01(85.49±13.99)	88.83
Cuticle	2.45	2.11-2.79 (2.45±0.27)	2.48
Lip region wide	43.41	40.25-46.09 (43.25±2.38)	43.06
Lip region high	11.67	11.67-12.87 (12.34±0.5)	12.58
Buccal cavity length	53.40	52.52- 53.65 (53.19±0.48)	48.52
Buccal cavity width	36.74	35.68- 42.82 (38.41±3.14)	29.82
Dorsal tooth apex from stoma base	23.50	22.44-26.88 (24.27±1.89)	19.11
Nerve ring from anterior end	131.71	131.71-193.64(170.47±27.58)	171.88
Excretory pore diameter	2.32	2.32-2.74 (2.51±0.17)	2.96
Excretory pore from nerve ring	4.25	4.25-6.13 (5.11±0.77)	5.24
Oesophago-intestinal junction from anterior end	549.32	538.73-555.13 (547.72±6.78)	501.15
Anterior end to vulva	1276.27	1247.65-1380.27 (1301.39±56.98)	
Anterior gonad length	298.96	298.96-384.69 (340.77±35.03)	
Posterior gonad length	281.56	281.56-376.02 (327.55±38.60)	
Tail length	566.74	479.60-569.55 (538.63±41.75)	400.07
Rectum	55.42	38.59-55.42 (48.83±7.33)	52.49
ABD	54.64	40.13-55.28 (50.01±6.9)	55.89
Supplements			11
Lateral guiding piece			12.35
Gubernaculum			18.34
Spicule			68.02

(All measurements in µm except L in mm).

52.52-53.65 (53.19±0.48) µm in length and 35.68-42.82 (38.41±3.14) µm in width. The dorsal tooth is large and its apex from stoma base is situated at 22.44-26.88 (24.27± 1.89) µm or at 42%-50% of the buccal cavity. Ventral walls bear two denticles. Two ventrosublateral foramina present. Amphid distinct, fovea cup shape and located at anterior region of the buccal cavity. Excretory pore has a diameter of 2.32-2.74 (2.51±0.17) µm and situated 4.25-6.13 (5.11± 0.77) µm from nerve ring. Nerve ring at 131.71-193.64 (170.47±27.58) µm or at 5.6-7.7% of the body length. Oesophago-intestinal junction tuberculate and present at 21.6-25.2% of the body length. Vulva at 54.68-56.81% of the total body length. Reproductive system is amphidelphic, ovaries reflexed. 1 pre- and 1 post- advulval papillae present. Sphincter present at oviduct-uterus junction. Tail long, filiform ranging between 479.60-569.55 (538.63±41.75) µm or 10-12 anal body width. Rectum is more or less similar in length to the anal body width with length between 38.59-55.42 (48.83±7.33) µm. Caudal glands well distinct, arranged in group, spinneret subterminal.

Male

Body is moderate size with length 2.19 mm. Cuticle smooth measuring 2.48 µm. Lip region 43.06 µm wide and 12.58 µm high. Buccal cavity is tubular in shape with 48.52 µm in length and 29.82µm in width. Dorsal tooth is large and ventral wall have two denticles. Dorsal tooth apex from stoma base is at 19.11µm or at 39.38% of the buccal cavity length. Excretory pore has a diameter of 2.96 µm and 5.24 µm away from nerve ring. Nerve ring at 171.88 µm from the anterior end of the body or at 7.8% of the body length. Oesophago-intestinal junction tuberculate, at 501.15 µm. Tail long, filiform, about 7 times that of anal body width. Anal body width slightly larger than rectum. Caudal gland group, spinneret subterminal. Spicule 68.02µm long, gubernaculum is 18.34 µm long, lateral guiding pieces 12.35 µm long and supplements 11 numbers.

Type specimens

Female on slide MZ2PD 1 and male on slide MZ2PDM 1 deposited in the Nematode Collection Centre of Parasitology

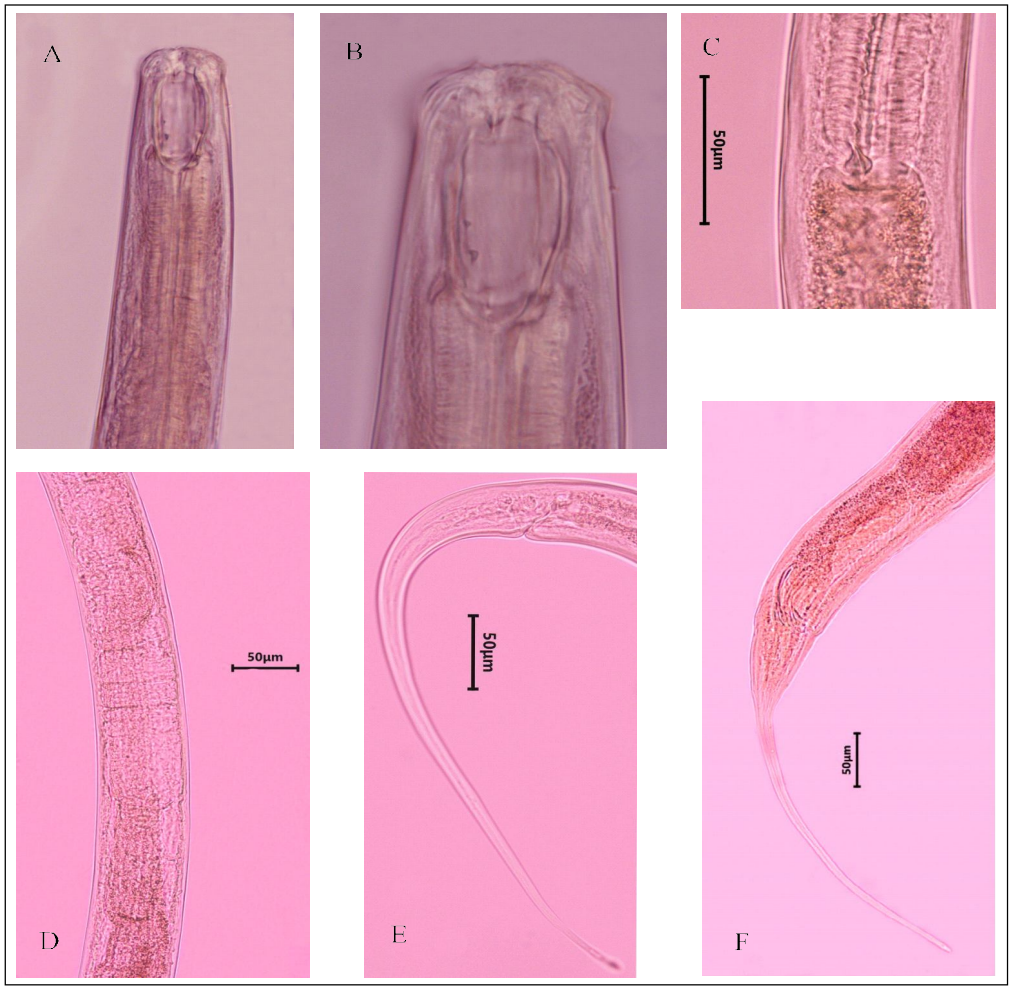

Fig 1: Photomicrograph of *Parahadronchus divendentus*.sp.n. A- Anterior end, B- Anterior end enlarged view, C- Oesophago-intestinal junction, D- Vulval region, E- Female tail, F- Male tail.

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Paratypes

On slides MZ2PD 2-4 deposited in the Nematode Collection Centre of Parasitology Section of Zoology Department of Manipur University, Canchipur, Imphal, Manipur, India.

Differential diagnosis (Table 2, Graph 1)

Parahadronchus divendentus sp.n is similar to *P. siroii* Renubala and Dhanachand, 1992, *P. shakili* (Jairajpuri, 1969) Mulvey, 1978 and *P. marami* Renubala and Dhanachand, 1992 in having two ridges of ventral denticles, location of dorsal tooth at posterior half of the buccal cavity, amphidelphic reproductive system and tail length longer than 500 µm.

The new species is different from *P. siroii* Renubala and Dhanachand, 1992 in many characters like smaller body, lesser number of ventral dentricles, caudal gland grouped with subterminal spinneret, dorsal tooth apex at 42-50%, tail about 10-12 times that of ABD, longer spicule, wider buccal cavity, thicker body, longer oesophagus. Ventral denticles 3-6, tandem caudal glands, terminal spinneret, dorsal tooth apex at 41-46%, tail about 12-18 times of ABD, spicule = 65 µm, oesophagus = µm in *P. siroii*.

P. divendentes sp.n. is again different from *P. marami* Renubala and Dhanachand, 1992 in number of ventral dentricles, size of buccal cavity, position of dorsal tooth apex, tail length, anal body width, length of rectum, nerve ring location, spicule size, lateral guiding piece and gubernaculum. The new species has larger buccal cavity, longer tail, longer rectum and longer ABD than that of *P. marami* Renubala and Dhanachand, 1992. Nerve ring is at about four labial widths in, tail 10-12 ABD long with grouped caudal gland. Buccal cavity = 48×24 µm, tail = 376 µm, rectum = 27.2 µm, ABD = 35.2 µm, nerve ring at 7 labial widths, tail 7-8 times of ABD, tandem caudal glands in *P. marami* Renubala and Dhanachand, 1992. In males, spicule, lateral guiding piece and gubernaculum are longer in the new species (spicule = 56-57.6 µm, gubernaculum = 5.0 µm in *P. marami* Renubala and Dhanachand, 1992).

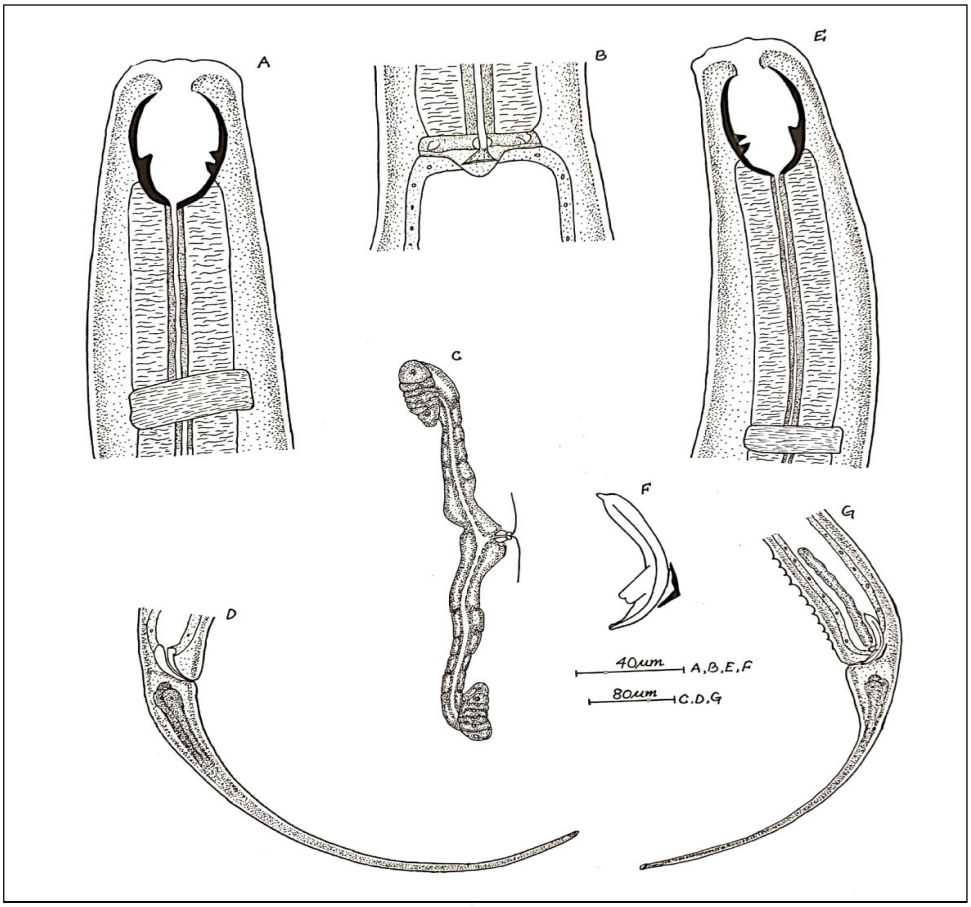
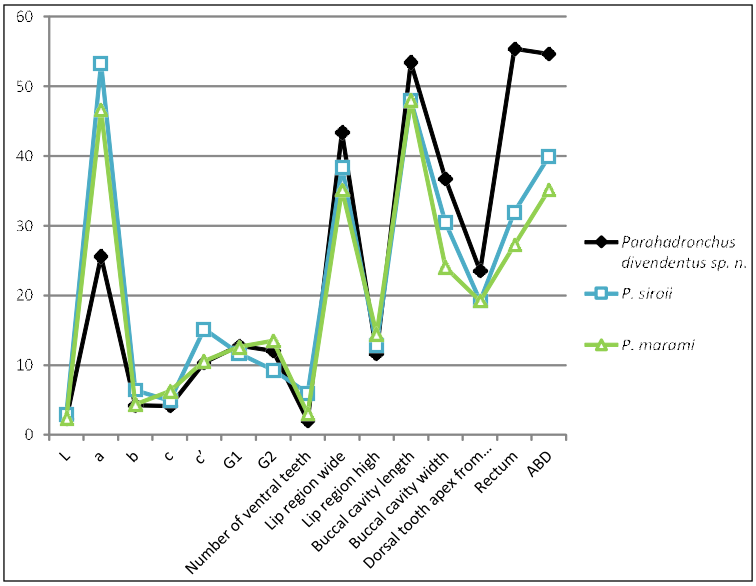


Fig 2: *Parahadronchus divendentus*. A- Female anterior end, B- Oesophago-intestinal junction, C- Female reproductive part, D- Female tail, E- Male anterior end, F- Spicule, G- Male anterior end.

Table 2: Comparison of the new species with other known related species.

Parameters	*P. divendentus* sp.n.	*P. siroii*	*P. marami*	*P. shakili*
a	25.13-33.16	41-61	31.5-45.1	32-47
b	3.95-4.61	5.0-6.3	4.37	4.2-4.9
c	4.11-4.57	4.1-5.2	6.3	5.5-11
V	54.68-56.81	52-59	57.7	56-70
L	2.19-2.48mm	2.34-3.11mm	2.38mm	2.3-3.3 mm
Ventral teeth	2	3-6	3	3-6
Caudal gland	Group	Tandem	Tandem	Tandem
Spinneret	Subterminal	Terminal	Ventrally terminal	Terminal
Dorsal tooth apex from stoma base	42-50%	41-46%	>30%	40-60%
Tail	10-12 ABD	12-18 ABD	7-8 ABD	9.1-16.5 ABD
Nerve ring	4 labial width	3 labial width	7 labial width	3 labial width
Lip high	11.67-12.87	12.8-16.0	14.4	11.2-22.0
Lip width	40.25-46.09	33-43.2	35.2	35.2-59.0
Buccal cavity length	52.52-53.65	46.4-53	48	49-59.2
Buccal cavity width	35.68-42.82	28.8-36.8	24	27.2-36.8
Spicule	68.02	65.2-78.0	56-57.6	80-90
Supplements	11	9-13	8-9	13-15
Gubernaculum	18.34	14.0-19.2	5	22-24
Lateral guiding piece	12.35	15.0-19.2	5	16-23

(All measurements in µm except L in mm).



Graph 1: Comparison of the new species with other known related species.

Parahadronchus divendentus sp.n., has shorter body length than *Parahadronchus shakili* (Jairajpuri, 1969) Mulvey, 1978. Buccal cavity is also shorter and wider, lip region is higher and wider in *P. shakili* (Jairajpuri, 1969) Mulvey, 1978, dorsal tooth apex at 42-50%, tail length about 10-12 times anal body width with grouped caudal glands and subterminal spinneret. Male spicule longer, 84-93 µm and 13 supplements in *P. shakili* (jairajpuri, 1969) Mulvey, 1978. Male spicule longer (body length= 1.66-2.16mm, buccal cavity= 40×22.4 µm, lip region= 32-33.6×11.4-12.8 µm, dorsal tooth apex at 40-60%, tail length 9-16.5ABD, caudal glands tandem, spinneret terminal, spicule= 84-93 µm and 13 supplements in *P. shakili* (jairajpuri, 1969) Mulvey, 1978.

Due to the above mentioned characters *Parahadronchus divendentus* sp.n. is proposed as a new species. Nomenclature owing to its peculiar two ventral denticles.

CONCLUSION

Analysis of the soil samples from Mizoram lead to the identification of a new species of the order Mononchida. *Parahadronchus divendentus* sp.n.is characterized by larger body width from other related species, strong feeding apparatus with two ventral teeth, group caudal glands, subterminal spinneret, *etc.* Morphological parameters supported by photomicrographs and drawing are also presented.

Conflict of interest: None.

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