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**NEW RECORDS OF THE GENUS *Miconchus* (Mononchida, Anatonchidae)  
FOR VIETNAM NEMATODE FAUNA**

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**ABSTRACT**

Two species of the genus *Miconchus*, viz. *M. dahousiensis* and *M. baeticus*, were recorded for the first time in Vietnam. The two collected species from Tuyen Quang, Ha Giang and Bac Can Provinces were redescribed and illustrated.

**Keywords:** Taxonomy, free-living soil nematodes, natural conservation area.

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## INTRODUCTION

The genus *Miconchus* (Anatonchidae, Miconchinae) is firstly elected by Andrassy (1958) as a new genus with four genera *Brachonchulus*, *Cobbonchus*, *Granonchulus* and *Judonchulus*, which belong to the family Mononchidae. Andrassy (1976) proposed the new subfamily Miconchinae including the genus *Miconchus* under the family Mononchidae. Then, this subfamily Miconchinae was moved to the family Anatonchidae by Khan et al., (1978) (Ahmad & Jairajipuri, 2010). The genus *Miconchus* is characterized by the same size and position of dorsal and subventral or ventrosublateral teeth (either one or two pairs), directed anteriorly and located nearly basal or midway in the buccal cavity and by a similar tail in both sexes.

Up to now, 41 species have been described in this genus worldwide (Ahmad & Jairajipuri, 2010; Siddiqi, 2016): 7 species in Europe; 9 species in Asia including Far East, Korea, Japan, Malaysia, India and Thailand; 9 species in North America; 10 species in South America including El Salvador, Cuba, Ecuador, St Lucia and Columbia; 5 species in Afrika including Egypt, Nigeria, South Afrika and Zaire; 5 species in Australia, New Zealand, Papua New Guinea and Fiji islands. *Miconchus dalhousiensis* Jairajpuri, 1969 was reported only from India and Pakistan (Jairajipuri, 1969; Tabassum et al., 2001) and *Miconchus baeticus* Jiménez Guirado, Alhama & Gutiérrez, 1997 was documented by its type population from Málaga, Spain (Jiménez Guirado et al., 1997).

Until now, six species of the genus *Miconchus* were recorded from some provinces in Vietnam including *M. aquaticus* Khan, Ahmad & Jairajpuri, 1978, *M. citri* Khan, Ahmad & Jairajpuri, 1978, *M. digiturus* Cobb, 1893, *M. kansaensis* Mulvey & Dickerson, 1970, *M. studeri* Steiner, 1914 and *M. triodontus* Buangsowon & Jensen, 1966 (Nguyen, 2005). However, the records of *M. dalhousiensis* and *M. baeticus* reported here are the first records for the nematode fauna in Vietnam.

## MATERIALS AND METHODS

Soil samples were collected randomly around the base of trees from natural conservation areas, Cham Chu (Tuyen Quang Province), Du Gia (Ha Giang Province) and Ba Be National Park (Bac Kan Province), Vietnam. Nematodes were extracted from soil samples using a modified Baermann funnel technique (Southey, 1986). They were killed by heat, fixed in 4% formaldehyde, transferred to anhydrous glycerol (Seinhorst, 1959) and mounted on glass slides for microscopic observation. Photographs were taken with a Nikon digital camera connected to a Nikon *Eclipse Ni* microscope and edited using Adobe Photoshop CS6. Permanent slides were stored at the Department of Nematology, Institute of Ecology and Biological Resources, VAST, Ha Noi, Vietnam.

## RESULTS AND DISCUSSION

### *Miconchus dalhousiensis* Jairajpuri, 1969

**Materials:** two populations from natural conservation areas Cham Chu (Tuyen Quang Province) and Du Gia (Ha Giang Province) with 16 females in good condition. Measurements: see table 1.

**Female:** Body large size. Habitus after fixation slightly ventrally arcuate, particularly toward posterior end; tapering slightly anteriorly and more pronounced posteriorly. Cuticle smooth, 4.5–6 µm thick at the base of pharynx. Lip region 48–53 µm wide and 15–17 µm height, slightly offset and wider than adjacent body contour; slightly angularly head with anterior sensilla arranged in two circles (6+10). Amphids small cup-like, aperture 6 µm wide at 15–17 µm from the anterior end or at beginning of buccal cavity. Buccal cavity large size, as length as 1.4–1.6 times its width, barrel shaped, narrowing at base; foramina present, its wall moderated sclerotized.

Dorsal tooth and ventrosublateral teeth large; similar in size and shape with sharp apex, pointing forward and clearly suprabaasal. Apex of dorsal tooth situated in posterior half of buccal cavity, at 15–17 µm or

approximately 26–35% of cavity length from its base. Pharynx cylindrical, 410–570  $\mu\text{m}$  long. Nerve ring located at 145.4–163.2  $\mu\text{m}$  or 31–38% of the pharyngeal region measured from the anterior body end. Excretory-secretory pore is conspicuous with distinctly sclerotized terminal duct;

situated just posterior to nerve ring at about 172.7–186.2  $\mu\text{m}$  or 36–44% of pharynx length from anterior body end. Pharyngo-intestinal junction tubercles prominent. Cardia projects into intestinal lumen. Rectum straight almost equal to anal body width long i.e. 13–15  $\mu\text{m}$  long.

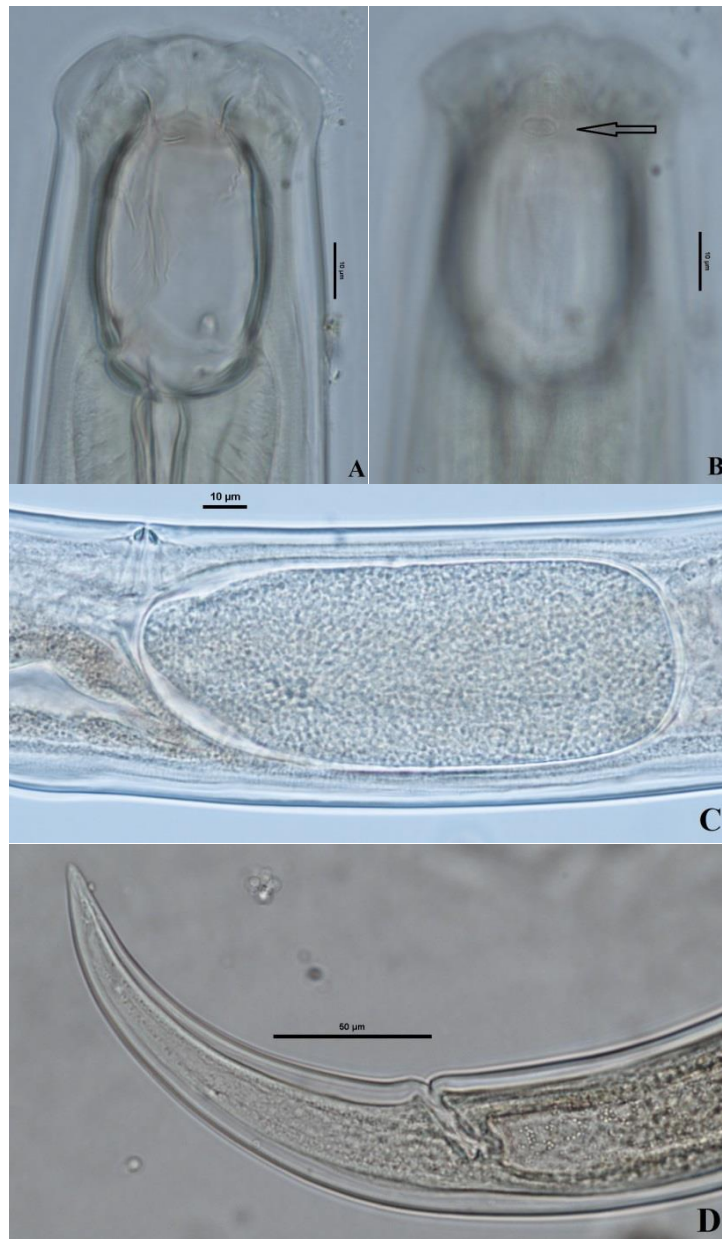
Table 1. Comparison of morphometric data of *Miconchus dalhousiensis* Jairajpuri, 1969

Local	<i>Miconchus dalhousiensis</i>			
	Dalhousie, India		Present paper	
Characters	Holotype	Paratype	Ha Giang	Tuyen Quang
n	1 ♀	3 ♀	7 ♀	9 ♀
L ( $\mu\text{m}$ )	2060	1890–2000	1718–1927	1727–1918
V (%)	68	66–67	64.6–66.7	64.3–67.7
a	28	28–30	25.4–27.5	25.1–28.2
b	3.7	3.5–3.6	3.8–4.1	3.8–4.2
c	13	12–13	13–14.7	12.4–13.4
c'	$\leq 4^*$		3.3–3.9	3.3–4
Pharynx length ( $\mu\text{m}$ )	557*	-	418–490	413–572
Position excretory pore of pharyngeal region length (%)	33–35*		35.9–39.2	36–44.2
Position nerve-ring of pharynx length (%)	-	-	31.4–34	32–37.9
Buccal cavity length ( $\mu\text{m}$ )	54–56		50–53	46–52
Buccal cavity width ( $\mu\text{m}$ )	39–41		33–36	30–35
Position of tooth apex (%) from the base of buccal cavity	29.6–34*		26–30.8	26.5–34.8
G1 (%)	-	-	5.4–10.9	9.3–12.4
G2 (%)	-	-	5.1–9.8	7.6–11.2
Lip region height ( $\mu\text{m}$ )	18–19		15–17	15–17
Lip region width ( $\mu\text{m}$ )	46–51		48–51	49–53
Body width at pharynx base ( $\mu\text{m}$ )	-	-	62–65	60–69
Maximum body width ( $\mu\text{m}$ )	-	-	66–76	66–72
Anal body width ( $\mu\text{m}$ )	-	-	15–18	16–17
Vagina length ( $\mu\text{m}$ )	-	-	13–14	14–17
Rectum length ( $\mu\text{m}$ )	23–28		13–15	13–16
Tail length ( $\mu\text{m}$ )	150–160		123–141	134–157

Notes: “-”: No information; \*: Calculation from original description.

Reproductive system didelphic-amphidelphic, both branches about equally developed with ovaries reflexed, sphincter at the oviduct-uterus connection not seen. The forward branch is slightly longer than posterior branch. Vulva transverse slit like. Uterus with one or two eggs in some cases

with egg size 102–115  $\times$  45–54  $\mu\text{m}$ . Vagina short, 13–17  $\mu\text{m}$  long or about one-fourth of corresponding body width, surrounded by well-developed constrictor muscle with *par refringens vaginae* as two drop-like sclerotized pieces in optical section.



*Figure 1. Miconchus dalhousiensis* Jairajpuri, 1969  
A. Head region; B. Amphid aperture; C: Vagina region; D. tail region

Tail elongated conoid with 130–157  $\mu\text{m}$  long, gradually tapering and ventrally curved. Caudal glands and *spinneret* absent.

*Male:* Not found.

*Remarks:* The measurements of Vietnamese specimens corresponded well with those of the holotype and paratype

specimens from type population from Dalhousie, India (Jairajpuri, 1969) except for the slightly smaller size of buccal cavity (46–52  $\times$  30–35 vs 50–53  $\times$  33–36  $\mu\text{m}$ ), lower lip height (15–17 vs 18–19  $\mu\text{m}$ ) and shorter tail (130–157 vs 150–160  $\mu\text{m}$ ). The distribution of this species is not only the first time in Vietnam but also for Southeast Asia.

*Locality:* Yen Thuan Commune (altitude at 900 m), Cham Chu natural conservation area, Tuyen Quang Province and Minh Ngoc, Lac Nong Communes, Bac Me District (altitude at 700 m), Du Gia natural conservation area, Ha Giang Province, Vietnam.

***Miconchus baeticus* Jiménez-Guirado, Alhama & Gutiérrez, 1997**

*Materials:* four females and three males in good condition were collected from Ba Be National Park (Bac Can Province).  
*Measurements:* see table 2.

Table 2. Comparison of morphometric data of *Miconchus baeticus* Jiménez-Guirado, Alhama & Gutiérrez, 1997

Local	<i>Miconchus baeticus</i>				
	Málaga, Spain			Present paper	
Characters	holotype	paratypes			
n	1 ♀	20 ♀	12 ♂	4 ♀	3 ♂
L (mm)	2.96	2.68–3.75	2.45–3.28	2.05–2.17	1.93–2.15
V (%)	65.7	61.6–66.9	-	63.3–66.2	-
a	45	38.3–51.3	37.6–53.2	27–29	29.6–32
b	4.8	4.4–5.3	4.6–5.5	4–4.3	3.9–4.1
c	15.5	14.3–18.3	17.2–21.7	12–12.6	13.5–14
c'	4.3	3.6–4.8	2.5–3.2	3.7–4.3	3–3.2
Pharynx length	567	513.5–652	475–659	481–577	463–531
Position excretory pore of pharyngeal region length (%)	36.5*	34.9–37.1*	36.1–37.7*	34–39	36–39
Position nerve-ring of pharyngeal region length (%)	30.9*	26–33.3		33–34	32.5–33.6
Buccal cavity length (µm)	57	51–60	50–55.5	48–52	47–48
Buccal cavity width (µm)	37.5	33.5–39.5	30.5–34	29–31	26–27
Position of tooth apex (%) from the base of buccal cavity	-	31.5–41.7		38–42	39–42
G1 (%)	10.1	9–13.5	-	11.7–14.9	-
G2 (%)	9.7	8.9–12.2	-	9.3–14	-
Lip region height (µm)	13.5	14–20	12.5–20	14–17	14–17
Lip region width (µm)	45	45–55.5	42–49.5	43–47	43–43
Body width at pharynx base (µm)	-	-	-	66–73	48–50
Maximum body width (µm)	65.5	57.5–82	52–84	72–89	64–70
Vagina length (µm)	23.5	17.5–28	-	21–28	-
Rectum length (µm)	-	-	-	29.5–38.6	-
Tail length (µm)	191	166.5–209	132.5–186	166–173	143–152
Egg length (µm)	-	165.5	-	79–91	-
Egg width (µm)	-	55.5	-	41–45	-
Add vulva papillae	-	0–3/0–3	-	0–2/0–3	-
Spicule length (µm)	-	-	80–105.5	-	90–94
Gubernaculum (µm)	-	-	18–26	-	20–26
Lat.guid.pieces (µm)	-	-	15–24.5	-	15–15
Supplement number	-	-	13–16	-	14–16

Notes: “-”: No information; \*: Calculation from original description.

*Female:* Body large size. Habitus after fixation straightly anteriorly and ventrally curved to J-shaped posteriorly. Cuticle smooth, 5–6  $\mu\text{m}$  thick at the base of pharynx. Lip region 43–47  $\mu\text{m}$  wide and 14–17  $\mu\text{m}$  height, clearly offset and wider than adjacent body contour; rounded head with short anterior labial

sensilla and cephalic. Amphids small cup-like, aperture 5–6  $\mu\text{m}$  wide at just behind of the beginning of buccal cavity. Buccal cavity large size, with 48–52  $\mu\text{m}$  long and 29–31  $\mu\text{m}$  wide or as length as 1.6–1.8 times its width, barrel shaped, narrowing at base and thick walls, foramina present.

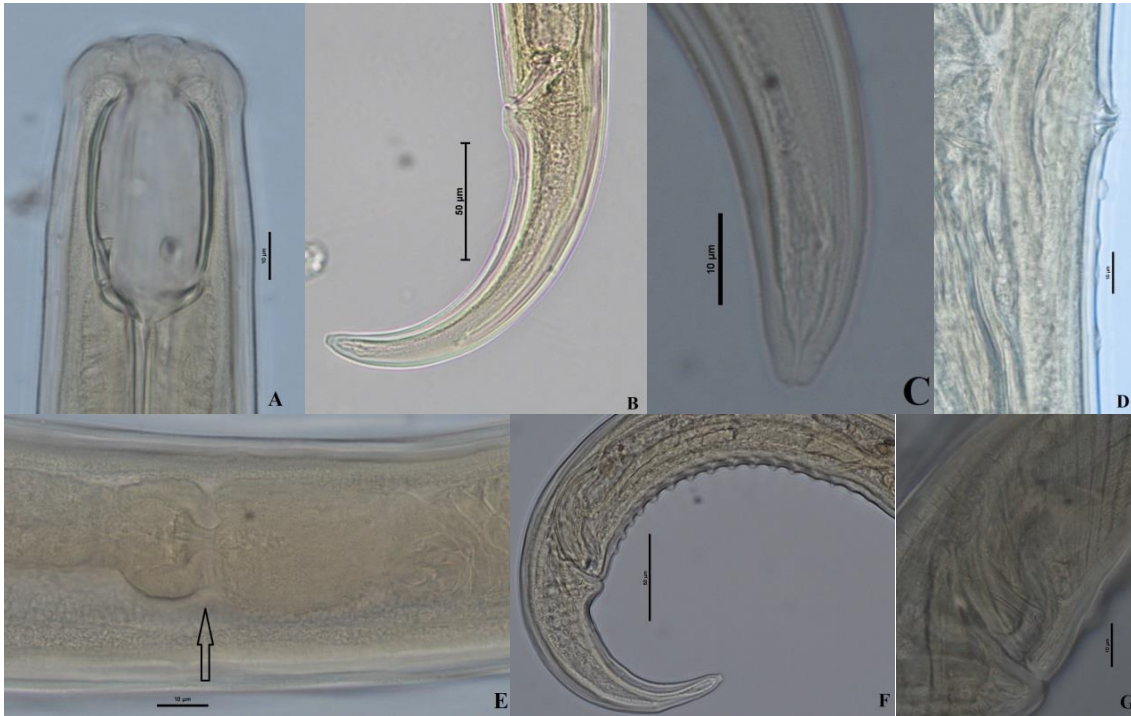


Figure 2. *Miconchus baeticus* Jiménez-Guirado, Alhama & Gutiérrez, 1997  
A. Female head region; B. Female tail region; C. Female tail terminus; D. Advulval papillae;  
E. Sphincter; F. Male tail region; G. Accessory piece

Dorsal tooth and ventral-sublateral teeth large, similar in size and shape with sharp apex, forward directed Apex of dorsal tooth situated in posterior half of buccal cavity, at 38–42% its length measured from the base. Pharynx cylindrical and muscular, 481–577  $\mu\text{m}$  long. Nerve ring located at the level 181.3–200.8  $\mu\text{m}$  or 33–34% of pharyngeal region from anterior. Secretory-excretory pore small but clearly visible, situated just posterior to nerve ring, about 208.8–221  $\mu\text{m}$  or 34–39% of its length from anterior body end. Pharyngo-intestinal junction tuberculate and tubercles prominent. Rectum straight, thick-walled, 29.5–38.5  $\mu\text{m}$  long.

Genital system didelphic-amphidelphic, both branches about equally developed with ovaries shorted and reflexed, large sphincter at the oviduct and uterus junction clearly visible. The anterior genital branch slightly longer than posterior branch. Vulva a short transverse slit. Advulval papillae well developed, 0–2 papillae anterior and 2–3 posterior to vulva. Vagina short, 21–28  $\mu\text{m}$  long or about one-third of corresponding body width, surrounded by well-developed constrictor muscle with *par refringens vaginae* visible as two rounded triangular or dot like sclerotized pieces in optical section.

Tail elongate conoid, ventrally curve, 166–173  $\mu\text{m}$  long. Terminus sub-truncate. Caudal glands well developed with a common duct expanding to apparently form an ampulla. Terminal *spinneret* present.

*Male*: Similar to female in morphology and body size, posterior part of body more ventrally arcuate. Genital system diorchic; testes opposed, elongated. Spicule moderate slender, ventrally curved and 90–94  $\mu\text{m}$  long. Gubernaculum developed and 20–26  $\mu\text{m}$  long; lateral guiding pieces 15  $\mu\text{m}$  long with bifurcate tips. 14–16 ventromedian supplements present and more or less regularly spaced.

*Remarks*: The morphology and measurements of Vietnamese specimens corresponded well with those of the holotype and paratype specimens from type population from Sierra de las Nieves, Ronda, Province

of Málaga, Spain (Jiménez-Guirado, 1997) except for a shorter body size (1.93–2.17 vs 2.68–3.75 mm), smaller size of buccal cavity (48–52  $\times$  29–31 vs 51–60  $\times$  33–39  $\mu\text{m}$ ) and lower in “c” ratio (12–13 vs 14–18); the latter can be explained by longer body size. Málaga Province is located in the southern Spain and lies about 130 km to the north of Africa with the climate is subtropical-Mediterranean, where the climate is very similar to that of Vietnam. The distribution of this species reported here is also not only the first time in Vietnam but also for Southeast Asia.

*Locality*: Ba Be National Park (altitude at 700 m), Bac Can Province, Vietnam.

In current paper, 8 species of the genus *Miconchus* have been recorded in Vietnam. The following adapted key to species is based on Ahmad & Jairajpuri (2010):

- 1a Female mono-prodelphic.....2
- 1b Female didelphic-amphidelphic.....3
- 2a Post-uterus sac as long as one body width.....*M. digiturus*
- 2b Post-uterus sac ca 2 times the body width.....*M. triodontus*
- 3a Ventral-sublateral teeth originating very end of lateral wall.....4
- 3b Ventral-sublateral teeth in position or further anterior to midway in buccal cavity.....5
- 4a Caudal spinneret present, male known.....*M. studeri*
- 4b Caudal spinneret absent, male unknown.....*M. citri*
- 5a Apices of dorsal and ventral-sublateral teeth at midway of buccal cavity.....*M. kansasensis*
- 5b Apices of dorsal and ventral-sublateral teeth at 30–40% of buccal cavity from the its base.....6
- 6a Caudal spinneret absent, male unknown, advulval papillae absent.....*M. dalhousiensis*
- 6b Caudal spinneret present, advulval papillae present, male known.....7
- 7a Buccal cavity large size 48–52  $\times$  29–31  $\mu\text{m}$ ; 0–3 anterior advulval papillae and 0–3 posterior; male with 13–16 supplements.....*M. baeticus*
- 7b Buccal cavity large size 43–48  $\times$  29–31  $\mu\text{m}$ ; 5–7 anterior advulval papillae well developed and 0–1 weak posterior one; male with 17–21 supplements.....*M. aquaticus*

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