

New predatory nematodes of the genus *Iotonchus* (Iotonchidae—Mononchida) from the soils of Kerala (India)

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Abstract. ~~Four new species of the genus~~ *Iotonchus*, ~~*I. kherai*, *I. khani*~~ *I. nayari*, *I. kherai*, *I. khani* and *I. heynsi* are described. *I. nayari* comes close to *I. risoceiae* but differs in having shorter body and longer spicules compared to body length. *I. kherai* differs from *I. indicus* in body size, shape and size of buccal cavity and presence of males and from *I. risoceiae* in the shape of buccal cavity and subventral opening of caudal glands. *I. khani* differs from *I. chantaburensis* in having shorter tail, poorly developed caudal glands and spinneret and absence of distinct valve between oviduct and uterus. *I. heynsi* differs from *I. longicaudatus* by having an indistinct terminal caudal gland opening, non-cuticularised vagina and absence of sphincter at oviduct-uterus junction and from *I. trichurus* by the size and anterior position of dorsal tooth. A key to Indian species of the genus *Iotonchus* is provided.

Keywords. Predatory nematodes; iotonchidae; soil; systematics.

1. Introduction

During an extensive survey for plant parasitic and predatory nematodes inhabiting soils of Kerala state, many known species and a few new species belonging to different genera were identified. Special attention has been paid to the predatory nematodes because of their importance as agents of biological control of plant parasitic nematodes. Four predatory nematodes collected in the survey had already been reported (Mohandas 1972a, b). In this paper four new species of the genus *Iotonchus* (Cobb 1916) Altherr, 1950 are described.

2. Materials and methods

The specimens were killed and fixed simultaneously in 4% hot formalin neutralised previously with calcium carbonate and processed to glycerine by the glycerol-ethanol method.

3. Observations

3.1. Description and diagnosis of new species

Iotonchus nayari n.sp.

Measurements: Paratypes, 12 ♀♀: $L = 2.32-2.68$ mm; $a = 31-34$; $b = 4.2-4.6$; $c = 12-14$; $c' = 4.0-4.9$; $V = 62-67$; buccal cavity = $55-64 \times 34-38 \mu\text{m}$.

Paratypes, 4 ♂♂: $L = 2.20-2.46$ mm; $a = 31-33$; $b = 4.1-4.6$; $c = 13.1-16.5$; $c' = 2.5-2.9$; buccal cavity = $52-54 \times 28-30 \mu\text{m}$.

Description: Holotype ♀: $L = 2.52$ mm; $a = 31$; $b = 4.6$; $c = 12.6$; $c' = 4.4$; $V = 64$; buccal cavity = $61 \times 36 \mu\text{m}$. Body ventrally arcuate on fixation. Maximum thickness of cuticle 5, 4 and $10 \mu\text{m}$ at neck, midbody and tail region respectively. Lip region expanded, $22 \mu\text{m}$ high and $48 \mu\text{m}$ wide. Amphid opening $5 \mu\text{m}$ (4-6 in paratypes) wide, $18 \mu\text{m}$ (17-20) from anterior end. Buccal cavity (figure 1 A) slightly longer than one and half times its width, wall about $3 \mu\text{m}$ thick (at the thickest region). Dorsal tooth situated in posterior one-third, $16 \mu\text{m}$ (15-18) from base. A minute tooth-like projection present in the anterior part of the vertical subventral wall. Two minute teeth in the oblique subventral wall of the cavity. Oesophago-intestinal junction tuberculate. Nerve ring $158 \mu\text{m}$ from anterior end. Reproductive system didelphic; ovaries reflexed. Proximal portion of the oviduct enlarged. Sphincter present between oviduct-uterus junction. One egg measuring $115 \times 55 \mu\text{m}$ in anterior uterus. Cuticular pieces in vulva-vagina junction absent. One prevulval papilla present; absent in paratypes. Tail elongate and arcuate (figure 1 B) $190-230 \mu\text{m}$ long and 7.0-8.6% of body length. Rectum less than one anal body-width long. Caudal glands indistinct, but the duct and the opening distinct, terminal (figure 1 C).

Male: Amphid opening larger than that of females, $8 \mu\text{m}$ (7-8) wide. Rectal glands well-developed. Spicules and gubernaculum as in figure 1 D. Spicule $117-126 \mu\text{m}$ long, 5.0 to 5.3% of body length. Gubernaculum $40-42 \mu\text{m}$. Supplements 16 (15-16), usually the anterior one is less-developed and found in inundation. Tail shape differs from that of female in that it is shorter ($150-180 \mu\text{m}$) and 6.0-7.6% of body length.

Type habitat and locality: Soil around roots of blackgram (*Vigna mungo*) and chilly (*Capsicum frutescens*) from Changanaseri, collected on 17-7-1972.

Type material: Holotype female and one paratype female on slide, deposited with the National Nematodes Collection (NNC), Division of Nematology, IARI, New Delhi and one each of paratype male and female on slide, deposited with National Collection of Nematodes (NCN), Zoological Survey of India.

Differential diagnosis: This species comes close to *Iotonchus risoceiae* (Carvalho 1955) Andrassy, 1958, but is distinct in having a minute tooth in vertical subventral wall of buccal cavity opposite to dorsal tooth, small body size and tail and in having larger spicules compared to body length. In Carvalho's (1955) specimens spicule is 3.7% of body length and Mulvey's (1963) it is 3.9 to 4.0% of body length whereas in the present specimens it is 5.0 to 5.3% and it is considered to be quite significant.

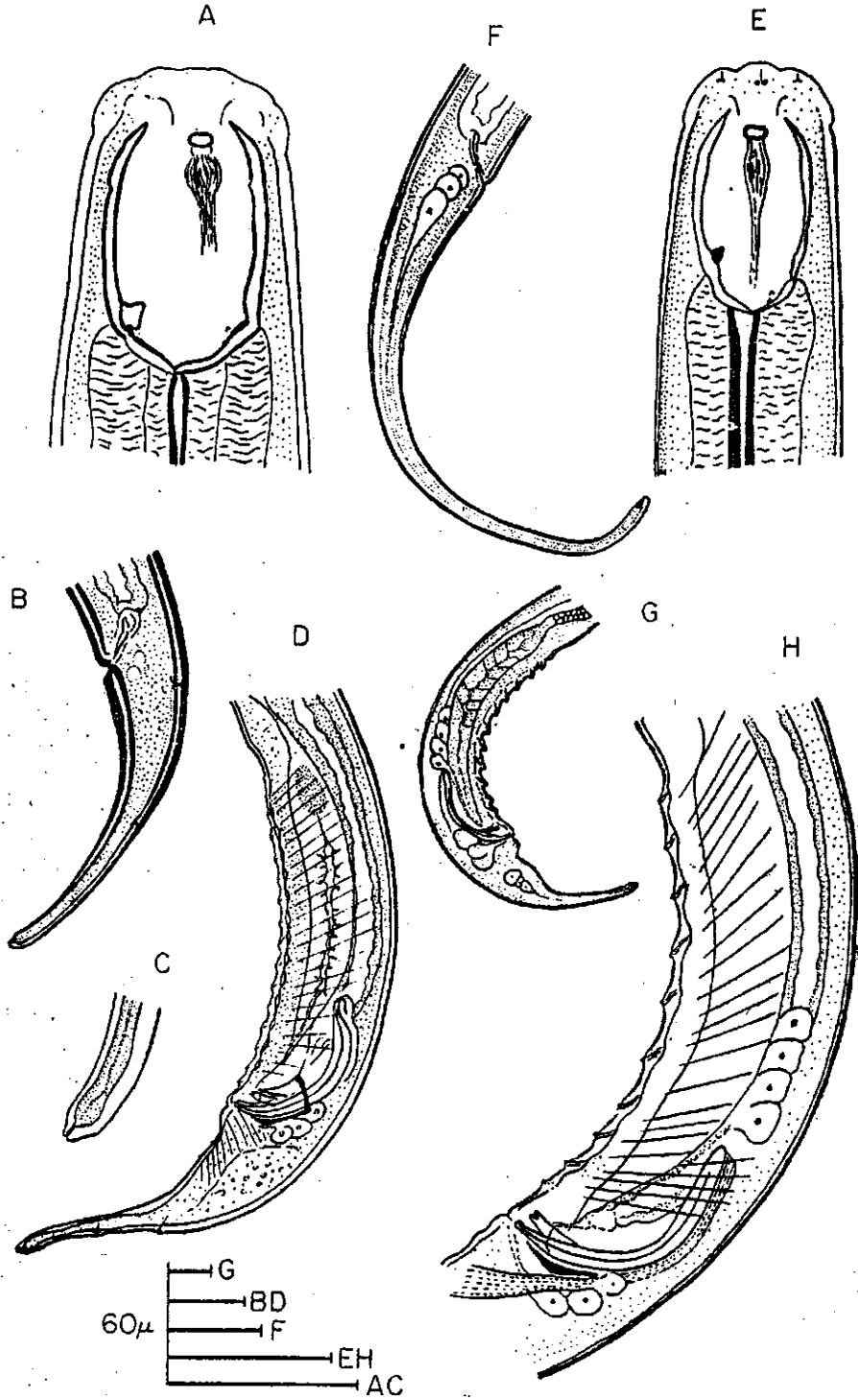


Figure 1. A-D. *Iotonchus nayari* n. sp. Female: A—anterior end, B—posterior end, C—tail end; Male: D—posterior end. E-H. *Iotonchus kherai* n. sp. Female: E—anterior end, F—posterior end. Male: G—posterior end, H—spicule and supplements.

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Dedicated to the memory of late Prof. K K Nayar, Head of the Department of Zoology, University of Kerala.

Iotonchus kherai n.sp.

Measurements : Paratypes, Thirumala 5 ♀♀ : $L = 3.10-3.41$ mm; $a = 35-36$; $b = 4.3-4.6$; $c = 7.9-8.0$; $c' = 7.4-7.6$; $V = 61$; buccal cavity = $66-75 \times 37-40 \mu\text{m}$.

Paratypes, Thirumala 8 ♂♂ : $L = 2.50-2.92$ mm; $a = 38$; $b = 4.4-4.6$; $c = 7.7-8.7$; $c' = 5.6-6.3$; buccal cavity = $59-64 \times 29-32 \mu\text{m}$.

Kariavattom 7 ♀♀ : $L = 2.51-2.81$ mm; $a = 33-34$; $b = 4.2-4.5$; $c = 6.0-8.3$; $c' = 7-8$; $V = 61-62$; buccal cavity $66-67 \times 37-39 \mu\text{m}$.

Kariavattom 12 ♂♂ : $L = 2.18-2.82$ mm; $a = 32-38$; $b = 4.1-4.9$; $c = 7-9$; $c' = 5-6$; buccal cavity = $56-59 \times 30-31 \mu\text{m}$.

Description : Holotype, Thirumala ♀ : $L = 3.13$ mm; $a = 36$; $b = 4.4$; $c = 8.0$; $c' = 7.6$; $V = 61$; buccal cavity = $75 \times 39 \mu\text{m}$. Body ventrally arcuate on fixation. Maximum thickness of cuticle 5, 4 and $8 \mu\text{m}$ at neck, midbody and tail region respectively. Lip region expanded, $21 \mu\text{m}$ high and $56 \mu\text{m}$ wide. Amphid opening $8 \mu\text{m}$ (7-8 in aratypes) wide, $22 \mu\text{m}$ (19-24) from anterior end. Buccal cavity about twice as long as wide (figure 1 E), wall about $2.5 \mu\text{m}$ thick. Dorsal tooth situated at posterior one-third, $25 \mu\text{m}$ (20-25) from base of buccal cavity. Two small teeth present in each oblique subventral wall. Oesophago-intestinal junction tuberculate. Nerve ring $198 \mu\text{m}$ from anterior end. Reproductive system didelphic; ovaries reflexed. Sphincter present at uterus-oviduct junction. One or two eggs in the uterus of paratypes observed. Cuticular pieces in vulva-vagina junction absent. Vulval region markedly elevated in holotype and in a few paratypes. One indistinct vulval apilla found only in holotype. Tail conoid, then cylindroid (figure 1 F), $0.39-0.43$ mm and 12-13% of body length (0.33 to 0.39 mm and 12-15% of body length in Kariavattom specimens). Caudal glands three, in random; its opening subventral.

Male : Smaller than females. Body slightly more arcuate, especially at the posterior end (figure 1 G). Amphid opening larger than that of females, $10 \mu\text{m}$ (8 to 10) wide. Two pairs of well-developed ejaculatory glands found anterior to spicules. Rectal glands present. Spicules and gubernaculum $97-101 \mu\text{m}$ and $30-32 \mu\text{m}$ respectively. It is $90-102 \mu\text{m}$ and $27-38 \mu\text{m}$ respectively in Kariavattom specimens. Supplement 10 (9-11), usually the anterior one is poorly developed. An inundation just anterior to the first supplement.

Habitat and locality : Soil around roots of unidentified grasses and that of black pepper (*Piper nigrum*) from Thirumala collected on 12-6-1972, 1-7-1972, and 3-12-1973. Also collected from soil around roots of unidentified grasses from Kariavattom on 1-7-1972 and 10-5-1973.

Type material : Holotype ♀ and paratypes 2 ♀♀ and 3 ♂♂ on slides are deposited with NCN, Zoological Survey of India, and paratypes 3 ♀♀ and 4 ♂♂ on slides are deposited with NNC, IARI.

Differential diagnosis: This species resembles *Iotonchus indicus* Jairajpuri 1969 but differs in the shape and size of buccal cavity, body size and also in the presence of males; from *I. risocheiae* (Carvalho 1955) Andrassy, 1958 the present species differs in the shape of the buccal cavity and subventral opening of caudal glands. Also males of the present species have less number of supplements.

Named after Dr S Khera, Professor of Zoology, Meerut University, Meerut.

Iotonchus khani n.sp.

Measurements: Paratypes, 6 ♀♀: $L = 0.90-0.95$ mm; $a = 24-26$; $b = 3.8-3.9$; $c = 5.8-6.0$; $c' = 6.7-7.4$; $V = 63-65$; buccal cavity = $26-30 \times 14-17 \mu\text{m}$.

Description: Holotype ♀: $L = 0.90$ mm; $a = 25$; $b = 3.9$; $c = 6$; $c' = 6.8$; $V = 64$; buccal cavity = $26 \times 14 \mu\text{m}$. Body ventrally arcuate, when fixed. Maximum thickness of cuticle 2.5 , 1.0 and $3.0 \mu\text{m}$ at neck, midbody and tail region respectively. Lip region expanded, $10 \mu\text{m}$ high and $29 \mu\text{m}$ wide. Buccal cavity slightly wider than half of the length; its wall about $1.5 \mu\text{m}$ thick. Dorsal tooth basal, $6 \mu\text{m}$ (6.0 to 8.5 in paratypes) from base of buccal cavity, opposed by a longitudinal ridge (figure 2A). There are two minute teeth in each oblique subventral wall of buccal cavity. Nerve ring 82 to $86 \mu\text{m}$ from anterior end. Oesophago-intestinal junction tuberculate. Reproductive system pro-monodelphic; ovary reflexed; proximal portion of the oviduct and uterus, enlarged. Posterior uterine sac rudimentary (figure 2B). Cuticular pieces at vulva-vagina junction absent. Vulval papillae absent. Tail elongate ($0.15-0.17$ mm, $17-18\%$ of body length), ventrally curved, conoid then cylindroid (figure 2C). Caudal glands grouped, indistinct; its subventral opening also indistinct. Rectum 19 to $21 \mu\text{m}$ long, less than one anal bodywidth.

Type habitat and locality: Soil around roots of rubber, *Hevea brasiliensis*, Kottayam, collected on 31-12-1973.

Type material: Holotype ♀, paratype ♀ and 2 juveniles on slide deposited with the NNC, IARI. One paratype ♀ and 5 juveniles on slide, deposited with NCN, Zoological Survey of India.

Differential diagnosis: This species closely resembles *I. chantaburensis* Buangsuwon and Jensen 1966 but differs in having shorter tail ($C = 5.8-6.0$ as against 3.8 to 4.9 in *I. chantaburensis*), in the absence of distinct valve between oviduct and uterus, and in having poorly developed caudal glands and spinneret.

Named after Dr E Khan, Division of Nematology, IARI, New Delhi.

Iotonchus heynsi n.sp.

Measurements: Paratypes, 5 ♀♀: $L = 1.09-1.20$ mm; $a = 32-34$; $b = 4.4-4.6$; $c = 3.7-4.0$; $c' = 13.5-14.4$; $V = 60-61$; buccal cavity = $22-25 \times 12-13 \mu\text{m}$.

Description: Holotype ♀: $L = 1.11$ mm; $a = 33.6$; $b = 4.4$; $c = 3.8$; $c' = 13.8$; $V = 60$; buccal cavity = $22 \times 12 \mu\text{m}$. Body ventrally arcuate, when fixed. Maximum thickness of cuticle 1.5 , 1.0 and $2.5 \mu\text{m}$, at neck, midbody and

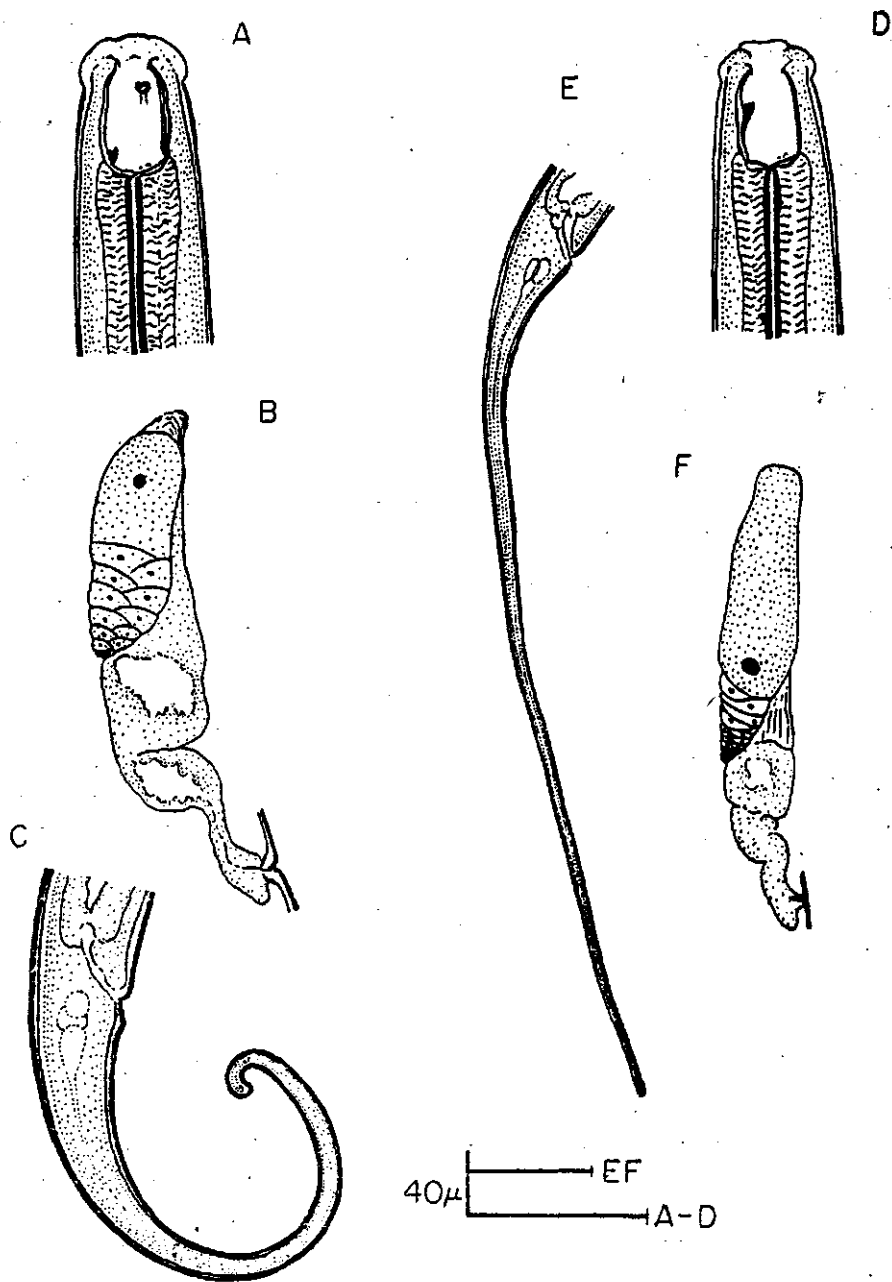


Figure 2. A-C. *Iotonchus khani* n.sp. Female: A—anterior end, B—gonad, C—posterior end, D-F. *Iotonchus heynsi* n.sp. Female: D—anterior end, E—posterior end, F—gonad.

tail region. Lip region set off, 7 to 8 μm high and 21 to 22 μm wide. Amphid opening not observed. Buccal cavity (figure 2 D) about twice as long as wide, its wall about 1 μm thick. Dorsal tooth big, its apex situated at about 65 to 68% or 15 μm from base of stoma. Two minute teeth observed in each oblique sub-ventral wall. Oesophagointestinal junction tuberculate. Nerve ring about 82 μm from anterior end. Gonad monodelphic; ovary reflexed; proximal portion of oviduct enlarged (figure 2 F). Posterior uterine sac rudimentary, less than half of the vulval body-width. A single egg measuring 112 \times 20 μm is noticed in the uterus of one paratype. Tail filiform (figure 2 E), 0.29 to 0.31 mm, 26 to 27% of body length. Caudal glands indistinct appearing to be grouped, terminal opening indistinct.

Type habitat and locality : Soil around roots of pepper (*Piper nigrum*) and coconut (*Cocos nucifera*) from Thirumala, collected on 3-8-1974.

Type material : Holotype ♀ on slide deposited with NCN, Zoological survey of India and one paratype ♀ on slide with NNC, IARI, New Delhi.

Differential diagnosis : This species resembles *I. longicaudatus* Baqri *et al* 1978 and *I. trichurus* (Cobb, 1917) Andr ssy 1958. From the former the present species differs in having an indistinct terminal caudal gland opening, non-cuticularised vagina and absence of sphincter at oviduct-uterus junction (caudal gland opening sub-terminal, vagina sclerotised and sphincter present in *I. longicaudatus*). From the latter it can be easily distinguished by the position and size of dorsal tooth which is basal and small in *I. trichurus*.

Named after Dr J Heyns, Department of Zoology, Rand Afrikaans University, Johannesburg, South Africa.

3.2. Key to Indian species of *Iotonchus*

1. Female monodelphic ... 2
 - Female didelphic ... 7
2. Cuticularised pieces in vagina, 9-12 μm from vulva ... *baqrii* Jairajpuri, 1969
 - Cuticularised pieces, if present at vulva ... 3
3. Tail conoid arcuate; $c = 14-19$... *monhystera* (Cobb, 1917)
 - Tail elongate conoid to filiform; $c = 3.4-6.0$... 4
4. Tail conoid then cylindroid; $c = 5.8-6.0$... *khani* n.sp.
 - Tail long, filiform; $c = 3.4-4.0$... 5
5. Dorsal tooth small, basal, apex 7 μm from base of stoma ... *trichurus* (Cobb, 1917)
 - Dorsal tooth big, in middle of stoma, apex 11-15 μm from base ... 6
6. Caudal gland opening terminal, indistinct ... *heynsi* n.sp.
 - Caudal gland opening subterminal ... *longicaudatus* Baqri *et al* 1978
7. Caudal glands opening terminal ... 8
 - Caudal glands opening subterminal ... 10
8. $L = 1.4-1.7$ mm; males absent ... *prabhooi* Mohandas 1979
 - $L = 2.3-4.3$ mm; males present ... 9
9. Spicules 3.7-4.0% of body length ... *risoeciae* (Carvalho 1955)
 - Spicules 5.0-5.3% of body length ... *nayari* n.sp.
10. $L = 1.54-1.97$ mm; males absent ... *indicus* Jairajpuri 1969
 - $L = 2.51-3.41$ mm; males present ... *kherai* n.sp.

Acknowledgements

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