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# ONE NEW AND THREE KNOWN SPECIES OF THE GENUS *HELICOTYLENCHUS* STEINER, 1945 ASSOCIATED WITH BANANA FROM WEST BENGAL, INDIA

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## INTRODUCTION

One new and three known species of plant parasitic nematodes belonging to the genus *Helicotylenchus* Steiner, 1945, *H. wasimi* n. sp., *H. crenacauda* Sher, 1966, *H. dihystera* (Cobb, 1893) Sher, 1961 and *H. hydrophilus* Sher, 1966 are being described and illustrated. The species were collected from rhizospheric soil of banana plantations (*Musa paradisiaca* L. cv Kanthali) in Paschim Medinipur district of West Bengal, India, during a taxonomic survey from March 2004 to February 2006. *H. wasimi* n. sp. is characterized by its rounded lip region without annulations, 26-27 µm long spear with anteriorly indented knobs, posteriorly located (808-809 µm from head end) vulva, anterior genital branch longer than posterior one, short hemispherical tail with thick cuticular rounded terminus, tail with four distinct striations and phasmids located opposite to anus. *H. hydrophilus* is the first record from India.

## MATERIALS AND METHODS

Nematodes were collected from rhizospheric soil samples (250 gm) around banana plantations (*Musa paradisiaca* L. cv Kanthali). Soil sample was taken from an area of 10 cm × 10 cm up to the depth of 20 cm, at a distance of 25 cm from the main bole of the orchard. The specimens were extracted from soil by Cobb's sieving technique (Cobb, 1918) and decanting method followed by Modified Baermann's funnel technique (Christie and Perry, 1951); processed by Seinhorst's slow dehydration method (Seinhorst, 1959); mounted on slides in anhydrous glycerin and sealed. Measurements were taken with the help of an ocular micrometer using BX 41 Olympus research microscope with drawing tube attachment. Dimensions were tabulated in accordance with De Man's Formula (De Man, 1884). Diagrams were drawn with the help of a camera lucida.

Abbreviations used in the text as well as in the table are as follows :

L = body length
a = body length / maximum body width
b = body length / oesophageal length
c = body length / tail length
c' = tail length / body width at anus
V = distance from head end to vulva × 100 / body length
V' = distance from head end to vulva × 100 / distance from head end to anus
m = length of conus × 100 / stylet length
O = distance between stylet base and orifice of dorsal oesophageal gland × 100 / stylet length
MB = distance between anterior end of body and center of median oesophageal bulb × 100/ oesophageal length
$G_1$ = anterior genital branch × 100 / body length
$G_2$ = posterior genital branch × 100 / body length

## SYSTEMATIC ACCOUNTS

### Systematic position

Order TYLENCHIDA Thorne, 1949

Suborder HOPLOLAIMINA Chizhov & Berezina, 1988

Superfamily HOPLOLAIMOIDEA Filipjev, 1934 (Paramonov, 1967)

Family HOPLOLAIMIDAE Filipjev, 1934 (Wieser, 1953)

Subfamily ROTYLENCHOIDINAE Whitehead, 1958

Genus ***Helicotylenchus*** Steiner, 1945

***Helicotylenchus wasimi*** n. sp.

*Material examined* : 15 females.

*Measurements* : Shown in Table 1.

*Description* : *Female* : Body arcuate, C-shaped after fixation. Cuticular annules 1.0-1.5 µm wide at middle of the body. Lip region hemispheroid, broadly rounded, continuous with body and without annulations. Lip region height slightly larger than half of lip region width. Lateral field about one-fourth of body width near middle, with four smooth incisures.

Stylet 3.6 times lip region width long; shaft part (15 µm) 1.2 times in length than conus (12 µm). Spear guide massive, spear knobs with anterior cupped surface measuring 3 µm across and 2 µm high. Dorsal oesophageal gland opening measures 14 µm from posterior to base of stylet knobs; more than half of stylet length. Median oesophageal bulb more or less rounded in shape measuring 10 µm across. The center of the bulb 81 µm from the anterior extremity of the body. Hemizonid distinct, 2 annules wide and 3 annules anterior to excretory pore. Nerve ring 9 µm posterior to base of median oesophageal bulb. Oesophago-intestinal

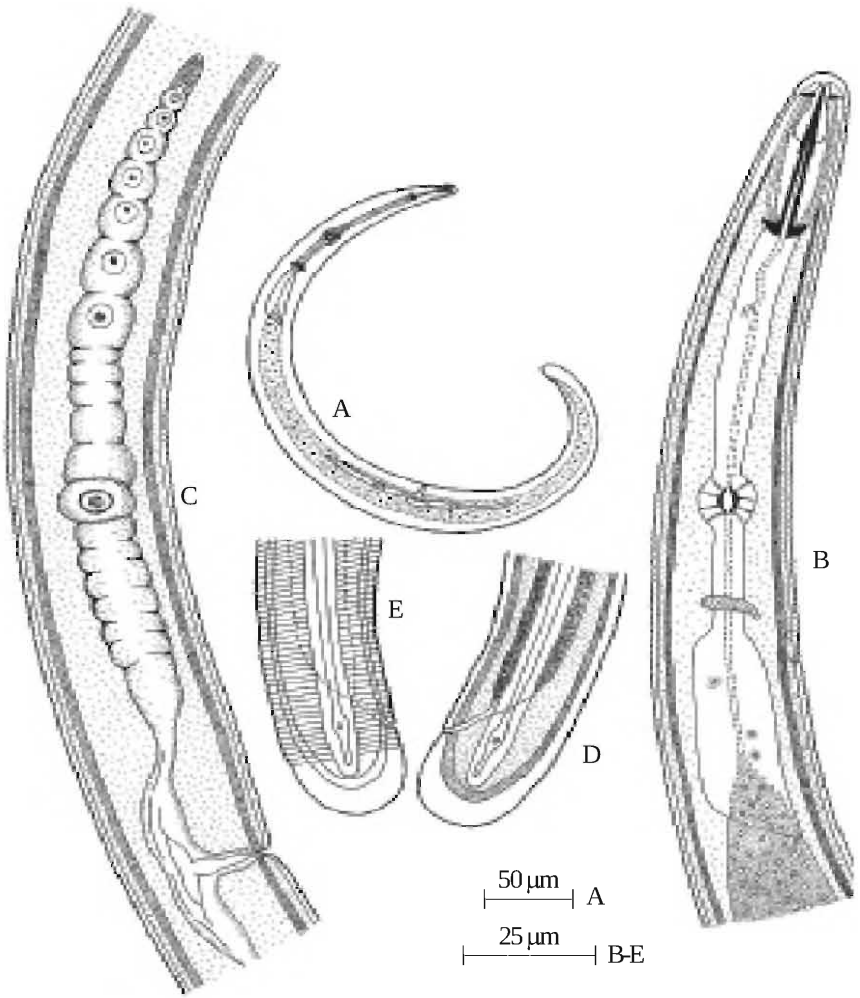


**Fig. 1 :** Camera lucida drawings of *Helicotylenchus wasimi* n. sp. A : Entire female; B : Neck region of female; C : Vulva with anterior gonad; D and E : Posterior portion of female.

junction 135 µm from head end. Excretory pore 37 µm anterior to oesophago-intestinal junction.

Reproductive system didelphic, with opposed genital branches. Vulva transverse located in the posterior half of the body, 808 µm from head end. Gonads asymmetrical, anterior gonad (140 µm) larger than posterior one (103 µm). Anterior and posterior ovary 78 µm and 59 µm respectively. Anterior oviduct with uterus (62 µm) longer than the posterior (44 µm) one. Oocytes arranged in a single row except tip of the gonad. Spearmathecae small, without sperm. Vagina occupied almost half of the corresponding body width.

Rectum about three-fourth of anal body width. Tail short, hemispheroid with rounded terminus; cuticle at tail terminus 4.8 µm thick. Striations on tail indistinct, four annules after cloaca are prominent. Phasmids clearly visible close to inner ventral incisures, located just opposite to anus.

*Male* : Not found.

*Type habitat and locality* : Specimens were collected by the first author on 17.7. 2005 from rhizospheric soil of banana plantations (*Musa paradisiaca* L. cv Kanthali) at Pathardaha village under Salbani block of Paschim Medinipur District, West Bengal, India.

*Type materials* : Specimens are deposited with the National Zoological Collections of Zoological Survey of India, Kolkata, West Bengal, India, under the Registration No.WN 970 (Holotype) and WN 971 (Paratypes) on slides.

*Differential diagnosis and relationships : Helicotylenchus wasimi* n. sp. comes close to *H. concavus* (Roman, 1961), *H. retusus* (Siddiqi and Brown, 1964) and *H. orthosomaticus* (Siddiqi, 1972) in general body shape but has many notable structural differences and may be claimed as a new species.

The new species comes close to *H. concavus* in the values of c´ and m (c´= 0.8-1.0 and m = 44-49 in *H. concavus*). Lip region hemispherical without annulations, spear with anteriorly cupped knobs in both the species. But they differ in the values of L, a, b, c, V and O (L = 0.64-0.86 mm; a = 26-33; b = 6-8; c = 42-51; V = 61-65 and O = 34-46 in *H. concavus*). Spear length (29-32 µm) in *H. concavus* is larger than the present species. Though tail terminus is hemispherical in both the species, yet in *H. concavus* it has a slight concavity on dorsal side with 6-12 annules, but in the present species, tail has four annules instead. Phasmids located more anterior to anus in *H. concavus* but they lie just opposite to anus in the present species.

*H. wasimi* n. sp. resembles with. *H. retusus* in the values of c´, m and in spear length (c´ = 0.7-1.0; m = 47-50; spear = 25-27µm in *H. retusus*). Spear knobs with indented anterior surfaces, tail terminus hemispherical, sometimes slightly clavate in both the species. But the present species is distinguished from *H. retusus* by its body length and in the values of a, b, c, V and O (L = 0.75-0.85 mm; a = 31-36; b = 6-7; c = 51-65; V = 60-64 and O = 41-48 in *H. retusus*). Lip region with indistinct annulations in both the species; it is high hemispherical in *H. retusus* but more or less rounded in the present species. Phasmids are located opposite to anus in the present species, but it is 8-14 annules anterior to anus in *H. retusus.*

The present species shows resemblances with *H. orthosomaticus* in body length and in the values of b and c´ (L = 0.89-1.30 mm; b = 8-10; c´ = 0.7-0.9), but differs in the values of a, c, V, m and O (a = 34-39; c = 53-64; V = 52-55; m = 49-50 and O = 23.5-31.0). Lip region without annulations in both the species; but it is elevated, broadly rounded in *H. orthosomaticus*. Spear larger in *H. orthosomaticus* (34-36 µm) than the present species. Spear with anteriorly cupped knobs in the present species but it is rounded with slightly concave anterior surfaces in *H. orthosomaticus.* Tail hemispherical in both the species; with 15-19 annules in *H. orthosomaticus* but with four annules in the new species. Phasmids 11-19 annules anterior to anal latitude in *H. orthosomaticus* but they lie opposite to anus in the present species.

*Etymology* : The new species has been named after the renowned nematologist Dr. Wasim Ahmad, Professor of Zoology, Aligarh Muslim University, Aligarh, India.

***Helicotylenchus crenacauda*** Sher, 1966

1966. *Helicotylenchus crenacanda* Sher, *Nematologica*, **12** : 1-56.

1979. *H. indentatus* Chaturvedi and Khera, *Zoological Survey of India, Technical Monograph No.* **2** : 1-105.

**Table-1** : Measurements of *Helicotylenchus wasimi* n. sp. (all measurements in µm except L in mm).

| Morphometric characters | Holotype female | Paratype females (n = 14) | Mean ± SD |
|---|---|---|---|
| L | 1.13 | 1.11-1.27 | 1.18 ± 0.04 |
| a | 58 | 57-59 | 58 ± 0.3 |
| b | 8.4 | 8.1-9.0 | 8.6 ± 0.3 |
| c | 77 | 76-78 | 77 ± 0.4 |
| c' | 0.9 | 0.8-1.0 | 0.9 ± 0.1 |
| V | 71.5 | 71.2-72.0 | 71.7 ± 0.3 |
| V' | 72.5 | 72.3-73.0 | 72.6 ± 0.2 |
| m | 45.5 | 45.2-46.0 | 45.7 ± 0.3 |
| O | 53 | 52.5-53.0 | 53.0 ± 0.3 |
| MB | 61.5 | 61.2-62.3 | 61.8 ± 0.4 |
| $G_1$ | 12.3 | 11.1-12.6 | 11.8 ± 0.5 |
| $G_2$ | 9.1 | 8.0-9.2 | 8.8 ± 0.4 |
| Height of lip region | 4.0 | 4.0-4.1 | 4.4 ± 0.2 |
| Width of lip region | 7.5 | 7.1-7.9 | 7.6 ± 0.3 |
| Stylet length | 27 | 26.5-27.2 | 27.0 ± 0.2 |
| Nerve ring from anterior end | 94.5 | 94.3-95.2 | 95.0 ± 0.3 |
| Excretory pore from anterior end | 102 | 102-103 | 102.4 ± 0.3 |
| Vulva from anterior end | 808 | 808-809 | 808 ± 0.4 |
| Length of anterior gonad | 140 | 139.4-140.6 | 140 ± 0.4 |
| Length of posterior gonad | 103 | 102.6-103.3 | 102.9 ± 0.2 |
| Body width at vulva | 19.5 | 19.4-20.2 | 19.8 ± 0.2 |
| Body width at anus | 16 | 15.8-16.3 | 16.1 ± 0.2 |
| Tail length | 15 | 14.3-15.5 | 15 ± 0.4 |

*Material examined* : 27 females.

*Measurements* : *Female* : L = 0.55-0.76 mm; a = 24-28; b = 5-6; c = 4-5; V = 59.5-64.0; O = 34-40; $G_1$ = 18-23; $G_2$ = 17-21.

*Description* : *Female* : Body spiral in shape upon fixation. Cuticle with distinct transverse striations; annules 1-2 µm in width. Lateral fields one-sixth to one-fourth of body width near mid-body; with four incisures of which the inner two fuse near middle of tail. Lip region continuous, broadly rounded and marked by 4-5 annules. Stylet 25-28 µm long; basal knobs indented anteriorly. Excretory pore anterior to level of oesophago-intestinal junction; 2-3 annules long. Hemizonid 2 annules anterior to excretory pore. Reproductive system amphidelphic; outstretched. Vulva a transverse slit; vagina about half of the corresponding body width. Spermatheca well developed, empty. Oocytes arranged in one or two rows. Phasmids 4-6 annules anterior to anus. Tail indented terminally; pronounced ventral projection, 7-8 annules.

*Male* : Not found.

*Habitat and locality* **:** Specimens were collected by the first author from rhizospheric soil of banana plantations (*Musa paradisiaca* L. cv Kanthali) at Murarichak village (Sabang block), Kusumda (Mohanpur block), Maligram and Jamna (Pingla block) and Pathardaha village (Salbani block) of Paschim Medinipur District, West Bengal, India.

*Materials deposited* : Specimens are deposited with the National Zoological Collections of Zoological Survey of India, Kolkata, West Bengal, India, under the Registration No.WN 1280 on slides.

*Distribution* : India (West Bengal, Tripura, Rajasthan, Andaman and Nicobar Islands), U.S.A. and Bangladesh.

*Remarks* : The present specimens are in agreement with the original measurements and description of the species made by Sher, 1966 except in having slightly larger stylet (24-26 µm). Chaturvedi and Khera (1979) proposed a new species *Helicotylenchus indentatus*, but Baqri and Ahmad (1983) proposed this as new synonym of *H. crenacauda*. Baqri and Ahmad (1983) provided the allometric and morphometric variations in this species. Jairajpuri and Baqri (1991) reported that *H. crenacauda* has been distributed in many districts of West Bengal, India and Bangladesh.

***Helicotylenchus dihystera*** (Cobb, 1893) Sher, 1961

1893. *Tylenchus dihystera* Cobb, *Agric. Gaz. N. South Wales*, **4** : 808-833.
1930. *Tylenchus spiralis* Cassidy, *Hawaiian Planters Rec.*, **34** : 379-387.
1945. *Helicotylenchus nannus* Steiner, *Proc. Helminth. Soc. Wash.*, **12** : 34-38.
1960. *Helicotylenchus crenatus* Das, *Ztschr. Parasitenk.*, **19** : 553-605.
1961. *Helicotylenchus dihystera* (Cobb, 1893) Sher, *Nematologica*, **6** : 155-169.

*Material examined* : 22 females.

*Measurements* :

*Female* : L = 0.54-0.83 mm; a = 25-32; b = 4-6; c = 35-41; V = 59-64; $G_1$ = 19-23; $G_2$ = 15-23.

*Description* : *Female* : Body spirally curved upon fixation. Lip region continuous, hemispherical and marked by 4-5 annules. Stylet 25-27 µm long; with anteriorly indented basal knobs. Excretory pore 117-125 µm from anterior end. Hemizonid 2 annules long, 2-3 annules anterior to excretory pore. Reproductive system amphidelphic, long, outstretched. Vagina extending about half of the corresponding body width. Spermatheca rounded, without sperm. Tail 14-18 µm long, dorsally convex-conoid, with slight ventral projection. Phasmids 6-8 annules anterior to anus.

*Male* : Not found.

*Habitat and locality* : Specimens were collected by the first author on 18-7-2004 from rhizospheric soil of banana plantations (*Musa paradisiaca* L. cv Kanthali) at Amlasuli village under the block Garhbeta-1 of Paschim Medinipur District, West Bengal, India.

*Materials deposited* : Specimens are deposited with the National Zoological Collections of Zoological Survey of India, Kolkata, West Bengal, India, under the Registration No.WN 1281 on slides.

*Distribution* : India (Gujarat, Himachal Pradesh, West Bengal, Karnataka, Orissa, Sikkim, Madhya Pradesh, Andaman and Nicobar Islands, Haryana, and Maharastra), Australia, Malaysia, Senegal, Ivory Coast, Nigeria, South Africa, Morocco, California, Java, Fiji Islands, Mauritius.

*Remarks* : The present specimens closely conform to the measurements and description of the species given by the earlier workers except smaller tail length (16-19 µm). Baqri and Ahmad (1983) discussed variations in different populations of *Helicotylenchus dihystera* from India. Baqri (1991) revealed that it is a widely distributed and highly variable species.

***Helicotylenchus hydrophilus*** Sher, 1966

1966. *Helicotylenchus hydrophilus* Sher, *Nematologica*, **12** : 1-56.

*Material examined* : 3 females.

*Measurements* : *Female* : L = 0.72-0.81 mm; a = 27-29; b = 5-7; c = 40.5-46.0; c' = 0.7-1.0; V = 58.5-62.5; m = 47.5-49.0; O = 37.5-42.0.

*Description* : *Female* : Body spiral in shape upon fixation; annules about 2 µm wide at mid body. Lip region hemispherical, continuous, with 4-5 annules. Stylet 29-31 µm long, with rounded basal knobs. Median oesophageal bulb oval-shaped; dorsal oesophageal gland opening 17-18 µm posterior to base of stylet knobs. Excretory pore 117-120 µm from anterior end. Hemizonid one annule wide; one annule anterior to excretory pore. Vagina extends half of the corresponding body width. Genital system amphidelphic, ovary out stretched; oocytes arranged in a single row. Spermatheca rounded, without sperm. Tail with pronounced ventral projection, terminus hemispherical, with 7-8 annules. Phasmids 4-5 annules anterior to anus.

*Male* : Not found.

*Habitat and locality* : Specimens were collected by the first author on 09-01-2005 from rhizospheric soil of banana plantations (*Musa paradisiaca* L. cv Kanthali) at Amalda village under Keshpur block of Paschim Medinipur District, West Bengal, India.

*Materials deposited* : Specimens are deposited with the National Zoological Collections of Zoological Survey of India, Kolkata, West Bengal, India, under the Registration No.WN 1282 on slides.

*Distribution* : India (West Bengal), U.S.A. (Florence, South Carolina).

*Remarks* : The present specimens agree in most respect with the types, described by Sher (1966); slightly smaller in size (0.75-0.82 mm). He reported it from swamp soil, from U.S.A. This is the first report from India. Banana is the new host record of the species.

## SUMMARY

One new and three known species of tylenchid nematodes, *Helicotylenchus wasimi* n. sp., *H. crenacauda* Sher, 1966, *H. dihystera* (Cobb, 1893) Sher, 1961 and *H. hydrophilus* Sher, 1966 associated with banana plantations (*Musa paradisiaca* L. cv Kanthali) in Paschim Medinipur district of West Bengal, India have been described and illustrated. *H. hydrophilus* has been reported first time from India. Banana is a new host record of the species.

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