Twelve species of nematodes: new records for India

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Abstract: Twelve species of nematodes belonging to orders Tylenchida (6 sp.) and Dorylaimida (6 sp.). Under nine genera of nine families; were reported as new record from India. Samples were collected from agriculture fields, surroundings of lakes of Udaipur and Sitamata Wild Life Sanctuary, Rajasthan.

Keywords: Family, genera, nematodes, new records, species, taxonomy.

A review of literature reveals that Rajasthan State does not feature in nematological literature till Arya (1957) reported the first plant parasitic nematode (Meloidogyne sp.) from the Thar Desert from Jodhpur exactly after 57 years of the first record of plant nematodes from India in 1901. Khera (1967–1969) and his associates identified and reported a significant number of species, including many new to science, from Jodhpur, Pali, Bikaner and Jaisalmer districts of Rajasthan (Sethi & Swarup 1968 a, b; Tikyani & Khera 1968; Tikyani et al. 1969; Nandkumar & Khera 1969, 1970; Khera 1971; Bajaj & Jairajpuri 1979; Bohra & Baqri 2000, 2003; Baqri & Bohra 2001, 2003; Bohra 2008, 2011).

Despite all these studies, our knowledge of freshwater nematode fauna from Rajasthan is meagre. Keeping this point in view, attempts were made to collect water samples from different depths of the lakes of Udaipur and from submerged plants surrounding the lakes. However, from the samples taken from different depths of the lakes, the recovery of nematodes was not satisfactory.

The present paper is based on the collection brought from agricultural fields, surroundings of lakes of Udaipur during (2009–2010) surveys, districts of Udaipur, Rajsamand and Sitamata Wildlife Sanctuary, Chittorgarh. The analysis of samples yielded a wide variety of nematodes which included 12 species of nematodes belonging to Orders Tylenchida (6 spp.) and Dorylaimida (6 spp.) as new records for India. Besides, brief descriptions, illustrations and information on host(s) and locality(ies) of these species have also been provided.

Material and methods

Forty soil samples were collected around the roots of host plants with the help of a shovel from depths of 5–15 cm in two surveys of six days duration. The soil/sediment samples were collected in a polythene bag, labelled and brought to the laboratory. Samples can be stored at 6–10 °C to keep the nematodes physiologically young and active. Lower storage temperature (4–5 °C) may cause chilling injury. Exposer to 40 °C or above even for a short time kill some species moderate temperature for storage of samples is 10–15 °C. Samples were processed through Cobb’s sieving and decantation technique. Nematodes were killed and fixed in hot 4% formaldehyde and kept for dehydration in desiccators. Body measurements were taken for specific species identification. Presently specimens are deposited in National Zoological Collection of Desert Regional Centre, Jodhpur, Rajasthan.

Abbreviations: L = body length (mm/µm); a = body length/maximum body width; b = body length/oesophageal length; c = body length/tail length; c’ = tail length/body width at anus; V = d
Results
The analysis of samples yielded a wide variety of nematodes which included 12 species belonging to nine genera of nine families of Orders Tylenchida and Dorylaimida.

Systematic Account:
Order: Tylenchida Thorne, 1949
Family: Tylenchidae Orley, 1880

Zanechus zanchus Siddiqi, 1979
(Fig. 1 A–B and Image 1 A–C)

Material examined: Two females, two males; 15.x.2009, coll. P. Kadela; Reg.No. IV/2332

Measurements: Females: L = 0.70–0.75 mm; a = 39.47–41.21; b = 6.8–7.0; c = 12.50–14.00; c’ = 3.2–3.5; V = 80–82. Males: L = 0.56–0.57 mm; a = 31.30–33.30; b = 5.8–6.2; c = 11.34–12.54;

Description: Female: Body ventrally arcuate upon fixation. Cuticle deeply annulated, annules contiguous. Lip region low, continuous with body contour. Stylet 8–9 µm long. Median bulb oval. Vulva post equatorial. Post vulval uterine sac absent. Tail 50–55 µm long, elongate conoid to a hooked tip (Fig. B)


Habitat: Collected from moist soil surrounding the bank of Pichola Lake, Udaipur.

Remarks: The measurement of present specimens fits well within the range given by Siddiqi (1979).

Family: Hoplolaimidae Filipjev,1934

Helicotylenchus californicus Sher, 1966
(Fig. 1, C–D and Image 2 A–C)

Material examined: Three females, 05.i.2010, coll. R. Sultana, Reg.No. IV/2350.

Measurements: Females: L = 0.57–0.61 mm; a = 19–27; b = 5.6–6.9; c = 30.50–32.50; c’ = 0.8–1.3; V = 59–62.

Description: Female: Body spirally coiled upon fixation. Lip region hemispherical, marked by four annules. Stylet 25–26µm long, basal knobs with flattened anterior surfaces. Excretory pore just posterior to oesophago–intestinal valve. Ovaries paired. Phasmid two annules anterior to anus. Tail with pronounced ventral projection, terminus irregularly hemispherical, marked by eight annules (Fig. C.)

Habitat and locality: Collected from soil around roots of wheat (Triticum aestivum) at village Poonmal (Sayra), Udaipur District, Rajasthan, India.

Remarks: H. californicus can be distinguished from related species H. bryophilus in having shorter stylet knobs with flattened stylet; offset anterior surface; spermathecae and irregular ventral projection of the female tail (Stylet 28–32 µm; ventral projection of tail hemispherical in H. bryophilus).

Figure 1. Zanenchus zanchus Siddiqi, 1979
A - Anterior end; B - Posterior end.
Helicotylenchus californicus Sher, 1966
C - Anterior end; D - Posterior end.
Helicotylenchus densibullatus Siddiqi, 1972
E - Anterior end; F - Posterior end.
Helicotylenchus minzi Sher, 1966
G - Anterior end; H - Posterior end.
Helicotylenchus talonus Siddiqi, 1972
I - Anterior end; J - Posterior end.
K - Anterior end; L - Posterior end.
Image 1. Zanenchus zanchus Siddiqi, 1979. A - Anterior end; B - Posterior end; C - Male - Posterior end.

Image 2. Helicotylenchus californicus Sher, 1966. A - Anterior end; B - Basal Knobs; C - Posterior end.

**Helicotylenchus densibullatus** Siddiqi, 1972  
(Fig. 1, E–F and Image 3 A–B)


**Measurements:** Females: L = 0.43–0.44 mm; a = 22–24; b = 4.7–6.2; c = 42–44; c’ = 0.76–0.90; V = 65–67.


**Habitat and locality:** Collected from moist soil around the bank of Pichola lake, Udaipur District, Rajasthan, India.

**Remarks:** *H. densibullatus* can be distinguished from *H. canadiensis* by having shorter stylet; (stylet 30–33 µm; female tail terminus hemispherical to irregularly hemispherical with six to 12 annules in *H. canadiensis*).

**Helicotylenchus minzi** Sher, 1966  
(Fig. 1, G–H and Image 4 A–B)

**Material examined:** Three females, 27.7.2009, coll. P. Bohra, Reg.No. IV/2344.

**Measurements:** Females: L = 0.41–0.46 mm; a = 22–24; b = 5.8–6.5; c = 1.1–1.2; c’ = 0.8–0.9; V = 62–66.

**Description:** Female: Body in loose spiral shape. Lip region truncated, marked by 5 annules. Stylet 26–28 µm long, basal knobs indented anteriorly. Excretory pore anterior to oesophago–intestinal junction. Hemizonid at level of excretory pore. Female reproductive system amphidelphic. Spermatheca offset; with sperms. Phasmids 2–4 annules anterior to anus. Tail more curved dorsally, terminus irregularly hemispherical bearing 10–11 annules.

**Habitat and locality:** Collected from soil around roots of Lemon (*Citrus reticulate*) at Kakarwa, Rajasamand District, Rajasthan, India.

**Remarks:** *H. minzi* can be distinguished from *H. canadiensis* by having shorter stylet; (stylet 30–33 µm; female tail terminus hemispherical to irregularly hemispherical with six to 12 annules in *H. canadiensis*).

**Helicotylenchus talonus** Siddiqi, 1972  
(Fig. 1, I–J and Image 5 A–B)

**Material examined:** 3 females, 31.xii.2009; coll. P. Bohra, Reg.No. IV/2344.

**Measurements:** Females: L = 0.41–0.46 mm; a = 22–24; b = 5.8–6.5; c = 1.1–1.2; c’ = 0.8–0.9; V = 62–66.

**Description:** Female: Body spirally curved upon fixation. Lip region hemispheroid, distinctly marked by 4–5 labial annules. Ovaries paired. Intestine not exceeding into rectum. Tail dorsally convex–conoid, with 3–7 annules ventrally and a large, bluntly rounded, claw–like unstriated ventral projection. Habitat and locality: Collected from soil around roots of Lemon (*Citrus reticulate*) at Kakarwa, Rajasamand District, Rajasthan, India.

**Remarks:** *H. talonus* Siddiqi, 1972 comes close to *H. glissus* Thorne & Malek, 1968; *H. bradys* Thorne & Malek, 1968 and *H. borinquensis* Roman, 1965. From *H. glissus* it differs in having a distinctly annulated lip region, a wider tail projection and inner incisures of the lateral fields usually fusing distally on tail. From *H. bradys* it can be differentiated by spear length (spear 29–33 µ long in *H. bradys*), finer body annules (3 µ wide at mid– body in *H. bradys*) and fewer tail annules. From *H. borinquensis* it can be separated by its fewer tail annules, a large tail projection and phasmids which are closer to the anal level.
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Image 5. *Helicotylenchus talonus* Siddiqi, 1972; A - Anterior end; B - Posterior end.

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Family: Telotylenchidae Siddiqi, 1960

**Neodolichorhynchus (Neodolichorhynchus) judithae (Andrassy, 1962)** Jairajpuri & Hunt, 1984
(Fig. 1, K–L and Image 6 A–C)

**Material examined:** Two females, two males; 14.x.2009, coll. R. Sultana, Reg.No. IV/2336.

**Measurements:** Females: L = 0.51–0.55 mm; a = 27–28; b = 4.9–5.6; c = 17–18; c’ = 2.25–3.55; V = 57–58; Males: L = 0.55–0.60 mm; a = 27; b = 4.5–5.3; c = 17; c’ = 3.55–4.00.

**Description:** Female: Body ventrally arcuate upon fixation. Annules prominent, marked by deep transverse striae. Cuticle with 6–14 longitudinal ridges or lamellae outside lateral fields. Lateral fields with four incisions variably aerolated. Lip region rounded, labial framework moderately sclerotized. Stylet 12–17 µm long; conus solid appearing in anterior third. Median bulb round or oval. Female reproductive system amphidelphic. Tail 27–36 µm long, conoid to subcylindrical, ending in a rounded often lobe–like hyaline terminus.

**Male:** Spicules 20–22 µm long. Gubernaculum 12–15 µm long, protrusible. Tail 32–36 µm long, enveloped by large bursa, 59–62 µm long; Bursa not notched at tail terminus (Image 6 B)

**Habitat and locality:** Collected from soil around roots of Chickoo (*Manikara zopota*) at Nathdwara district, Udaipur, Rajasthan, India.

**Remarks:** The measurements of specimens are in conformity with those given by Jairajpuri & Hunt, 1984.

Order: Dorylaimida Pearse, 1942
Family: Dorylaimidae de Man, 1876

**Mesodorylaimus subtiloides (Paetzold, 1958)**
Andrassy, 1959
(Fig. 2 A–B and Image 7 A–C)

**Material examined:** Two females, two males, 14.x.2009, coll. P. Kadela, Reg.No. IV/2283.

**Measurements:** Females: L = 1.17–1.21 mm; a = 31–41; b = 4.45–4.92; c = 8.36–10.85; c’ = 8.5–8.6; V = 47–50. Males: L = 0.88–1.06 mm; a = 31–35; b = 3.50–3.98; c = 40–50; T = 52–55.


**Habitat:** Collected from moist soil around the bank of water body around Aarmpura Range, Sitamata Wildlife Sanctuary, Chittorgarh.

**Remarks:** Identification done with the help of...

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Fig. 2. Mesodorylaimus subtiloides (Paetzold, 1958)
Andrássy, 1959
A - Anterior end; B - Posterior end.
Aporcelaimellus adoxus Tjeukema, Ferris & Ferris, 1971
C - Anterior end; D - Posterior end.
Sicorinema sericatum Siddiqi, 1982
E - Anterior end; F - Posterior end.
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the key provided by Andrassy, 1986 for the genus *Mesodorylaimus*. Measurements of present specimens fit well within the range give by Andrassy, 1986.

**Family: Aporcelaimidae Heyns, 1965**

*Aporcelaimellus adoxus* Tjepkema, Ferris & Ferris, 1971  
(Fig. 2, C–D and Image 8 A–C)


**Measurements:** Females: L = 1.7–2.2 mm; a = 28–33; b = 3.4–4.5; c = 39–48; c’ = 1.4–1.5; V = 45–52.

**Description:** Female: Body curved more posteriorly upon fixation. Lips well separated from each other and set off from body by deep constriction. Amphids funnel-shaped, weakly duplex. Odontostyle 14–19 µm long; its aperture 62–65 % of odontostyle length. Odontophore 22–25 µm long. Guiding ring plicated anteriorly. Oesophageal expansion gradual, expanded part of oesophagus occupies 55–59 % of total oesophageal length. Cardia conical. Cardiac disc present between oesophagus and intestine. Female reproductive system amphidelphic. Pre–rectum 60–62 µm long or 1.9–2.1 anal body–width long. Rectum 35–36 µm long or 1.0–1.2 anal body–width long. Tail 45–47 µm long or 1.4–1.5 anal body–width long, dorsally convex with blunt tip.

**Habitat and locality:** Collected from soil around the roots of Rizka (*Medicago sativa*) at Manda Ki Ghati, Sitamata Wildlife Sanctuary, Chittorgarh, Rajasthan, India.

**Remarks:** Identification done with original description and measurements provided by Tjepkema, Ferris & Ferris, 1971.

**Family: Qudsianematidae Jairajpuri, 1965**

*Sicorinema sericatum* Siddiqi, 1982  
(Fig. 2, E–F and Image 9 A–B)

**Material examined:** Two females.  
(Fig. 3, A–B and Image 10 A–B)

**Measurements:** Females: L = 2.68–2.74 mm; a = 83–85; b = 8.5–8.7; c = 90–91; c’ = 0.9–1.0; V = 53.


**Habitat and locality:** Collected from soil around Dalia Jalashya on Udaipur to Jaisamand Road, Udaipur District, Rajasthan, India.

**Remarks:** The measurement of specimens fits well within the range.

**Family: Leptonchidae Thorne, 1935**

*Sclerostylus karri* Goseco, Ferris & Ferris, 1981  
(Fig. 3, C–D and Image 11 A–B)

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Measurements: Females: L = 0.50–0.72 mm; a = 30–33; b = 4.5–4.8; c = 48–50; c´ = 1.0–1.1; V = 47–48.


Habitat and locality: Collected from soil around roots of unidentified grasses at Borundimaugra, Sitamata Wildlife Sanctuary, Chittorgarh, Rajasthan, India.

Remarks: Measurements of specimens fit well within the range of measurements provided by Goseco, Ferris & Ferris, 1981.

Family: Mydonomidae Thorne, 1964

Dorylaimoides (Longidorylaimoides) akon Goseco Ferris & Ferris, 1976
(Fig. 3, E–F and Image 12, A–C)


Measurements: Female: L = 1.36 mm; a = 34.05; b = 6.8; c = 12.16; c´ = 7.4; V = 44; Male: L = 1.28 mm; a = 40.25; b = 5.8; c = 19.8; c´ = 3.10, T = 63–65.

Description: Female: Body cylindroids, ventrally arcuate upon fixation. Lip region slightly off set, outer liplets and papillae distinct. Odontostyle 12µm long; ventral arm 4µm long. Odontophore 13µm long, arcuate. Oesophageal bulb cylindroids which occupies 50% of oesophageal length. Vulva transverse, ovaries paired. Prerectum distinct. Rectum 20µm long or one anal body diameter. Tail 112µm long, elongate conoid or 7.4 anal body width, terminus dorsally bent. Male: Spicules 40µm long. Lateral guiding pieces present. Series of 5–8 ventromedian supplements plus adanal pair. Tail elongate conoid 3.10 anal body-width long.

Habitat and locality: Collected from moist soil around the bank of Fatehsagar Lake, Udaipur District, Rajasthan, India.

Remarks: Measurements fit well within the range given by Goseco, Ferris & Ferris, 1976.

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