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## *Heterodera raskii* n. sp. (Heteroderidae: Tylenchina), a Cyst Nematode on Grass from Hyderabad, India<sup>1</sup>

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**Abstract:** *Heterodera raskii* n. sp. is described and illustrated from specimens collected from roots of bulb grass, *Cyperus bulbosus*, in Hyderabad, India. The new species belongs to the 'goettingiana' group and differs from closely related *H. cyperi* by the elongate ovoid shaped cysts and females, greater fenestral length, width, vulval slit, and absence of egg sac. The stylet knob shape was round in second-stage juveniles and posteriorly sloping in females and males of *H. raskii* n. sp., while it was anteriorly directed in second-stage juveniles and spherical in females and males of *H. cyperi*.

**Key words:** taxonomy, morphology, bulb grass, *Cyperus bulbosus*.

During the survey of plant parasitic nematodes of fodder grasses cultivated in Hyderabad, India, a new species of *Heterodera* was found on roots of bulb grass (*Cyperus bulbosus* Vab.) and is described here. The cysts were formed on the roots as well as the nuts. In affected fields the bulb grass shows slow decline in growth and loss of vigor.

### MATERIALS AND METHODS

Cysts, white females, males, and second-stage juveniles of the new *Heterodera* species obtained from rhizosphere of bulb grass were fixed in 4% formalin and mounted in glycerine (3). Eggs were mounted in water for comparisons (1). Phase contrast micrographs of the nematodes were taken with an Olympus BHT Standard microscope, and camera lucida figures were used for measurements.

### SPECIES DESCRIPTION

*Heterodera raskii* n. sp.  
(Figs. 1-15)

**Females** (50): Length (including neck) 650  $\mu$ m (575-700); width 240  $\mu$ m (210-

290); stylet length 22.5  $\mu$ m (21-24); dorsal esophageal gland orifice (DGO) from base of stylet 5.6  $\mu$ m (5-7).

**Holotype** (female): Length 670  $\mu$ m; width 230  $\mu$ m; stylet length 23  $\mu$ m; DGO from base of stylet 5.5  $\mu$ m.

**Description:** Female body pearly white, elongate ovoid with protruding neck and prominent vulva. Cephalic sclerotization weak. Head bearing two annules with second always larger than the first (Fig. 7). Stylet with posteriorly sloping knobs. Esophageal region as illustrated with excretory pore in the base of the neck at 125  $\mu$ m (106-140). Egg sac absent.

**Cysts** (50): Length 760  $\mu$ m (710-835); width 280  $\mu$ m (250-310); l/w ratio 3.0 (2.7-3.5).

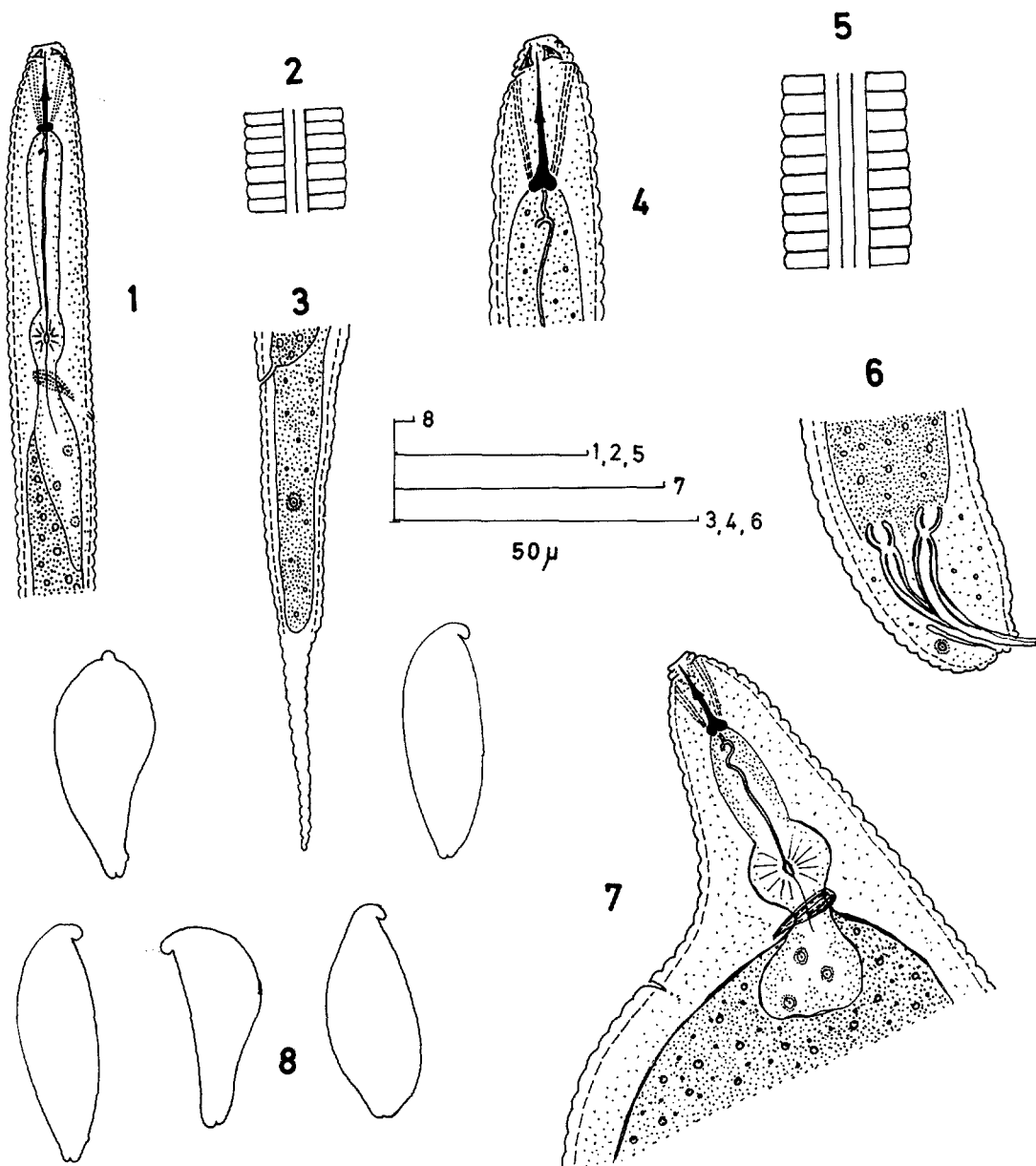
**Description:** Cysts light to dark brown, elongate ovoid, symmetrical with protruding neck and prominent vulva (Figs. 8, 11, 13, 14). External cuticular pattern zig zag without any punctations and the lines not clear in the middle of cyst (Fig. 12). Vulva ambifenestrate and bullae absent (Fig. 15). Semifenestra symmetrical, fenestra length 50  $\mu$ m (48-54), width 43  $\mu$ m (40-45), and vulval slit 49  $\mu$ m (46-52). Length-to-width ratio of fenestra is about 1.2. Underbridge weak and inconspicuous. Anus distinct with circum-anal cuticular pattern and situated at 55  $\mu$ m (50-66) from posterior end (Fig. 14).

**Males** (20): Length 1,015  $\mu$ m (950-1,050); a = 33.8 (30-35); b = 4 (3.5-4.5); b' = 8.4 (7-9.5); c = 338 (317-350); stylet

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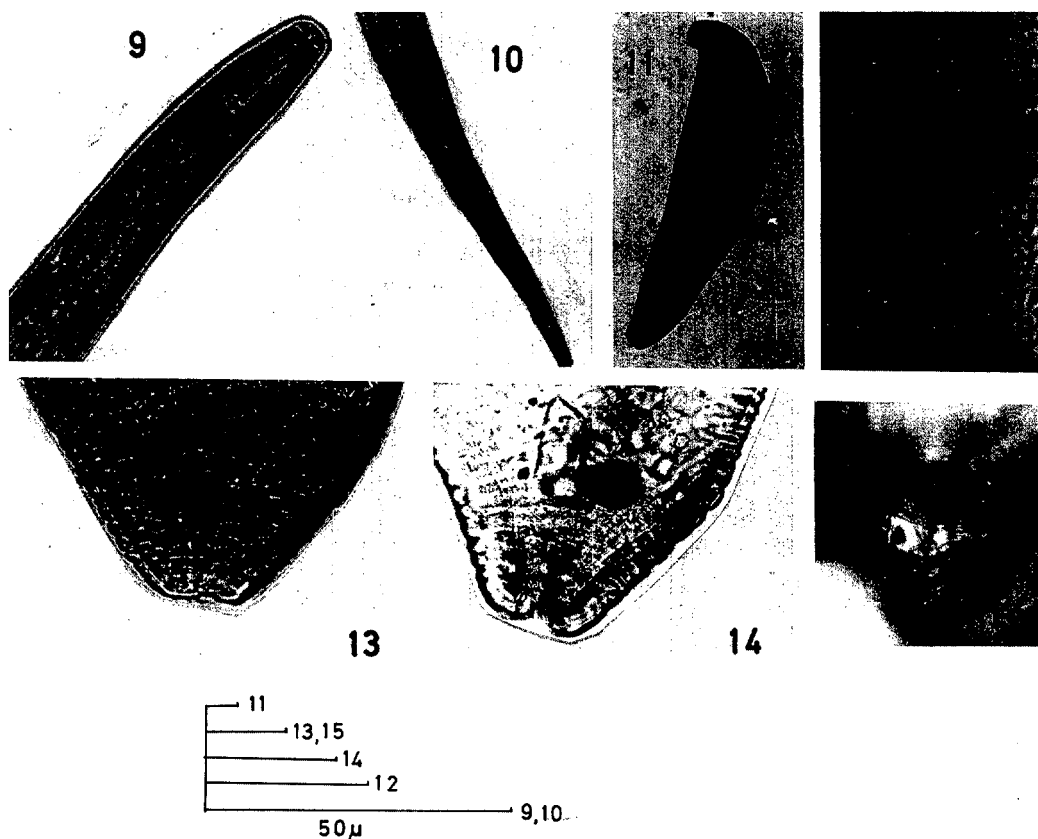


Figs. 1-8. *Heterodera raskii* n. sp. 1) Second-stage juvenile (J2), esophageal region. 2) J2, lateral field. 3) J2, tail. 4) Male, head. 5) Male, lateral field. 6) Male, tail. 7) Female, esophageal region. 8) Cysts.

length 21  $\mu\text{m}$  (20.5-22); DGO from base of stylet 5.5  $\mu\text{m}$  (5-7); spicule length 35  $\mu\text{m}$  (33.5-36); gubernaculum 10.5  $\mu\text{m}$  (9-11.5).

*Allotype* (male): Length 1,005  $\mu\text{m}$ ; a = 30.5; b = 3.8; b' = 7.7; c = 335; stylet length 21  $\mu\text{m}$ ; DGO from base of stylet 5.7  $\mu\text{m}$ ; spicule length 34.2  $\mu\text{m}$ ; gubernaculum 10.5  $\mu\text{m}$ .

*Description.* Males present, body cylindrical, elongate and tapering at both ends. Cuticular annules 1.8  $\mu\text{m}$  apart at mid body. Head offset with five head annules and strong cephalic sclerotization. Stylet with posteriorly sloping knobs (Fig. 4). Median bulb valvated and excretory pore situated at 132  $\mu\text{m}$  (114-147). Lateral field non-



FIGS. 9–15. *Heterodera raskii* n. sp. 9) J2, head. 10) J2, tail. 11) Mature cyst. 12) Cuticular pattern of cyst wall. 13) Vulval cone. 14) Vulval cone with distinct anus. 15) Cone top fenestra.

areolated with four equally spaced lines (Fig. 5). Spicules arcuate with bidentate tips. Tails short bluntly round with protruding cloaca (Fig. 6). Phasmids present in tip of tail.

*Second-stage juveniles* (50): Length 500  $\mu\text{m}$  (470–520); a = 26 (24.5–28); b = 7.5 (7–8); b' = 3.2 (3–3.5); c = 6.3 (6.1–6.4); stylet 18.5  $\mu\text{m}$  (17.5–20); DGO from base of stylet 5.6  $\mu\text{m}$  (5–7); tail length 80  $\mu\text{m}$  (74–85); hyaline portion of tail 34  $\mu\text{m}$  (30–43).

*Description*: Body cylindrical, vermiform finely annulated, annules 1  $\mu\text{m}$  apart at mid body. Head offset with three or four annules, cephalic sclerotization strong. Stylet with round basal knobs (Figs. 1, 9). Excretory pore posterior to nerve ring, situated at 70–95  $\mu\text{m}$  from head end. Lateral field nonareolated with three lines (Fig. 2). Tail long, tapering to a fine acutely pointed terminus (Figs. 3, 10). Phasmids present in the anterior third of the tail.

*Eggs* (100): Length 105  $\mu\text{m}$  (100–200); width 42  $\mu\text{m}$  (39–45); l/w ratio 2.5 (2.4–2.7).

*Description*: Egg shell hyaline without visible markings, second-stage juveniles folded three or four times inside the egg. Eggs visible through the transparent cyst wall (Fig. 13).

*Holotype* (female): Collected in January 1982 from bulb grass cultivated in dry Musi river bed opposite Andhra Pradesh High Court at Hyderabad, India. Slide No. H-2, CPPTI Nematode collection, Hyderabad, India.

*Allotype* (male): Slide No. H-3. Same data and collection as holotype.

*Paratypes*: Cysts and second-stage juveniles deposited with USDA Nematode Collection (USDANC), Beltsville, Maryland, and University of California Nematode Collection, Davis, California.

*Type host and locality*: Rhizosphere and

roots of bulb grass (*Cyperus bulbosus* Vab.) growing in dry Musi river bed opposite Andhra Pradesh High Court at Hyderabad, India.

*Diagnosis:* *Heterodera raskii* n. sp. is a member of the *goettingiana* group or group of 5 of Mulvey (2) because of its elongate ovoid, abullate, and ambifenestrate cysts. Of the described species of this group, it is related most closely to *H. cyperi* Golden, Rau, & Cobb, 1962. The new species differs from *H. cyperi* by its elongate ovoid cyst shape, greater fenestral length, width, vulval slit, second-stage juvenile length, presence of a weak underbridge, and lack of egg sac. Further, the stylet knob shape was posteriorly sloping in female and male and round in the second-stage juvenile of *H. raskii* n. sp. (Figs. 1, 4, 7, 9), while it was

round in female and male and anteriorly directed in second-stage juveniles of *H. cyperi* (1).

The species name is given in honor of Dr. D. J. Raski, who has spent a great deal of his time aiding the development of nematology in India.

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