

# *Heterodera sorghi* sp. n., a new cyst-forming nematode parasitizing sorghum

Kum Kum JAIN, Chaman Lal SETHI, Gopal SWARUP  
and Amar Nath SRIVASTAVA

*Division of Nematology, Indian Agricultural Research Institute, New Delhi-110 012, India.*

## SUMMARY

A new cyst-forming nematode species on sorghum *Heterodera sorghi* n. sp. is identified and described from India. The new species differs from *Heterodera gambiensis*, another cyst forming nematode species from sorghum, in the presence of an egg sac, shorter spicules, shorter vulval slit length and greater depth of underbridge.

## RÉSUMÉ

*Heterodera sorghi* sp. n. un nouveau nématode à kystes parasitant le sorgho

Les auteurs décrivent et figurent un nouveau nématode à kyste, *Heterodera sorghi* sp. n., parasitant le sorgho en Inde. Cette nouvelle espèce diffère d'un autre nématode à kyste parasitant le sorgho (*H. gambiensis*) par la présence d'une masse d'œufs, par des spicules plus courtes, par une fente vulvaire moins longue et par la position plus en profondeur du pont inférieur.

Cysts were found on sorghum (*Sorghum vulgare* Pers.) during a survey for nematodes on various crops of Ghaziabad district (Uttar Pradesh, India). The cysts were light to dark brown in colour with prominent neck and vulval cone. In the newer cysts, a thick sub crystalline layer was present. Merny and Netscher (1976) described *H. gambiensis* from sorghum and pearl millet (*Pennisetum typhoides* Rich.). A comparison with the measurements and description of *H. gambiensis* indicated that the present population is close to it but differs in some important respects like presence of an egg sac, length of vulval slit, depth of underbridge, longer males and spicules and non-infestation of *P. typhoides*. It is, therefore, described here as a new species.

## *Heterodera sorghi* n. sp.

### FEMALES

#### Measurements

*Holotype*: L (excluding neck) = 500  $\mu\text{m}$ ; w = 310  $\mu\text{m}$ ; neck length = 118  $\mu\text{m}$ ; stylet length = 25  $\mu\text{m}$ .

*Paratypes* (15) : L = 500-980 (730  $\pm$  40.2)  $\mu\text{m}$ ; w = 300-580 (482.8  $\pm$  22.2)  $\mu\text{m}$ ; neck length = 90-190 (117.8  $\pm$  6.64)  $\mu\text{m}$ ; stylet length = 24-26  $\mu\text{m}$ .

#### Description

Female white, lemon shaped with long neck and prominent vulval cone; lip region truncate with two retrorse annules, the second larger than the first; cephalic sclerotization weak; stylet weak, 24-26  $\mu\text{m}$  long with prominent posteriorly sloping knobs; dorsal oesophageal gland opening 4.5  $\mu\text{m}$  behind stylet base; metacarpus rounded, massive, with well developed valvular apparatus. Cuticular annulation only in anterior region with a zig zag pattern posteriorly. Excretory pore not distinct.

### CYSTS

*Measurements* (20) : L (excluding neck) = 550-910 (738.6  $\pm$  25.2)  $\mu\text{m}$ ; w = 400-600 (492  $\pm$  142)  $\mu\text{m}$ ; L/w = 1.2-1.8 (1.4  $\pm$  0.041); vulval-slit

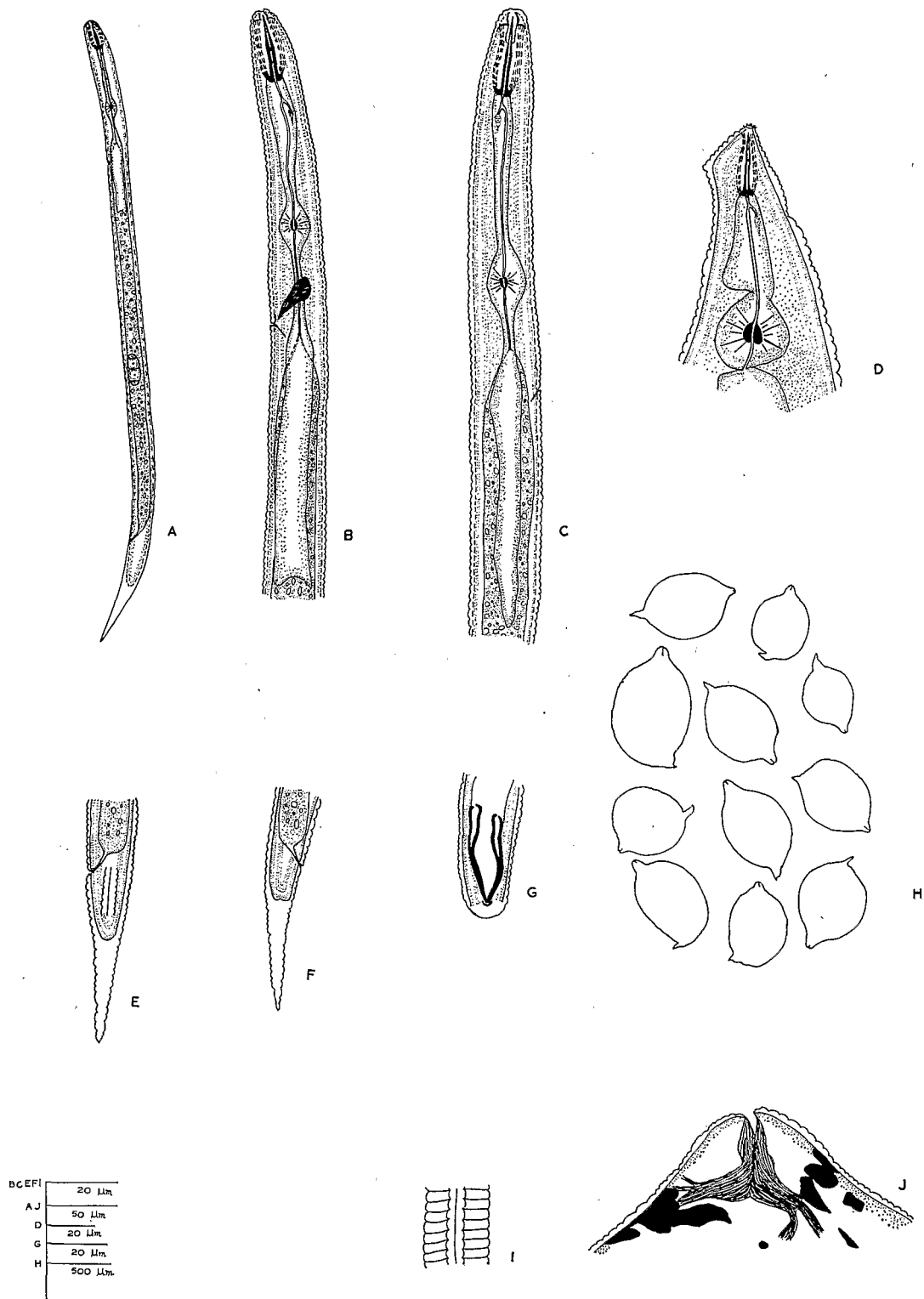


Fig. 1. *Heterodera sorghi* n. sp. 2nd stage larva. A : Entire, B : Anterior end, E-F : Tail region ; Male. C : Anterior end, G : Tail region, I : Lateral lines ; Female. D : Anterior end. H : Mature cysts. J : Vulval cone, lateral view.

length = 28-39 ( $31.8 \pm 1.30$ )  $\mu\text{m}$ ; fenestral length = 40-56 ( $47.4 \pm 1.99$ )  $\mu\text{m}$ ; fenestral width = 32-56 ( $38.4 \pm 2.08$ )  $\mu\text{m}$ ; underbridge length = 70-115 ( $79.3 \pm 4.39$ )  $\mu\text{m}$ ; width = 28-40 ( $32.7 \pm 1.51$ )  $\mu\text{m}$ ; depth = 58-70 ( $60.8 \pm 1.67$ )  $\mu\text{m}$ .

#### Description

Light to dark brown in colour, lemon shaped with prominent neck and vulval cone; new cysts covered completely with thick sub-crystalline layer; cuticular pattern zig-zag; cyst cone ambifenestrate, fenestrae separated by a narrow vulval bridge; underbridge strongly developed without finger-like projections in the middle, attached to the cyst wall by such projections, bullae dark brown in colour, numerous and at the level of underbridge, varying in size, shape and number.

#### SECOND STAGE JUVENILES

*Measurements* (20): L = 420-525 ( $461 \pm 6.19$ )  $\mu\text{m}$ ; a = 20-26 ( $23 \pm 0.33$ ); b = 8-12 ( $9 \pm 0.2$ ); stylet length = 20-22 ( $21 \pm 0.16$ )  $\mu\text{m}$ ; tail length = 42-60 ( $52 \pm 0.85$ )  $\mu\text{m}$ ; hyaline portion = 28-35 ( $31 \pm 0.39$ )  $\mu\text{m}$ ; tail length/hyaline length area = 1.3 — 1.8 ( $1.7 \pm 0.03$ ).

#### Description

Body slightly curved ventrally when heat relaxed; slightly tapering anteriorly, more attenuated at the posterior end. Cuticle annulated, annules 1.6  $\mu\text{m}$  apart in mid-body region; lateral fields with three incisures, not areolated; lip region dome-shaped with three annules, cephalic frame-work heavily sclerotized; stylet strong, anterior and posterior portions of almost equal length, knobs with concave anterior surfaces. Dorsal oesophageal gland opening situated 5-6  $\mu\text{m}$  behind the stylet base, median oesophageal bulb ovoid, with well developed valvular apparatus; oesophageal glands elongated, covering the intestine ventrolaterally, nuclei not seen; nerve ring situated in the middle of the isthmus. Hemizonid 3-4 annules anterior to oesophago-intestinal junction, excretory pore immediately behind the hemizonid. Tail tapering posteriorly, conical. Phasmids small, pore like, 3-4 annules behind the anus level.

#### MALES

*Measurements* (10): L = 950-1 360 ( $1 185 \pm 33.66$ )  $\mu\text{m}$ ; a = 32-44 ( $39 \pm 1.18$ ); b = 8-12 ( $9 \pm 0.33$ ); b' = 5-7 ( $6 \pm 0.22$ ); c = 111-193 ( $144.7 \pm 6.04$ ); spicule length = 25-30 ( $28 \pm 0.36$ )  $\mu\text{m}$ ; gubernaculum = 8-10 ( $9 \pm 0.19$ )  $\mu\text{m}$ ; stylet length = 24-26 ( $25 \pm 0.16$ )  $\mu\text{m}$ .

#### Description

Body curved ventrally when relaxed, tapering anteriorly, tail terminus rounded; cuticle coarse, 1.8 to 2.0  $\mu\text{m}$  thick in the mid-body region; lateral fields with three lines, not areolated outer lines crenate; lip region dome shaped, with four annules (in some specimens (25%) four on one side and three on the other side); cephalic sclerotization heavy; stylet strong, knobs posteriorly rounded and anteriorly flat; hemizonid three annules posterior to oesophago-intestinal junction and extending over two annules; excretory pore three annules behind the position of hemizonid; testis single, slightly reflexed in the anterior region; spicules slightly arcuate ventrally; gubernaculum simple, thin, rod shaped; phasmids indistinct.

#### TYPE DATA

*Holotype*: Cyst, deposited in the National Nematode Collection, Indian Agricultural Research Institute, New Delhi, India.

*Paratypes*: Fifteen juveniles, six males, two females, thirteen cone tops, eight anterior ends of female, deposited at the same place. One male, ten juveniles and five cysts deposited in each of the following collections: Rothamsted Experiment Station, Harpenden, Herts, UK; USDA National Collection, Beltsville, Md, USA; University of California, Div. Nematology Davis, Ca, USA; Laboratorium voor Nematologie, Plantenziektenkundigedienst, Wageningen, Nederland.

*Type host*: Collected from roots of *Sorghum vulgare* Pers.

*Type locality*: Village Raispur, District Ghaziabad, U.P., India. Additional collection from Allahabad Agricultural Institute Farm, Naini and adjoining villages.

#### DIAGNOSIS

*Heterodera sorghi* n.sp. falls in group IV of Mulvey (1972) because of the presence of bullae and a well developed underbridge. In the presence of an egg sac, shorter spicules, shorter vulval slit length and greater depth of the underbridge, the present species is differentiated from *H. gambiensis* which has been recorded also on *Sorghum vulgare* by Merny & Netscher (1976) (egg sac absent, spicule length = 37.46  $\mu\text{m}$ ; vulval slit length = 49-60  $\mu\text{m}$ ; depth of underbridge 24-40  $\mu\text{m}$  in *H. gambiensis*). In the absence of finger-like projections in the underbridge, the present form does not fit with any of the recorded species in the Group IV of Mulvey (1972). From *H. gambiensis*, the present form is further distinguish-

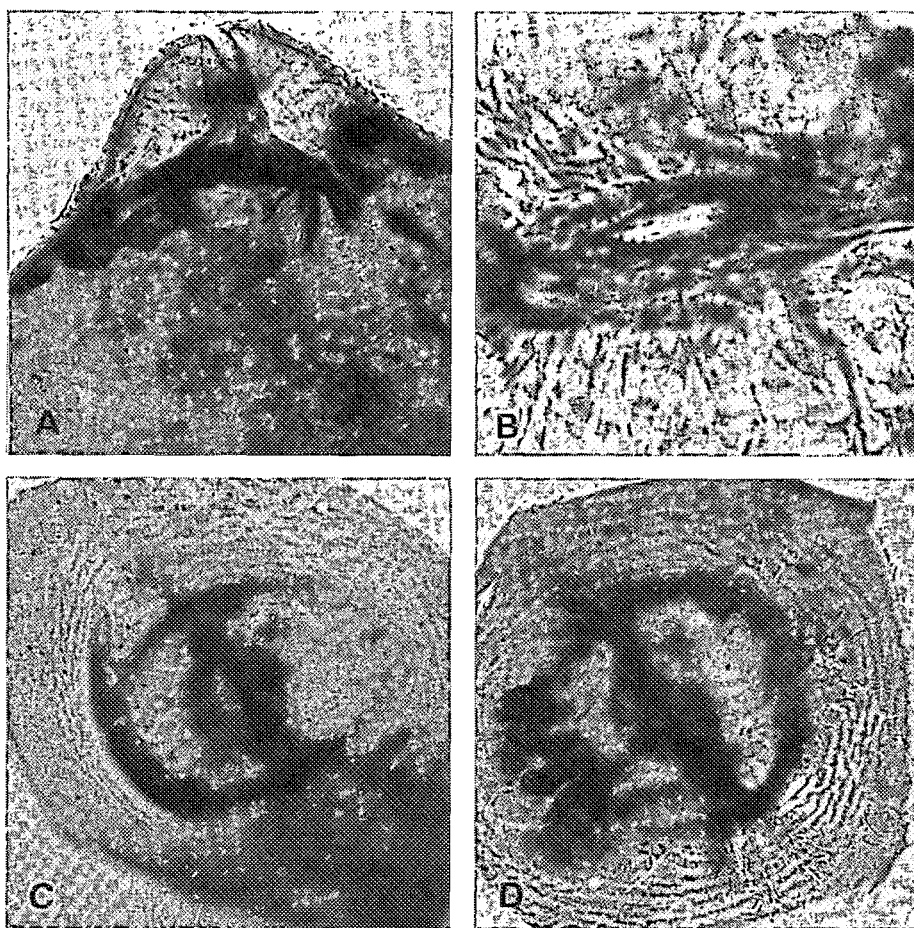


Fig. 2. *Heterodera sorghi* n. sp. A : cone top ; B : vulval slit ; C : central part of underbridge showing absence of finger-like projections ; D : distal parts of underbridge and bullae.

ed by the non-infestation of *Pennisetum typhoideum*, a host recorded for *H. gambiensis*. Of the other species in Group IV, *H. sorghi* sp. n. is differentiated from *H. vigni*, *H. elachista*, *H. oryzicola* and *H. oryzae* by having three lateral incisures in males as against four. It differs further from *H. oryzae* by shorter vulval slit length and length and width of fenestra being more or less equal (vulval slit length 43-51  $\mu\text{m}$ ; width of fenestra more than length). From *H. oryzicola* it is differentiated by shorter vulval slit length, greater length and width of fenestrae; longer stylet of second stage juveniles (vulval slit length 36-47  $\mu\text{m}$ , length of fenestra 27-40  $\mu\text{m}$ ; width of fenestra 20-39  $\mu\text{m}$ , stylet length of second stage juveniles 17-19  $\mu\text{m}$  in *H. oryzicola*). It also differs from *H. sacchari* and *H. leuceilyma* by the absence of

finger-like projections in the underbridge of the vulval cone.

#### REFERENCES

- MERNY, G. & NETSCHER, C. (1976). *Heterodera gambiensis* n. sp. (Nematoda : Tylenchida) parasite du mil et du Sorgho en Gambie. *Cah. ORSTOM Sér. Biol.*, 11 : 209-218.
- MULVEY, R. H. (1972). Identification of *Heterodera* cysts by terminal and cone top structures. *Can. J. Zool.*, 50 : 1277-1292.
- RAO, Y. S., & JAYAPRAKASH, A. (1978). *Heterodera oryzicola* n. sp. (Nematoda : Heteroderidae) a cyst nematode on rice (*Oryza sativa* L.) from Kerala State, India. *Nematologica*, 24 : 341-346.

Accepté pour publication le 13 novembre 1981.