C.I.H. Descriptions of
Plant-parasitic Nematodes
Set 4, No. 48

HETERODERA SACCHARI

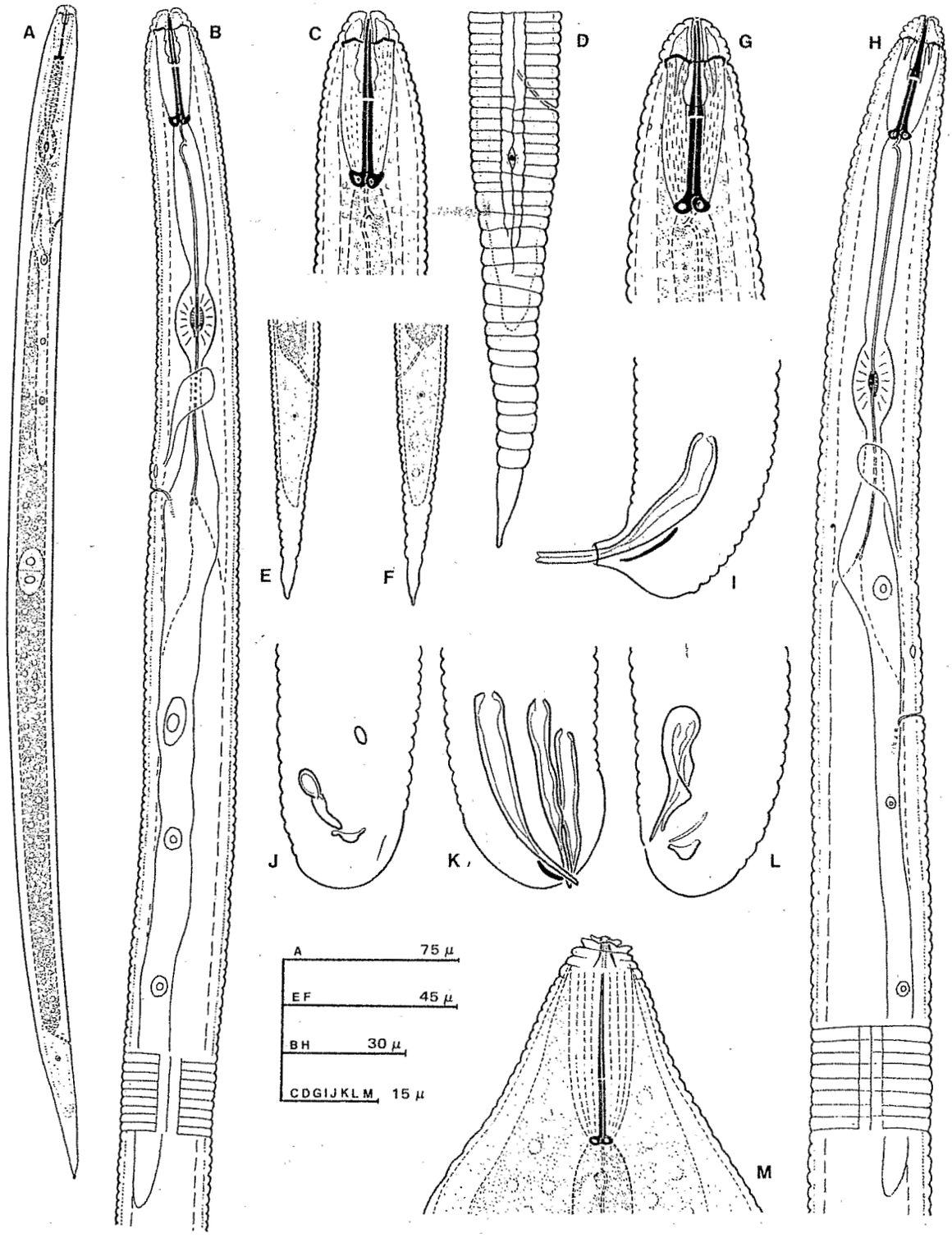


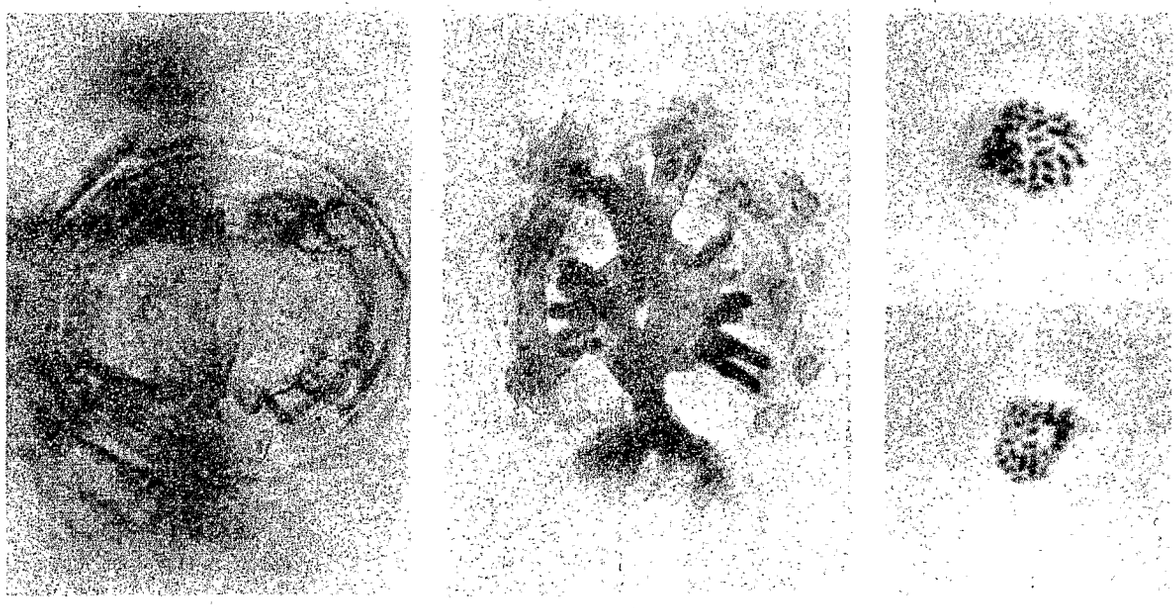
Fig. 1. *Heterodera sacchari* Luc & Merny. A–F. Second-stage larva. A. Entire larva. B. Oesophageal region. C. Head end. D, E, F. Tail ends. G–L. Male. G. Head end. H. Oesophageal region. I. Normal tail end, lateral view. J, K, L. Tail ends showing abnormal copulatory apparatus. M. Anterior end of young female. (A, D, E, F, M after Luc & Merny, 1963; I, J, K, L after Netscher, Luc & Merny, 1969; B, C, G, H original.)

***Heterodera sacchari* Luc & Merny, 1963.** LUC (M.)

MEASUREMENTS Original population, sugar-cane, Congo (after Luc & Merny, 1963; Netscher, Luc & Merny, 1969). 100 cysts: L = 0.38–1.03 (0.65) mm; breadth = 0.28–0.83 (0.45) mm; L/breadth = 1.02–2.2 (1.5).

20♂♂: L = 1.04–1.51 mm; a = 44–57; b = 3–7; T = 42–76; spear = 24–30 μ; spicules = 29–38 μ; gubernaculum = 8 μ.

25 second-stage larvae: L (n = 100) = 0.42–0.53 (0.48) mm; a = 24–28 (26); b = 2.3–3.6 (3.0); c (n = 11) = 8.3–9.5 (8.8); breadth = 17–19 (18.5) μ; spear = 21–24 (22) μ; tail length = 49–60 μ; hyaline part of



A B C

Fig. 2. *Heterodera sacchari* Luc & Merny. A. Fenestrae and vulval slit. B. Underbridge. C. Telophase plates of the first meiotic division. (C after Netscher, 1969; A & B original.)

the tail = 20–30 (26) μ; hyaline part of the tail/spear length = 0.9–1.5.
Paedotype: L = 0.49 mm; a = 27.4; b = 2.9; c = 8.5; breadth = 17.5 μ; spear = 22 μ; hyaline part of tail = 24 μ.
Population 2917, from flooded rice, Ivory Coast (after Merny, 1970). 60 cysts: L = 0.50–0.89 (0.64) mm; breadth = 0.32–0.62 (0.43) mm; length/breadth = 1.2–2.0 (1.5).
1♂: L = 1.03 mm; a = 40; b = 5; T = 32; spear = 26 μ; spicules = 30 μ; gubernaculum = 7 μ.
60 second-stage larvae: L (n = 206) = 0.42–0.53 (0.50) mm; a = 22–33 (29); b (n = 53) = 1.8–2.5 (2.2); c (n = 24) = 7.3–9.7 (8.8); breadth = 16–20 (17.5) μ; spear = 21–26 (22.5) μ; hyaline part of tail = 27–35 (30) μ; hyaline part of the tail/spear length = 1.0–1.5 (1.3).

DESCRIPTION **Mature females:** White, lemon-shaped; lip region truncated, with 2 offset retrorse annules; weak cephalic sclerotization. Weak spear, 23–25 μ long, with small rounded knobs. Opening of the dorsal oesophageal gland situated 4–5 μ behind the spear; procorpus cylindrical; heavy median bulb with strong valvular apparatus; short isthmus; basal glandular part of the oesophagus nearly spherical. Nerve ring encircling the isthmus. Excretory pore situated 165–175 μ from the anterior extremity.

Cysts: Mature cysts brown to dark brown, lemon-shaped with prominent vulval cone and neck of medium size. Cuticle with a lace-like pattern; numerous "perforations" evenly but irregularly distributed on the inner layer. Young cysts with a **thick subcrystalline layer. Cyst cone ambifenestrate:** fenestrae rather obscurely demarcated, 45–55 μ long and 35–45 μ wide; vulval slit 50–52 μ long, as long as vulval bridge; **underbridge strongly developed with finger-like projections:** length = 100–150 μ; width = 50–70 μ; depth = 22–28 μ (Mulvey, 1972); **few peripheral bullae.**

Males: Rare. Body from nearly straight to C-shaped when relaxed by heat, twisted at the posterior end, cylindrical, slightly tapering anteriorly, terminus rounded. Cuticle distinctly annulated; annules 2.5 μ in the middle of body; lateral field faintly marked by **3 longitudinal lines (= incisures) irregularly crossed by annules,** occupying 1/5 of the corresponding body width. Lip region dome-shaped, with 4–5 (exceptionally 6) annules, often anastomosed, without longitudinal striations; cephalic framework heavily sclerotized, with outer margin conspicuously marked; cephalids difficult to see, situated 2 and 6–7 annules behind labial constriction. Spear strong, anterior and posterior parts of the same length; knobs rounded posteriorly and with flat, sloping anterior surface. Dorsal oesophageal gland opening situated 4 μ behind the spear. Median oesophageal bulb ovoid; dorsal gland short and wide with a large nucleus, anterior to the **subventral glands which are elongated and narrow,** and each with a small nucleus. Nerve ring strongly marked, encircling the oesophagus just behind the median bulb. Excretory pore situated 137–150 μ from the anterior end. Hemizonid flat, 7–15 μ anterior to the excretory pore and extending over one annule. Hemizonion not seen. Testis single; spermatozoa 4–5 μ in diameter. Spicules curved, **notched at the tip**; specimens with **abnormal atrophied spicules frequent** (up to 20% of the specimens); exceptionally, three spicules where observed. Spicular sheath present. Lamellate gubernaculum. Tail 1/4 to 1/3 of the cloacal diameter. Phasmids not observed.

Eggs: 112–139 (128) μ long, 43–45 (44) μ wide; L/W = 2.5–3.1 (2.9); **retained in body.**

Second-stage larvae: Body straight or slightly ventrally curved when heat-relaxed, slightly tapering at the anterior end, more attenuated at the posterior one. Cuticle annulated; annules 1.7 μ wide in the middle of body; **lateral field composed of 3 longitudinal lines,** not crossed by annules except in the fore-part and at the level of the phasmids. Lip region dome-shaped, **with 3 annules;** cephalic framework heavily sclerotized. Spear strong, anterior part slightly shorter than the posterior; knobs well developed, rounded posteriorly, concave anteriorly. Dorsal oesophageal gland opening situated 5–8 μ behind the spear; median oesophageal bulb ovoid, with strong valvular apparatus; dorsal gland broad, anterior to the subventrals, with a large nucleus; **subventral glands not completely filling the body cavity,** each with a small nucleus. Nerve ring well defined, situated immediately behind the median bulb. Excretory pore 104–130 μ from the anterior end. Hemizonid immediately in front of the excretory pore, lenticular, extending over 2 annules. Genital primordium with 2 nuclei, located at the mid-body. Tail elongated, conical, with pointed terminus. Phasmids pore-like, situated 45–47 μ from the posterior end.

H. sacchari falls into group 4 of *Heterodera* species, as defined by Mulvey (1972), in which the cysts are lemon-shaped, the vulval slit is >30 μ and there is generally a strong underbridge with few or many bullae. In this group, *H. sacchari* is characterized by having few bullae and a massive underbridge with finger-like projections, the underbridge being 22–28 μ below the fenestral level (see keys in Mulvey, 1972).

TYPE HOST AND LOCALITY *Saccharum officinale* L. (sugar-cane) var. POJ 2878, S.I.A.N. Estate, Jacob, Congo.

SYSTEMATIC POSITION Tylenchida: Tylenchoidea: Heteroderidae: Heteroderinae: *Heterodera* Schmidt, 1871.

DISTRIBUTION AND HOSTS Found originally on sugar-cane in Congo. *Heterodera sacchari* was recorded on the same species at Bacita, Northern Nigeria (Jerath, 1968). This nematode is frequent in flooded rice fields of north and central Ivory Coast (Merny, 1970). Populations of a *Heterodera* found in flooded rice fields of Casamance (Senegal) are tentatively ascribed to this species (Fortuner & Merny, 1973). It has been recorded in India on *Saccharum spontaneum* (Swarup *et al.*, 1964), and Singh (1974) recorded larvae thought to be this species from sugar-cane soil in Jamaica.

BIOLOGY Monolarval infestations proved *H. sacchari* to be **parthenogenetic.** This parthenogenesis is of the mitotic type and there are **27 chromosomes, indicating that the species is triploid** (Netscher, 1969). **Males are rare,** only being found in any number in old-established pot cultures. **They are apparently not functional,** a great number of them (20%) having **deficient copulatory apparatus.** The larvae hatch easily in plain water. At Bacita, Nigeria, Jerath (1968) observed that *H. sacchari* was more abundant in sandy soils than in clay soils, and that cysts were more numerous in the soil during the dry season.

HOST-PARASITE RELATIONSHIPS Sugar-cane plants attacked by *H. sacchari* are stunted, measuring 1–1.5 m in height and remaining thin as compared with healthy plants which are 3–4 m high; secondary roots are fewer in damaged plants (Jerath, 1968).

CONTROL Little work has been done on control. Jerath (1968) indicated that molasses applied to sugar-cane fields decreases the number of cysts recovered to one-fourth of the number found in untreated soils.

LITERATURE CITED

Fortuner, R. & Merny, G., 1973. *Cah. ORSTOM Sér. Biol.* **21,** 3–20. **Jerath, M.L., 1968.** *Pl. Dis. Reptr* **52,** 237–239 [*H.A.* **37,** No. 3509]. **Luc, M. & Merny, G., 1963.** *Nematologica* **9,** 31–37 [*H.A.* **33,** No. 1621]. **Merny, G., 1970.** *Cah. ORSTOM, Sér. Biol.* **11,** 3–43 [*H.A.*(*B*) **40,** No. 909]. **Mulvey, R.H., 1972.** *Canad. J. Zool.* **50,** 1277–1292 [*H.A.*(*B*) **42,** No. 567]. **Netscher, C., 1969.** *Nematologica* **15,** 10–14 [*H.A.* **38,** No. 6452]. **Netscher, C., Luc, M. & Merny, G., 1969.** *Nematologica* **15,** 156–157 [*H.A.* **38,** No. 6273]. **Singh, N.D., 1974.** *Pl. Dis. Reptr* **58,** 122. **Swarup, G., Prasad, S.K. & Raski, D.J., 1964.** *Pl. Dis. Reptr* **48,** 325 [*H.A.* **33,** No. 2696].

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