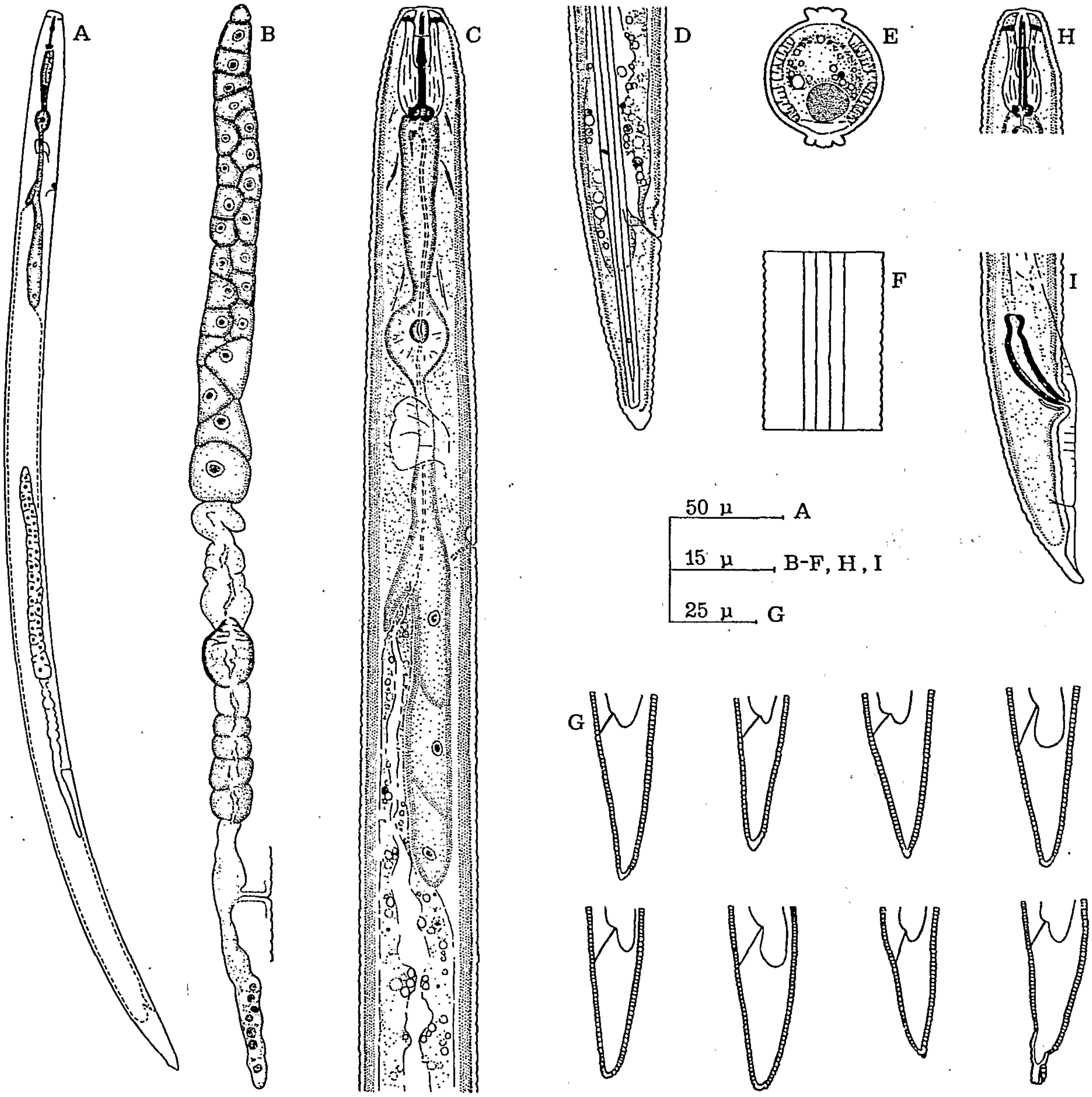
C.I.H. Descriptions of
Plant-parasitic Nematodes
Set 6, No. 77

PRATYLENCHUS ZEAE



Pratylenchus zeae Graham. A–G. Female. A. Entire female. B. Ovary. C. Oesophageal region. D. Tail. E. Mid-body transverse section showing lateral fields. F. Lateral field in surface view. G. Tails. H, I. Male. H. Head. I. Tail. (A–F. Specimens from Senegal (orig.). G. After Taylor & Jenkins (1957). H, I. Specimens from Ivory Coast (orig.).)

Pratylenchus zeae **Graham, 1951.**

MEASUREMENTS After Sher & Allen (1953): ♀♀: L = 0.36–0.58 mm; a = 25–30; b = 5.4–8.0; c = 17–21; $V = {}^{26-43}68\text{–}76^{3.4-6.0}$; spear = 15–17 µ.

Neotype ♀: L = 0.47 mm; a = 26; b = 5.9; c = 21; $V = {}^{30}70^{4}$; spear = 16 µ.

After Taylor & Jenkins (1957): 90 ♀♀: L = 0.413–0.639 mm; a = 17–25; b = 5.0–9.6; c = 11.2–24.1; V = 64.7–74.9.

After Merny (1970): 25 ♀♀: L = 0.34–0.55 mm; a = 22–33; b = 3.3–4.9; c = 13–18; V = 69–74; spear = 15–18 µ.

5 ♂♂: L = 0.40–0.42 mm; a = 27–32; b = 3.6–5.0; c = 17–21; spear = 15 µ; T = 30–44.

Specimens from Senegal: 25 ♀♀: L = 0.373–0.506 (0.428) mm; a = 20–30; b = 4.9–6.1; b′ = 3.2–4.6; c = 15–19; $V = {}^{23-38}68.6\text{–}73.9^{3.8-6.7}$; spear = 15.5–16.5 µ.

DESCRIPTION **Female:** Body slender, almost straight when relaxed, marked by very faint annules. Lateral field with 4 incisures extending along tail beyond phasmids; the inner band shows a slight irregularity in the mid-body region but no corresponding 5th line is seen in transverse section (Fig. E, F). **Lip region** not set off from body, **bears 3 annules.** Outer margins of heavily sclerotized labial framework extend into body about one annule. **Spear 15–17 µ long,** with broad, anteriorly flattened basal knobs. Orifice of dorsal oesophageal gland about 3 µ behind spear base. Hemizonid about 2 body annules long, just in front of excretory pore; hemizonion 9–11 annules behind hemizonid. Ovary not extending to oesophagus, with oocytes in double row, except for the last 2 or 3. Oviduct indistinct; uterus short; **spermatheca round,** small, **without sperms** (even in the only population recorded with males): the "spermatheca" full of sperms described by Merny (1970) was, in fact, mature eggs of granular appearance. **Vulva at 68–76% of body length.** Post-vulval uterine branch short, 1–2 body widths long, with rudiments of ovary. Intestine with a short postrectal extension dorsally. Phasmids slightly posterior to middle of tail. Tail tapering, with 16–25 annules in a Senegal population (25–27 according to Seinhorst, 1968): **terminus variable, generally almost pointed, narrowly rounded to subacute, unstriated.**

Male: Extremely rare, found only once in Ivory Coast (Merny, 1970), not essential for reproduction. Similar to female except for sexual dimorphism. Spicules slender, ventrally arcuate, 14–15 μ long; gubernaculum 4–5 μ in length; bursa margins faintly crenate.

For variations within this species see Taylor & Jenkins (1957).

TYPE HOST AND LOCALITY Roots of maize (*Zea mays*), Florence, South Carolina, USA.

SYSTEMATIC POSITION Tylenchida: Tylenchoidea: Pratylenchidae: Pratylenchinae: *Pratylenchus* Filipjev, 1936.

DISTRIBUTION AND HOSTS *P. zeae* is a pest of tobacco in the USA and Madagascar (Baudin & Vuong, 1973); of maize in the USA, Panama, Brazil, Egypt, South Africa and India (Monteiro, 1963; Pall & Chand, 1971); of cotton in the USA; of sweet corn (*Zea mays* var. *saccharata*) in south-east USA; of sugarcane in the USA, Trinidad, Iraq, Rhodesia and Hawaii (Allow & Katcho, 1967; Martin, 1967; Singh, 1974b); of rice in the USA, Brazil, Rhodesia, Ivory Coast, Cuba and Senegal (Atkins *et al.*, 1957; Fortuner, 1975; Gateva & Penton, 1971). Other hosts are sorghum, millet, rye, soybean, tomato, oat, sweet potato, wheat, peanut, barley, strawberry, blue lupin, cowpea, *Amaranthus spinosus, Ambrosia artemisiifolia, Andropogon virginicus, Chenopodium album, C. ambrosioides, Crotalaria mucronata, C. spectabilis, Cynodon dactylon, Dactyloctenium aegyptium, Digitaria sanguinalis, Diodia teres, Echinochloa crus-galli, Eremochloa ophiuroides, Heterotheca subaxillaris, Lespedeza* sp., *Solidago gigantea, Tribulus terrestris, Xanthium pungens* in the USA (Graham, 1951; Ayoub, 1961), *Panicum maximum*, and *P. purpurascens* in Brazil (Lordello & Mello Filho, 1970), *Pennisetum glaucum* and sorghum × sudangrass hybrids (Johnson & Burton, 1973), *Capsicum annuum* in Trinidad (Singh, 1974a), onion and lettuce in Nigeria (Bridge, 1972) and natural uncultivated grassland in Japan (Gotoh, 1970) and in South Africa (Van der Vegte & Hèyns, 1963). *P. zeae* was recorded in Australia on sugarcane and peach (Colbran, 1955) and M. R. Siddiqi (pers. commun.) records it from *Sorghum vulgare*, wheat and maize in Rhodesia; from sugarcane in Malawi, Nigeria and several localities in Venezuela; from maize and rice in Malawi and from pangola grass (*Digitaria decumbens*) in Trinidad.

BIOLOGY AND LIFE-HISTORY *P. zeae* is a migratory endoparasite of the root cortex, entering the smaller roots at any point. All stages are found in the outer parenchyma cells, never in the vascular tissues, usually lying parallel to the root axis. Relatively few eggs are laid, either singly or in scattered groups of 3–4 within a single lesion. Hatching takes 15–20 days and the period from egg to maturity is 35–40 days (Graham, 1951). Overwintering occurs in the USA in dead roots of crabgrass (*Digitaria* sp.) maize, cotton and, to a lesser extent, tobacco. Nematodes are also able to survive the winter in soil without roots. Maize root rot was more severe and the number of nematodes increased with increasing soil temperature from 16–21°C to 27–32°C (Graham, 1951). In the presence of plant roots sandy soils are more favourable for horizontal migration than clay soils. There is little or no migration in the absence of roots (Endo, 1959). Krusberg (1960) assayed homogenates and extracts of *P. zeae* for various enzymes: he found cellulolitic enzyme activity, which probably helps the nematode to penetrate cell walls.

HOST-PARASITE RELATIONSHIPS Symptoms of attack by *P. zeae* and *P. brachyurus* on tobacco include stunting, wilting and premature yellowing of the leaves; reddish brown lesions appear on the roots followed by rotting and breaking when plants are removed from soil, giving the root system a brush-like appearance. In spite of the severe damage, Graham (1951) reports that lesions contain only 2–4 nematodes although, in experiments, growth was reduced by 43 %. Southards (1971), however, found no evidence of feeding by *P. zeae* on tobacco in Tennessee, USA. Damage to maize is much less severe although up to 100 nematodes may be found in a lesion. Consequently, tobacco grown after maize may be severely damaged (Graham, 1951). Harrison (1952) reports injury to maize by this nematode in Texas. A high negative correlation between nematode numbers and dry weight of tops of maize in pot experiments was found by Tarté (1971). Cotton harboured fewer *P. zeae* than maize but tobacco following cotton had increased root damage (Graham, 1951).

ASSOCIATIONS WITH OTHER PATHOGENS In the glasshouse, *P. zeae* alone and with *Phytophthora* sp. caused significant reduction in sugarcane yield from the plant crop but not from the ratoon crop: populations of *P. zeae* were higher in roots containing the fungus (Khan, 1959). In the field, in Louisiana, up to 225 *P. zeae* per gram of root were found. *P. zeae* and *Phytophthora megasperma* affected sugarcane growth independently (Khan, 1963). When sugarcane was inoculated with *P. zeae* and *Pythium graminicola* both parasites were found in the same lesions but their effect appeared to be independent and additive after 12 weeks at 30°C. Nematode population increase was less when the fungus was present (Santo & Holtzmann, 1970; Holtzmann & Santo, 1971).

CONTROL Tobacco grown after cotton or maize in infested land suffered more from root rot than when planted after other crops, or when tobacco was grown continuously (Graham, 1951). Millet and sorghum × sudangrass hybrids are poor summer cover crops because they favour intensive development of *P. zeae* (Johnson & Burton, 1973). Resistance to cyst nematode *Heterodera glycines* in "Peking" soybean does not confer similar resistance to root lesion nematode (Endo, 1967). Maize varieties Nab Elgamal, Early American and Giza Baladi showed less damage from *P. zeae* than did Single Cross 14 and Double Cross 67 (Oteifa & Taha, 1964). Tiflate pearl millet was more resistant than other millets and sorghums to injury by *P. zeae* (Johnson & Burton, 1973).

Vapam gave good control of the nematode and increased maize yield in Egypt (Oteifa & Taha, 1964). In Hawaii pre- and post-planting treatment of sugarcane with DD and DBCP reduced populations of *P. zeae* but did not give an economic yield increase (Holtzmann & Wismer, 1967). DD, DBCP, EDB, aldicarb, carbofuran, fensulfothion, phenamiphos and prophos at 6.7 kg/ha all controlled *P. zeae*; *Zea mays* var. *saccharata* sown 1–3 days after the treatments showed increased average yields (Johnson & Chalfant, 1972, 1973). When soil heavily infested with various plant-parasitic nematodes including *P. zeae* was treated with Nemagon, Nemacur, Mocap, methomyl or Dowfume MC-2 the greatest yield increases of *Capsicum annuum* followed treatment with Nemagon 75 % emulsifiable concentrate or methomyl, but yields were not correlated with reduced nematode populations (Singh, 1974a). Phenamiphos and aldicarb at 11.2 kg/ha significantly reduced the number of nematodes and increased yield of pearl millet and sorghum × sudangrass hybrids (Johnson & Burton, 1973).

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