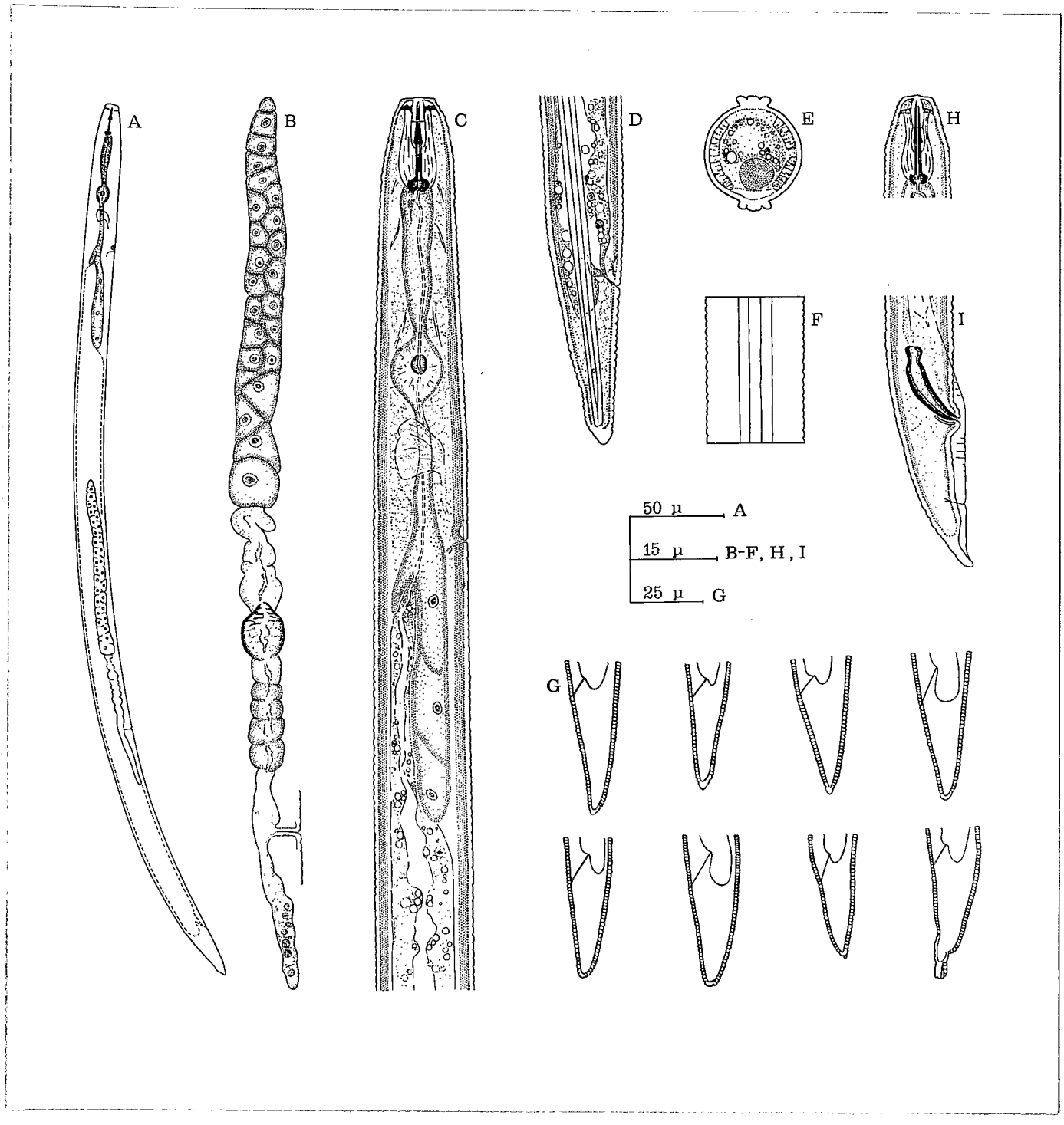
FORTUNER (R.)
ORSTOM Adiopodoumé 1975.

PRATYLENCHUS ZEAE



Pratylenchus zeae Graham. A-G. Female. H,I. Male. A. Entire female. B. Ovary. C. Oesophageal region. D. Tail. E. Mid body section showing lateral fields. F. Lateral view. G. Tail ends. 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; c = 17-21; V = $^{26-43}_{68-76}$ $^{3.4-6}$; 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 = 5-9.6; 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; 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 = $^{23-38}_{68.6-73.9}$ $^{3.8-6.7}$; spear = 15.5-16.5µ.

DESCRIPTION Female : Body slender, almost straight when relaxed, marqued by very faint annules. Lateral fields with 4 incisures extending on tail past phasmids; the inner band shows a slight irregularity in mid-body section but there is no corresponding 5th line in lateral view (fig. E, F). Lip region not set off from body, rounded, bears 3 annules. Outer margins of heavily sclerotized labial framework extend into body about I body annule. Spear 15-17 µ long, with broad flattened basal knobs. Orifice of dorsal oesophageal gland about 3 µ behind spear base. Hemizonid about 2 body annules long, just above excretory pore; Hemizonion 9-11 annules behind hemizonid. Ovary not extending to oesophagus, with oocytes in double row, except for the 2-3 last ones. Oviduct indistinct Uterus short. Spermatheca round, small, without sperms even in the only population with males : the "spermatheca" full of sperms described by Merny (1970) are in fact mature eggs of granular appearance. Vulva anterior for the genus (V = 68-76). Post uterine branch short, 1-2 body width long. Intestine with dorsal extention posterior to rectum. Phasmids slightly posterior to middle of tail. Tail tapering, terminus variable, generally almost pointed, narrowly rounded to subacute, unstriated, with 16-25 annules in Senegal population (25-27 in Seinhorst, 1968).

Male : Extremely rare, found only once in Ivory Coast (Merny, 1970). 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.

TYPE HABITAT 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 ; of maize in the USA, Panama, Brazil. Egypt, South Africa and India ; of cotton in the USA ; of sweet corn (*Zea mays* var. *saccharata*) in southeast USA ; of sugar cane in the USA, Trinidad, Iraq, Rhodesia and Hawaii ; of rice in the USA, Brazil, Rhodesia, Ivory Coast, Cuba and Senegal. Other hosts are sorghum, millet, rye, soybean, tomato, oat, sweet potato, wheat, peanut, barley, strawberry, blue lupine, cowpea, *Digitaria sanguinalis, Solidago gigantea, Chenopodium ambrosioides, Amaranthus spinosus, Chenopodium album, Xanthium pungens, Heterotheca subaxillaris, Crotalaria mucronata, Ambrosia artemisiifolia, Andropogon virginicus, Diodea teres, Eremochloa ophiuroides, Lespedeza sp., Cynodon dactylon, Crotalaria spectabilis, Dactylocetenium aegyptium, Tribulus terrestris, Echinochloa crus galli* in the USA (Graham, 1951), (Ayoub, 1961), *Panicum maximum*, and *P. purpurascens* in Brazil (Lordello & Mello Filho, 1970), *Pennisetum glaucum* and Sorghum x sudan grass hybrids (Johnson & Burton, 1973) *Capsicum annuum* in Trinidad (Singh, 1974) Onion and lettuce in Nigeria (Bridge, 1972) and natural uncultivated grassland in Japan (Gotoh, 1970).

BIOLOGY AND LIFE HISTORY *P. zeae* is a migratory endoparasite of the root cortex. Nematodes enter 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 singly or in scattered groups of 3-4 within a single lesion. The period required for hatching is 15-20 days and the period from eggs to maturity is 35-40 days (Graham, 1951). Overwintering occurs in the USA in crabgrass, maize, cotton and, to a lesser extent, tobacco dead roots. Nematodes were also able to survive through winter in soil without roots. Maize root rot was more severe and the number of nematodes increased with increasing soil temperature from 15.6-21.1°C to 26.7-32.2°C (Graham, 1951). Horizontal migration of *P. zeae* was favored by sandy soils much better than by clay soils in the presence of plant roots. There was little or no migration in the absence of roots (Endo, 1959). Homogenate and extract of *P. zeae* were assayed for various enzymes by Krusberg, 1960. Cellulolitic enzyme activity was present, which probably helped the nematode penetrate cell walls.

HOST PARASITE RELATIONSHIPS In the USA, root rot of tobacco caused by *P. zeae* and *P. brachyurus* appears in infested areas or individually diseased plants. Plants attacked early grow no more than 30 cm. Mildly affected plants show various degrees of wilting even though soil moisture is adequate, causing premature yellowing and production of low quality leaf. Nematodes produce elongated and reddish brown lesions 1-2 mm long which enlarge later. Finally all the outer parts of invaded roots decay. The roots break when diseased plants are pulled out causing a typical brush like appearance to the root system. Tobacco do not support large populations of *P. zeae* : no more than 2-4 nematodes were found from any single lesion, yet tobacco was more severely damaged than maize. Experimental trials showed growth of tobacco was reduced by as much as 43% : (Graham, 1961). On maize, early lesions appearedas indistinct water soaked

areas which later became discolorated. Populations were much more numerous : as much as 100 nematodes per lesion, thus increasing the severity of infestation in subsequent tobacco crop (Graham, 1951). In Texas, *P. zeae* caused considerable damage to maize roots (Harrison, 1952). Maize sown in pots inoculated with 0 to 10000 *P. zeae* showed highly negative correlation between initial population of *P. zeae* and dry weight of tops (Tarte, 1971). Cotton harboured fewer nematodes than maize but favoured root rot in following tobacco crop (Graham, 1951).

On sugarcane, in greenhouse, *P. zeae* alone and with *Phytophthora sp.* caused significant reduction in plant cane yield but not in stubble cane yield. Populations of *P. zeae* were higher in roots containing the fungus. The nematode alone caused yellowing and stiffening of leaves and shortened internodes. Stubble cane exibited shortened chlorotic leaves in early growth stage. Roots were thickened and distorted and had fewer feeder branches (Khan, 1959). In the field, in Louisiana, up to 225 *P. zeae* per gram of root were found. *P. zeae* and *Phytophthora megasperma* affected independantly sugar cane growth (Khan, 1963). When sugar cane was inoculated with *P. zeae* and *Pythium graminicola* both parasites were found in the same lesions but their effect appeared to be independant and additive after 12 weeks at 30°C. Nematode population increase was less when the fungus was present (Santos & Holtzmann, 1970).

CONTROL Tobacco grown after cotton or corn 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 x 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 variety does not confer similar resistance to root lesion nematode (Endo, 1967). Maize varieties Nab Elganal, Harly American, 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). Pre and post planting treatment of sugar cane with DD and DBCP reduced populations of *P. zeae* but yield increase was not economic. DD, DBCP, EDB, aldicarb, carbofuran, fensulfothion, phenamiphos, and prophos at 617 kg/ha all controlled *P. zeae*. *Zea mays var. saccharata* sown 1-3 days after treatment showed increased average yields (Johnson & Chalfant, 1972). When *Capsicum annuum* was treated with Nemagon, Nemacur, Mocap, methomyl, and Dowfume MC-2, Nemagon 75% emulsifiate concentrate and methomyl gave the greatest increase in yield but there was no correlation with reduction in nematode populations (Singh, 1974). Bay 68138 and aldicarb at 11.2 kg/ha significantly reduced the number of nematodes and increased yield of pearl millet and sorghum x sudangrass hybrids (Johnson & Burton, 1973).

LITERATURE CITED

Allow, J.M., & Katcho, Z.A., 1967 - Pl. Dis. Reptr. 51, 809 (H.A. 38, N° 2742).

Atkins, J.G., Fielding, M.J. & Hollis, J.P., 1957 - Pl. Prot. Bull. FAO 5, 53-56 (H.A. 26, N° 225a).

Ayoub, S.M., 1961 - Pl. Dis Reptr 45, 940 (H.A. 32, N° 252).

Baudin, P. & Vuong Huu Hai, 1973 - Agron. trop. Nogent 28, 189-207 (H.A. (B) 43, N° 299).

Bridge, J., 1972 - Samaru Micel. Paper, Ahmadu Bello Univ., Nigeria, N° 42, 17 pp. (H.A. (B) 43, N° 551).

Endo, B.Y., 1959 - Phytopathology 49, 417-421 (H.A. 29, N° 716).

Endo, B;y;, 1967 - Nematologica 13, 140-141 (H.A. 36, N° 3268).

Fortuner, R., 1975 - Cah. ORSTOM, Sér. Biol. 10, 147-159.

Gateva, S. & Penton, G., 1971 - Ciencias Agropecuarias, Ser. I, Ingenieria Agronomica 10, 19pp. (H.A. (B) 42, N° 494).

Gotoh, A., 1970 - Proc. Ass. Pl. Prot. Kyushu 16, 34-37 (H.A. (B) 43, N° 435).

Graham, T.W., 1951 - Bull. S. Carol. Agric. Exp. Stn 390, 25pp. (H.A. 20, N° 84a).

Harrison, A.L., 1952 - Pl. Dis. Reptr. 36, 491 (H.A. 21, N° 760d).

Holtzmann, V. & Santo, G.S., 1971 - Phytopathology 61, 1321 (H.A. (B) 41, N° 406).

Holtzmann, V. & Wismer, C.A., 1967 - Proc. 12th Congr. Intern. Soc. Sug. Cane Technol. Puerto Rico, 1413-1419 (H.A. 37, N° 3534).

Johnson, A.M. & Burton, C.W., 1973 - J. Nematol. 5, 54-59 (H.A. (B) 43, N° 224).

Johnson, A.W.& Chalfant, R.B., 1972 - J. Nematol. 4, 227-228 (H.A. (B) 42, N° 668).

Johnson, A.W. & Chalfant, R.B. 1973 - J. Nematol. 5, 177-180 (H.A. (B) 43, N° 473).

Khan, S.A., 1959 - Phytopathology 49, 543 (H.A. 29, N° 2236).

Khan, S.A., 1963 - Proc. 11th Congr. intern. Soc. Sug. Cane Technol. Mauritius, 711-717 (H.A. 33, N° 1998).

Krusberg, L.R., 1960 - Phytopathology 50, 9-22 (H.A. 29, N° 1501).

Lordello, L.G.E. & Mello Filho, A. de T., 1970 - Revta Agric. Piracicaba 45, 78 (H.A. (B) 41, N° 687).

Martin, G.C., 1967 - FAO Pl. Prot. Bull. 15, 45-58 (H.A. 38, N° 2903).

Merny, G., 1970 - Cah. ORSTOM, Sér. Biol. II, 3-4 (H.A. (B) 40, N° 909).

Monteiro, A.R., 1963 - Revta Agric., S. Paulo 38, 177-187 (H.A. 36, N° 1588).

Monteiro, A.R., 1968 - Solo 60, 81 (H.A. (B) 40, N° 293).

Oteifa, B.A. & Taha, A., 1964 - Tech. Bull. Bahtim Exp. Stn. Egypt agric. Org. 74, 26pp. (H.A. 38, N° 4076).

Pall, B.S. & Chand, J.N., 1971 - Indian Phytopath. 24, 607-608 (H.A. (B) 42, N° 508).

Santo, G.S. & Holtzmann, O.V., 1970 - Phytopathology 60, 1537 (H.A. (B) 40, N° 338).

Seinhorst, J.W., 1968 - Nematologica 14, 497-510 (H.A. 38, N° 2836).

Sher, S.A. & Allen, M.W., 1953 - Univ. Calif. Publs Zool. 57, 441-470 (H.A. 22, N° 417b).

Singh, N.D., 1974 - Trop. Agric., Trinidad 51, 81-84 (H.A. (B) 43, N° 491).

Singh, N.D., 1974 - Pl. Dis. Reptr 58, 122 (H.A. (B) 44, N° 73).

Southards, C.J., 1971 - Pl. Dis. Reptr. 55, 41-44 (H.A. (B) 40, N° 782).

Tarte, R., 1971 - J. Nematol. 3, 330-331 (H.A. (B) 41, N° 386).

Taylor, D.P. & Jenkins, W.R., 1957 - Nematologica 2, 159-174 (H.A. 26, N° 124j).

Van der Vegte, F.A. & Heyns, J., 1963 - Koedoe 6, 134-136.