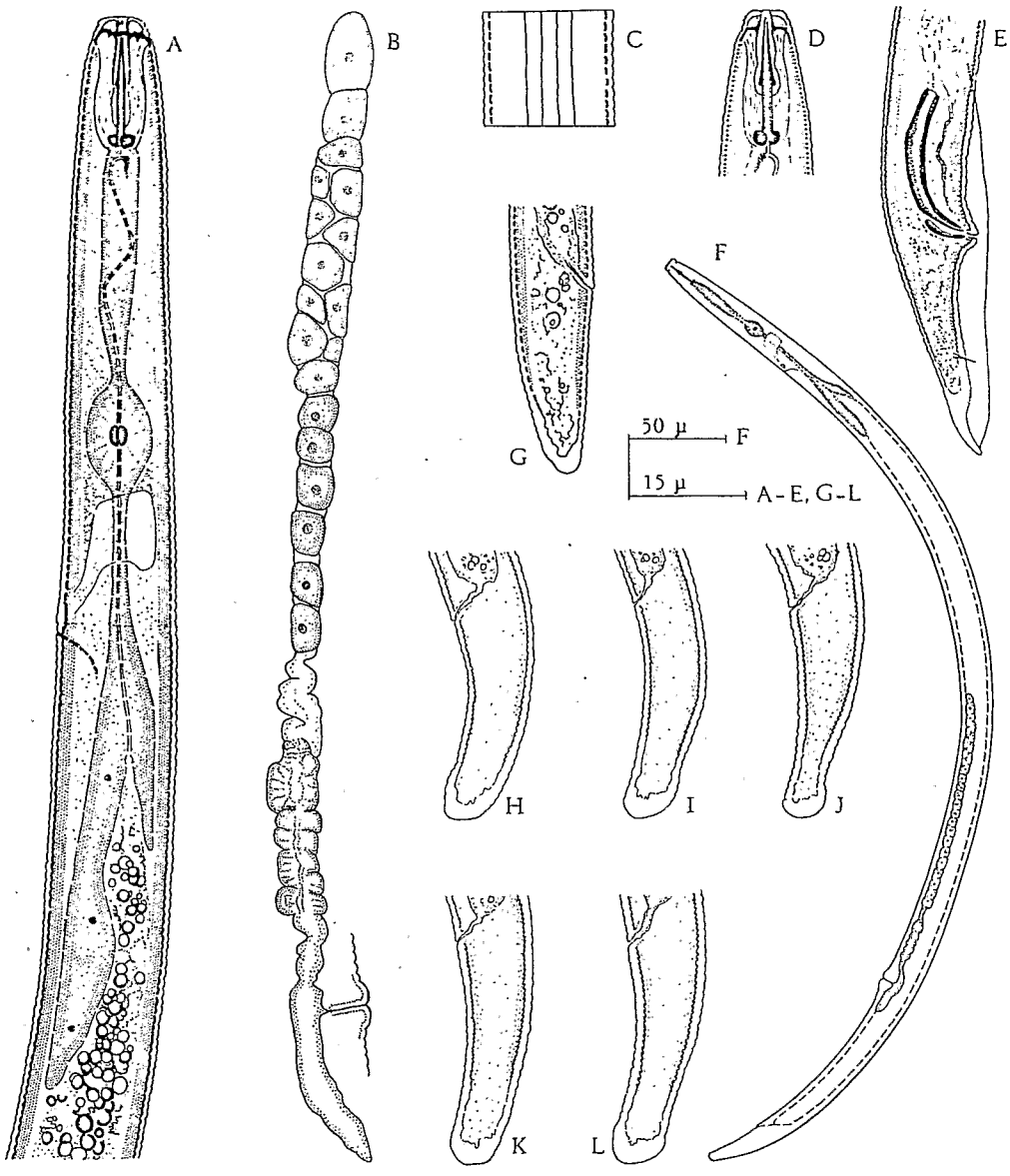
C.I.H. Descriptions of
Plant-parasitic Nematodes
Set 7, No. 93

PRATYLENCHUS THORNEI



Pratylenchus thornei Sher & Allen. A. Oesophageal region. B. Ovary. C. Lateral field. D, E. Male. D. Head. E. Tail. F. Entire female. G–L. Tails. (A–C, F & G. Specimens from Mexico, courtesy of S.D. Van Gundy. D, E, J–L. Specimens from Morocco. H, I. Specimens from Holland.)

***Pratylenchus thornei* Sher & Allen, 1953.**

MEASUREMENTS (After Sher & Allen, 1953): ♀♀: L = 450–770 µ; a = 26–36; b = 5.5–8; c = 18–22; V = $^{26-35}$73–80$^{4-6}$; spear = 17–19 µ. Holotype ♀: L = 570 µ; a = 31; b = 5.8; c = 20; V = ^{29}77.4$^{4.4}$; spear = 18 µ.
Allotype ♂: L = 480 µ; a = 32; b = 5.6; c = 20; T = 30; spear = 16 µ.
(After Loof, 1960): ♀♀: L = 408–708 µ; a = 25.3–36.4; b = 5.4–8.3; c = 16.8–25.1; V = $^{24-38}$74.4–79; spear = 15–19 µ.
♂: L = 492 µ; a = 29; b = 6.2; c = 20.3; spear = 16 µ.
(After D'Errico, 1970): ♀♀: L = 454–614 µ; a = 28–32; b = 4.8–7.8; b′ = 3.9–5.6; c = 18.8–27.7; V = 76–79; spear = 15 µ.
(From *Citrus*, Morocco, original observations): ♂: L = 551 µ; a = 39; b = 6.3; b′ = 4.2; c = 19; spear = 16 µ.

DESCRIPTION **Female:** Body large and slender, assuming an open "C" shape when killed by gentle heat. Cuticle with transverse striae about 1 µ apart, not conspicuous. Lateral field with 4 incisures, the outer ones straight or weakly crenate. In one specimen, oblique striae were observed by Loof (1960) in the central zone. **Lip region with 3 annules, not set off from body. Outer margin of sclerotized labial framework extends conspicuously about 2 annules into body and about 1 annule into lip region.** Spear guiding apparatus extends posteriorly from basal plate for about 4 annules. **Spear medium sized (17–19 µ long)** with broadly rounded to almost anteriorly flattened basal knobs. Orifice of dorsal oesophageal gland about 3 µ behind spear base. Nerve ring directly behind oesophageal bulb; hemizonid about 2 annules long, 1 annule anterior to excretory pore. Ovary not extending up to oesophagus; oocytes in single row, except for the anterior zone of multiplication; oviduct indistinct, uterus short. **Spermatheca difficult to see, not containing spermatozoa (males very rare);** post uterine sac a little more than one and one half times body width at

vulva. Phasmids slightly posterior to middle of tail; the 4 incisures extend past the phasmids. Tail dorsally convex-conoid, terminus bluntly rounded to truncate, unstriated.

Male: Very rare (only 2 specimens previously known, the allotype and one observed by Loof, 1960; a third has been found by the present author from citrus in Morocco). Similar to female. Outstretched testis with spermatocytes in single row, followed by a region of multiple rows. Phasmids slightly posterior to mid-tail, not extending into bursa. Spicules very long (21 μ), arcuate, hafted, resting upon trough-shaped gubernaculum.

TYPE HOST AND LOCALITY Grass, University of California campus, Berkeley, California, USA.

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

DISTRIBUTION AND HOSTS *P. thornei* was first observed by Sher & Allen (1953) in California associated with grass, oak, sugar beet, grape, bean, manzanita, nectarine, strawberry, walnut, cypress and pine and in Utah on wheat and sugar beet. It is an important pest of wheat in Utah (Thorne, 1961), Australia (Colbran & McCulloch, 1965) Yugoslavia (Grujičič, 1969), India (Joshi *et al.*, 1970), Italy (D'Errico, 1970), and Mexico (Perez *et al.*, 1970). It is known in Holland on *Iberis* sp., maize, red currant, apple, pear, plum and cherry (Oostenbrink, 1954), in Belgium on rose (Coolen & Hendricks, 1972) and chrysanthemum (d'Herde & Brande, 1963), in soil in Germany (Loof, 1960), on fruit trees in Italy (D'Errico, 1970), in Egypt on sugar cane (Oteifa *et al.*, 1963a) and onion (Oteifa & El-Sharkawi, 1965), on tomato, bean, wheat, alfalfa and tea in Iran (Kheiri, 1972), in soil on Tenerife Island (Guiran & Vilardebo, 1962), in South Africa (Koen, 1969), in Japan (Gotoh & Ohshima, 1963) and in Mexico on *Agrostis* sp., *Trifolium repens* and *Crotalaria juncea* (Van Gundy *et al.*, 1974).

BIOLOGY AND LIFE-HISTORY *P. thornei* is a root parasite, primarily of wheat. The initial invasion is probably at random but other nematodes subsequently enter through the wounds, perhaps attracted by the contents of the punctured cells (Baxter & Blake, 1967). After 6 weeks, in the field as well as *in vitro*, many nematodes are found inside the roots, usually in the cortex, lying parallel to the long axis of the root. As the cytoplasm is withdrawn from the cells the walls disintegrate and cavities are formed in the cortex. These are enlarged when several nematodes are present. Necrosis is confined to the cells lining the cavities and to epidermal cells injured during invasion. The vascular tissue appears unaltered while the cortex remains intact but when it is destroyed the epidermis sloughs off and the exposed stele becomes necrotic. Eggs are laid singly and deposited in groups or in rows. Second-stage juveniles appear 24 days after inoculation (Baxter & Blake, 1968). In Utah, USA, where infection occurs only in rather heavy clay loams, the nematodes may migrate into the soil when the roots become hard and inhospitable and remain there until the next crop is planted (Thorne, 1961). In Holland and in Mexico infestation is also found in heavy soils (Loof, 1960; Van Gundy *et al.*, 1974). In experimental conditions wheat plants kept at 14°C during the early part of the growth cycle were not significantly affected by the nematode; maximum reduction in yield occurred in plants grown at 25°C throughout their cycle (Van Gundy *et al.*, 1974). In clay loam, in the absence of a host, the number of nematodes diminishes rapidly during the first 5 weeks, then more slowly for 50 weeks. Survival of *P. thornei* in 200 g soil samples is reduced by drying to 5% moisture content and/or high temperature: at 40°C the nematode is killed in less than 2 weeks, but this may be due to moisture loss from the soil. During the experiment many nematodes, at first inactive and irregularly shaped, recovered when placed in water. Freezing to −5°C induces inactivity (Baxter & Blake, 1968). In Egypt *P. thornei* occurs at soil depths of around 40 cm under fallow, then moves upwards when sugar-cane is planted (Oteifa *et al.*, 1963b). Monoxenic culture of *P. thornei* is possible on lucerne callus tissue on a medium devoid of coconut milk (Andersen, 1972).

HOST–PARASITE RELATIONSHIPS *P. thornei* is a serious parasite of wheat in Salt Lake County (Utah) causing severe stunting and shrinkage of grains (Thorne, 1961). In Mexico most root samples contained 0–400 nematodes/g; some had as many as 4,800. Damage included stunting, chlorosis, sometimes necrosis of leaf tips, reduced tillering and reduced size and number of ears, but only rarely death of the plant (Van Gundy *et al.*, 1974). In pot experiments the threshold for occurrence of damage was 42 *P. thornei* per 100 cc sterilized soil, which caused reduction of head weight. Field observations in Mexico have shown a higher threshold—50–100 nematodes per 100 g of soil (Van Gundy *et al.*, 1974). Wheat is also affected in Yugoslavia where *P. thornei* causes ear sterility resulting in heavy crop losses (Grujičič, 1969). In a wheat field in India, the plants had a sickly appearance, with poor patchy growth. Roots were infested but without any browning or lesions (Sethi & Swarup, 1971). The damage is probably due to loss of the cortex which reduces the absorptive capacity of the root. There is no change in either number or size of cells (Baxter & Blake, 1968). *P. thornei* also causes growth stagnation in barley and apple in Holland (Oostenbrink *et al.*, 1956), and in maize and oats in Utah (Thorne, 1961).

ASSOCIATIONS WITH OTHER PATHOGENS Oats and maize infested by *P. thornei* are subject to severe attack by smut (Thorne, 1961). Nematode attack on wheat roots in Mexico causes them to be vulnerable to soil fungi, mainly *Fusarium solani*, so that the wheat problem in Mexico may be the result of a disease complex (Van Gundy *et al.*, 1974).

CONTROL Since infestation in Utah occurs only on rather heavy clay loams, soil fumigation is impractical (Thorne, 1961). Methyl bromide seems to induce bromine toxicity in wheat in England (Jones, 1969) and in Mexico (Van Gundy *et al.*, 1974). In Holland, wheat growth in pots was improved by fumigation with DD or heating the soil at 60°C for 2 hrs (Oostenbrink *et al.*, 1956). In Mexico, 1,3-D at 187 and 373 l/ha increased plant growth and vigour but due to the low commercial value of wheat, chemical soil treatment is not economic (Van Gundy *et al.*, 1974). Varietal resistance has not been found in existing wheat cultivars in Mexico (Van Gundy *et al.*, 1974), nor in the sugar cane varieties CO 413, N. CO310 and 48D12 tested in Egypt (Oteifa *et al.*, 1963a). Some rose cultivars or rootstocks are better hosts than others (Winfield, 1974). Crop rotation with alfalfa and sugar beet for several years reduced populations of *P. thornei* to negligible numbers in Utah (Thorne, 1961). Flax, peas, potatoes and beet seem to reduce *P. thornei* populations in Holland (Oostenbrink *et al.*, 1956). Numbers of *P. thornei* were higher in a wheat–fallow–wheat rotation than in rotations involving maize, cotton or soybean and/or in which wheat does not appear for 2 consecutive years. Correct nitrogen fertilization prevents damage in Mexico if the nematode populations are not too high. The wheat problem in Mexico can be reduced by pest management, e.g. improvement of host vigour through nitrogen nutrition, late planting when soil temperature has declined to 15°C and certain crop rotations (Van Gundy *et al.*, 1974).

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