

Observations on the morphology and histopathology of *Quinisulcius acti* on corn

Nicola VOVLAS

Istituto di Nematologia Agraria, C.N.R., 70126 Bari, Italy.

SUMMARY

The original description of *Quinisulcius acti* (Hooper, 1959) Siddiqi, 1971 is amplified and supplemented with observations by light microscope and scanning electron microscope (SEM). The main characters added to those already reported for this species are the irregular areolations on the lateral field of the anterior part of the body; the slightly fourlobed shape of the head; the well-developed hemizonid and the inner incisure of the lateral field on the tail which does not end at the phasmid level, but is present for all the length of the lateral field in the posterior portion. *Q. acti* has semi-endoparasitic habits on the feeder roots of corn and causes lesions and cavities in epidermal, subepidermal and cortical tissue.

RÉSUMÉ

Observations sur la morphologie et l'histopathologie de Quinisulcius acti sur maïs

La description originale de *Quinisulcius acti* (Hooper, 1959) Siddiqi, 1971 est étendue et complétée grâce à des observations au microscope optique et au microscope électronique à balayage (SEM). Parmi les nouvelles caractéristiques de cette espèce, les principales sont constituées par les aréolations irrégulières du champ latéral observées à la partie antérieure du corps, la forme légèrement quadrilobée de la tête, l'hémizonide bien développé et l'incisure interne du champ latéral qui ne se termine pas au niveau de la phasmide mais est présente dans toute la partie postérieure du champ latéral. *Q. acti* est un endoparasite des racines nourricières du maïs et provoque des lésions et des cavités dans les tissus épidermique, subépidermique et cortical.

The genus *Quinisulcius* was established by Siddiqi (1971) and on that occasion, *Tylenchorhynchus*

information on the pathological effects of the nematode feeding activity on corn roots.

in the lateral field were included in this genus. Populations of *Q. acti* are reported from Chiavari, Genoa, Italy, around roots of *Phoenix dactylifera*, and from rhizosphere of *Bambusa* sp., in Mexico (Loof, 1959; Knobloch & Laughlin, 1973).

During 1981 a nematode survey of corn (*Zea*

Materials and methods

Specimens were obtained from soil around roots of corn growing in Lido di Volano, Ferrara, and from glasshouse cultures on corn hybrid Dekalb XL41

(1973). Ethanol was used for dehydration instead of acetone.

Clay pots, containing 500 g of steam pasteurized loam soil and one corn seedling, were inoculated with 500 specimens/pot of *Q. acti*.

For histological observations small segments (4-5 mm long) of corn hybrid Dekalb-XL-41 roots collected two and four weeks after inoculation were washed free of soil fixed in chrome-acetic-formalin solution for 48 hours, dehydrated in tertiary butyl alcohol, stained in Safranin and fast-green and mounted in dammar xylene (Johansen, 1940).

Results

MEASUREMENTS AND MORPHOLOGY

Measurements of *Quinisulcius acti* (Hooper, 1959) Siddiqi, 1971, from corn fields collected in Volano (Ferrara), Northern Italian Adriatic coast, are as follows :

Females (n = 25). L = 690 (641-730) μm ; a = 33 (31-35) ; b = 4.9 (4.1-5.3) ; c = 15 (13-16) ; stylet = 16 (15-17) μm ; V% = 56 (54-57) ; MB = 51 (57-60) ; c' = 3.0 (2.8-3.2) ; m = 46 (43-50) ; O = 17 (18-19) ; phasmids = 32 (31-34) μm from terminus ; tail annules = 46 (42-51).

Light microscope and SEM observations have shown that the body of this species is cylindrical, tapering at both ends (Figs. 2 B, E) assuming an open C-shaped when killed by gentle heat (Fig. 1 B). Head hemispherical in profile with eight distinct postlabial annules, clearly separated from the body by a distinct lip constriction (Fig. 2 A, B). The head region is divided into two halves by a dorsal and ventral hollow assuming a four-lobed shape ; each half is subdivided by shallower grooves that delimit the two lateral sectors, these being smaller than the subdorsal and subventral sectors (Fig. 2 A). Body annules fine, about 1.2 μm wide at mid body. The lateral fields have five incisures, 6-7 μm wide, and occupy 30% of body width (Figs. 1 D, 2 C, D). Anteriorly the lateral fields begin at 12th-15th body annule as two or three bands forming 3-4 incisures, and after another 5-10 annules show the 5th incisure. Irregular areolations of the lateral field are present only on the anterior part of the body ; the areolations usually correspond with the body annulations (Fig. 2 B). No longitudinal striations are present on the body annules outside the lateral field, and in the lateral field the middle incisure does not end at the phasmid level (Fig. 2 C) as originally described for *Q. acti* by Hooper (1959), but continues until the

lateral field ends near the tail terminus. Stylet slender, with well-developed knobs (3 μm wide) with anterior faces inclined posteriorly as illustrated (Fig. 1 A). Median oesophageal bulb ovoid ; nerve ring encircling oesophagus near middle of isthmus. Hemizonid distinct, 2-3 annules long, two annules anterior to opening of excretory pore. Basal oesophageal bulb saccate which extends in length for about a body width. Dorsal oesophageal gland opens 2.4 μm behind the stylet base. Excretory pore located 121 μm (119-128) from the anterior end. Tail conoid (44-48 μm), bluntly pointed with a characteristic enlarged tip (Fig. 1 C), bearing 46 (42-51) annules (Fig. 2 E). Phasmids conspicuous, opening at 32 μm (31-34) from terminus (Figs. 1 C, 2 E). The anal opening is located 44-48 μm from terminus and is visible by SEM as a small pore about an annule width in diameter (Fig. 2 F).

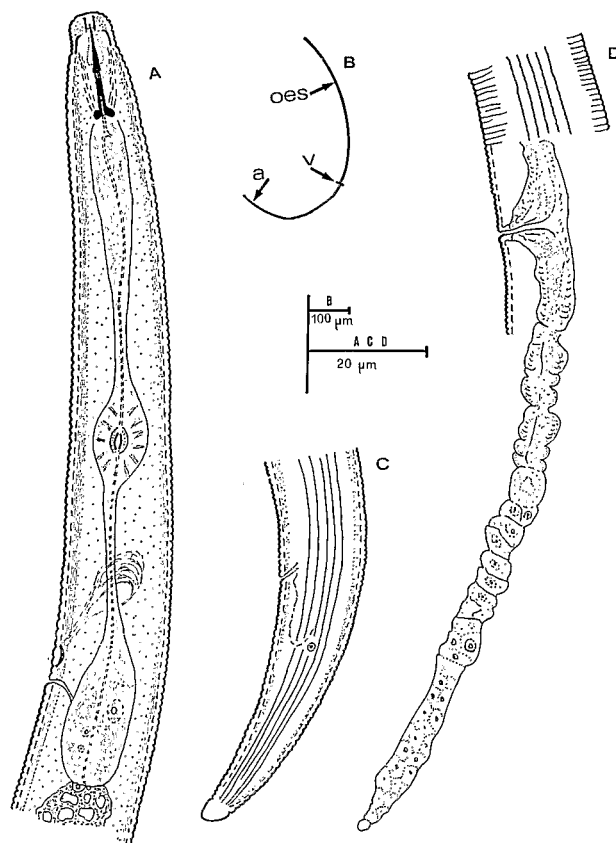
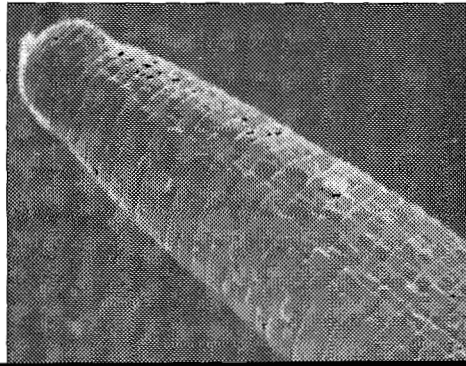
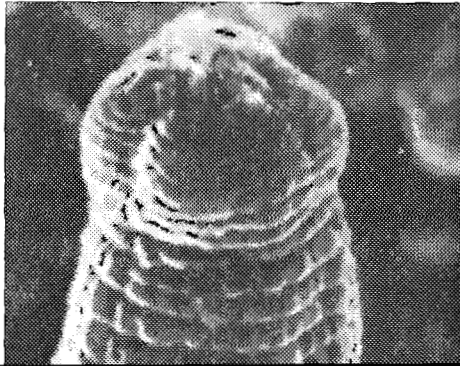


Fig. 1. *Quinisulcius acti*. A : Female oesophageal region. B : « Habitus » when killed by heat. C : Female tail. D : Female reproductive tract (oes = oesophageal-intestinal valve ; V = vulva ; a = anus).

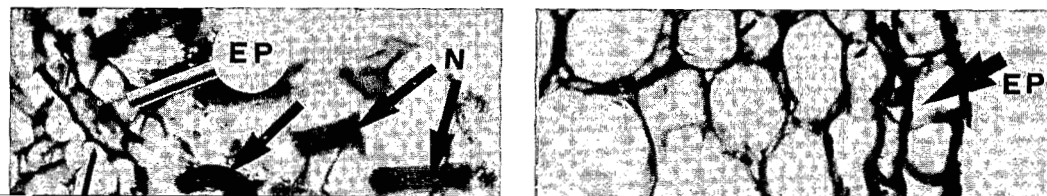


PARASITIC HABITS

Q. acti has been observed in semi-endoparasitic feeding position on fifteen-day-old seedling roots of corn. The surface of infested roots showed numerous irregular brown necrotic lesions, due to the nematode feeding activity. Examination of nematode infected corn root cross sections showed that the anterior portion of the nematode penetrates through the epidermal cells and the outer layers of the cortex (Figs. 3 A-B). Usually brown lesions and cavities were observed in tissues near the nematode. Necrotic (as indicated by positive safranin stain) and collapsed epidermal and subepidermal cells with thickened

walls were observed at the nematode feeding sites (Fig. 3 A, B). The nematode damage seemed to be limited to epidermal and cortical tissues without any evidence of vascular alterations.

Corn appears to be a suitable host of *Q. acti* and an average of 18,750 nematodes/kg soil were obtained by culturing the nematode for four months on corn hybrid seedlings inoculated with one nematode/g soil and maintained in glasshouse at 24-28° of temperature and 65-75% of humidity. The detrimental effect of this nematode on the growth and yield of corn are unknown. Further studies are needed on its pathogenicity, threshold limits, and influence of population densities.



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