

# Rothamsted Repository Download

## A - Papers appearing in refereed journals

Vovlas, N. and Cham, S. 1981. Scanning electron microscope observations on the morphology of *Tylenchorhynchus aduncus*. *Nematologia mediterranea*. 9 (1), pp. 91-97.

The output can be accessed at:

<https://repository.rothamsted.ac.uk/item/96y0q/scanning-electron-microscope-observations-on-the-morphology-of-tylenchorhynchus-aduncus>.

© Please contact [library@rothamsted.ac.uk](mailto:library@rothamsted.ac.uk) for copyright queries.

*Istituto di Nematologia Agraria, C.N.R., 70126 Bari, Italy*  
and  
*Rothamsted Experimental Station, Harpenden, Herts, England*

SCANNING ELECTRON MICROSCOPE OBSERVATIONS  
ON THE MORPHOLOGY OF  
*TYLENCHORHYNCHUS ADUNCUS*

by

N. VOVLAS and S. CHAM

*Tylenchorhynchus aduncus* De Guiran was described in 1967 and transferred to *Tetylenchus* Filipjev by Tarjan in 1973. After the suppression of this genus (Sher, 1973; Siddiqi, 1979) the species was replaced in *Tylenchorhynchus*.

Most of the morphological studies of *Tylenchorhynchus* species have been based on observations with the light microscope. Observations with the scanning electron microscope (SEM) have been made on only five species: *T. cylindricus*, *T. goffarti*, *T. lamelliferus*, *T. maximus* and *T. phaseoli* (Sher and Bell, 1975; De Grisse, 1977 and 1979). There is also a lack of biological information on *T. aduncus*. This note describes characters of this species seen by SEM, and gives information on its distribution in Italy.

*Materials and methods*

The specimens used for this study were extracted from soil samples by Cobb's sieving and decanting method. Adults were killed and fixed in hot aqueous 4% formaldehyde + 1% propionic acid and some of them were mounted in dehydrated glycerin (see Southey, 1970 for general techniques).

Several females and males were transferred to 1% osmium tetroxide for 12 hours after fixation and then infiltrated with Spurr's resin,

by the method of De Grisse (1973) but ethanol was used for dehydration instead of acetone.

*Tylenchorhynchus aduncus* De Guiran, 1967

Measurements of specimens from dunes at Torre Canne, Apulia along the Adriatic sea coast.

*Female* (n = 20): L = 823 (740-910)  $\mu\text{m}$ ; a = 31 (28-32); b = 5.9 (5.4-6.6); c = 17 (15-19); c' = 2.5 (2.4-2.6); maximum body width = 27 (24-29)  $\mu\text{m}$ ; stylet = 19.4 (19-20)  $\mu\text{m}$ ; V =  $^{23-25}_{59}22-24$  (58-60)%; phasmids = at 32-38  $\mu\text{m}$  from tail terminus; tail length = 48 (43-53)  $\mu\text{m}$  with 18-22 annules; body annule width = 2.1-2.3  $\mu\text{m}$  at mid-body; head tip to excretory pore = 127 (124-128)  $\mu\text{m}$ ; lateral fields with 4 incisures approximately 1/3 of body width; head tip to median bulb = 75 (67-77)  $\mu\text{m}$ .

*Male* (n = 10): L = 786 (730-810)  $\mu\text{m}$ ; a = 30 (25-34); b = 5.6 (5.4-6.0); c = 14 (13-16); maximum body width = 25 (23-28)  $\mu\text{m}$ ; stylet = 18.8 (18-19); spicule length along axis = 26 (24-28)  $\mu\text{m}$ ; gubernaculum = 14 (12-15)  $\mu\text{m}$ ; head tip to excretory pore = 122 (114-135)  $\mu\text{m}$ ; head tip to median bulb = 75 (69-77)  $\mu\text{m}$ ; tail length = 57 (53-60)  $\mu\text{m}$ .

Females and males contained numerous « intestinal fasciculi » (0.8-1.2  $\mu\text{m}$  wide) orientated in different directions in the intestinal cytoplasm. These structures, described in detail by Byers and Anderson (1973) have not been reported from *Tylenchorhynchus aduncus* but are known from *T. dubius*, *T. gladiolatus*, *T. bursifer*, *T. claytoni*, *T. maximus*, *T. martini*, *T. canalis*, *T. capitatus* and *T. parvus* (Byers and Anderson, 1973; Fortuner and Amougou, 1973).

Fasciculi have also been reported for some other Tylenchids including *Macrotrophurus arbusticola*, *Belonolaimus gracilis*, *Helicotylenchus canalis* and *Radopholus ritteri* (Sher, 1966; Thorne, 1968; Byers and Anderson, 1973).

Although their diagnostic significance and function is doubtful, intestinal fasciculi seem more common in *Tylenchorhynchus* than in other genera. Similar structures were not seen in the many specimens of *Rotylenchus laurentinus*, *Helicotylenchus* sp., *Hemicyclophora epicharoides*, *Hemicriconemoides promissus*, *Heterodera mediterranea* juveniles and males, *Longidorus* sp. and *Xiphinema* spp. and others examined from the same locality.

## SEM morphology

*Female:* Lip region hemispherical in profile 3-4  $\mu\text{m}$  long with five distinct post-labial annules clearly separated from the body by a distinct constriction (Fig. 1 C). Cephalic plate square, four-lobed and slightly raised from the first annule. Oral opening oval, dorso-ventrally orientated, surrounded by six raised labial papillae, three on each side (Fig. 1 A). Two conspicuous ovoid amphidial apertures (often covered by 'mucus') present on the lateral edges of cephalic plate, between the rounded subdorsal and subventral lobes (Fig. 1 A, C). A small pit is present on each subdorsal and subventral lobe of the cephalic plate, which could be (according to De Grisse, 1979) the openings of the four cephalic nerves (Fig. 1 A, C).

Body annules distinct 2.1-2.3  $\mu\text{m}$  wide at mid-body. The lateral fields have four equidistant incisures and are about one third of the body width at mid-body and one half body width at the anal level (Fig. 2 C). Anteriorly the field begins at the 12th-15th body annule as three lines forming two bands for a length of 15-20 annules when the inner line divides to form a third band. A few areolations on the lateral field appear anteriorly but they are very rare at mid-body, and absent posteriorly (Fig. 2 A, C). The areolations on the lateral field, when present, are spaced from one to six annules apart (Fig. 2 A). Posteriorly, the inner band of the lateral field disappears, leaving a groove three annules long just before the end of the field (Fig. 2 C). No longitudinal striations or other cuticular ornamentations are present on the body annules outside the lateral field (Figs 1 C; 2 A, C). The prominent pore-like phasmidial opening occurs 34-36  $\mu\text{m}$  from tail terminus, 6-7 annules behind the anus between the two inner field incisures. The inner band at the phasmid opening level is not enlarged as seen in many other Tylenchids (Fig. 2 C). The anal opening, on the 18th-23rd annule from tail terminus, lies near the anterior margin of the annule and appears, in ventral view, as a circular pore half an annule width wide (Fig. 2 C, D). Tail, elongate-conoid with smoothly rounded terminus, without areolations on the lateral field (Fig. 2 C) but the ventral annulation on the distal tail portion is irregular (Fig. 2 D).

*Male:* The lip region in profile and in face-view is elongated in contrast to the more rounded head of the female and is characterized by a dorsal and ventral hollow (Fig. 1 B, D). The cephalic plate is also elongated, with a narrow central part, prominent submedian lobes

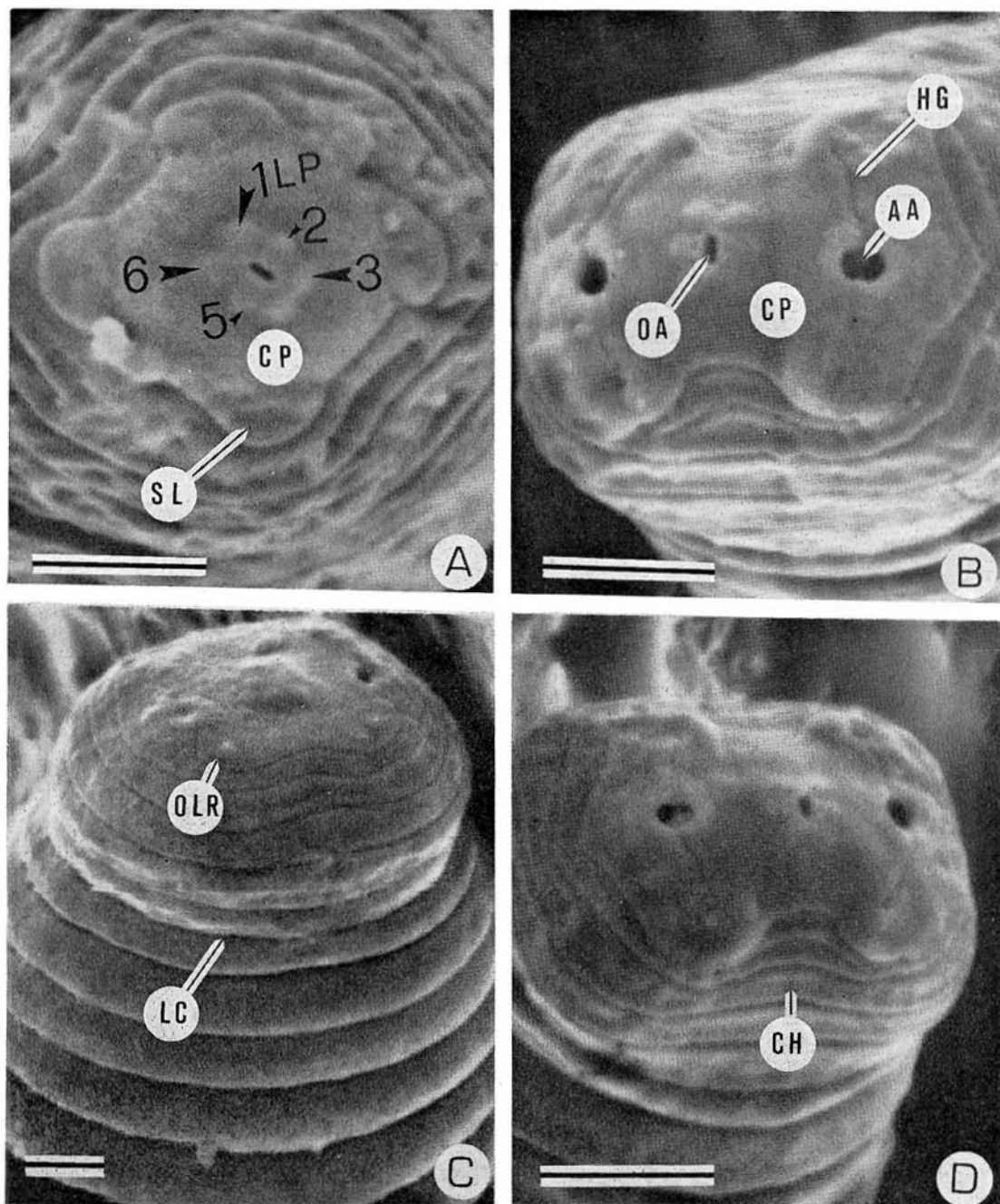


Fig. 1 - (A-D). *Tylenchorhynchus aduncus* (SEM micrographs). A) Female face view; C) Female body anterior portion; B, D) Male face view (A-D scale bar 2 µm).

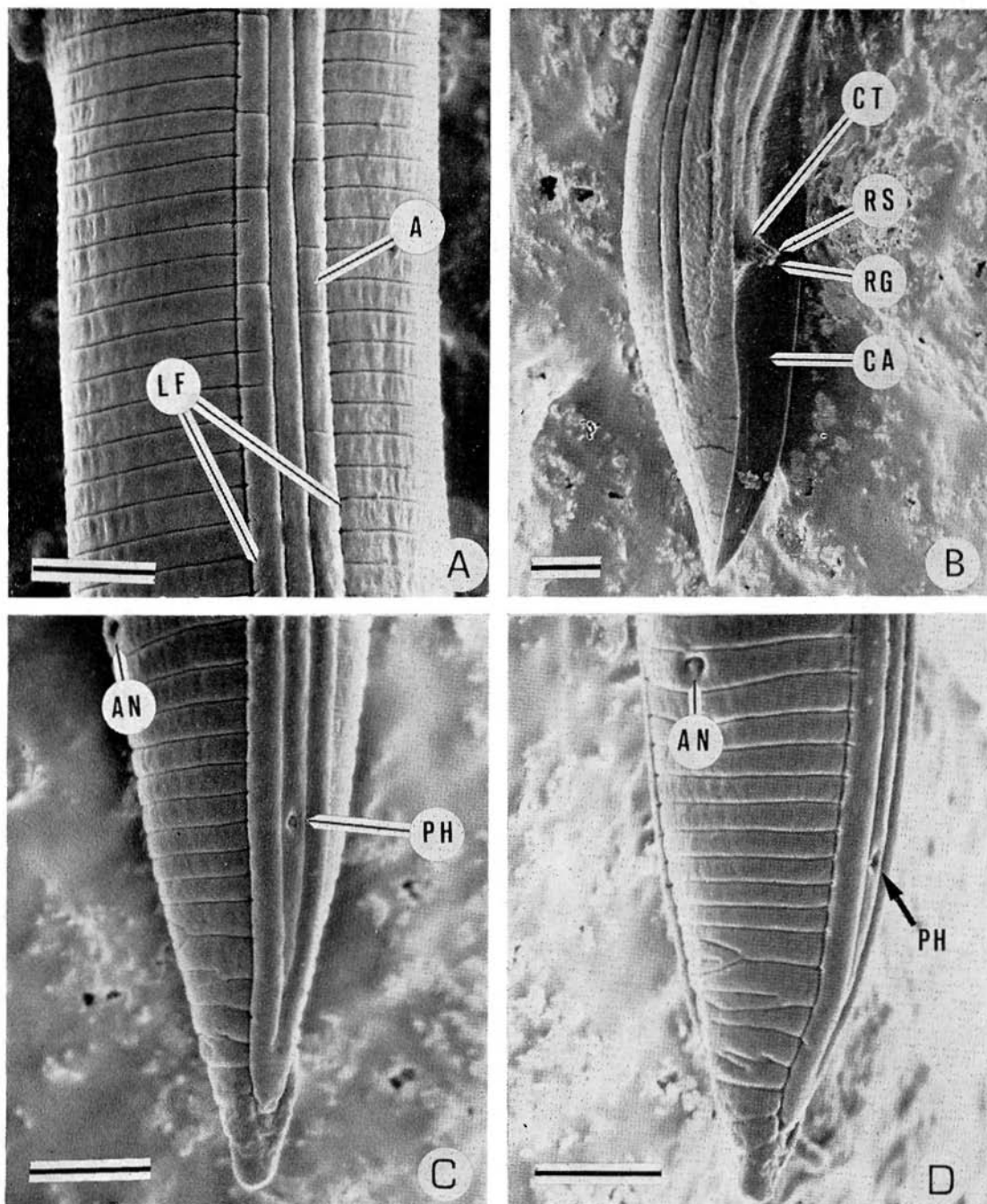


Fig. 2 - (A-D). *T. aduncus* (SEM micrographs). A) annulation and lateral field with irregular areolation of anterior portion of female body. B) Male caudal region. C and D) Lateral and ventral view of female tail. (A-D scale bar 10 µm).

Abbreviations in figures: A = Areolation; AA = Amphid aperture; AN = Anus; CA = Caudal ala; CH = Cephalic hollow; CP = Cephalic plate; CT = Cloacal tube; HG = Head grooves; LC = Lip constriction; LP = Labial papillae (arrowed 1 to 6); LF = Lateral field; OLR = Outer labial receptor; OA = Oral aperture; PH = Phasmid; RG = Retracted gubernaculum; RS = Retracted spicules; SL = Submedian lobe.

and obtusely-pointed lateral edges. Dorso-ventral grooves run from the amphidial openings (Fig. 1 B, D).

Oral aperture and labial sensillae are similar to those of the female. The lateral fields are also similar to those of the female except that at about 15 annules anterior to the cloacal opening the field diverges and only the dorsal band extends posteriorly to the phasmid level (Fig. 2 B). The well developed caudal alae are twice the tail length, finely annulated and protrude ventrally one body width at the anal level (Fig. 2 B). The caudal ala begins 30-35 annules anterior to cloaca and ends very close to the pointed unstriated tail terminus. The annulation on the posterior body is less distinct than anteriorly and the acutely-pointed tail is slightly curved ventrally. A posteriorly directed prominent unstriated « cloacal tube » protrudes ventrally, and ends in a circular opening (Fig. 2 B).

*T. aduncus* has not been reported since it was first described from grape (*Vitis* sp.) rhizospheres in Montpellier, France. Field observations in Italy show this nematode to be polyphagous. It has been found in sandy soil along the Adriatic coast associated with carrots (*Daucus carota* L.), onions (*Allium cepa* L.), peas (*Pisum sativum* L.) and potatoes (*Solanum tuberosum* L.). It has also been found on grape and, in uncultivated regions, in sand-dunes associated with lentisc (*Pistacia lentiscus* L.) and other halophytes.

This work was in part done while the senior author was at Rothamsted Experimental Station.

## S U M M A R Y

The original description of *Tylenchorhynchus aduncus* De Guiran is amplified and supplemented with observations by light microscope and Scanning Electron Microscope (SEM). The main additional characters to those already reported for this species are irregular areolations only on the anterior part of the lateral field, the much more elongate male head than that of the female, the fine annulation on the caudal alae and the numerous « intestinal fasciculi ». In Italy, this species has been found in sandy soil along the Adriatic coast associated with several vegetable crops and also on *Pistacia lentiscus* and other halophytes on sand dunes.

## R I A S S U N T O

*Osservazioni al microscopio elettronico a scansione sulla morfologia di Tylenchorhynchus aduncus.*

Alla descrizione originale di *Tylenchorhynchus aduncus* De Guiran viene aggiunta l'illustrazione di alcuni nuovi caratteri di notevole importanza tassono-

nomica osservati al microscopio ottico ed a quello elettronico a scansione. In particolare viene descritta una scultura ad areole irregolari, notate solo nella porzione anteriore del corpo del nematode, a livello dei campi laterali. Viene messa in risalto, inoltre, una finissima anellatura a livello delle ali caudali del maschio, assieme alla presenza di numerosi « fascicoli intestinali », osservati in ambedue i sessi e dimorfismo sessuale nella conformazione della piastra cefalica che risulta ellissoidale nel maschio e quadrangolare nella femmina. In Italia questa specie è stata rinvenuta in terreni sabbiosi lungo la costa Adriatica, in associazione a Carota, Cipolla, Patata e Pisello. Inoltre, in dune costiere, è stata osservata su Lentisco ed altre piante alofile.

## L I T E R A T U R E   C I T E D

- BYERS J.R. and ANDERSON R.V., 1973 - Morphology and ultrastructure of the intestine in a plant-parasitic nematode, *Tylenchorhynchus dubius*. *J. Nematol.*, 5: 28-37.
- DE GRISSE A., 1973 - A method for preparing nematodes and other soft tissues for SEM. *Meded. Fac. LandbWet. Rijksuniv. Gent*, 38: 1685-1703.
- DE GRISSE A., 1977 - *De ultrastructuur van het zenuwstelsel in de kop van 22 soorten plantenparasitaire nematoden, behorende tot 19 genera. (Nematoda: Tylenchida)*. D. Sc. thesis, Rijksuniversiteit Gent, 420 pp.
- DE GRISSE A., 1979 - SEM observations on the sensory organs in the head region of Tylenchid nematodes. pp. 487-494. SEM Inc., AMF O'Hare, IL 60666, USA.
- DE GUIRAN G., 1967 - Description de deux espèces nouvelles du genre *Tylenchorhynchus* Cobb, 1913 (Nematoda: Tylenchinae) accompagnée d'une clé des femelles, et précisions sur *T. mamillatus* Tobar-Jimenez, 1966. *Nematologica*, 13: 217-230.
- FORTUNER R. and AMOUGOU J., 1973 - *Tylenchorhynchus gladiolatus* n. sp. (Nematoda: Tylenchida) nematode associé aux cultures du Sénégal et Gambie. *Cah. ORSTOM, sér. Biol.*, 21: 21-24.
- SHER S.A., 1966 - Revision of the Hoplolaiminae (Nematoda). VI. *Helicotylenchus* Steiner, 1945. *Nematologica*, 12: 1-56.
- SHER S.A., 1973 - The classification of *Tylenchus* Filipjev, 1936, *Leipotylenchus* n. gen. (Leipotylenchinae n. subf.) and *Triversus* n. gen. (Nematoda: Tylenchoidea). *Nematologica*, 19: 318-325.
- SHER S.A. and BELL A.H., 1975 - Scanning electron micrographs of the anterior region of some species of Tylenchoidea (Tylenchida: Nematoda). *J. Nematol.*, 7: 69-83.
- SIDDIQI M.R., 1979 - Taxonomy of the plant nematode subfamily Merliniinae Siddiqi, 1970 with description of *Merlinius processus* n. sp., *M. loofi* n. sp. and *Amplimerlinius globicerus* n. sp. from Europe. *System. Parasitol.*, 1: 43-60.
- SOUTHEY, J.F., 1970 - *Laboratory methods for work with plant and soil nematodes*. Tech. Bull. No. 2, Minist. Agric. Fish. Fd, 148 pp. London: H.M.S.O.
- TARJAN A.C., 1973 - A synopsis of the genera and species in the Tylenchorhynchinae (Tylenchoidea, Nematoda). *Proc. helm. Soc. Wash.*, 40: 123-144.
- THORNE G. and MALEK R.B., 1968 - Nematodes of the Northern Great Plains. Part. 1. Tylenchida (Nemata: Secernentea). *Tech. Bull. S. Dak. agric. Exp. Stn.*, 31, 111 pp.

---

Accepted for publication on 21 September 1980.