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NOTES ON NEMATODES FOUND IN IRRIGATION WATER IN SOUTHERN ITALY[1]

by
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Summary. A survey carried out in Southern Italy to study the species composition and densities of plant parasitic nematodes occurring in irrigation canals showed that the species recorded were mainly ectoparasites and migratory endoparasites. *Helicotylenchus vulgaris, Merlinius brevidens, Pratylenchoides ritteri* and *Xiphinema index* were found at density levels varying from 2 to 35 specimens/mc of water. Two nematode microbial antagonists, *Pasteuria penetrans* and *Haptoglossa* sp., were recorded from *Aphelenchoides dactylocercus* and *Paroigolaimella* sp., respectively. The effect of water as a mean of dispersal for plant parasitic nematodes and microbial antagonists is briefly discussed.

Irrigation water is an effective way of disseminating plant parasitic nematodes (Faulkner and Bolander, 1970) and the widespread distribution of economically important nematodes, including ecto and endoparasitic species, has been shown to occur by this means in North America, Spain and India (Faulkner and Bolander, 1966; Tobar Jimenez and Palacios Mejia, 1975; Waliullah, 1989). In Italy, plant parasitic nematodes of the genera *Tylenchorhynchus, Pratylenchus, Helicotylenchus, Hemicycliophora* and *Criconema* have been reported from the Po river shores and other limnic habitats, together with several free living and fresh water species (Zullini, 1975; 1976).

The present study was undertaken in Southern Italy to assess the species composition and the relative densities of the nematode fauna commonly occurring in irrigation canals and to asses the economic importance of this source of nematode infestation.

Materials and methods

Two irrigated areas near Catania in Sicily and near Metaponto in Basilicata were examined during the period June-December 1990. Water samples were taken from the centre of the irrigation canals at an average depth of 120 cm using a 10 1 container. Each sample was then passed in situ through 25 and 325 meshes sieves to extract the nematodes. The average amount of water collected varied from 100 1 per sampling station in June 1990 to 500 1 in December 1990. The suspensions of nematodes were fixed in 2.5% hot formaldehyde, hand picked and processed to glycerol by the slow method and species were identified by light microscopy (Hooper, 1970).

Results and discussion

The sampling sites, the nematode species found and their relative densities are listed in Table I. Within the total number of nematode species recorded, 8 species were

TABLE I - *Nematode species occurring in irrigation water from Southern Italy.*

Locality	Nematode species	Collection date	Density (nem/mc)
Ginosa (Taranto)	*Aphelenchoides dactylocercus* Hooper	June 1990	125
	miscellaneus dorylaims (juveniles)		14.7
	A. dactylocercus	Nov. 1990	2
	Aphelenchoides sp.		4
	Merlinius brevidens Allen		6
	Merlinius sp.		4
	Tylenchus sp.		2
	Dorylaimus stagnalis Dujardin		34

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TABLE I - *Continued.*

Locality	Nematode species	Collection date	Density (nem/mc)
	Mesodorylaimus litoralis Loof		2
	Eudorylaimus sp.		4
	Zeldia sp.		2
	Eucephalobus sp.		4
	Bursilla monhystera (Bütschli) Andrassy		16
	Tobrilus sp.		2
Bernalda (Matera)	*Helicotilenchus vulgaris* Yuen	June 1990	12.5
	Filenchus sp.		12.5
	Thornia propinqua (Paesler) Andrassy		4
	misc. dorylaims		21
Pantanello (Matera)	*H. vulgaris*	Aug. 1990	5
	Pratylenchoides ritteri Sher		35
	Psilenchus hilarulus de Man		2
	Dorylaimus sp.		5
	Prodorylaimium sp.		7
	Anaplectus sp.		2
	Tobrilus sp.		2
	H. vulgaris	Nov. 1990	2
	M. brevidens		4
	P. hilarulus		2
	Tylenchus sp.		2
	Tobrilus sp.		22
	Acrobeles sp.		2
	Aphelenchoides sp.		6
Lentini (Siracusa)	*Xiphinema index* Thorne *et* Allen	Dec. 1990	2
	Cuticularia oxycerca (de Man) Andrassy		7
	Diplogaster sp;		12
	Paroigolaimella sp.		32
Paternò I (Catania)	*Macrolaimus*	Oct. 1990	100
	Tobrilus sp.		50
Paternò II (Catania)	*Paroigolaimella* sp.	Sept. 1990	90
	Dorylaimus sp.		10
	Microdorylaimus miser (Thorne *et* Swanger) Andrassy		10
	Diplogaster sp.		10

plant parasites, 9 miscellaneous dorylaims and 10 common limnic microbivorous Rhabditidae, Cephalobidae or Diplogasteridae. Plant parasitic nematodes of economic significance included *Xiphinema index* Thorne *et* Allen and some tylenchid ectoparasitic species or migratory endoparasites probably feeding on grasses growing on the canals banks.

Some specimens of the freshwater nematode *Tobrilus* sp. collected at Paternò (Catania) showed rod-like elements [measuring 6.1 (4-13) x 1.5 (1-2) μm] filling the body cavities and tissues (Fig. 1 a,b). Similar rod shaped crystalloids were observed and reported in the epithelial cells and the intestine in a specimen of *Tobrilus* sp. from Argentina and in this case were considered to result from bacterial parasitism (Altherr, 1963). Crystalloids reported in *Pelodera (Rhabditis) strongyloides*, however, were thought to be carbohydrates that were food reserves (Jacobs, 1937), whereas crystalloid bodies from the pseudocoelom of *Eutobrilus heptapapillatus, Tobrilus gracilis* and other freshwater nematodes were respectively considered to be a food storage source or the result of a detoxification process of sulfide ions (Bird *et al.* 1991).

Three specimens of *Aphelenchoides dactylocercus* Hooper collected at Ginosa (Taranto) in July and November 1990 had spores of the nematode parasite *Pasteuria penetrans* (Thorne) Sayre *et* Starr attached externally to the cuticle in the cephalic and caudal regions. Spore and endospore diameters had average measurements of 4 and 1.7 μm respectively (Fig. 1c). Although *P. penetrans* has been reported in association with *Aphelenchoides* spp. it has not previously been reported on *A. dactylocercus* (Sturhan, 1988) or on nematodes from limnic biotopes.

In some specimens of *Paroigolaimella* sp. collected at Paternò (Catania), a septate mycelium was present within the body and fungal cells extruded trough the cuticle, similar to the «gun cell» of the nematode destroying fungus *Haptoglossa* sp. (Barron, 1987).

The lower number of plant parasitic species of economic significance and the lower densities recorded in comparison with similar surveys undertaken in other countries (Faulkner and Bolander, 1970; Waliullah, 1989) can be in part explained by the concrete construction of the canal walls which reduces soil erosion and thus the dispersal of soil particles and associated nematodes in the water. The presence of iron dams placed at regular intervals on the canals to regulate or store the water flow and/or the reduced amount of rain and water drains observed during the 1990 summer season can also have affected the data recorded.

The densities observed for *Helicotylenchus vulgaris* Sher and other tylenchid parasites correspond to field introduction rates varying from 45 x 10^3 to 126 x 10^3 nematodes, when irrigation is provided for one hour at the rate of 1 mc/sec/ha. These species are, however, considered of little economic significance as they frequently occur in Southern Italy on wheat and other annual crops without causing significant damage (Vovlas and Inserra, 1978).

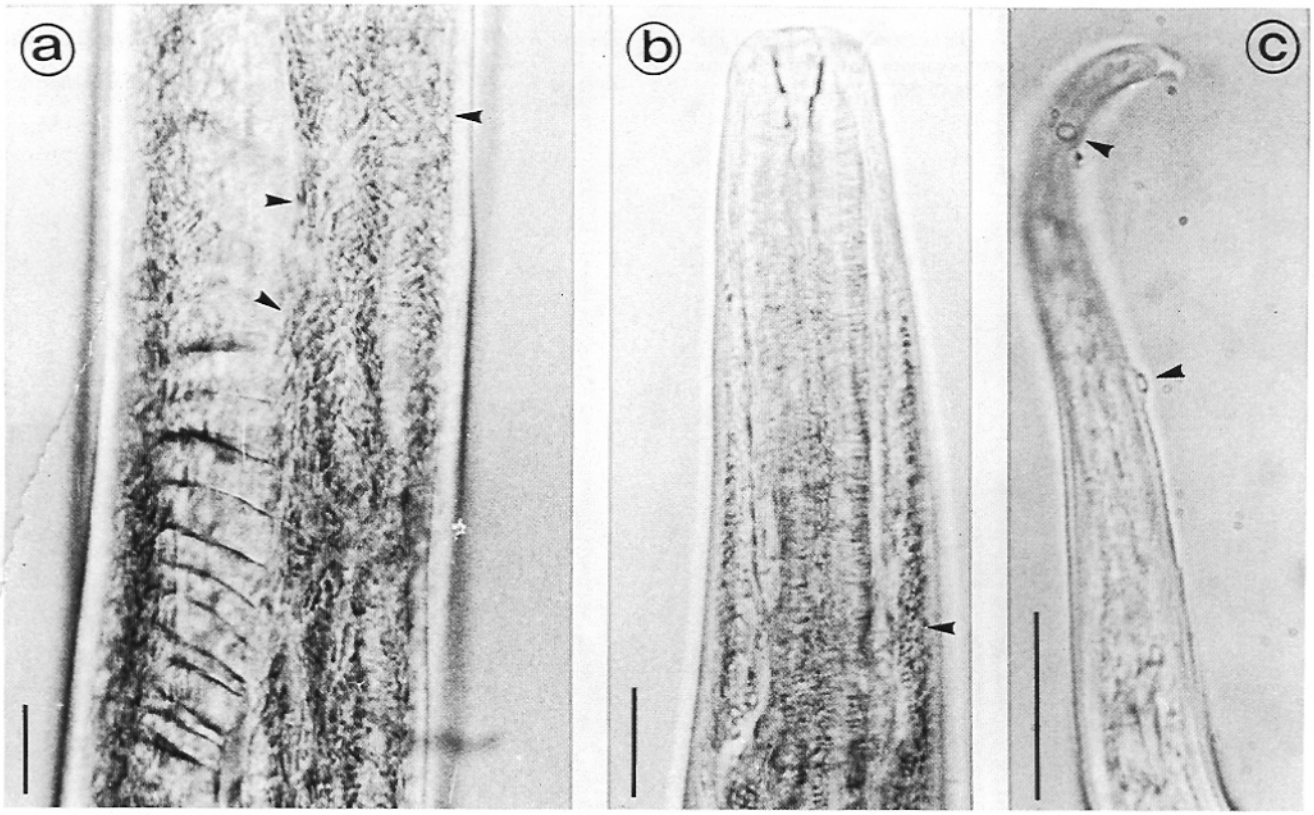

Fig. 1 - Crystalloids rods within *Tobrilus* sp: a, mid- body region; b, cephalic region; c, spores of *Pasteuria penetrans* attached to the caudal region of *Aphelenchoides dactylocercus*. Scale bars: 20 μm.

Xiphinema index frequently occurs in Italy where it actively transmits grapevine fanleaf virus. Although only a single female was recorded from an irrigation canal at Lentini (Siracusa), its presence in water must be considered potentially dangerous, because few individuals are required to establish virus infection although in themselves they would cause little damage by their feeding activity.

The presence of microbial nematode parasites together with the occurence of dorylaim predators in waters from both the areas sampled suggest that irrigation can also act as a mean of dispersal for some nematode antagonists. Since plant parasitic nematodes extracted from irrigation water appeared capable of parasitising plants experimentally (Tobar Jimenez and Palacios Mejia, 1975) it is likely that some nematode microbial antagonists of the *Pasteuria penetrans* group and other parasites are to be dispersed with their hosts. Further investigations on the occurrence, survival and infective rates of these antagonists are needed to asses their efficacy in lowering or balancing the adverse economic effects of pests eventually introduced in cultivated fields.

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