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TRICHODORUS TAYLORI SP. N. (NEMATODA: DORYLAIMIDA) FROM ITALY

by
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Since the beginning of the « European Plant Parasitic Nematode Survey », which is concerned with the geographical distribution of virus-vector nematodes and as influenced by abiotic and biotic factors, thousands of samples have been examined from both natural and agricultural biotopes throughout Europe. Many trichodorids have been identified and as a result the distribution of the species belonging to the genera *Trichodorus* Cobb, 1913 and *Paratrichodorus* Siddiqi, 1974 is fairly well known.

In a sample taken from around the roots of Eastern white pine (*Pinus strobus*) seedlings in Piedmont (Northern Italy) a *Trichodorus* population was found and identified as *T. aequalis* Allen, 1957 (Mancini *et al.*, 1979). Because of the limited distribution of *T. aequalis* — restricted to U.S.A. (Allen, 1957) and Japan (Shishida, 1979) — the Italian specimens were studied more intensively and additional material was collected.

The species appeared to be new and is described below as *T. taylori* sp. n.

The nematodes were killed by gentle heat, fixed in T.A.F. and processed to glycerin by the modified Seinhorst method (De Grisse, 1969).

Trichodorus taylori sp. n.

Holotype female: L = 0.960 mm; a = 17.4; b = 6.8; V = 58.5; G_1 = 20.5; G_2 = 22.9; onchiostyle = 70 µm; excretory pore from anterior body end = 126 µm.

Description:

F e m a l e : body almost straight when dead. Cuticle about 6 μm thick in mid-body region, consisting of three layers: a thin outer one, followed by a thicker middle one (about 2.5 μm) and a slightly thinner inner one; the last two are clearly demarcated. The inner layer shows a pseudoannulation in most specimens. Subcuticle with very fine transverse striations. Excretory pore about 1.7 - 2 times the onchiostyle length from the anterior end of the body, at the level of the anterior part of the pharyngeal bulb (Fig. 1B). Pharyngeal bulb occupying about one third of the pharynx. Five pharyngeal gland nuclei usually distinct. The posterior ventro-sublateral gland nuclei lie in the posterior third of the pharyngeal bulb, while the smaller anterior pair is in the anterior third of the bulb. The large dorsal gland nucleus is close to the posterior pair of ventro-sublateral gland nuclei (either at the same level or just anterior to them). The bulb does not overlap the intestine, but in most, though not all, specimens the intestine clearly overlaps the end of the pharynx, the end of the pharyngeal lumen being the reference point (Fig. 1B). Nerve ring located about halfway along the isthmus. Female reproductive system didelphic and amphidelphic, typical for the genus. Ovaries reflexed and in each genital branch a large oval spermatheca, filled with sperm (Fig. 1E). Vulval opening rounded (not pore-like) in ventral view (Fig. 1C). Conspicuous refractive thickenings at the vulva, appearing rounded in lateral view. Vaginal region generally rounded in lateral view (Fig. 1D). Only one lateral body pore present on each side of the body situated within one body-width behind the vulva (Fig. 1C). Anus subterminal. Tail with a pair of subterminal pores (Fig. 1G).

M a l e : general appearance similar to female, but posterior end slightly curved ventrally. Two conspicuous ventromedian cervical papillae present between the onchiostyle region and the excretory pore. Distance between the excretory pore and the second ventromedian papilla (EP-CP2) is much less than CP1-CP2 (Fig. 1A) (in two specimens the distance between EP-CP2 and CP1-CP2 was almost the same). A pair of lateral cervical pores are situated at about the level of the nerve ring. In all specimens three supplements present. The posterior one lies at about 50-60% of the spicules length anterior to the cloacal aperture, i.e. posterior to the head of the retracted spicules. The distance between the three supplements almost equals the

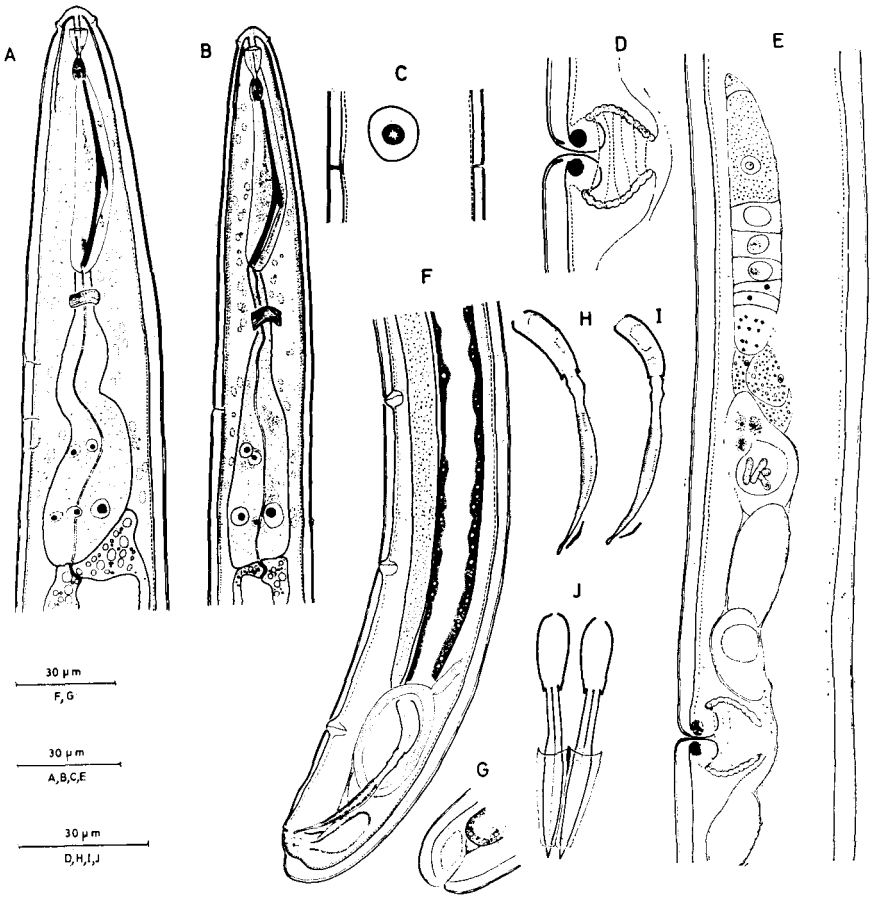

Fig. 1. - *Trichodorus taylori* sp. n.: A, anterior region ♂; B, anterior region ♀; C, vulva region, ventral; D. vagina and vulva region, lateral; E, anterior reproductive system of mature female; F, posterior region ♂; G, tail region ♀; H-I, spicules and gubernaculum, lateral; J, spicules and gubernaculum, dorsal.

spiculum length (Fig. 1F). Testis single, outstretched. Spicules curved ventrally 60 (57-64) µm long, the proximal end, or head, heavily built and clearly separated from the shaft. The middle part and the distal end of the spicules show fine transverse striae (Fig. 1H, I). No « setae » were observed. Gubernaculum curved, short. Tail asymmetrical, ter-

Fig. 2. - Geographical distribution of *T. sparsus* and *T. taylori* sp. n. in Italy.

minal cuticle thickened, with a pair of post-cloacal subventral papillae and a pair of subterminal pores (Fig. 1F).
Type habitat and locality: collected by G. Mancini from rhizosphere of Eastern white pine (*Pinus strobus* L.) in a nursery at Prato Sesia (Piedmont, Northern Italy) in October 1979.

Table I. - *Morphometric data of* Trichodorus taylori *sp. n. (specimens from the rhizosphere of* Pinus strobus *from Piedmont).*

Females (n = 7)

Characters	$\bar{x}$	R	S. D.	C. V.	p < 0.05
L (μm)	939	813 - 1061	72.79	7.75	67.32
Body width (μm)	50	40 - 55	5.48	10.96	5.07
Neck length (μm)	155	133 - 188	22.40	14.45	20.72
Onchiostyle length (μm)	70	64 - 72	2.76	3.94	2.55
Fore end to excretory pore (μm)	126	122 - 132	3.48	2.76	3.22
Ant. ovary length (μm)	194	139 - 229	30.74	15.85	28.43
Post. ovary length (μm)	179	127 - 243	37.13	20.74	34.34
Ratios - a	18.9	17.2 - 20.6	1.42	7.51	1.31
- b	6.1	5.0 - 6.9	0.77	12.62	0.71
- V	57.2	53.4 - 58.9	1.90	3.32	1.76
- G_1	20.6	17.1 - 24.3	2.33	11.31	2.15
- G_2	18.9	15.6 - 22.9	2.66	14.07	2.46
- Fore end to excretory pore/Neck length (%)	82.5	66.0 - 93.6	10.95	13.27	10.13
- Onchiostyle length/ Neck length (%)	45.5	37.6 - 53.4	6.37	14	5.89

Table II. - *Morphometric data of* Trichodorus taylori *sp. n. (specimens from the rhizosphere of* Pinus strobus *from Piedmont)*

Males (n = 9)

Characters	$\bar{x}$	R	S.D.	C.V.	$p < 0.05$
L (μm)	881	790 - 1019	70.34	7.98	54.07
Body width (μm)	46	37 - 55	6.69	14.54	5.14
Neck length (μm)	156	144 - 168	8.65	5.54	6.65
Onchiostyle length (μm)	68	66 - 70	1.32	1.94	1.01
Fore end to excretory pore (μm)	125	119 - 133	5.62	4.50	4.32
CP1 to CP2 (μm)	10	12 - 18	2.39	23.9	1.84
CP2 to excretory pore (μm)	9	4 - 12	2.71	30.11	2.08
Spicule length (μm)	60	57 - 64	2.69	4.48	2.07
Gubernaculum length (μm)	7	6 - 8	0.71	10.14	0.55
Cloaca to SP1 (μm)	33	29 - 35	1.87	5.67	1.44
SP1 to SP2 (μm)	51	43 - 64	6.6	12.94	5.07
SP2 to SP3 (μm)	52	47 - 70	19.21	36.94	14.77
Ratios - a	19.4	16.3 - 23.2	2.53	13.04	1.94
- b	5.6	5.1 - 6.1	0.30	5.36	0.23
- T	509	484 - 654	174.94	34.37	134.47
- Fore end to excretory pore/Neck length (%)	80.32	73 - 86.8	3.84	4.78	2.95
- Onchiostyle length/ Neck length (%)	43.8	40.5 - 46.5	1.89	4.31	1.45

Other localities (Fig. 2): collected by F. Roca from rhizosphere of olive trees (*Olea europaea* L.) near Como (Lombardy, Northern Italy) in November 1971, and from rhizosphere of grapevine (*Vitis* sp.) at Sondrio (Lombardy, Northern Italy) in November 1971, both crops growing in light soil.

Type material: holotype female, 14 paratype females and 21 paratype males deposited in the collection of the Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

Two paratype females and two paratype males deposited with each of the following nematode collections: Osservatorio per le Malattie delle Piante, Regione Piemonte, Torino, Italy; Istituto di Nematologia Agraria, C.N.R., Bari, Italy; Landbouwhogeschool, Wageningen, The Netherlands; U.S.D.A., Beltsville, U.S.A.; Rothamsted Experimental Station, Harpenden, Herts, England; Commonwealth Institute of Helminthology, St. Albans, England.

The new species is named after Professor C.E. Taylor in recognition of his important contribution to the successful organization of the « European Plant Parasitic Nematode Survey ».

Differential diagnosis:

Trichodorus taylori sp. n. comes closest to *T. aequalis* Allen, 1957, *T. sparsus* Szczygiel, 1968 and *T. hooperi* Loof, 1973, having, like them, a cuticle with three layers, two conspicuous ventral cervical papillae anterior to the excretory pore and three supplements, the posterior one lying near the head of the retracted spicules.

The males are easily differentiated by the characteristic shape of the spicules (the heavily build and elongated head clearly separated from the shaft of the spicule in the new species). From *T. aequalis* and *T. hooperi* they also differ in the spicule length [35-50 µm and 38-40.5 µm in *T. aequalis* populations from the U.S.A. (Allen, 1957) and from Japan (Shishida, 1979) respectively; 44-53 µm in the type population of *T. hooperi*] and in the striation of the spicules (not present in *T. aequalis* and *T. hooperi*).

The females are distinguished by the different shape of the sclerotized thickenings at the vulva and by the shape of the vagina.

Table III. - Morphometric data of Trichodorus taylori *sp. n. (specimens from the rhizosphere of olive trees from Lombardy)*

Females (n = 12)

Characters	$\bar{x}$	Range	S. D.	C. V.	$p < 0.05$
L (μm)	747	668 - 855	59.72	7.99	37.94
Body width (μm)	37	32 - 40	2.53	6.84	1.61
Neck length (μm)	158	135 - 171	10.35	6.55	6.58
Onchiostyle length (μm)	64	60 - 67	2.22	3.47	1.41
Fore end to excretory pore (μm)	116	111 - 123	3.64	3.14	2.31
Ant. ovary length (μm)	181	143 - 232	27.48	15.18	17.46
Post. ovary length (μm)	172	126 - 209	25.53	14.84	16.22
Ratios - a	20.4	18.1 - 21.9	1.66	8.14	1.05
- b	4.7	4.1 - 5.6	0.46	9.79	0.29
- V	58.7	56.7 - 60.8	1.33	2.27	0.85
- G_1	24.2	17.7 - 29.6	3.37	13.93	2.14
- G_2	22.9	18.5 - 26.1	2.50	10.92	1.59
- Fore end to excretory pore/Neck length (%)	72.5	65.5 - 80.0	3.62	4.99	2.30
- Onchiostyle length/ Neck length (%)	40.5	36.5 - 43.4	2.01	4.96	1.28

Table IV. - Morphometric data of Trichodorus taylori *sp. n. (specimens from the rhizosphere of olive trees from Lombardy)*

Males (n = 13)

Characters	$\bar{x}$	Range	S. D.	C. V.	$p < 0.05$
L (μm)	761	682 - 907	74.02	9.73	44.73
Body width (μm)	33	27 - 41	3.94	11.94	2.38
Neck length (μm)	156	151 - 165	6.72	4.31	4.06
Onchiostyle length (μm)	65	61 - 68	2.26	3.48	1.37
Fore end to excretory pore (μm)	123	111 - 134	8.23	6.69	4.97
CP1 to CP2 (μm)	18	11 - 22	3.44	19.11	2.08
CP2 to excretory pore (μm)	9	5 - 18	3.80	42.22	2.30
Spicule length (μm)	61	57 - 65	2.50	4.10	1.51
Gubernaculum length (μm)	7	6 - 8	0.75	10.71	0.45
Cloaca to SP1 (μm)	32	29 - 36	2.11	6.59	1.28
SP1 to SP2 (μm)	48	40 - 54	4.55	9.48	2.75
SP2 to SP3 (μm)	55	47 - 67	5.7	10.36	3.44
Ratios - a	23.3	19.3 - 25.3	1.58	6.78	0.95
- b	4.9	4.5 - 6	0.43	8.78	0.26
- T	64	59 - 71	3.99	6.23	2.41
- Fore end to excretory pore/Neck length (%)	78.5	73.5 - 82.2	2.55	3.25	1.54
- Onchiostyle length/ Neck length (%)	41.8	40.4 - 45	1.49	3.56	0.90

From *T. aequalis* and *T. sparsus* they also differ in having only one pair of lateral body pores (in *T. aequalis* and *T. sparsus* a second pair is present).

Furthermore, in both females and males of *T. taylori* sp. n. the intestine usually overlaps the pharynx (in *T. aequalis*, *T. sparsus* and *T. hooperi* an overlapping has never been observed). *T. taylori* sp. n. also resembles *T. tricaulatus* Shishida, 1979, in which species the intestine also overlaps the pharynx (in the text Shishida reported the pharynx overlapping the intestine ventrally, but he illustrated the reverse situation in his Fig. 1A). Males from the two species differ in the onchiostyle length (38-51 µm in *T. tricaulatus*), the number of ventral cervical papillae anterior to the excretory pore (usually three papillae in *T. tricaulatus*), the spicule length (35-44 µm in *T. tricaulatus*), the shape of the spicules and the position of the posterior supplement in relation to the head of the retracted spicules (anterior to the head of the retracted spicules in *T. tricaulatus*). Females differ in the shape of the sclerotized thickenings at the vulva and in the shape of the vagina. Two pairs of lateral body pores are present in *T. tricaulatus*.

Remarks on the *Trichodorus aequalis* group:

According to Loof (1973), *T. aequalis*, *T. sparsus* and *T. hooperi* belong to the *Trichodorus-aequalis* group.

The main characters of this group are: cuticle consisting of three layers; female possessing two pairs of lateral body pores (one located just behind the vulva, the other some distance anterior to it); male possessing two conspicuous ventral papillae anterior to the excretory pore, a middle part of the spicules with fine transverse striae and three supplements, the posterior one lying near the head of the retracted spicules.

According to Shishida (1979) *T. tricaulatus* also belongs to this group.

We consider it necessary to redefine the *Trichodorus-aequalis* group because of the following reasons: *T. hooperi* possesses only one pair of lateral body pores; *T. tricaulatus* usually possesses three conspicuous ventral cervical papillae anterior to the excretory pore

(three ventral cervical papillae present in 20 specimens, two in four specimens and one in two specimens); the spicules from both *T. hooperi* and *T. aequalis* do not show fine transverse striae. If the presence of two conspicuous ventral cervical papillae is the main character for the group, the position of *T. tricaulatus* becomes uncertain while *T. borneoensis* Hooper, 1962 and *T. lusitanicus* Siddiqi, 1974 would also be included together with *T. taylori* sp. n. Therefore, in our opinion, more information is required about the variability of such characters as the number of lateral body pores and the number and position of ventromedian cervical papillae before close relationships can be suggested or established between the species that are currently included in the so called *Trichodorus-aequalis* group.

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SUMMARY

A new species of the genus *Trichodorus* from Northern Italy is described, *T. taylori* sp. n., collected from the rhizosphere of Eastern white pine, olive and grapevine. It is mainly characterized by the shape of the spicules (heavily built and elongated head clearly separated from the shaft of the spicule) and by the shape of the sclerotized thickenings at the vulva and by the shape of the vagina. Some remarks concerning the *Trichodorus-aequalis* group are given, indicating a need for its redefinition.

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