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Trichodorus species from China, with a description of *T. paracedarus* n. sp. (Nemata : Trichodoridae)

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Summary – Three *Trichodorus* species, *T. paracedarus* n. sp., *T. cedarus* Yokoo, 1964 and *T. pakistanensis* Siddiqi, 1962, are reported from eastern China. *T. paracedarus* n. sp. is characterized by the presence of three ventromedian cervical papillae, almost straight or slightly ventrally curved spicules with a finely striated shaft of about equal width, the location of the posterior precloacal supplement (SP1) opposite the distal third of retracted spicules, strongly reduced pore-like SP2 and SP3, straight posterior body end with little developed copulatory muscles, the presence of a distinct bursa and the thickened terminal tail cuticle with a ventral indentation in the male; and by the usually triangular sclerotized vaginal pieces and the presence of a pair of lateral postadvulvar body pores in female. Morphometric data are given of some populations of *T. cedarus* and *T. pakistanensis,* which represent new records for China. Differences with the type populations and other formerly described populations of *T. cedarus* and *T. pakistanensis* are discussed.

Résumé – ***Espèces de* Trichodorus *provenant de Chine et description de* T. paracedarus *n. sp. (Nemata : Trichodoridae).*** – Trois espèces de *Trichodorus* sont signalées provenant de la partie orientale de la Chine : *T. paracedarus* n. sp., *T. cedarus* Yokoo, 1964 et *T. pakistanensis* Siddiqi, 1962. Le mâle de *T. paracedarus* n. sp. est caractérisé par la présence de trois papilles cervicales ventro-médianes, les spicules presque droits ou légèrement courbés ventralement et comportant une hampe finement striée de diamètre constant, la localisation du supplément précloacal postérieur (SP1) au niveau du tiers distal du spicule rétracté, les suppléments SP2 et SP3 considérablement réduits, poriformes, la portion terminale du corps rectiligne et comportant des muscles copulateurs faiblement développés, la présence d'une bourse distincte, un épaississement de la cuticule à l'extrémité de la queue indentée ventralement. La femelle est caractérisée par les pièces sclérotisées vaginales généralement triangulaires et la présence d'une paire de pores latéraux postadvulvaires. Des données morphométriques sont produites concernant plusieurs populations de *T. cedarus* et de *T. pakistanensis* dont c'est la première signalisation en Chine. Les différences avec la description originale et celles déjà publiées d'autres populations de ces deux dernières espèces sont discutées.

Key-words : Nematodes, *Trichodorus,* China.

Members of the genus *Trichodorus* are root ectoparasites of plants and potential vectors of plant viruses. Until now, very little has been known about the occurrence and distribution of these nematodes in China. Yin and Feng (1981) mentioned the presence of *Trichodorus* nematodes in the provinces Guangdong and Hunan, southern China, in their report on a nematode survey. The first and only official record, however, was made by Liu and Cheng (1990) who described *T. nanjingensis* from Jiangsu Province, eastern China. During a recent investigation on Longidoridae and Trichodoridae in eastern China, three species of *Trichodorus* other than *T. nanjingensis* were found in association with some economic plants in the region. They are reported here as *T. paracedarus* n. sp., *T. cedarus* Yokoo, 1964 and *T. pakistanensis* Siddiqi, 1962.

Specimens were extracted from soil samples by the sugar centrifugal-flotation method after Caveness and Jensen (1955), killed in water by gentle heat and fixed in TAF. They were then processed to and mounted in glycerin using the slow method of Golden (Hooper, 1970). A few glycerin-infiltrated female specimens were specially mounted in glycerin-jelly for dorso-ventral-view observation.

Trichodorus paracedarus n. sp.

(Figs 1, 2)

MEASUREMENTS

See Tables 1, 2.

DESCRIPTION

Male : Whole body nearly straight to slightly curved ventrally when relaxed by gentle heat. Posterior end always straight. Cuticle not strongly swollen upon fixation, composed of three main layers : a very thin outer layer, a wide middle layer thickened dorsally towards the tail terminus and a thin inner layer clearly demarcated from the middle one; entire cuticle 3.5-5.5 µm thick at mid-body, 4.5-7.0 µm at tail terminus. Lip region rounded with prominent labial papillae. Structure of amphids and onchiostyle typical of the genus. Pharyngeal isthmus long, gradually expanding posteriorly into

Table 1. *Morphometric data of males of* Trichodorus paracedarus *n. sp. and* T. cedarus *from China* (all measurements in μm).

Locality *Host*	*Trichodorus paracedarus* n. sp.			*Trichodorus cedarus*		
	Nanjing *Tomato*		*Lianyungang* *Cherry*	*Changxin* *Chinafir*	*Wuxi* *Peach*	*Ganyu* *Apple*
	(Holotype)	*(Paratypes)*				
n		34	20	20	8	12
L	680	512-711 (597 ± 48.4)	538-733 (623 ± 59.8)	707-899 (790 ± 58.5)	603-753 (660 ± 49.8)	638-800 (710 ± 49.6)
Body width	36	28-38 (32 ± 2.4)	28-39 (34 ± 3.1)	29-38 (34 ± 3.0)	32-39 (34 ± 2.7)	27-41 (35 ± 3.9)
Pharynx	132	110-156 (135 ± 11.1)	108-162 (132 ± 15.0)	155-197 (166 ± 9.0)	138-162 (152 ± 7.8)	180-125 (150 ± 18.3)
Onchiostyle	47	39-45 (42 ± 1.5)	39-43 (41 ± 1.4)	61-70 (67 ± 2.3)	56-61 (58 ± 1.6)	46-48 (47 ± 1.0)
Ant. end to excret. pore (EP)	102	81-114 (94 ± 7.0)	83-110 (94 ± 6.6)	121-142 (129 ± 5.8)	106-114 (111 ± 2.9)	93-118 (104 ± 8.5)
CP1 to CP2	8.0	6.0-13.0 (9.0 ± 1.64)	6.0-10.0 (8.5 ± 1.29)	7.5-14.0 (10.5 ± 1.67)	6.0-10.0 (8.5 ± 1.55)	9.0-12.5 (10.5 ± 1.35)
CP2 to CP3	8.0	6.0-10.0 (7.5 ± 1.06)	6.0-10.0 (7.0 ± 1.09)	7.5-11.5 (9.5 ± 1.22)	6.0-9.0 (7.0 ± 1.11)	7.5-10.0 (8.5 ± 1.26)
CP3 to EP	10.0	3.0-21.5 (8.5 ± 3.10)	3.0-14.0 (7.0 ± 2.34)	5.0-12.5 (10.0 ± 2.48)	5.0-12.0 (7.5 ± 2.51)	5.5-11.5 (9.0 ± 3.38)
Spicule	43	39-44 (41 ± 1.1)	38-47 (42 ± 2.2)	41-46 (44 ± 1.8)	41-45 (42 ± 1.4)	39-43 (41 ± 1.3)
Gubernaculum	20	17-20 (18 ± 0.9)	17-21 (19 ± 1.3)	18-23 (20 ± 1.1)	18-22 (20 ± 1.2)	19-22 (20 ± 0.7)
Cloaca to SP1	14	12-16 (14 ± 1.1)	13-17 (15 ± 1.0)	20-28 (24 ± 2.0)	22-28 (24 ± 2.1)	18-28 (24 ± 3.0)
SP1 to SP2	44	30-49 (37 ± 4.4)	32-53 (43 ± 5.8)	24-42 (33 ± 4.9)	28-34 (31 ± 2.3)	23-33 (27 ± 3.3)
SP2 to SP3	44	33-59 (45 ± 5.9)	36-63 (47 ± 7.1)	29-53 (41 ± 6.5)	32-43 (36 ± 4.1)	28-42 (36 ± 4.8)
a	19	16-22 (19 ± 1.1)	16-21 (19 ± 1.1)	20-27 (23 ± 2.1)	18-22 (20 ± 1.5)	18-26 (20 ± 2.2)
b	5.1	3.6-6.2 (4.4 ± 0.52)	3.7-5.5 (4.8 ± 0.57)	3.8-5.7 (4.8 ± 0.43)	3.9-5.0 (4.4 ± 0.43)	4.0-6.3 (4.8 ± 0.74)
T	67	53-72 (63 ± 3.7)	57-68 (63 ± 3.7)	58-72 (64 ± 4.6)	61-68 (64 ± 2.5)	57-68 (63 ± 3.4)
Ant. end to EP/Pharynx (%)	77	58-82 (69 ± 7.0)	56-82 (72 ± 7.7)	63-88 (78 ± 4.9)	70-77 (73 ± 3.4)	55-93 (71 ± 12.0)
Onchiostyle/Pharynx (%)	36	28-38 (31 ± 2.3)	24-37 (32 ± 3.4)	34-45 (41 ± 2.3)	36-41 (38 ± 1.9)	26-38 (32 ± 4.1)
Cloaca to SP1/Spicule (%)	32	28-40 (33 ± 2.7)	32-39 (35 ± 1.9)	52-64 (55 ± 3.0)	52-65 (57 ± 4.3)	45-69 (58 ± 7.0)
Cloaca to SP2/Spicule (%)	132	102-150 (123 ± 10.2)	112-156 (137 ± 13.5)	114-148 (129 ± 9.6)	121-144 (131 ± 8.5)	103-141 (124 ± 13.2)
Cloaca to SP3/Spicule (%)	232	186-269 (229 ± 19.1)	202-298 (247 ± 26.0)	191-260 (225 ± 18.4)	200-243 (218 ± 13.4)	187-231 (209 ± 14.2)

the more or less pear-shaped basal bulb. Nerve ring situated about one body width behind the onchiostyle base. Five pharyngeal gland nuclei present: the posterior pair of subventral nuclei large, located in the posterior third of the bulb; the anterior pair of subventral nuclei much smaller and obscure, located in the anterior third of the bulb and the dorsal nucleus large and distinct, located in between the two pairs of subventral nuclei. No ventral pharyngeal or dorsal intestinal overlap observed at the pharynx-intestine junction. Three ventromedian cervical papillae (CP) (exceptionally two in three specimens out of 34 paratype males), all positioned between the onchiostyle base and the excretory pore (EP), with the anteriormost one (CP1) lying at the level of mid-isthmus. Distance CP1-CP2, CP2-CP3 and CP3-EP roughly equal. Excretory pore usually opposite the anterior end of the pharyngeal bulb, 81-114 (94) μm from the anterior body end. A lateral cervical pore present at about the level of CP1 on each side of the body. Testis single, outstretched. Sperm cells large with sausage-shaped nuclei of 4.0-6.5 × 2.0-3.0 μm in size. Spicules 39-44 (41) μm long, almost straight or slightly curved ventrally, with a marked manubrium and a finely striated shaft of about equal width before tapering distally to a fine rounded tip, shaft sometimes showing irregular depressions in the middle region; four pairs of bristles

Table 2. *Morphometric data of females of* Trichodorus paracedarus *n. sp. and* T. cedarus *from China* (all measurements in µm).

Locality *Host*	*Trichodorus paracedarus* n. sp.		*Trichodorus cedarus*		
	Nanjing *Tomato*	*Lianyungang* *Cherry*	*Changxin* *Chinafir*	*Wuxi* *Peach*	*Ganyu* *Apple*
	(Paratypes)				
n	42	20	20	9	10
L	506-751 (591 ± 44.2)	518-707 (646 ± 58.0)	629-897 (776 ± 70.9)	617-717 (665 ± 30.1)	649-728 (692 ± 28.4)
Body width	27-42 (33 ± 2.6)	32-42 (36 ± 3.1)	32-38 (34 ± 2.0)	32-42 (36 ± 3.2)	29-38 (34 ± 2.7)
Pharynx	106-175 (133 ± 13.1	106-152 (134 ± 10.2)	146-194 (167 ± 10.9)	134-168 (152 ± 10.4)	127-175 (147 ± 14.3)
Onchiostyle	39-45 (42 ± 1.3)	39-42 (41 ± 1.0)	60-70 (66 ± 2.8)	56-61 (59 ± 1.6)	46-50 (47 ± 1.3)
Ant. end to excret. pore (EP)	83-108 (94 ± 5.6)	85-112 (98 ± 7.7)	91-142 (127 ± 11.2)	102-116 (111 ± 4.9)	86-113 (103 ± 11.7)
Ant. genital branch	142-240 (185 ± 24.6)	150-296 (224 ± 36.1)	182-295 (233 ± 33.5)	215-272 (249 ± 19.5)	174-244 (203 ± 23.3)
Post. genital branch	118-230 (186 ± 26.7)	132-292 (224 ± 47.6)	184-279 (226 ± 28.3)	185-227 (208 ± 16.3)	158-210 (185 ± 19.8)
a	15-22 (18 ± 1.3)	16-20 (18 ± 0.9)	20-25 (23 ± 1.5)	17-20 (19 ± 1.2)	19-24 (21 ± 2.0)
b	3.5-6.3 (4.5 ± 0.52)	4.0-5.5 (4.8 ± 0.46)	3.7-5.5 (4.7 ± 0.43)	3.9-5.0 (4.4 ± 0.41)	4.0-5.7 (4.7 ± 0.46)
V	52-60 (56 ± 1.8)	54-59 (57 ± 1.5)	55-60 (58 ± 1.5)	57-61 (59 ± 1.7)	54-59 (57 ± 1.4)
G1	25-39 (31 ± 4.0)	28-42 (34 ± 3.8)	22-34 (29 ± 3.8)	34-40 (37 ± 1.9)	25-34 (29 ± 2.6)
G2	20-39 (32 ± 4.2)	25-42 (35 ± 4.9)	22-36 (29 ± 4.1)	28-35 (31 ± 2.1)	22-30 (27 ± 2.6)
Ant. end to EP/Pharynx (%)	56-91 (72 ± 8.3)	61-85 (74 ± 6.7)	61-86 (76 ± 5.8)	62-82 (74 ± 6.5)	56-82 (71 ± 8.9)
Onchiostyle/Pharynx (%)	25-40 (32 ± 2.8)	28-37 (31 ± 2.2)	33-41 (40 ± 2.1)	35-42 (39 ± 2.1)	28-37 (32 ± 3.0)

visible just anterior to mid-shaft on extruded spicules. Gubernaculum 17-20 (18) µm long, linear, with pronounced keel-shaped distal end. There are three precloacal supplements (SP) : the posterior one (SP1) well developed with obvious sensory nerve, situated at 28-40 % (33 %) of spicule length anterior to the cloaca, i.e. opposite the distal third of retracted spicules; SP2 and SP3 strongly reduced to pore-like structure similar to those in *Paratrichodorus* species, rarely indiscernable, positioned out of reach of retracted spicules at 102-150 % (123 %) and 186-269 % (229 %) of spicule length anterior to the cloaca, respectively. Distance cloaca-SP1 much smaller than distance SP1-SP2 and the latter usually slightly smaller than distance SP2-SP3. Tail conoid, dorsally convex, with one pair of subventral postcloacal papillae and one pair of subventral caudal pores. Cuticle at tail terminus thickened conspicuously and showing a characteristic ventral indentation at the level of the caudal pores. A distinct bursa present, running from the tail terminus to the anterior third of the spicule region. Copulatory muscles little developed.

Female : Body straight to slightly curved ventrally upon death. Morphology of the anterior region similar to that of male except that ventromedian cervical papillae and lateral cervical pores are absent. Reproductive system didelphic-amphidelphic, with reflexed ovaries and well developed spermathecae filled with sperm. Vulva a short transverse slit in ventral view. Vagina more or less barrel-shaped or subcylindrical in lateral view, extending inwards about half the corresponding body width. Sclerotized vagina pieces conspicuously developed, typically triangular or rarely eye-drop like when viewed laterally. A pair of advulvar body pores present, situated laterally at 0.5-1.5 (1.0) body widths posterior to the vulva. Tail bluntly conoid with one pair of subventral caudal pores. Anus subterminal.

TYPE MATERIAL

Holotype (male) : Deposited in the Nematology Laboratory of Nanjing Agricultural University, Nanjing, China.

Paratypes : Three males and three females in the nematode collection of Koninklijk Belgisch Instituut voor Natuurwetenschappen, Brussels, Belgium; the remaining specimens with the holotype.

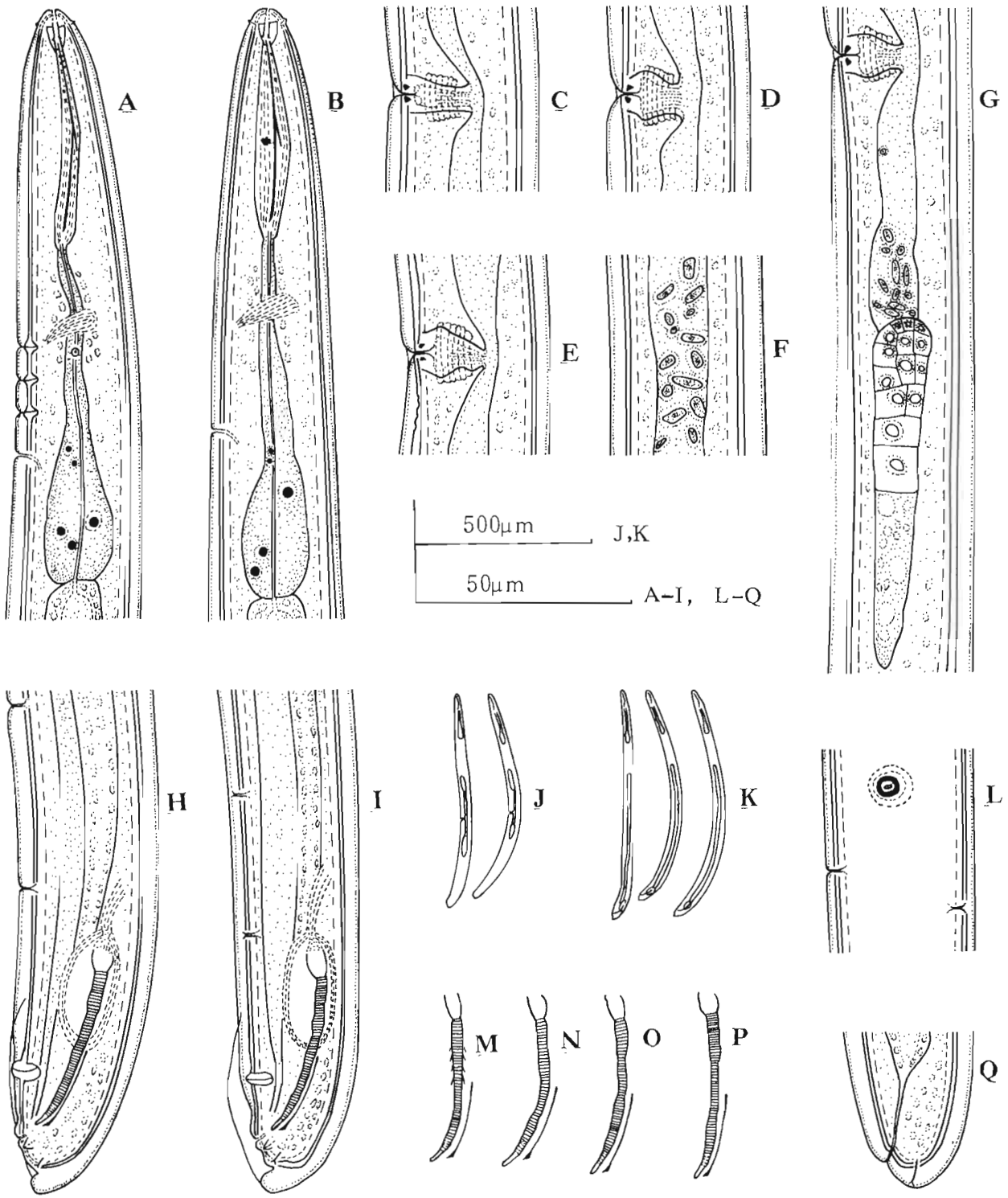

Fig. 1. Trichodorus paracedarus *n. sp. (type population). Male : A. Anterior region (lateral); F : Sperm cells; H : Posterior region (lateral); I : Posterior region (sublateral); K : Habitus; M-P : Spicules. - Female. B : Anterior region (lateral); C-E : Vulval region (lateral); G : Vulva and posterior genital branch (lateral); J : Habitus; L : Vulval region (ventral); Q : Tail region (lateral).*

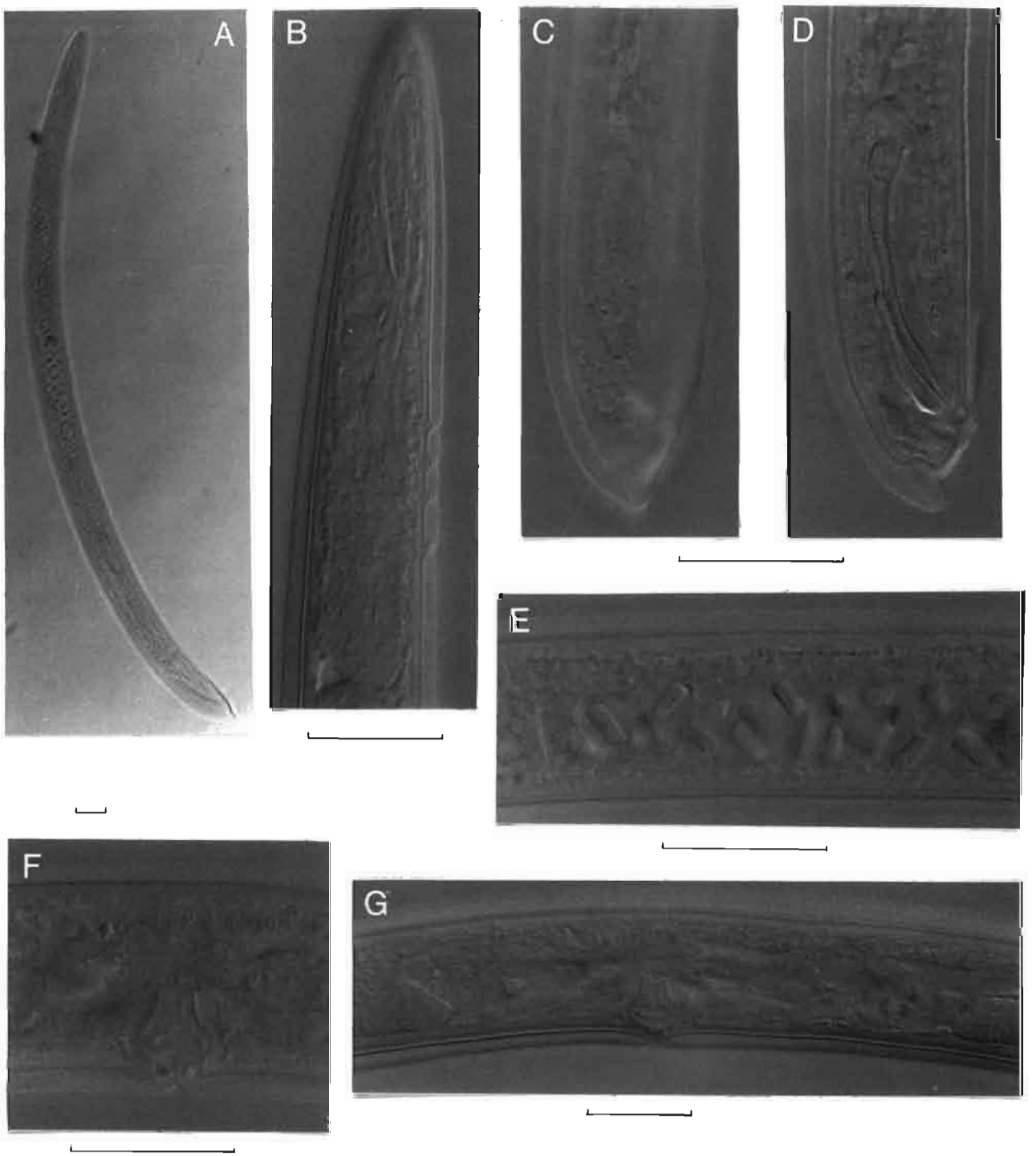

Fig. 2. Trichodorus paracedarus *n. sp. (paratype specimens). A : Entire male; B : Male anterior region (lateral); C : Male posterior region (sublateral), showing the bursa; D : Male posterior region (lateral); E : Sperm cells in testis; F : Vulval region (lateral); G : Female reproductive system (lateral).* (Scale bars = 20 µm).

TYPE HABITAT AND LOCALITY

Clay soil around roots of tomato (*Lycopersicon esculentum* Mill.) in Nanjing, Jiangsu Province, China.

OTHER HABITAT AND LOCALITY

Sandy soil around roots of Yoshino cherry (*Prunus yedoensis* Matsum) in Lianyungan, Jiangsu Province, China.

DIAGNOSIS AND RELATIONSHIPS

Trichodorus paracedarus n. sp. is characterized by a combination of the following features : body and onchiostyle relatively short in both male and female; presence of three ventromedian cervical papillae between the onchiostyle base and the excretory pore, spicules almost straight or slightly ventrally curved distally, with a marked manubrium and a finely striated shaft of about equal width, posterior precloacal supplement (SP1) located opposite the distal third of retracted spicules, SP2 and SP3 strongly reduced to pore-like structure and positioned outside the spicule region, posterior body end straight with little developed copulatory muscles, presence of a distinct bursa and cuticle at tail terminus thickened conspicuously with a ventral indentation in male; sclerotized vaginal pieces usually triangular and presence of a pair of lateral postadvulvar body pores in female.

T. paracedarus n. sp. appears to represent an intermediate form between the genera *Trichodorus* and *Paratrichodorus*. The straight posterior body end associated with weakly developed copulatory muscles and the presence of a bursa in males of *T. paracedarus* n. sp. are characters reminiscent of *Paratrichodorus* species. The nematode is considered more closely related to *Trichodorus* than to *Paratrichodorus* because of its cuticle status upon fixation in both male and female, distribution pattern of supplements in male and development of vaginal sclerotizations and vagina in female. Since there is no sufficient evidence at the present time to support either the synonymization of the genera *Trichodorus* and *Paratrichodorus* or the erection of a new genus, the new species is here retained in the genus *Trichodorus*.

T. paracedarus n. sp. is most closely related to *T. cedarus* Yokoo, 1964, of which many geographically different populations have been recorded from Japan and Korea (Yokoo, 1964; Mamiya, 1967; Lee, 1976; Shishida, 1979) and three populations from China are also reported in the present paper, by virtue of its general measurements, number and position of ventromedian cervical papillae, shape and ornamentation of spicules and relative position of SP2 and SP3 in male and shape of sclerotized vaginal pieces in female. *T. paracedarus* n. sp. differs consistently from the various populations of *T. cedarus* reported in a number of posterior body end characters in male : posterior end habitus (straight with little developed copulatory muscles in the former *vs* ventrally curved with well developed copulatory muscles in the latter, cf. Fig. 3 F, H); bursa development (present *vs* absent); tail terminus shape (terminal cuticle conspicuously thickened with a ventral indentation *vs* slightly thickened without any ventral indentation, cf. Fig. 3 F); SP1 position (opposite the distal third of retracted spicules *vs* opposite the middle of retracted spicules); SP2 and SP3 structure (strongly reduced to pore-like *vs* normally developed) and spicule curvature (almost straight or slightly ventrally curved distally *vs* distinctly ventrally curved proximally, cf. Fig. 3 F, I-K). The new species can furthermore be distinguished from *T. cedarus* by the position of advulvar body pores in female (situated laterally for the former *vs* subventrally for the latter, cf. Fig. 2 C-E *in* Mamiya, 1967).

Trichodorus cedarus Yokoo, 1964

(Figs 3 A-K, 4)

This nematode was found in three sampling areas : in association with Chinafir (*Cunninghamia lanceolata* [Lamb.] Hook), pear (*Pyrus pyrifolia* [Burm. f.] Nakai), peach (*Prunus persica* [L.] Batsch), apricot (*Prunus armeniaca* L.) and persimmon (*Diospyros kaki* Thunb.) in Changxin, northern Zhejiang Province; with apples (*Malus pumila* Mill.) in Ganyu, northern Jiangsu Province and with peach in Wuxi, southern Jiangsu Province. Morphometric date of three populations are presented in Tables 1 and 2.

The Chinese specimens conform well to the various former descriptions of *T. cedarus* from Japan and Korea (Yokoo, 1964; Mamiya, 1967; Lee, 1976; Shishida, 1979) in all the main morphological and morphometric features. It should be specially noted that the Chinese populations also exhibited high inter-populational variability in onchiostyle length (mean value 46-47 μm in male and 47-66 μm in female), indicating that onchiostyle length is of little diagnostic value of *T. cedarus* (cf. Shishida, 1979).

Trichodorus pakistanensis Siddiqi, 1962

(Fig. 3 L-Q)

Two populations of the species were collected from around roots of ramie (*Boehmeria nivea* [L.] Gaud) in Shexian, southern Anhui Province and lychee (*Litchi chinensis* Sonn.) in Zhangzhou, southern Fujian Province, respectively. Morphometric data are given in Tables 3 and 4.

The Chinese specimens generally agree with the original description of *T. pakistanensis* in the main diagnostic features such as number of ventromedian cervical papillae, shape of spicules and arrangement of supplements in male and shape of vaginal sclerotizations in female. Differences or variations of the Chinese populations from the type population include : in the former the body appears to be stouter in both sexes [a = 20-24 (22) *vs* 25-34 (29) in male; 19-26 (21) *vs* 24-31 (27) in female]; and the gubernaculum is longer and differently

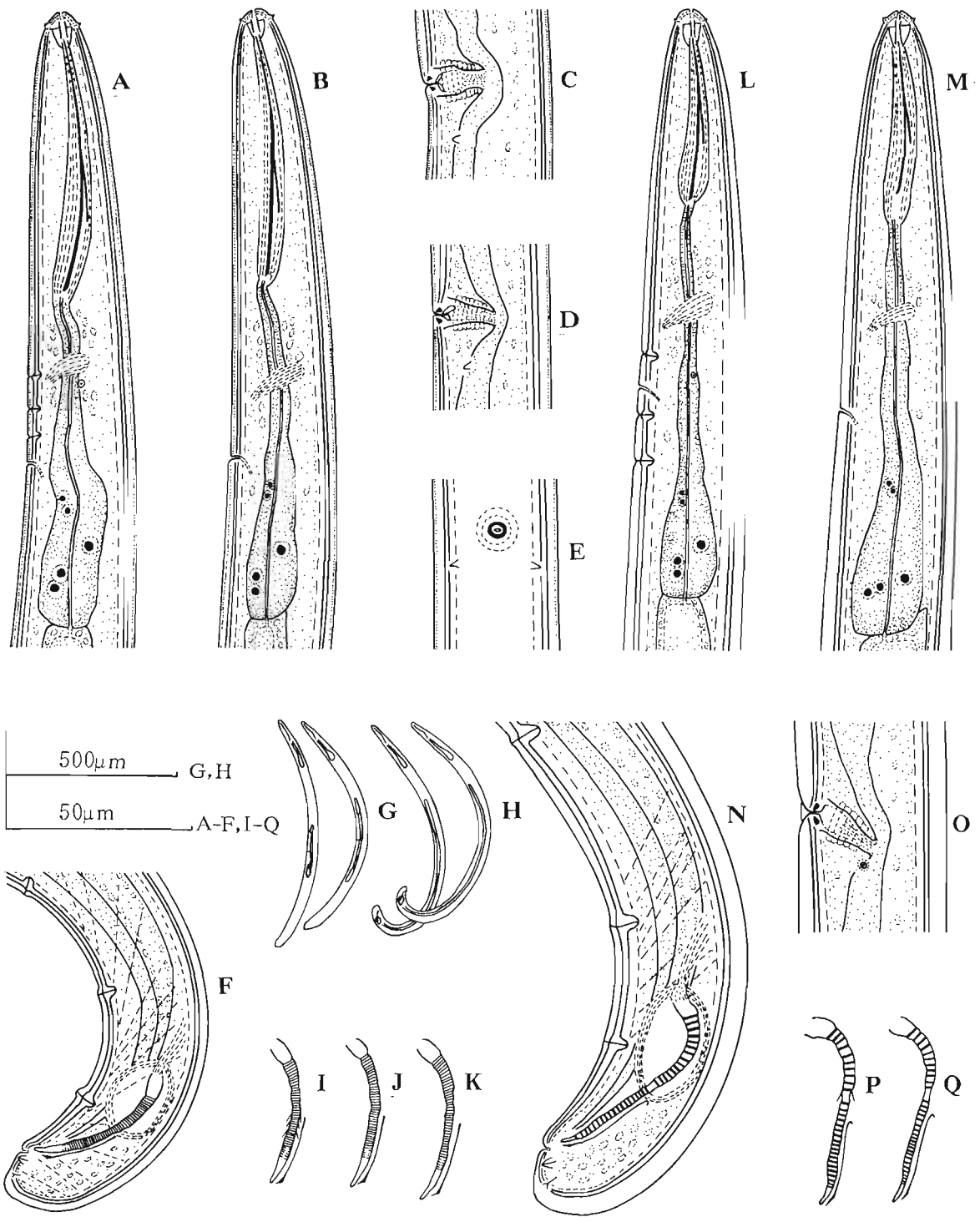

Fig. 3. Trichodorus cedarus *Yokoo, 1964 (Changxin population). A : Male anterior region (lateral); B : Female anterior region (lateral); C, D : Vulval region (lateral); E : Vulval region (ventral); F : Male posterior region (lateral); G : Female habitus; H : Male habitus; I-K : Spicules.* - T. pakistanensis *Siddiqi, 1962 (Shexian population); L : Male anterior region (lateral); M : Female anterior region (lateral); N : Male posterior region (lateral); O : Vulval region (lateral); P, Q : Spicules.*

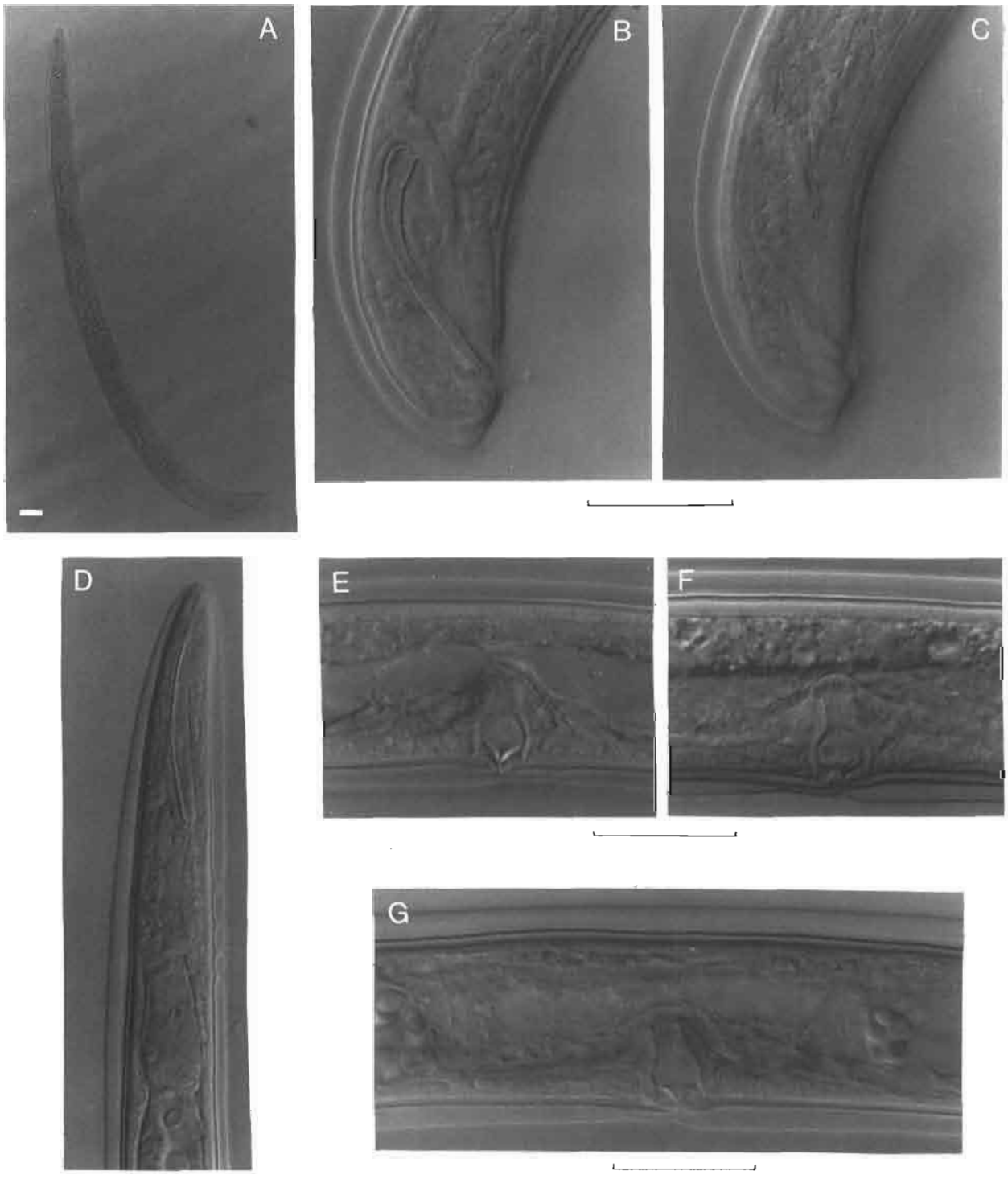

Fig. 4. Trichodorus cedarus *Yokoo, 1964 (specimens from Wuxi). A : Entire male; B : Male posterior region (lateral); C : Male posterior region (sublateral); D : Male anterior region (lateral); E-G : Vulval region (lateral).* (Scale bars = 20 μm).

Table 3. *Morphometric data of males of two populations of* Trichodorus pakistanensis *from China* (all measurements in μm).

Locality Host	Shexian Ramie	Zhangzhou Lychee
n	20	4
L	693-1056 (837 ± 99.0)	800-902 (850)
Body width	33-44 (38 ± 3.1)	33-37 (36)
Pharynx	132-187 (159 ± 14.7)	134-187 (164)
Onchiostyle	40-44 (42 ± 1.2)	40-43 (42)
Ant. end to excret. pore (EP)	99-116 (104 ± 6.1)	102-104 (103)
Ant. end to CP1	79-102 (92 ± 6.6)	87-89 (87)
CP1 to CP2	8.0-16.5 (12.5 ± 2.49)	8.0-12.0 (10.0)
CP2 to CP3	8.0-21.5 (13.0 ± 2.84)	14.0-16.0 (15.0)
Spicule	51-53 (52 ± 0.8)	47-52 (51)
Gubernaculum	22-25 (23 ± 0.8)	23-25 (24)
Cloaca to SP1	30-41 (37 ± 3.4)	30-36 (33)
SP1 to SP2	30-49 (40 ± 5.8)	41-49 (45)
SP2 to SP3	39-69 (53 ± 7.6)	43-57 (51)
a	20-24 (22 ± 1.5)	22-25 (24)
b	4.4-6.5 (5.3 ± 0.61)	4.3-6.0 (5.3)
T	50-66 (60 ± 4.3)	56-67 (62)
Ant. end to EP/Pharynx (%)	57-75 (66 ± 5.9)	58-77 (67)
Onchiostyle/Pharynx (%)	23-30 (26 ± 2.1)	22-32 (26)
Cloaca to SP1/Spicule (%)	56-81 (71 ± 6.4)	57-69 (65)
Cloaca to SP2/Spicule (%)	119-170 (148 ± 14.7)	150-162 (155)
Cloaca to SP3/Spicule (%)	208-302 (249 ± 25.4)	248-273 (257)

shaped [22-25 (23) μm long and proximally hook-shaped *vs* 12-16 (13.5) μm long and proximally straight, Fig. 2 N, P, Q], the spicules are provided with a pair of bristles just posterior to the constricted region (Fig. 2 P) and the excretory pore is situated between the first and second ventromedian cervical papillae in about 1/3 of the specimens examined (excretory pore always situated between the second and third ventromedian cervical papillae in the type population) in male. Although these differences or variations have been re-confirmed by examination of paratype specimens of *T. pakistanensis,* the Chinese populations are regarded here as geographical variants of *T. pakistanensis.*

Table 4. *Morphometric data of females of two populations of* Trichodorus pakistanensis *from China* (all measurements in μm).

Locality Host	Shexian Ramie	Zhangzhou Lychee
n	20	3
L	794-1064 (873 ± 68.3)	926-1052 (984)
Body width	37-47 (41 ± 2.8)	34-40 (38)
Pharynx	140-191 (160 ± 13.8)	146-164 (152)
Onchiostyle	41-45 (42 ± 1.1)	40-41 (41)
Ant. end to excret. pore (EP)	95-116 (105 ± 5.8)	106-118 (110)
Ant. genital branch	203-311 (249 ± 28.5)	262-296 (275)
Post genital branch	223-311 (256-28.9)	223-317 (268)
a	19-26 (21 ± 1.6)	25-28 (26)
b	4.3-6.6 (5.5 ± 0.52)	6.4-6.7 (6.5)
V	52-58 (55 ± 1.6)	55-57 (56)
G1	23-35 (29 ± 2.7)	25-32 (28)
G2	26-37 (30 ± 3.4)	24-33 (27)
Ant. end to EP/Pharynx (%)	51-73 (66 ± 6.7)	65-81 (73)
Onchiostyle/Pharynx (%)	22-30 (27 ± 2.0)	25-28 (27)

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