

Trichodoros reduncus sp. n. and *Tylenchorhynchus* (*Divittus*) *dispersus* sp. n. Associated with Groundnut in Vietnam

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Abstract. *Trichodoros reduncus* sp. n. and *Tylenchorhynchus* (*Divittus*) *dispersus* sp. n. isolated from soil samples collected from groundnut fields in Nghe An Province of Vietnam is described and illustrated. *T. reduncus* is recognized by males having 36-40 μ m long onchiostyle, three ventromedian cervical papillae between nerve ring and excretory pore, 30-33 μ m long spicules and gubernaculum 14-15 μ m long with dorsally recurved proximal region which lies in between the spicules when seen laterally. The females have 0.62-0.72 mm long body, 37-40 μ m long onchiostyle, vulva at 55-57 percent of body, vaginal sclerotization appearing round to roughly triangular pieces in lateral view and almost terminal caudal pores. *T. (D.) dispersus* is close to *T. (D.) divittus* Siddiqi, 1961 but differs from it in having a longer (18-20 μ m) stylet, female tail with a subterminal depression on its dorsal side, longer (22.0-24.5 μ m) spicules and phasmids located anterior to the middle of the tail.

Keywords: Groundnut, new species, plant-parasitic nematodes, systematics, *Trichodoros reduncus*, *Tylenchorhynchus* (*Divittus*) *dispersus*, Vietnam.

INTRODUCTION

During a survey of groundnut (*Arachis hypogaea* L.) growing regions of Vietnam in 1993, 31 species of plant-parasitic nematodes were found (Sharma *et al.*, 1994). These included two new species belonging to the genera *Trichodoros* Cobb, 1913 and *Tylenchorhynchus* Cobb, 1913, here described as *Trichodoros reduncus* sp. n. and *Tylenchorhynchus* (*Divittus*) *dispersus* sp. n. They were isolated from several soil samples from Nam Dan district (riverbed delta) in Nghe An Province of North Vietnam and the latter species was widely dispersed (hence the species name) in the areas surveyed in North Vietnam. The plants showed symptoms of nematode-caused damage such as root and peg discoloration and chlorosis of leaves. These symptoms were perhaps due to additive pathogenic effects of these species along with those of other associated nematodes such as *Pratylenchus brachyurus*, *Meloidogyne javanica*, *Rotylenchulus reniformis*, *Tylenchorhynchus annulatus* and *Macroposthonia ornata*. The nematodes were collected by the second author, killed and fixed in 2% hot formalin and mounted in dehydrated glycerine by processing through warm lactophenol (Siddiqi, 1986).

SYSTEMATICS

Trichodoros reduncus sp. n.

(Fig. 1, A-1)

Holotype male: L = 0.76 mm; a = 28; b = 6.2; c = 84;

T = 68; onchiostyle = 38 μ m; spicules = 33 μ m; gubernaculum = 14 μ m.

3 paratype males: L = 0.61-0.77 (0.67 \pm 0.059) mm; a = 24-29 (26.5 \pm 1.9); b = 5.3-6.1 (5.7 \pm 3.8); c = 68-83 (75 \pm 6.9); T = 60-69 (64.6 \pm 3.3); onchiostyle = 36-40 (38.6 \pm 1) μ m; spicules = 30-33 (32.1 \pm 0.6) μ m; gubernaculum = 14-15 (14.3 \pm 0.4) μ m.

6 paratype females: L = 0.62-0.72 (0.67 \pm 0.04) mm; a = 22.0-26.5 (24.3 \pm 1.4); b = 5.1-5.7 (5.46 \pm 2); c = sub-terminal; V = 55-57 (55.9 \pm 0.6); onchiostyle = 37-40 (38.3 \pm 0.9) μ m.

Description

Male. Body hockey stick-shaped; maximum width 23-28 μ m. Cuticle smooth, 2.5 μ m thick; subcuticle finely annulated; annules 0.9-1.0 μ m wide. Cephalic region rounded, with slightly raised sensilla. Amphidial aperture oval, about half as long as adjacent body width, at base of cephalic region. End of sclerotized stoma or collar 16-17 μ m from head end. Onchiostyle typical of the genus, 36-40 μ m long; solid cone of onchiostyle 17-18 μ m long. A pair of lateral cervical pores present a little behind onchiostyle base at 48-50 μ m from anterior end of body. Three ventromedian cervical papillae present between the level of nerve ring and excretory pore, at 54-67, 69-74, and 84-85 μ m from anterior end of body, the anteriormost lying opposite posterior margin of nerve ring.

Excretory pore 85-94 μ m from anterior end of body. Nerve ring at 57-63 μ m from anterior end of body. Oeso-

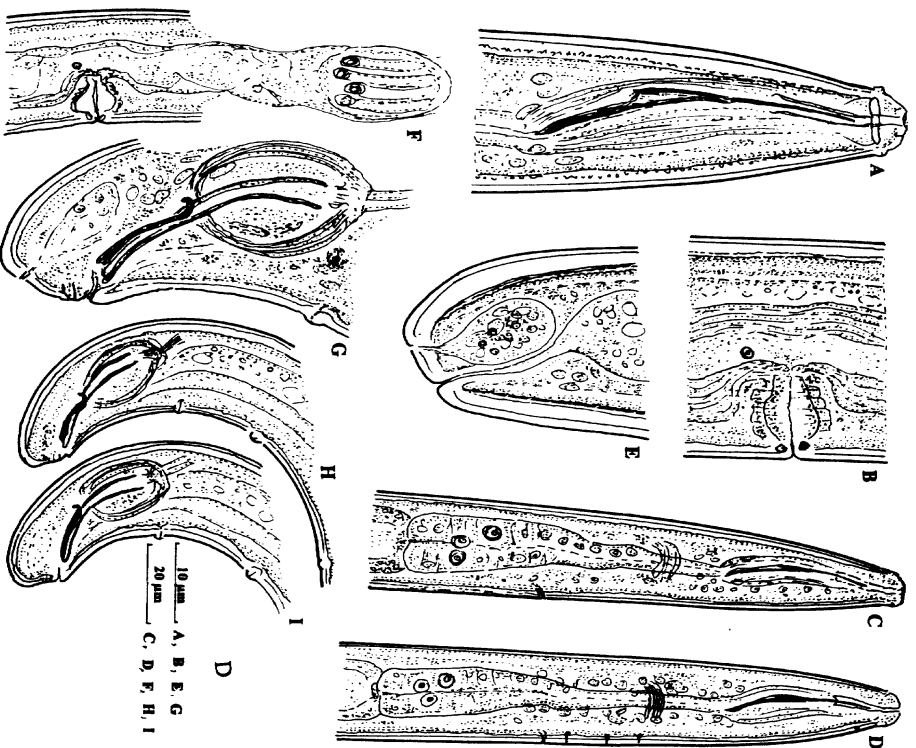


Fig. 1. *Trichodorus reduncus* sp. n. A. Anterior end of female. B. Vagina in lateral view. C & D. Oesophageal regions of female and male, respectively. E. Female tail end. F. Vulva region. G-I. Tail ends of male.

phagus a slender tube as it passes through nerve ring, then gradually enlarging to form basal bulb about one-third of its total length, 120-129 (125.6 ± 3.4) μm long. Dorsal gland nucleus (DN) about one adjacent body width anterior to base of oesophagus, the two posterior subventral nuclei (S_2N) opposite or a little behind DN (Fig. 1, D). Cardia small, rounded to discoidal. Testes single, with 13-15 spermatocytes followed by tightly packed sperms whose nuclei measure 6-7 μm long. Spicules slender, more narrowed in distal half, slightly arcuate, with a wide manubrium and small rounded to pointed distal end, not striated transversely (Fig. 1, G-I), 31-33 μm long medially. Suspensor muscles distinct, longitudinally oval. Gubernaculum prominent, proximal end dorsally hooked and lying in between the spicules so that in lateral view it appears to lie at the side of the spicule instead of being dorsal to it (Fig. 1, G-I). Tail about 10 μm long, conoid-rounded to hemispherical. Paired postanal papillae in ventrosulateral position just behind cloacal aperture. Caudal pores distinct, ventrally subterminal. First ventromedian supplement at 25-29 μm from cloacal aperture, usually opposite spicule head. Second and third supplements at 52-57 and 68-107 μm from cloacal aperture.

Female. Body straight to slightly arcuate ventrally; maximum width 26-28 μm . Cuticle smooth, about 3 μm thick. Cephalic region rounded, almost continuous. Onchiostyle and oesophagus as described for male. Conus of onchiostyle solid, 14.0-19.5 μm long. Excretory pore 86-102 (93 ± 6.8) μm from anterior end of body. Oesophagus gradually enlarging behind nerve ring; base flat and offset from intestine, with a small cardia, 114-130 (121 ± 5.9) μm long; S_2N closely behind DN.

Vulva a small transverse slit, at 350-408 (371 ± 24) μm from anterior end. A pair of lateral vulval pores present opposite or closely behind vulval level (Fig. 1, B). Didelphic. Vagina about one-third body width long, at right angles to body axis; its walls thick and appearing globular in lateral view; outer region with prominent sclerotization appearing as round or somewhat triangular pieces in lateral view (Fig. 1, B). Uteri well developed, with spermatheca which is longitudinally elongate and contains elongate sperms (Fig. 1, F). Ovaries reflexed. Rectum 15 μm long. Anus subterminal; tail end rounded. A pair of caudal pores present almost terminally (Fig. 1, E).

Type habitat and locality: Soil around roots of groundnut, *Arachis hypogaea* L., in Nam Dan district (riverbed delta), Nghe An Province, Vietnam.

Type specimens: Holotype male, 5 paratype males and 4 paratype females at the International Institute of Parasitology, St. Albans, England; 1 paratype male and 1

paratype female at Rothamsted Experimental Station, Harpenden, England; 1 paratype male and 1 paratype female at ICRISAT, Patancheru, Andhra Pradesh, India.

Relationship: *Trichodorus reduncus* sp. n. comes close to *T. pakistanensis* Siddiqi, 1963, in the three ventromedian cervical papillae located behind the nerve ring, but differs from it in having a smaller body (males 0.84-1.20 (0.97) mm, females 0.82-1.22 (0.98) mm long in *T. pakistanensis*), unstriated spicules, different gubernaculum shape and the vagina not directed posteriorly. It also has affinities with *T. borneensis* Hooper, 1962 and *T. nangingensis* Liu & Cheng, 1990. *T. borneensis* males have 51-60 (53) μm long onchiostyle, only two ventromedian cervical papillae, 45-52 (49) μm long and striated spicules, straight gubernaculum and females with 53-57 (54) long onchiostyle and teardrop-shaped appearance of vaginal sclerotization in lateral view. *T. nangingensis* has males 0.785-1.085 (0.911) mm long and with 43-48 (45) μm long onchiostyle, 42-49 (46) μm long, striated spicules, 17.6-22.7 (19.5) μm long and differently shaped gubernaculum, only two ventromedian cervical papillae and females 0.842-1.029 (0.921) mm long and with 42-46 (44) μm long onchiostyle and excretory pore at 105-132 (120) μm from anterior end.

Etymology: The species name *reduncus* is Latin meaning curved backwards, masculine in gender, and refers to the gubernaculum shape.

Tylenchorhynchus (Divittus) dispersus sp. n.

(Fig. 2, A-D)

Measurements

Holotype male: L = 0.72 mm; a = 36; b = 5.6; c = 14; V = 24.54^{26} ; stylet = 19 μm .

20 paratype females: L = 0.72-0.86 (0.78 ± 0.039) mm; a = 33-42 (38 ± 3.1); b = 5.2-6.5 (5.7 ± 4.1); c = 13-18 (15 ± 1.8); V = 51-61 (54.5 ± 3.4); stylet = 18-20 (19 ± 0.6) μm .

10 paratype males: L = 0.62-0.77 (0.71 ± 0.05) mm; a = 33-40 (37 ± 2.5); b = 5.0-5.9 (5.4 ± 3.1); c = 14-20 (16.7 ± 2.3); T = 56-72 (55.9 ± 5.4); stylet = 18.5-19.5 (19 ± 0.31) μm ; spicules = 22.0-24.5 (23 ± 0.7) μm ; gubernaculum = 10-13 (11.8 ± 0.9) μm .

Description

Female. Body ventrally arcuate when relaxed; maximum width 19-23 μm . Cuticle annules distinct, averaging 1.8 μm wide on midbody. Lateral field with 3 incisures, 28-34% of body width, not areolated except in oesophageal and tail regions, occasionally some transverse striae cross fields in posterior region; outer incisures crenate. Cephalic region rounded, offset by constriction, with 6, sometimes 7 annules plus an indistinct perioral disc. Cephalic frame

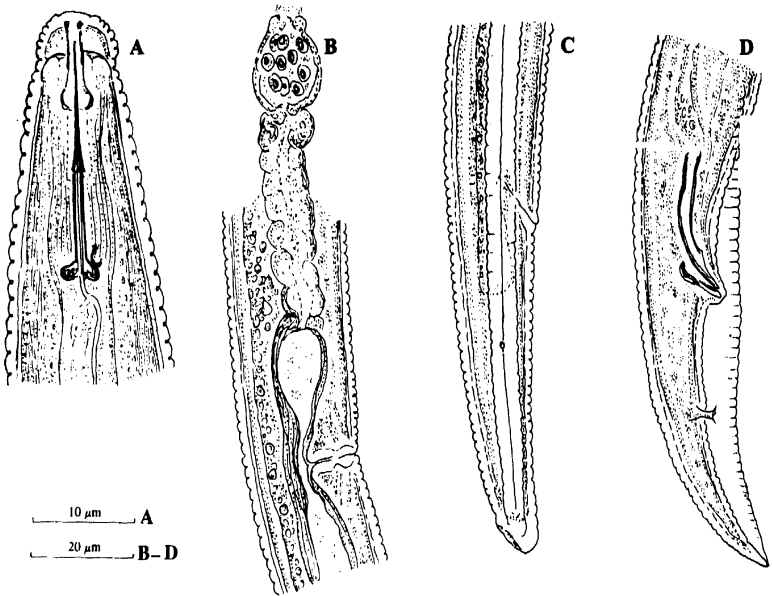


Fig. 2. *Tylenchorhynchus (Divittus) dispersus* sp. n. A. Anterior end of female. B. Vulva region. C. Tail end of female. D. Tail end of male.

work lightly sclerotized, outer margins extending 2 annules into body. Stylet slender, about 2.8-2.9 head widths or 18-20 μm long; conus solid appearing anteriorly, 50-53% of total stylet length; basal knobs rounded, slightly sloping backwards, well separated from each other. Dorsal gland orifice 1.5-2.5 μm behind stylet.

Oesophagus 125-138 (131 ± 3.6) μm long; base offset from intestine, with a rounded cardia. Median oesophageal bulb muscular, oval, 14-15 \times 10 μm , with 4 \times 3 μm valvular apparatus in centre located at 50-53 (51.5 ± 1.2) percent of oesophageal length. Basal oesophageal bulb saccate, about 25-26 \times 11.5 μm . Excretory pore opposite base of isthmus, at 107-117 (113 ± 3.5) μm from anterior end of body. Hemizonid two annules long, just anterior to excretory pore. Nerve ring crossing isthmus at or near its middle.

Vulva a transverse slit, lips slightly raised, at 390-478 (425 ± 27) μm from anterior end of body. Vagina at right

angles to body axis, about one-third as long as body width. Spermathecae rounded, with sperm in most females. Two branches of reproductive system equally developed. Ovaries with a single row of oocytes. Intestine extending as a blind sac for about one-third of the tail. Rectum shorter than anal body width, rectum-intestine junction indistinct. Tail elongate-subcylindrical to a smoothly rounded terminus, usually with 32-37 annules, with a small, sub-terminal depression on dorsal side; lateral fields reaching near to tail tip. Phasmids pore-like, distinct, just anterior to middle of tail.

Male. Body C-shaped with posterior region often more strongly curved; maximum width 18-22 μm . Cuticle, lateral field, cephalic region, stylet and oesophagus as described for female. Excretory pore 106-115 (109 ± 3.1) μm from anterior end of body. Centre of median oesophageal bulb at 50-53 percent of oesophageal length.

Testis outstretched, with serially arranged spermatocytes. Spicules ventrally arcuate, distinctly flanged in posterior third, with pointed distal end. Gubernaculum with rounded proximal end often curved ventrally and distal third with raised sides. Tail conoid, ventrally arcuate, completely enveloped by a well developed bursa that arises well anterior to head of spicules. Phasmids anterior to middle of tail, slightly extending into bursa.

Type host and locality: Groundnut, *Arachis hypogaea* L., in Nam Dan district (riverbed delta) of Nghe An Province, Vietnam.

Type specimens: Holotype female, 15 paratype females and 8 paratype males at the International Institute of Parasitology, St. Albans, England; 3 paratype females and 2 paratype males at Rothamsted Experimental Station, Harpenden, England; 2 paratype females and 1 paratype male at ICRISAT, Patancheru, Andhra Pradesh, India.

Relationship: *Tylenchorhynchus (Divittus) dispersus* sp. n. comes close to *T. (D.) divittatus* Siddiqi, 1961 but differs from it in having a longer stylet, spicules and gubernaculum, phasmids located anterior to middle of tail and female tail carrying a subterminus depression on its dorsal side and the cuticle of lateral field not extending beyond tip (stylet in females 16-17 μm , in males 15.5-16.0 μm long and spicules 17 μm long in *T. (D.) divittatus*, after

Siddiqi, 1961).

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