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NEMATODES FROM WEST BENGAL (INDIA)

XVIII. STUDIES ON THE SPECIES OF THE SUBFAMILY TYLENCHORHYNCHINAE
(TYLENCHORHYNCHIDAE : TYLENCHIDA)

By

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ABSTRACT

Tylenchorhynchus mashhoodi Siddiqi & Basir, 1959 is being recorded from several localities of Burdwan, Birbhum, Murshidabad and West Dinajpur districts of West Bengal. Tylenchorhynchus goldeni Rashid & Singh, 1982 is being considered a synonym of T. mashhoodi. The study of the type specimens of Tylenchorhynchus swarupi Singh & Khera, 1978 reveals that it is a synonym of T. goffarti Sturhan, 1966. The paper also reports the morphometric variations in T. goffarti. Quinisulcius capitatus (Allen, 1955) Siddiqi, 1971 and Merlinius affinis (Allen, 1955) Siddiqi, 1970 are being reported for the first time from West Bengal.

INTRODUCTION

Singh & Khera (1978) and Chaturvedi & Khera (1979) have reported T. mashhoodi Siddiqi & Basir, 1959 from the rhizosphere of different hosts at Howrah, 24-Parganas, Hooghly, Nadia, Burdwan, Bankura and Murshidabad districts of West Bengal. Singh & Khera (1978) have also described a new species Tylenchorhynchus swarupi (= now T. goffarti Sturhan, 1966) from 24-Parganas and Hooghly districts. Tylenchorhynchus nudus Allen, 1955 has been reported by Baqri & Ahmad (1981) from district Jalpaiguri (West Bengal). Baqri & Ahmad (l.c.) have also studied the morphometric variations in T. nudus.

The recent extensive and intensive surveys of plant and soil nematodes conducted by the authors in several districts of West Bengal have revealed that Tylenchorhynchus mashhoodi is a widely distributed species.

The present study mainly deals with the morphometric variations in T. goffarti and concludes that T. swarupi Singh & Khera, 1978 is a synonym of the former. Our observations are based on the study of the type specimens of T. swarupi, available in the National Collection of Zoological Survey of India.

MATERIAL

All the specimens have been mounted in anhydrous glycerin, registered and deposited in the National Collection of Zoological
Survey of India. The type specimens (n = 24♀ & 18♂♂) of Tylenchorhynchus swarupi Singh & Khera, 1978, available in the National Collection of Zoological Survey of India, have also been included in the present study.

Tylenchorhynchus mashhoodi Siddiqi & Basir, 1959
(Fig. 1, A–C)


**Dimensions:**

**Females (10):**
- L (mm) = 0.53-0.64 (0.60) SD = 0.04 ; a = 25-29 (28) SD = 1.20 ; b = 4.8-5.5 (5.1) SD = 0.37 ; c = 12-18 (15) SD = 1.89 ; c' = 2.5-3.5 (3.2) SD = 1.96 ; V = 52-57 (55.7) SD = 1.83 ; G₁ = 20-29 (23) SD = 2.94 ; G₂ = 19-26 (21.6) SD = 1.90 ; Stylet (μm) = 15-19 (15.9) SD = 1.20 ; Metenchium (μm) = 8-10 (8.5) SD = 0.66 ; m = 50-56 (53.5) SD = 1.20.

**Males (10):**
- L (mm) = 0.49-0.60 (0.55) SD = 0.04 ; a = 27-31 (28) SD = 1.85 ; b = 4.6-5.1 (4.9) SD = 0.15 ; c = 14-16 (14.8) SD = 0.92 ; c' = 2.5-3.0 (2.7) SD = 0.23 ; T = 39-52 (45.8) SD = 4.36 ; Stylet (μm) = 15-17 (15.8) SD = 0.92 ; Metenchium (μm) = 8-9 (8.3) SD = 0.42 ; m = 50-53 (52) SD = 1.41 ; Spicules (μm) = 19-22 (19.4) SD = 3.40 ; Gubernaculum (μm) = 10-12 (10.5) SD = 0.67.

**Habitat and locality:** Soil around roots of paddy (*Oryza sativa*L.) at Saldar, District Burdwan.

**Other localities:** Several localities in the districts of Burdwan, Birbhum, Murshidabad and West Dinajpur.

**Discussion:** Rashid & Singh (1982) described a new species *Tylenchorhynchus goldeni* from soil around roots of sugarcane hybrid, at Lucknow (U.P.) and differentiated it from *T. annulatus* (Cassidy, 1930) Golden, 1971 and *T. mashhoodi*. From *T. mashhoodi* they have differentiated *T. goldeni* in having a longer body, longer stylet, lower value of b and larger number of tail annules. While comparing with the dimensions and description provided by Allen (1955) and Baqri and Jairajpuri (1970) of *T. mashhoodi*, it is hereby noted that differential characters used by Rashid & Singh (1982) are either overlapping or insignificant. These are as follows: L = 0.57-0.82 mm against L = 0.54-0.76 mm in *T. mashhoodi* ; stylet = 16-19 μm against 16-19 μm in *T. mashhoodi* ; tail annules = 19-36 against 14-29 in *T. mashhoodi*.

This comparison reveals that the only character in which the description of *T. goldeni* differs from *T. mashhoodi* is the higher number of tail annules. However, we feel that 19-36 tail annules against 14-29 should not be treated as diagnostic character because this has been found highly variable character in *Tylenchorhynchus* species (Baqri and Ahmad, 1981 in *T. nudus* ; and the present study in *T. goffarti*). It is, therefore, proposed that *T. goldeni* is a synonym of *T. mashhoodi*.
Tylenchorhynchus goffarti Sturhan, 1966  
(Fig. 1, D-F)


**Dimensions:**

**Narendrapur population:** Table I

**Birbhum population:**

Females (9): L (mm) = 0.57-0.63 (0.61) SD = 0.03; a = 31-34(32.5) SD = 1.01; b = 4.8-5.3(5.1) SD = 0.17; c = 14-15(14.2) SD = 0.44; c' = 3.0-3.6(3.4) SD = 0.18; V = 52-60 (54) SD = 1.83; G₁ = 23-28(25) SD = 1.67; G₂ = 20-28(23) SD = 2.65; Stylet (μm) = 16-17(16.4) SD = 0.53; Metenchium (μm) = 8-9(8.6) SD = 0.49; m = 50-56(52) SD = 2.50.

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**TABLE I. Morphometric and Allometric Variations in Adults of Tylenchorhynchus gofarti.**

<table>
<thead>
<tr>
<th>Characters</th>
<th>Female (n=24, paratypes of <em>T. swarupi</em>)</th>
<th>Male (n=18, paratypes of <em>T. swarupi</em>)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Mean ± S. D.</td>
</tr>
<tr>
<td>Length (μm)</td>
<td>478-637</td>
<td>558±36.27</td>
</tr>
<tr>
<td>a</td>
<td>26-32</td>
<td>30±1.84</td>
</tr>
<tr>
<td>b</td>
<td>4.7-5.7</td>
<td>5.1±0.28</td>
</tr>
<tr>
<td>c</td>
<td>13-17</td>
<td>15±1.28</td>
</tr>
<tr>
<td>c'</td>
<td>2.6-3.2</td>
<td>2.9±0.16</td>
</tr>
<tr>
<td>V/T</td>
<td>52-58</td>
<td>53±1.64</td>
</tr>
<tr>
<td>G₁</td>
<td>24-30</td>
<td>27±2.37</td>
</tr>
<tr>
<td>G₂</td>
<td>20-30</td>
<td>25±2.51</td>
</tr>
<tr>
<td>m</td>
<td>50-57</td>
<td>53±2.11</td>
</tr>
<tr>
<td>Head height (μm)</td>
<td>3-4</td>
<td>3.3±0.20</td>
</tr>
<tr>
<td>Head width (μm)</td>
<td>6-8</td>
<td>6.8±0.46</td>
</tr>
<tr>
<td>Stylet (μm)</td>
<td>13-14</td>
<td>13.4±0.39</td>
</tr>
<tr>
<td>Stylet knobs (μm)</td>
<td>3.3-3.5</td>
<td>3.04±0.14</td>
</tr>
<tr>
<td>Metenchium (μm)</td>
<td>7-8</td>
<td>7.1±0.42</td>
</tr>
<tr>
<td>Oesophagus (μm)</td>
<td>100-121</td>
<td>109±5.27</td>
</tr>
<tr>
<td>Median bulb (μm)</td>
<td>49-58</td>
<td>54±2.80</td>
</tr>
<tr>
<td>Median oesophageal bulb length (μm)</td>
<td>10-13</td>
<td>12.4±0.49</td>
</tr>
<tr>
<td>Median oesophageal bulb width (μm)</td>
<td>8-10</td>
<td>9.4±0.65</td>
</tr>
<tr>
<td>Nerve ring (μm)</td>
<td>66-76</td>
<td>71±3.13</td>
</tr>
<tr>
<td>Excretory pore (μm)</td>
<td>80-95</td>
<td>88±3.94</td>
</tr>
<tr>
<td>Vulva (μm)</td>
<td>264-343</td>
<td>304±18.50</td>
</tr>
<tr>
<td>Anterior gonad (μm)</td>
<td>126-195</td>
<td>154±17.50</td>
</tr>
<tr>
<td>Posterior gonad (μm)</td>
<td>108-182</td>
<td>141±19.56</td>
</tr>
<tr>
<td>Vagina (μm)</td>
<td>9-13</td>
<td>10.3±1.17</td>
</tr>
<tr>
<td>Vulva body width (μm)</td>
<td>16-22</td>
<td>19±1.72</td>
</tr>
<tr>
<td>Anal body diameter (μm)</td>
<td>12-15</td>
<td>12.6±1.01</td>
</tr>
<tr>
<td>Rectum (μm)</td>
<td>9-11</td>
<td>9.8±0.64</td>
</tr>
<tr>
<td>Tail (μm)</td>
<td>35-44</td>
<td>38±3.16</td>
</tr>
<tr>
<td>Tail annules</td>
<td>24-43</td>
<td>35±8.50</td>
</tr>
<tr>
<td>Spicules (μm)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Gubernaculum (μm)</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

* Distances from anterior end  
S. D. = Standard deviation  
C. V. = Coefficient of variability
Male: L (mm) = 0.62; a = 31; b = 5.1; c = 15; c' = 3.0; T = 41; Stylet (μm) = 16.0; Metenchium (μm) = 8.0; m = 53.

Description: Female: Cuticle transversely striated 1-2 μm apart. Longitudinal striations absent. Lateral fields marked by 4 incisures, 1/5th-1/4th the body-width near middle. Lip region set off from the body, bearing 5-6 indistinct striae, 6-8 μm wide and 3-4 μm high. Head framework slightly sclerotized. Stylet 1.6-2.3 hed-width long, its anterior part (metenchium) 50-57% of stylet length. Stylet knobs slopping downward, 3-5 μm wide. Orifice of dorsal oesophageal gland about 2μm from base of stylet. Median oesophageal bulb ovate, 46-54% of oesophageal length. Hemizonid prominent, 2-3 annules long, situated 0-5 annules from excretory pore. Vulva a transverse slit. Vagina about 1/2 the corresponding body-width. Gonads typical to the genus. Spermatheca functional, ovate or spherical in shape. Tail with a smooth rounded terminus, marked with 32-43 annules ventrally. Post intestinal

Fig. 2. Tylenchorhynchus goffarti: Body length in relation to position to median bulb, position of excretory pore and position of vulva.
sac about 1.1-1.3 anal body-width long. Phasmids in the anterior half, 36-40% of tail from anus.

**Male**; Male resembles females in general morphology. Spicules 18-24 (21.3) μm long medially. Gubernaculum trough shaped, 7-10 (8.8) μm long. Tail elongate conoid with acute terminus, 2.6-3.2 times the anal body diameter. Phasmids in the anterior half, 33-40% of the tail.

**Morphometric and Allometric variations**: The various morphometric and allometric characters analysed statistically for their variability in adults (Narendrapur population) are presented in Table I. This has been noted that the position of median oesophageal bulb, excretory pore and vulva are significantly correlated with body length (Fig. 2). The coefficient of correlations are respectively R = 0.707, 0.728 and 0.929. The length of stylet (R = 0.432), oesophagus (R = 0.659), Gonads (R = 0.802) and Tail (R = 0.234 in females and 0.460 in males) are not significantly correlated with the body length.

Among the various morphometric and allometric characters evaluated for their variability, the length of stylet and value of ‘V’ have been found least variable, their C.V. being 2.9-3.0% and 3.1% respectively. The highly variable characters (C.V. = >10%) are length of genital branches (C.V. = 11-14%), vagina (C.V. = 14%), value of c (C.V. = 13%), and tail length (C.V. = 11% in males only), length of gubernaculum (C.V. = 12%), and tail annules (C.V. = 24%). Remaining characters have been found either moderately variable (C.V. = 4-6%) or markedly variable (C.V. = 7-10%).

**Remarks**; The present description, based on 42 paratypes of *T. swarupi*, agrees with the description provided by Singh & Khera (1978) except the differences noted by us in the tail terminus and the fusion of the inner two incisures in tail region. Surprisingly they (l.c.) have reported and illustrated striated tail terminus whereas our study confirms that the tail terminus is smooth (Fig. 1, E). This is further being confirmed that inner two incisures fuse well below the phasmids in the tail region (after Singh & Khera, “the inner two incisures fuse at the phasmids).

Singh & Khera (1978) described *T. swarupi* from Narendrapur, district 24-Parganas (West Bengal) and separated it from *T. vulgaris* Upadhyay et al. 1974, *T. brevilineatus* Williams, 1960 and *T. brassicae* Siddiqi, 1966. The present study reveals that their observations on tail terminus as striated instead of smooth, has led the misidentification of *T. gofferti* as a new species. In fact, the specimens belong to *T. gofferti*. Hence, *T. swarupi* is hereby proposed a synonym of *T. gofferti*. Singh & Khera (1978) were having 42 paratypes of *T. swarupi* but they measured only 10 females and 10 males.

**Quinisulcius capitatus** (Allen, 1955)
Siddiqi, 1971
(Fig. 1, G—J)

**Dimensions**:

**Female** (7); L (mm) = 0.67-0.76 (0.72) SD = 0.04; a = 20-33 (30.6) SD = 1.72; b = 4.9-5.5 (5.2) SD = 0.21; c = 14-16 (15)
AHMAD & BAKRI: Nematodes from W. Bengal

\[ SD = 0.90; \quad c' = 2.6-2.9 \ (2.7) \quad SD = 0.10; \quad V = 52-59 \ (55) \quad SD = 2.30; \quad G_1 = 25-29 \ (27) \quad SD = 1.27; \quad G_2 = 22-25 \ (24) \quad SD = 0.89; \quad \text{Stylet} \ (\mu m) = 17-18 \ (17.2) \quad SD = 0.39; \quad \text{Metenchium} \ (\mu m) = 8.5-9.6 \ (9.1) \quad SD = 0.19; \quad m = 50-53 \ (52) \quad SD = 1.46. \]

**Description:**

**Female:** Cuticle transversely striated, 1-2 μm apart. Longitudinal lines absent, lateral fields marked by five incisures, 1/5th-1/4th of the body-width near middle. Lip region set off from the body, bearing 5-6 annules, 4-5 μm high and about 8 μm wide. Head framework slightly sclerotized. Stylet 2.1-2.3 times the head-width, its anterior part (metenchium) 50-53% of the stylet length. Stylet knobs indented anteriorly, about 3.0-3.5 μm wide. Hemizonid about 2 annules long, situated at 1-5 annules above the excretory pore. Tail cylindrical ending in an acute smooth terminus, marked with 37-44 annules ventrally. Phasmids in the anterior half (23-37%) of the tail.

**Male:** Not found.

**Habitat and locality:** From soil around roots of Citrus sp. at Dalapchand basti, Kalimpong, Darjeeling, West Bengal.

**Merlinius affinis** (Allen, 1955) Siddiqi, 1970 (Fig. 1, K-N)

**Dimensions:**

**Female** (4); \[ L \ (mm) = 0.78-0.91 \ (0.84) \ SD = 0.06; \quad a = 20-21 \ (20.9) \ SD = 0.82; \quad b = 5.2-6.0 \ (5.5) \ SD = 0.36; \quad c = 13-16 \ (15) \ SD = 1.41; \quad c' = 1.41-2.41 \ (1.87) \ SD = 0.42; \quad V = 53-56 \ (54) \ SD = 1.50; \quad G_1 = 20-21 \ (20.5) \ SD = 0.58; \quad G_2 = 14-20 \ (18) \ SD = 2.83; \quad \text{Stylet} \ (\mu m) = 26-28 \ (27.1) \ SD = 0.85; \quad \text{Metenchium} \ (\mu m) = 14-14.5 \ (14.4) \ SD = 0.25; \quad m = 52-54 \ (53) \ SD = 0.96. \]

**Male** (2); \[ L \ (mm) = 0.78-0.87 \ (0.82) \ SD = 0.07; \quad a = 22-24 \ (23) \ SD = 1.41; \quad b = 5.4-5.6 \ (5.5) \ SD = 0.14; \quad c = 12-17 \ (14.5) \ SD = 3.54; \quad c' = 1.93-2.5 \ (2.3) \ SD = 0.43; \quad T = 29-40 \ (35.4) \ SD = 7.78; \quad \text{Stylet} \ (\mu m) = 26-28 \ (27) \ SD = 1.42; \quad \text{Metenchium} \ (\mu m) = 13-15 \ (14) \ SD = 1.41. \]

**Description:**

**Female:** Cuticle transversely striated, 2 μm apart. Longitudinal lines absent, lateral fields 1/7th-1/4th of the body near the middle. Lip region slightly set off from the body, flat at apex, bearing 6 annules, 3-4 μm high and 6.5-8.0 μm wide. Head framework heavily sclerotized. Stylet 2.6-2.8 times the head width, its anterior part (metenchium) about 50-54% of stylet length. Stylet knobs slightly indented anteriorly. Hemizonid 1-2 annules long, situated 0-1 annule above the excretory pore. Gonads typical to genus. Tail broadly rounded, marked with 28-34 annules ventrally. Phasmids in the anterior half (30-35%) of the tail.

**Male:** Similar to females in general morphology except the male genital system and tail shape. Spicules 24 μm medially. Gubernaculum stout, 6 μm long. Tail elongate conoid with acute terminus, 1.9-2.5 times the anal body diameter. Phasmids in the anterior half (37-45%) of the tail.

**Habitat and locality:** From soil around roots of Tea (Thea sinensis L.) at Lebong, Darjeeling, West Bengal.

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