ORDER
TYLENCHIDA
ORDER TYLENCHIDA THORNE, 1949

**Diagnosis:** Secernentea. Cuticle distinctly striated from anterior end to the tail tip. Amphids small and pocket-like which open on the anterior face of the lip region. Deirids small and generally indistinct. Stoma with a protrusible spear which is formed by the fusion of the rhabdions. Excretory system comprises of a single lateral canal. Oesophagus consists of a procorpus, a median bulb, narrow isthmus and the glandular basal bulb. The basal bulb contains three oesophageal glands; one dorsal gland which opens into the lumen of oesophagus between spear base and the median bulb; the other two are subventral glands opening in the median bulb. Reproductive system mono-prodelphic or amphidelphic with outstretched ovaries. Testis single outstretched. Spicules simple, arcuate. Gubernaculum usually present. Bursa present except in Heteroderoidea. Tail in both sexes long filiform to short conoid and hemispheroidal.

Type suborder: Tylenchina Geraert, 1966

Other suborders: Criconematina Siddiqi, 1980
Hexatylina Siddiqi, 1980
My^énchina Siddiqi, 1980
SUBORDER TYLENCINA GERAERT, 1966

Diagnosis: Tylenchina. Body vermiform in both the sexes. Sexual dimorphism only in some forms. Body striations fine to moderate, without spines or setae. Oesophagus well defined into procorpus; small to moderate, distinct median bulb with valvular apparatus; elongate narrow isthmus; and well developed oesophageal glands (tylenchoid type). Oesophageal glands enclosed in a distinct basal bulb or free, overlapping anterior end of intestine. Bursa present.

Type family : Tylenchidae Örley, 1880

Other families: Atylenchidae Skarbilovich, 1959
Belonolaimidae Whitehead, 1959
Dolichodoridae Chitwood & Chitwood, 1950
Tylodoridae Paramonov, 1967

FAMILY TYLENCHIDAe ÖRLEY, 1880

**Diagnosis:** Tylenchoidea. Small sized nematodes, about 1.0 mm or generally less. No sexual dimorphism. Lip region elevated; cephalic framework absent or weakly developed. Spear generally small, rarely elongate, with or without basal knobs. Amphid apertures pore or slit-like. Deirids usually present. Phasmids may be invisible or absent. Basal oesophageal bulb contains oesophageal glands. Cardia present. Oesophageal glands do not form an overlap over the intestine (except in *Pseudhalenchus*). Ovary single, very rarely double (in *Psilenchus*). Bursa generally adanal. Female tail attenuate, filiform, clavate or elongate conoid.

**Type subfamily:** Tylenchinae Örley, 1880

**Other subfamilies:** Aglenchinae Siddiqui & Khan, 1983
Campbellenchinae Wouts, 1978
Duosulciinae Siddiqi, 1979
Psilenchinae Paramonov, 1967
Leipotylenchinae Sher, 1974
SUBFAMILY TYLENCHINAE ÖRLEY, 1880


Type genus: Tylenchus Bastian, 1865

Other genera: Aerotylenchus Potedar & Handoo, 1978
Filenchus Andrássy, 1954
Irantylenchus Kheiri, 1972
Lelenchus Andrássy, 1954
Polenchus Andrássy, 1981
Pseudhalenchus Tarjan, 1958

GENUS TYLENCHUS BASTIAN, 1865

Diagnosis: Tylenchinae. Cuticle with well-defined annules. Spear with distinct basal knobs. Median bulb rounded or oval. Isthmus long and slender, ending in a pyriform basal bulb. Cardia present. Vulva without lateral membranes (vulval folds), well posterior to middle of body. Reproductive system monoprodelphic. Post-vulval uterine sac present. Lateral fields with 4 incisures. Tail elongate conoid to filiform, often

Type species: *Tylenchus davainei* Bastian, 1865.

*Tylenchus ritaí* Siddiqi, 1963 was found in the soil samples from around roots of rose plants from Bomdila, Arunachal Pradesh. A full description of the species is given below.

**TYLENCHUS RITAÍ SIDDIQI, 1963**

**Dimensions:**

Females (5): \( L = 0.67-0.72 \) mm; \( a = 25-32; \) \( b = 6.2-7.6; \) \( c = 4.8-5.7; \) \( V = 59-62; \) spear = 15 um; \( m = 47; \) \( O = 20; \) MB = 45-53.

**Description:**

Body upon death slightly arcuate on ventral side, slightly tapering anteriorly but more gradually posteriorly and ending into a long filiform tail. Cuticle with fine annulations, 1.5 um apart at midbody. Lateral fields marked with four incisures.

Lip region continuous, bearing 4 fine annules, 8 um wide and 4 um high. Spear with rounded basal knobs, about twice lip region width long, metenchium and telenchium almost equal in length. Orifice of dorsal oesophageal gland 3 um from base of

Reproductive system mono-prodelphic. Vulva a transverse slit- without vulvar membrane or fold. Vagina thick-walled, 10-15 um long. Ovary outstretched with oocytes arranged in a single row. Spermatheca spherical, measuring 13-25 x 19-20 um, filled with sperm. Post-vulval uterine sac 12-15 um or slightly more than 2/3rd of vulval body width long. Rectum about half of anal body width long. Vulva-anus distance 1.0-1.2 tail length. Tail long, filiform with ventral arcuate terminal portion, 8-10 anal body widths long.

Male: Not found

Habitat and locality: Soil around root of rose (Rosa centifolia) from Bomdila (8791 feet altitude), Arunachal Pradesh, India.

Remarks: The present specimens are identical to those described by Siddiqi (1963).
FAMILY TYLODORIDAE PARAMONOV, 1967

Paramonov (1967) proposed the subfamily Tylodorinae for the genus *Tylodorus* Meagher, 1963 under the family Tylenchidae. Siddiqi (1970, 71) and Spaull (1972) transferred the subfamily Tylodorinae to the family Dolichodoridae. However, Paramonov (1970) and Golden (1971) assigned it to the family Tylenchidae. Later, Siddiqi (1976) raised Tylodorinae to the rank of a family because of the fact that the tails are similar and filiform in both the sexes and the bursa is short, adanal which separates it from the family Dolichodoridae.

**Diagnosis:** Tylenchoidea. Body slender, medium to large sized (1-2 mm). Cuticle distinctly annulated. Lateral fields marked with four to six incisures. Lip region usually continuous with body contour, smooth or annulated, with or without oral disc; cephalic sclerotization usually inconspicuous. Amphids labial. Deirids present. Phasmids pore-like, distinct, on tail. Spear well developed, over two lip region widths long, with prominent basal knobs. Spear muscles almost parallel to body axis. Orifice of dorsal oesophageal gland duct close to spear base. Procorpus cylindrical, median bulb with well developed valvular apparatus. Isthmus elongate-slimber, gradually enlarging posteriorly into a
sac-like bulb enclosing the usual three oesophageal glands. Cardia well developed. Female reproductive system mono-
prodelphic or amphidelphic. Spermatheca axial. Vagina not sclerotized. Vulva a transverse slit, median or post-median.
Tails in both sexes elongate-filiform. Spicules arcuate, cephalated, gubernaculum non-protrusible. Bursa short, adanal.

Type subfamily : Tylodorinae Paramonov, 1967

Other subfamily : Antarctenchinae Spaull, 1972

SUBFAMILY TYLODORINAE PARAMONOV, 1967

Diagnosis: Tylodoridae. Body small to medium sized. No sexual dimorphism. Body cuticle thin, annulated. Lip region continuous or offset, often with annules. Amphid apertures labial, pore-like. Deirids present. Spear long and attenuated. Procorpus very short, median oesophageal bulb oval, isthmus narrow, oesophageal glands enclosed in a basal bulb, sometimes with a small lobe extending over intestine. Cardia present, may be greatly reduced or absent. Female reproductive system mono-
prodelphic. Spicules cephalated, gubernaculum fixed. Tails in both sexes long filiform.

Type genus : Tylodorus Meagher, 1963

Other genera : Cephalenchus Goodey, 1962
Imphalenchus Dhanachand & Jairajpuri, 1980
GENUS CEPHALENCHUS GOODEY, 1962

Goodey (1962) established the subgenus Cephalenchus under the genus Tylenchus for Tylenchus (Cephalenchus) megacephalus, but this species was later found by Geraert & Goodey (1964) to be a synonym of Tylenchus hexalineatus and hence the type species was redesignated as T. (C.) hexalineatus. Golden (1971) upgraded Cephalenchus to a genus.

Diagnosis: Tylodorinae. Body less than 1.0 mm long. Cuticle thin, finely striated. Head prominent, rounded, set off by a constriction or continuous with body contour, annulated or non-annulated. Cephalic framework moderately developed. Spear with rounded basal knobs. Deirids present. Procorpus shorter than isthmus. Basal oesophageal bulb cylindrical or pyriform without overlapping intestine (except slight dorsal overlap in C. lobus). Cardia may or may not be present. Vulva in posterior portion of body, lateral vulval flaps present (may not be easily distinguishable). Female reproductive system mono-prodelphic. Post-vulval uterine sac present. Lateral fields with six incisures. Spicules arcuate, bursa adanal, well defined.

Type species: Cephalenchus hexalineatus (Geraert, 1962) Golden, 1971

Other species: C. cephalodiscus Sultan & Jairajpuri, 1982
C. cylindricus Sultan & Jairajpuri, 1982
C. emarginatus (Cobb, 1893) Golden, 1971
In the soil samples collected during the course of present investigation one new species of *Cephalenchus* was found. A full description of the species is given below.

**CEPHALENCHUS MICROSTYLUS** N. SP.  
(Fig. 1)

**Dimensions:**

Paratype females (8): L = 0.42-0.47 mm; a = 32-43; b = 5.3-6.3; c = 4.2-5.0; V = 60-63; G₁ = 18-25; G₂ = 1.0-1.6; spear = 8 um; θ = 50; MB = 43-49.

Holotype female: L = 0.41 mm; a = 41; b = 5.3; c = 4.1; V = 60; G₁ = 20; G₂ = 1.4; spear = 8 um; θ = 50; MB = 45.

**Description:**

Body almost straight upon fixation, tapering towards both extremities. Cuticle finely striated, 1 um apart. Lateral fields marked with six incisures about 1/3 body width wide at midbody.
Lip region somewhat hemispherical, truncated from above, continuous with body contour, 5 um wide and 2 um high. Lip striations indistinct. Cephalic framework prominent. Spear 1.6 lip region widths long with rounded basal knobs 2 um across. Orifice of dorsal oesophageal gland half of spear length from base of spear knobs. Procorpus shorter than isthmus, 19-23 um long, median bulb oval in shape with refractive valvular thickenings, 32-36 um from anterior end, measuring 8-9 x 4-5 um, isthmus slender, slightly longer than procorpus, 23-26 um long, basal bulb pyriform, 14-17 um long, 7-8 um wide. Cardia present. First pair of cephalids 5 um from anterior end at level of middle of spear; second pair near the base of spear, 8 um from anterior end. Nerve ring 45-50 um from anterior end. Excretory pore behind level of nerve ring, 54-61 um from anterior end. Hemizonid above excretory pore. Deirids 63-64 um from anterior end near beginning of basal oesophageal bulb.

Vulva a transverse slit. Lateral vulval flaps not visible. A pair of rounded cuticularized bodies in the anterior part of vagina. Vagina extending slightly less than half across the body. Reproductive system mono-prodelphic. Spermatheca spherical. Post-vulval uterine sac short, 5-7 um or less than one vulval body width long. Vulva-arms distance 60-73 um or less than the tail length. Tail long, filiform, tapering gradually to a rounded tip, 11-14 anal body widths long.
Male: Not found.

Type habitat and locality: Soil around roots of ferns from Shillong Peak, Khasi Hills district, Meghalaya, India.

Type material: Collected in June 1981. Holotype female on slide Cephalenchus microstylus n. sp./1; paratype females on slides Cephalenchus microstylus n. sp./2-3.

Relationship: Cephalenchus microstylus n. sp. comes close to Cephalenchus hexalineatus (Geraert, 1962) Golden, 1971 and C. lobus Dhanachand & Jairajpuri, 1980. It differs from the former in having smaller body; smaller spear; and anteriorly located vulva (L = 0.47-0.59 mm; spear = 15-17 um; and V = 60-70 in C. hexalineatus). From C. lobus it differs in having a smaller body; smaller spear; longer oesophagus without basal overlap; and smaller tail (L = 0.63-0.71 mm; spear = 15-16 um; b = 5.3-6.3; oesophagal glands with a small overlap over the anterior part of intestine; c = 3-4 and c' = 17-22 in C. lobus).

Remarks: In all the species of Cephalenchus spear is 1.0-1.5 times of procorpus length, but in Cephalenchus microstylus n. sp. this ratio is about 2.5 and also no vulval flaps are present. Still this species is put in the genus Cephalenchus due to the presence of six incisures.
GENUS IMPELENCHUS DHANACHAND & JAIRAJPURI, 1980

Dhanachand & Jairajpuri (1980) established the genus Imphalenchus with I. indicus as type species for those tylenchids which have slender body, four incisures, long attenuated spear almost equal to the length of procorpus, mono-prodelphic gonad and long filiform tails in both sexes. They also shifted Tylenchus (Aglenchus) macrodorus Chawla et al., 1969 to this genus as I. macrodorus. In the present study a known species of Imphalenchus was found in the soil samples collected from Assam.


Type species: Imphalenchus indicus Dhanachand & Jairajpuri, 1980
Other species: Imphalenchus macrodorus (Chawla et al., 1969) Dhanachand & Jairajpuri, 1980
IMPHALENCHUS INDICUS DHANACHAND & JAIRAJPURI, 1980

Dimensions:

Females (5): L = 0.60-0.69 mm; a = 31-46; b = 7.1-7.9; c = 2.9-3.4; c' = 15-17; V = 58-65; spear = 16-17 um; 0 = 18-19.

Males (4): L = 0.61-0.73 mm; a = 32-45; b = 7.0-9.0; c = 3.0-3.4; c' = 15-19; T = 44-49; spear = 16-17 um; 0 = 18-19.

Habitat and locality: Soil around roots of chum tree from Kachari Pathar, Rajmai, Sibsagar district, Assam, India.

Remarks: Imphalenchus indicus was described by Dhanachand & Jairajpuri (1980) from Manipur, India. The present population of this species are similar to the type population.

SUBFAMILY DUOSULCIINAE SIDDIQI, 1979

Diagnosis: Tylenchidae. Cuticle with distinct annules, without longitudinal ridges except laterally. Lateral fields with two closely spaced incisures. Amphid apertures longitudinal to oblique, near oral opening, conspicuous or obscure. Deirids present. Phasmids outside lateral fields in a dorso-sublateral position 0.5-2.0 body widths anterior to vulva. Cephalic
sclerotization weak or absent. Spear small sized (below 12 um) with comus markedly shorter than half spear length. Orifice of dorsal oesophageal gland closely behind spear base. Excretory duct and pore distinct. Procorpus slender, gradually enlarging into either a muscular valvate median bulb or a spindle-shaped swelling lacking muscle fibres and inner cuticular valvular plates. Basal oesophageal bulb enclosing oesophageal glands, with a distinct cardia at base. Reproductive system monoprolphic. Spermatheca offset. Post-vulval uterine sac present or absent. Tail elongate conoid or filiform (over six anal body widths long), similar in both sexes and juveniles. Bursa adanal (bursa lacking in Miculenchus); spicules arcuate cephalated and gubernaculum small, fixed.

Type genus : Duosulcius Siddiqi, 1979

Other genera : Duotylenchus Saha & Khan, 1981
Malenchus Andrássy, 1968
Miculenchus Andrássy, 1959
Neomalenchus Siddiqi, 1979
Ottolenchus Husain & Khan, 1967
Zanenchus Siddiqi, 1979
GENUS MALENCHUS ANDRÁSSY, 1968

The genus Malenchus was proposed by Andrássy (1968) for M. machadoi and M. acarayensis. Later Merny (1970), Knobloch (1976), Siddiqi (1979), Andrássy (1980-81) and Siddiqui & Khan (1983), added species to this genus. A new species of Malenchus is described in the following from Arunachal Pradesh.


Type species: Malenchus machadoi (Andrássy, 1963) Andrássy, 1968
MALENCHUS DISCOCEPHALUS N. SP.
(Fig. 2)

Dimensions:
Holotype female: \( L = 0.425 \) mm; \( a = 28.3; \) \( b = 6.5; \) \( c = 3.7; \)
\( c' = 12.5; \) \( V = 59; \) spear = 8 \( \mu \)m; \( 0 = 37.5; \) MB = 41.5

Paratype males (2): \( L = 0.404-0.411 \) mm; \( a = 27-34; \) \( b = 5.6-5.7; \)
\( c = 3.6-3.8; \) \( c' = 12-13; \) \( T = 31; \) \( 0 = 33.3-37.5; \) MB = 42-44.

Description:

Female: Body slender, ventrally curved upon fixation, tapering slightly anterior to middle of oesophagus, posteriorly ending in an elongated-conoid tail with finely pointed terminus. Body cuticle marked with fine transverse striations, about 1 \( \mu \)m apart at mid-body. Lateral fields with two incisures occupying about 1/7th - 1/6th of the body width.

Lip region set off by a shallow depression with fine striations, 5 \( \mu \)m wide, 2 \( \mu \)m high, small labial disc present. Spear short with posteriorly sloping basal knobs measuring 1.5 \( \mu \)m across. Orifice of dorsal oesophageal gland at 3 \( \mu \)m from base of spear. Oesophagus 65 \( \mu \)m long. Median oesophageal bulb spherical, valvular apparatus at 27 \( \mu \)m from anterior end of body. Procorpus 11 \( \mu \)m and isthmus 20 \( \mu \)m long. Basal oesophageal bulb pyriform. Cardia small. Nerve ring 45 \( \mu \)m from anterior end of body. Excretory pore below level of nerve ring. Hemizonid just above excretory pore, three annules wide.
Reproductive system mono-prodelphic. Vulva a transverse slit with distinct vulvar flaps. Vagina thick-walled, extending little less than half way across body. Spermatheca rounded, 9 um, filled with sperm. Post-vulval uterine sac small, 8 um or about 2/3 of vulval body width long. Tail 113 um long, elongate-conoid, terminus pointed. Vulva-anus distance 1.8 times of tail length or 6.8 anal body widths long. Phasmids about one vulval body width anterior to vulva.

Male: Similar to female in general morphology. Spicules 13 um long, ventrally curved. Gubernaculum 3 um or about 1/4th of spicular length, trough-shaped, fixed. Bursa adanal, 24-26 um long. Tail elongate-conoid, 105-113 um in length.

Type habitat and locality: Soil around roots of incense tree (Boswellia serrata) from Kimin, Arunachal Pradesh, India.

Type material: Collected in October 1981. Holotype female on slide Malenchus discocephalus n. sp./1; Paratype males on slide Malenchus discocephalus n. sp./2.

Relationship: Malenchus discocephalus n. sp. differs from all the other species of Malenchus in presence of labial disc. However, it comes close to Malenchus nanellus Siddiqi, 1979 and M. moini Siddiqui & Khan, 1983. It differs from the former in having a longer body; shorter oesophagus; excretory pore at the level of middle of basal bulb; and longer tail (L = 0.29-0.34 mm; b =
4.5-5.0; excretory pore near the base of isthmus; and tail 74-86 μm in M. nanellus). From M. moini it differs in having a longer body; shorter oesophagus; and longer tail (L = 0.29-0.37 mm; b = 4.5-6.0; and tail = 63-68 μm in M. moini).

SUBFAMILY PSILENCHINAE PARAMONOV, 1967


Type genus: Psilenchus de Man, 1921

Other genera: Neopsilenchus Thorne & Malek, 1968
Basiria Siddiqi, 1959
Basiroides Thorne & Malek, 1968
Clavilenchus Jairajpuri, 1966

GENUS BASIRIA SIDDIQI, 1959

Diagnosis: Psilenchinae. Body cuticle with conspicuous transverse striae. Lateral fields marked with four incisures. Lip
region elevated, set off by a slight narrowing. Labial framework not sclerotized. Amphid apertures large, conspicuous, slit-like, situated posterior to base of lateral lips. Deirids and phasmids prominent, spear slender, with basal knobs. Orifice of dorsal oesophageal gland situated at more than half spear length behind base of spear. Distance from anterior end of body to centre of median oesophageal bulb greater than that from latter to base of oesophagus. Corpus ovate, with distinct valvular apparatus. Basal oesophageal bulb pyriform. Cardia well developed. Vulva situated in posterior region of body. Gonad mono-prodelphic. Bursa adanal. Tail of both sexes elongate, filiform.

Type species: *Basiria graminophila* Siddiqi, 1959

In the present study a known species of *Basiria* was found in the soil samples collected from Meghalaya.

**BASIRIA GRAMINOPHILA SIDDIQI 1959**

Dimensions:

Females (5): L = 0.56-0.67 mm; a = 32-40; b = 4.0-6.9; c = 4.5-6.2; V = 61-65; spear = 10-11 um.

Male: L = 0.53 mm; a = 36; b = 6.4; c = 5.2; spear = 9 um.

Habitat and locality: Soil around the roots of pear (*Pyrus communis*) from Fruits garden, Shillong, Meghalaya, India.
**Remarks:** The present specimens conform well with the dimensions and description of *Basiria graminophila* given by Siddiqi (1959).

**SUPERFAMILY ANGUINOIDEA NICOLL, 1935**

**Diagnosis:** Tylenchina. Cuticle finely annulated. Spear small. Deirids usually present. Phasmids indistinct. Median bulb well developed or poorly developed with crescentic plates. Oesophageal glands large. Female reproductive system mono-prodelphic. Post-vulval uterine sac present or absent. Spermatheca elongate axial. Spicules thick; bursa present; sperms usually large sized.

Type family : Anguinidae Nicoll, 1935

Other families : Nothotylenchidae Thorne, 1941
    Sychnotylenchidae Paramonov, 1967

**FAMILY ANGUINIDAE NICOLL, 1935**

**Diagnosis:** Anguinoidea. Amphid apertures pore-like, labial. Cephalic region weakly sclerotized. Spear small. Median oesophageal bulb with or without refractive thickenings. Cardia absent. Female gonad mono-prodelphic, spermatheca axial, with a sphincter between uterine sac and crustaformeria. Tails of
both sexes conoid. Bursa envelops most of the tail.

Type genus : **Anguina** Scopoli, 1777

Other genera : **Afrina** Brzeski, 1981

- **DiptENCHUS** Khan, Chawla & Seshadri, 1969
- **Ditylenchus** Filipjev, 1936
- **Nothanguina** Whitehead, 1959
- **Orrina** Brzeski, 1981
- **Subanguina** Paramonov, 1968

**GENUS DITYLENCHUS FILIPJEV, 1936**

**Diagnosis:** Anguinidae. Lip region without annules. Lateral fields marked with 4 or more incisures. Defrids small obscure, phasmids indistinct. Basal oesophageal bulb somewhat clavate or variously expanded, sometimes with small lobe extending over anterior end of intestine. Vulva in posterior fourth of body. Gonad mono-prodelphic, posterior uterine sac present. Tail elongate-conoid, with acute or slightly rounded terminus in both sexes. Bursa enveloping 25-75% of tail.

Type species : **Ditylenchus dipsaci** (Kühn, 1857) Filipjev, 1936

In the present study **Ditylenchus dipsaci** (Kühn, 1857) Filipjev, 1936 was found in the soil samples from around roots of apricot from Shillong, Meghalaya. A full description of the species is given below.
DITYLENCHUS DIPSACI (KÜHN, 1857) FILIPJEV, 1936

Dimensions:

Females (6): $L = 0.81-0.92 \text{ mm}; \ a = 35-40; \ b = 6.3-7.3; \ c = 14-16; \ V = 81-86; \ \text{spear} = 6-8 \text{ um}; \ 0 = 19-25; \ MB = 36-40.$

Description:

Body straight to slightly curved on ventral side, tapering gradually towards both the extremities. Cuticle marked by fine, transverse striae, about 1 um apart. Lateral fields marked by four incisures, occupying about $1/6 - 1/4$ of body width.

Lip region smooth, continuous with body, without annulation, 6 um wide and 3 um high. Spear small, about one lip region width long and with well developed basal knobs 2 um across. Orifice of dorsal oesophageal gland at 1.5 um from base of spear. Oesophagus 110-129 um long, procorpus and isthmus almost of equal length, median oesophageal bulb fusiform with valvular apparatus, 12-17 x 7 um in size, basal bulb long pyriform. Nerve ring at 75-83 um and excretory pore at 95-108 um from anterior end of body.

Reproductive system mono-prodelphic. Vulva a transverse slit. Vagina thick-walled, extending to about one-third across body. Oocytes arranged in a single row. Post-vulval uterine sac prominent, 56-69 um or 2.4-3.0 vulval body widths long. Tail 3.9-4.4 anal body widths long. Vulva-amus distance 1.7-2.1 of tail length.
Male: Not found.

Habitat and locality: Soil around roots of apricot (Prunus armeniaca) from Govt. Fruits Gardens, Shillong, Meghalaya.

Remarks: The present specimens conform well with the dimensions and description of *Ditylenchus dipsaci* given by Thorne (1945).

FAMILY NOTHOTYLENCHIDAE THORNE, 1941

Diagnosis: Anguinoidea. Cephalic framework six sectored. Oesophagus without valvular median bulb, a fusiform, non-muscular swelling may be present at base of corpus where sub-ventral glands open. Terminal basal bulb symmetrical, or if lobed, elongate ventrally. Female reproductive system mono-prodelphic, post-vulval uterine sac present. Tail usually long, bursa adanal, only rarely longer than half length of tail.

Type subfamily: Nothotylenchinae Thorne, 1941

Other subfamily: Boleodorinae Khan, 1964

SUBFAMILY NOTHOTYLENCHINAE THORNE, 1941

Diagnosis: Nothotylenchidae. Amphids minute, inconspicuous. Spear with rounded knobs. Excretory duct weakly cuticularized. Tail more or less straight.
Type genus:  

**Nothotylenchus** Thorne, 1941

Other genera:  

**Dorsalla** Jairajpuri, 1966  
**Sakia** Khan, 1964  
**Thada** Thorne, 1941

**GENUS SAKIA S. H. KHAN, 1964**


A new species of **Sakia** was found in the soil samples from around roots of lemon from Gauhati University Campus, Assam. A full description of the species is given below.

**Type species:**  

**Sakia typica** S. H. Khan, 1964

**Other species:**  

**S. alii** Suryawanshi, 1971  
**S. castori** Khan, 1968
S. citri n. sp.
S. indica (Husain & Khan, 1965) Khan et al., 1968
S. jonesi (Husain & Khan, 1965) Khan et al., 1968
S. propora (Husain & Khan, 1967) Suryawanshi, 1971

SAKIA CITRI N. SP.
(Fig. 3)

Dimensions:
Paratype females (6): L = 0.38-0.51 mm; a = 26-36; b = 5.3-6.5; c = 3.4-3.8; c' = 11-16; V = 55-59; spear = 8-9 um.
Holotype female : L = 0.47 mm; a = 34; b = 6.5; c = 3.4; c' = 14; V = 57; spear = 8 um.
Paratype males (4): L = 0.46-0.47 mm; a = 42-47; b = 5.9-6.9; c = 3.3; c' = 15-18; T = 27-41; spear = 8 um.

Description:

Female: Body slender, straight to slightly curved ventrally upon fixation, tapering slightly anteriorly but more prominently posteriorly. Cuticular striations fine. Lateral fields with four incisures occupying about 1/3 body width at mid-body.
Lip region continuous with labial disc, 4 um wide and 3 um high. Spear slender with posteriorly directed basal knobs. Dorsal oesophageal gland opening located at 2 um from base of spear. Basal bulb pyriform, about 12 um long. Cardia present. Nerve ring at 47-52 um and excretory pore at 60-68 um from anterior end of body. Hemizonid just above excretory pore.

Reproductive system mono-prodelphic. Vulva transverse, slit-like, slightly directed anteriad, without lateral vulval flap$. Vagina extending to about one-third way across body. Oocytes arranged in a single row. Spermatheca rounded, filled with round sperm. Post — vulval uterine sac 11-12 um or about one vulval body width long. Vulva- anus distance 54-71 um or slightly more than half of tail length long. Tail elongate, filiform with rounded tip, 101-138 um or about one-third of total body length.

Male: General morphology similar to female. Spicules 14 um or more than one anal body width long, gubernaculum 3 um long. Bursa 21-26 um or about three anal body widths long. Cloacal opening elevated. Tail long filiform, 137-141 um or about one-third of total body length.

Type habitat and locality: Soil around roots of lemon (Citrus aurantifolia) from Gauhati University Campus, Gauhati, Assam, India.

Type material: Collected in August, 1980. Holotype female and
a paratype male on slide Sakia citri n. sp./1; paratype males and females on slides Sakia citri n. sp./2-3.

Relationship: Sakia citri n. sp. comes close to Sakia typica S. H. Khan, 1964 and S. alii Suryawanshi, 1971. From the former it differs in having posteriorly directed spear knobs, smaller post-vulval uterine sac, shorter vulva-arms distance and smaller gubernaculum (spear knobs rounded; post-vulval uterine sac one or more than one vulval body width long; vulva-anus distance 90 um or more and gubernaculum 4.5 um in S. typica). It differs from S. alii in the shape of lip region, in having differently shaped spear knobs, in the position of vulva, in having longer post-vulval uterine sac, longer tail and in the presence of male (labial disc wider; spear knobs rounded; vulva posterior, V = 59-61; post vulval uterine sac less than 5 um in length; tail short, c = 4.0-4.6 and males absent in S. alii).

SUPERFAMILY HOPLOCLAIMOIDEA FILIPJEV, 1934

Diagnosis: Tylenchina. Lip region with well developed cephalic framework. Cuticle distinctly striated. Spear strong, well developed with prominent basal knobs. Median oesophageal bulb ovate to spheroid, with crescentic valvular plates. Oesophageal glands in a lobe overlapping intestine. Female reproductive system amphidelphic. Phasmids usually located on the tail, in
male usually extending into bursa. Female tail short, hemispherical, or convex conoid to digitate.

Type family : Hoplolaimidae Filipjev, 1934

Other families : Nacobbidae Chitwood & Chitwood, 1950
Pratylenchidae Thorne, 1949

FAMILY HOPLOLAIMIDEA FILIPJEV, 1934 (WEISER, 1953)

Diagnosis: Hoplolaimoidea. Lip region elevated, with well developed cephalic framework, sometimes massive and showing sexual dimorphism. Cuticle distinctly striated. Lateral fields usually marked with four incisures. Spear well developed with conspicuous basal knobs. Median oesophageal bulb ovate to spheroid, muscular with crescentic valvular plates. Oesophageal glands lobe-like extending over the intestine. Intestinal granules coarse, refractive. Ovaries one or two, outstretched. Vulva near middle of the body or posterior. Phasmids small, pore-like or large, scutella-like. Female tail small, terminus hemispherical to convex-conoid, sometimes bluntly digitate ventrally. Bursa enveloping entire tail.

Type subfamily : Hoplolaiminae Filipjev, 1934

Other subfamilies: Hoplotylinae Khan, 1969
Rotylenchoidinae Whitehead, 1958
SUBFAMILY HOPLOLAIMINAE VILIPJEV, 1934

**Diagnosis:** Hoplolaimidae. Lip region may show sexual dimorphism with heavily sclerotized framework. Lateral fields marked with 4 or fewer incisures. Oesophageal gland lobe lying dorsally over intestine. Gonad double, outstretched. Vulva near middle of body. Phasmids large, scutella-like, opposed or at different levels. Female tail short, hemispheroid.

Type genus: *Hoplolaimus* Daday, 1905

Other genera: *Scutellonema* Andrássy, 1958
*Aorolaimus* Sher, 1963
*Peltamigratus* Sher, 1963

**GENUS SCUTELLONEMA ANDRÁSSY, 1958**

**Diagnosis:** Hoplolaiminae. Body curved on ventral side upon death. Lateral fields with four incisures, areolated near extremities. Lip region with transverse and with or without longitudinal striations, may be set off. Cephalic framework strongly developed. Spear and basal knobs well developed. Orifice of dorsal oesophageal gland 1/3 or less of spear length from its base. Oesophageal glands overlapping intestine dorsally and laterally. Phasmids very large, scutella-like, located opposite one another near anal region. Female tail short, with rounded terminus.
Type species: *Scutellonema bradys* (Steiner & LeHew, 1933) Andrássy, 1958

Other species: *Scutellonema aberrans* (Whitehead, 1959) Sher, 1961

- *S. africans* Smit, 1971
- *S. annulatum* n. sp.
- *S. bangalorensis* Khan & Nanjappa, 1972
- *S. bizanae* Van den Berg & Heyns, 1973
- *S. brabanum* Khan, Saha and Chawla, 1980
- *S. brachyurum* (Steiner, 1938) Andrássy, 1958
- *S. brevistyletum* Siddiqi, 1972
- *S. cavenessi* Sher, 1964
- *S. clariceps* Phillips, 1971
- *S. clathricaudatum* Whitehead, 1959
- *S. commune* Van den Berg & Heyns, 1973
- *S. conicaudatum* Sivakumar & Selvasekaran, 1982
- *S. conicephalum* Sivakumar & Selvasekaran, 1982
- *S. dentivaginum* Van den Berg & Heyns, 1973
- *S. erectum* Sivakumar & Khan, 1981
- *S. grande* Sher, 1964
- *S. impar* Phillips, 1971
- *S. imphalus* Sultan & Jairajpuri, 1979
- *S. incisicaudatum* Phillips, 1971
- *S. insulare* Phillips, 1971
- *S. labiatum* Siddiqi, 1972
- *S. laeviflexum* Phillips, 1971
In the present study one new species and a known species of *Scutellonema* was found in the soil samples collected from Meghalaya.

*SCUTELLONEMA ANNULATUM* N. SP.  
(Fig. 4)

**Dimensions:**
Paratype females (9): $L = 0.54-0.64$ mm; $a = 23-25$; $b = 7.5-9.0$; $b' = 5.4-6.5$; $c = 42-65$; $V = 57-61$; spear $= 22-25$ um; $m = 39-44$; $0 = 21-25$; $MB = 75-81$. 

*S. mangiferae* Khan & Basir, 1965
*S. magniphasmum* Sher, 1964
*S. minutum* Sher, 1964
*S. multistriatum* Van den Berg & Heyns, 1973
*S. navelnum* Sivakumar & Khan, 1981
*S. orientalis* Rashid & Khan, 1973
*S. picea* Cubina, 1973
*S. ramai* Verma, 1972
*S. sofiae* Van den Berg & Heyns, 1973
*S. sexlineatum* Razzhivin, 1971
*S. sherl* Edward & Rai, 1970
*S. siamense* Timm, 1965
*S. truncatum* Sher, 1964
*S. tsitsikamensis* Van den Berg, 1976
*S. umum* Sher, 1964
*S. validum* Sher, 1964
Holotype female: L = 0.61 mm; a = 24; b = 9.0; b' = 6.0; c = 51; V = 58; spear = 25 um; m = 44; 0 = 21; MB = 79.

Description:

Body spiral upon fixation, tapering slightly towards anterior end. Body striations 1.0-1.5 um apart. Lateral fields occupying about 1/4 of body width at middle, outer incisures crenate in scutellar region.

Lip region truncate, slightly offset, with three distinct annules, labial disc prominent. Spear about three times the lip region width long, metenchium shorter than telenchium, spear knobs rounded, 3 um across. Orifice of dorsal oesophageal gland at 5-6 um from base of spear. Oesophagus 57-85 um long. Procorpus about thrice the length of isthmus. Excretory pore located in posterior region of basal oesophageal gland lobe, 83-98 um from anterior end. Hemizonid just above excretory pore, 81-97 um from anterior end. Nerve ring near middle of isthmus, 54-75 um from anterior end.

Vulva a depressed transverse slit; vagina extending half way across body. Reproductive branches equally developed with oocytes arranged in single row. Spermatheca without sperm. Epitygma absent. Tail rounded with 7-9 annules, 0.4-0.7 anal body width long. Scutella 3 um wide, at level of anus.

Male: Not found.
Type habitat and locality: Soil around roots of millet (Sorghum vulgare) from Darugiri village, East Garo hills district, Meghalaya, India.

Type material: Collected in June 1981. Holotype female on slide Scutellonema annulatum n. sp./1; paratype females on slide Scutellonema annulatum n. sp./2-3.

Relationship: Scutellonema annulatum n. sp. comes close to Scutellonema truncatum Sher, 1963, S. siamense Timm, 1965, S. impar Phillips, 1971 and S. conicephalum Sivakumar & Selvasekaran, 1982. It differs from S. truncatum in having lip annules; smaller spear; smaller oesophagus and basal lobe; longer tail; lesser number of tail annules; and in the position of scutella (lip continuous with body; without lip annules; spear 26-29 um; b = 5.7-7.5; b' = 4.7-5.9; c = 50-80; tail annules 11 in number; and scutella post anal in position in S. truncatum). From S. siamense it differs in the absence of longitudinal striations in the basal lip annule; in the shape of spear knobs; in having longer oesophagus; in the position of vulva; absence of epiptygma; in lesser number of tail annules; and in the position of scutella (basal lip annule with longitudinal striations; spear knobs oval; b = 9.6-11.9; V = 54.5-58.4; epiptygma two; 7-12 tail annules; and scutella post-anal in S. siamense). From S. impar it differs in having shorter and stouter body; shorter oesophagus and basal lobe; in the position
of dorsal oesophageal gland opening; vulva and scutella
(L = 0.68–0.76 mm; a = 30–36; b = 6.7–7.7; b' = 5.0–5.6;
0 = 16–17; V = 61–66 and scutella pre-anal in S. impar).
It can be distinguished from S. conicephalum in having smaller
body, smaller spear, a shorter oesophagus, in absence of
epitygma, in having longer tail; number of tail annules and
in the position of scutella (L = 0.63–0.78 mm; spear = 27.4–
31.2 um; b = 5.3–8.0; epitygma one; c = 52–83; 8–12 tail
annules and scutella pre anal in S. conicephalum).

SCUTELLONEMA ORIENTALIS RASHID & KHAN, 1973

Dimensions:
Females (5): L = 0.60–0.73 mm; a = 25–28; b = 6.1–6.9;
b' = 5.3–5.5; c = 50–73; c' = 0.58–0.70; V = 60–62; spear =
26–28 um; 0 = 21–25.

Male: Not found.

Habitat and locality: Soil around roots of pine (Pinus sp.)
from Jowai, Meghalaya.

Remarks: The specimens of this population conform well with
the description and dimensions of Scutellonema orientalis as
given by Rashid & Khan (1973) except that these have slightly
smaller bodies.
FAMILY PRATYLENCHIDAE THORNE, 1949

**Diagnosis:** Hoplolaimoidea. Vermiform nematodes with usually fine striations. Marked sexual dimorphism sometimes present, often manifested by degeneration of anterior portion of the male. Head low, rounded or flattened anteriorly, and about 1/2-3/5 as wide as length of spear. Cephalic framework sclerotized hexaradiate, prominent. Spear small but strong, with well developed basal knobs. Oesophageal glands lobe-like, overlapping anterior end of intestine. Ovary one or two. Female tail about twice as long as anal body width. Bursa terminal or subterminal.

Type subfamily: Pratylenchinae Thorne, 1949

Other subfamilies: Radopholinae Allen & Sher, 1967
Rotylenchulinae Husain & Khan, 1967

SUBFAMILY RADOPHOLINAE ALLEN & SHER, 1967

**Diagnosis:** Pratylenchidae. Cephalic region usually with heavily sclerotized framework. Spear strong, with well developed basal knobs (excepting degenerate males of some species). Oesophageal gland lobe overlapping anterior portion of intestine dorsally or ventrally. Female tail 2 or more anal body widths long. Males with terminal or subterminal bursa.
Type genus: Radopholus Thorne, 1949

Other genus: Radopholoides De Guiran, 1967

**GENUS RADOPHOLUS THORNE, 1949**

*Diagnosis*: Radopholinae. Body cylindrical, small, usually less than 1.0 mm. Cephalic framework and spear well developed in females. Sexual dimorphism marked, with males being degenerate in anterior portion. Oesophageal glands overlapping intestine dorsally. Female reproductive system amphidelphic. Phasmids usually conspicuous and in anterior portion of tail. Female tail 2-4 anal body widths long. Males with arcuate, cephalated spicules. Bursa subterminal or terminal

*Type species*: Radopholus similis (Cobb, 1893) Thorne, 1949

In the soil samples collected from Shillong, Meghalaya during the course of present investigation Radopholus similis (Cobb, 1893) Thorne, 1949 was found. A full description of the species is given below.
RADOPHOLUS SIMILIS (COBB, 1893) THORNE, 1949

Dimensions:

Females (5): L = 0.54-0.63 mm; a = 32-33; b = 5.9-6.6; b' = 3.3-4.1; c = 7.8-9.2; V = 54-57; spear = 15-16 um;

Males (5): L = 0.55-0.61 mm; a = 37-39; b = 5.6-6.8; b' = 4.5-5.2; c = 7.7-9.4; T = 27-40; spear = 9-13 um.

Description:

Female: Body slender, straight to slightly curved on ventral side upon fixation, tapering only slightly towards anterior end but more towards posterior end. Body striations 1.0-1.5 um apart. Lateral fields with four incisures, occupying about 1/4 of body width at mid-body.

Lip region rounded, set off by a slight constriction and marked with three annules, 8-9 um wide, 3 um high. Spear stout with rounded basal knobs, about twice lip region width long. Spear knobs about 5 um across. Orifice of dorsal oesophageal gland at 4-5 um from base of spear. Median oesophageal bulb sub-spherical to somewhat oval, isthmus short, basal lobe of oesophagus extending back dorsally over anterior part of intestine. Nerve ring at 70-73 um and excretory pore 80-87 um from anterior end.

Vulva transverse, slit-like. Vagina extending about half of corresponding body width. Vulva-anus distance 174-209 um or
2.5-3.0 tail length long. Tail conical with irregularly rounded end, 4.7-5.5 anal body widths long.

**Male:** Lip region elevated, set off, sub-spheroid, 6 um wide and 4 um high. Spicules 20-22 um or 1.5-1.8 anal body widths long, gubernaculum 9-10 um or about half of spicular length. Bursa 65-97 um or 5-8 anal body widths long, extending from a point in front of spicules to about two-thirds the tail length. Tail conoid with irregularly rounded end, 4.9-6.1 anal body widths long.

**Habitat and locality:** Soil around roots of *Machillus* sp. from Botanical gardens, Shillong, Meghalaya.

**Remarks:** The present population conform well with the dimensions and description of the species by Thorne (1949).

---

**SUBORDER CRICONEMATINA SIDDQUI, 1980**

**Diagnosis:** Tylenchida. Female small cylindrical, sausage-shaped or spheroid with well developed oesophagus. Female and juveniles with thick cuticle marked with retrorse or smooth annules without lateral fields or provided with spines, scales or other cuticular configuration, with or without an extra-cuticular sheath. Lip region in female and juveniles with less than three usually modified annules; oral apertures dorso-ventrally longitudinal, often I-shaped due to two lateral liplets on a raised area or labial disc; amphid apertures round to
oval. Four submedian pseudo-lips and two small lateral pseudo-lips may be present. Cephalic framework hexa-radiate with weak or strong sclerotization. Deirids reported in *Tylenchulus* and *Paratylenchus*. Phasmids absent. Spear long, metenchium longer than telenchium; basal knobs well developed, sloping backwards or anchor-shaped with outer margins directed forward. Oesophagus with procorpus amalgamated with metacorpus, isthmus usually short. Vulva transversely oval or slit-like, located posteriorly usually at 75 percent or more of body length. Gonad mono-prodelphic, ovary outstretched (coiled in swollen females). Small post-vulval uterine sac present in Paratylenchoidea. Spermatheca round to oval, set off. Uterus with ovijector. Vagina leading inward and forward. Intestine syncytial, lacking a definite lumen, often extending beyond anal level, female anus a small pore. Sexual dimorphism distinct. Males slender, spear and oesophageal region degenerate. Monorchic, gonoduct usually filled with small-sized sperms. Testis in mature males obliterated. Spicules often very long and setaceous with small narrow head, an elongate slender shaft and finely pointed distal ends, variable in shape, often arcuate. Genitalaculum crescent-shaped in lateral view. Bursa low, rarely elevated or drawn out as a penial tube.

*Type superfamily:* Criconematoida Taylor, 1936

*Other superfamilies:* Hemicycliophoroidea Skarbilovich, 1959
Tylenchuloidea Skarbilovich, 1947.
SUPERFAMILY CRICONEMATOIDEA TAYLOR, 1936

Diagnosis: Criconematina. Body length about 1.0 mm. Sexual dimorphism present. Body cuticle deeply annulated, annules smooth or coarse, bearing scales, spines or other spine-like retractive projections. Labial framework lightly sclerotized. Median lobes usually present. In males oesophagus degenerate and spear lacking. Spicules small, may be slightly arcuate. Gubernaculum small, trough-shaped. Bursa absent or poorly developed.

Type and only family: Criconematidae Taylor, 1936

FAMILY CRICONEMATIDAE TAYLOR, 1936

Diagnosis: Same as above.

Type family: Criconematinae Taylor, 1936

Other family: Macroposthoniinae Skarbilovich, 1959

SUBFAMILY MACROPOSTHONIINAE SKARBILOVICH, 1959

Diagnosis: Criconematidae. Body cylindrical, tapering towards extremities. Body annules coarse, smooth or finely crenate, 40-200 in number. Extra-cuticular sheath and lateral fields
lacking. Lip region distinct, not set off, oral disc surrounded by pseudolips often forming four submedian lobes. Spear knobs anteriorly directed. Tail short, conoid or rounded. Spicules slightly arcuate. Bursa rudimentary, if present. Cuticle in juveniles smooth or slightly fringed, without scales or spines.

Type genus: **Criconemella** De Grisse & Loof, 1965

Other genera: **Discocriconemella** De Grisse & Loof, 1965  
**Xenocriconemella** De Grisse & Loof, 1965

**GENUS CRICONEMELLA DE GRISSE & LOOF, 1965**

**Diagnosis:** Macroposthoniinae. Female body 0.20-1.0 mm. Annules 42-210, smooth to crenate, anastomoses present or absent. Submedian lobes present or absent, if present may be fused to varying degrees or separate. Labial plates present or absent. Vulva open or closed, anterior vulval lip ornamented or not. Vagina straight or sigmoid. Stylet well developed, 25-129 um. Oesophagus 30% or less of body length. Tail variable. Males with rounded to conoid heads. Incisures 2 to 4, usually 4, bursa distinct.

Type species: **Criconemella parva** (Raski, 1952) De Grisse & Loof, 1965
**CRICONEMELLA ONOENSIS** (LUC, 1959) DE GRISSE & LOOF, 1965

**Dimensions:**
Females (5):  \( L = 0.37-0.45 \) mm;  \( a = 9-10; \)  \( b = 4.3-4.0; \)  \( c = 15-18; \)  \( V = 92-94; \)  \( \text{spear} = 43-44 \) um;  \( \text{Rex} = 27-30; \)  \( \text{RV} = 7-8; \)  \( \text{RVan} = 1; \)  \( \text{Ran} = 6-7; \)  \( R = 111-121; \)  \( \text{PV/ABD} = 1.0-1.1; \)  \( \text{T/ABW} = 0.79-1.00; \)  \( \text{VA/T} = 10-13 \)

Male: Not found.

**Habitat and locality:** Soil around roots of Kadam (*Anthocephalus cadamba*) from Central Nursery, Garampani, Sibsagar district, Assam, India.

**Remarks:** The present population conforms well with the description and measurements of the species by Luc (1959), Raski & Golden (1966) and Baqri (1979).

**GENUS DISCOCRICONEMELLA** DE GRISSE & LOOF, 1965

De Grisse & Loof (1965) established the genus *Discocriconemella* for those species of *Criconemoides* (*sensu lato*) having an oval distinctly set off cephalic disc. They also designated *Criconemoides limitanea* Luc, 1959 as type species and shifted *C. mauritiensis* Williams, 1960 to this genus. Other workers viz., Diab & Jenkins (1966), De Grisse (1967 & 70), Krnjaic (1967); Heyns (1970); Luc (1970); Hoffman (1974),
Choi & Geraert (1975), Sauer & Winoto (1975), Pinochet & Raski (1976), Khan, Chawla & Saha (1976), Orton Williams (1979), Loof & Sharma (1980) etc. added new species to this genus. Luc (1970) transferred four of these species to Criconemoides while Loof & De Grisse (1973) shifted two species to Macroposthonia and one species to Nothocriconema but they brought Criconemoides colbrani to Discocriconemella. Ebsary (1982) shifted two species of Criconemoides and Madinema to this genus. The genus Acrozostron Orton Williams (1981) was considered a synonym of Discocriconemella by Ebsary (1982). A new species of Discocriconemella is described in the following from Meghalaya.

**Diagnosis:** Macroposthoniinae. Body size ranges from 0.20-0.50 mm in length, assuming a C-shaped posture upon fixation. Body annules angular, posterior edges of annules finely but distinctly crenate, with many anastomoses. Lip region set off, saucer-shaped in females, but in males it is conoid and with a typical elevation. Bursa absent, spicules short and lateral fields with two lines in males.

**Type species:** Discocriconemella limitanea (Luc, 1959) De Grisse & Loof, 1965

**Other species:** D. baforti De Grisse, 1967  
D. caudaventer Orton Williams, 1979  
D. colbrani (Luc, 1970) Loof & De Grisse, 1973
De Grisse, 1967
D. hengsugica Choi & Geraert, 1975
D. inaratus Hoffmann, 1974
D. lamottei (Luc, 1970) Ebsary, 1982
D. maccarnphidia De Grisse, 1967
D. mauritiensis (Williams, 1960) De Grisse & Loof, 1965
D. pannosa Sauer & Winoto, 1975
D. recensi Khan et al., 1971
D. repleta Pinochet & Raski, 1976
D. retroversa Sauer & Winoto, 1975
D. theobromi (Chawla & Samathanam, 1980) Ebsary, 1982
D. oryzae n. sp.

**DISCOCRICONEMELLA ORYZAE N. SP.**
(Fig. 5)

**Dimensions:**

Paratype females (3):  
L = 0.17-0.21 mm;  
a = 5-7;  
b = 2.3-2.6;  
c = 12-14;  
V = 80-87;  
VL/VB = 1.04-1.08;  
Rex = 36;  
RV = 10-13;  
RVan = 4-6;  
Ran = 6-7;  
R = 89-104;  
T/ABW = 0.75-0.88;  
spear = 54-61 um.

Holotype female:  
L = 0.19 mm;  
a = 5;  
b = 2.3;  
c = 13;  
V = 87;  
VL/VB = 1.0;  
Rex = 37;  
RV = 12;  
RVan = 5;  
Ran = 7;  
R = 100;  
T/ABW = 0.78;  
spear = 61 um.
Description:

Body short and stout, ventrally curved upon fixation. Body annules 3-4 um apart at midbody, 39-40 annules up to oesophago-intestinal junction, 37-52 annules from oesophago-intestinal junction to vulva, 4-6 annules from vulva to anus and 6-7 annules from anus to terminus. Margins of posterior body annules finely crenate or wavy with occasional anastomoses. Lip region distinctly set off, 4-5 um high with two non-retroverse annules, first lip annule saucer-shaped with little anteriorly directed margins, 12-13 um wide, second annule with laterally directed margins, 12-13 um wide; first body annule retroverse 15-16 um wide. Labial plates extending up to second annule. Metenchium of 43-50 um or 80-82% total spear length. Basal knobs of spear 7 um across, located on 26th-27th body annule from anterior end. Orifice of dorsal oesophageal gland 2-3 um from spear base. Pro-metacorpus 8-9 um and basal bulb 8 um wide. Nerve ring at 64-68 um from anterior end of body. Oesophago-intestinal junction at 74-83 um from anterior end. Vulva closed, located on 10th-13th annule and anus on 6th-7th annule from posterior end. Vulva-anus 4-6 annules apart, the distance 9-12 um or about half of vulval body width. Tail conoid, 15-16 um or slightly less than one anal body width or less than two vulva-anus distance long.

Male: Not found.
Type habitat and locality: Soil around roots of paddy (Oryza sativa L.) from Nagapgiri village, East Garo hills district, Meghalaya, India.

Type material: Collected in June 1981. Holotype female on slide Discocriconemella oryzae n. sp./1; paratype females on slides Discocriconemella oryzae n. sp./2-3.

Relationship: Discocriconemella oryzae n. sp. comes close to Discocriconemella limitanea (Luc, 1959) De Grisse & Loof, 1965 and D. repleta Pinochet & Raski, 1976. From the former it differs in the shape of lip region; in having a longer spear and a longer tail (spear = 45-53 μm; c = 17-30 in D. limitanea). From the latter it differs in the shape of lip region, in having anteriorly located vulva, more annules between vulva-anus and vulva-tail; and a longer tail (V = 92-95; RVan = 3-4; RV = 7-8; and c = 20-26 in D. repleta).
SUPERFAMILY HEMICYCLIOPHOROIDEA SKARBILOVICH, 1959

**Diagnosis:** Criconematina. Body length in both sexes varies from 0.6-1.9 mm. Sexual dimorphism present. Body annules coarse, non-retrorse, usually over 200 in number. Females and juveniles are enclosed an extra cuticular sheath except in Caloosia. Lip region consists of 1-3 annules. Oral opening a dorso-ventral slit on labial disc. Amphids open, situated close to labial disc. Submedian lobes absent. **Caloosia** females without lateral fields. Spear elongated, with spheroid basal knobs, generally sloping posteriorly. Vulva may be oval, transverse or slit-like, usually with modified lips, located in posterior region of body. Ovary mono-prodelphic. Tail may be elongated and pointed, rounded, cylindrical or hemispherical. Males with degenerate spear and oesophagus. Spicules differently shaped, setaceous and long, weakly cephalated, straight, arcuate, semi-circular, U-or hook-shaped. Gubernaculum fixed. Cloacal lips may form penial tube in some genera.

**Type family:** Hemicycliophoridae Skarbilovich, 1959

**Other family:** Caloosiidae Siddiqi, 1980

**FAMILY HEMICYCLIOPHORIDAE SKARBILOVICH, 1959 (GERAERT, 1966)**

**Diagnosis:** Hemicycliophoroidea. Lip annules of females not modified or separate (except in **Hemicycliophora hesperis**). Vulva
a transverse slit over half a body width long, vulval lips modified and projecting (except Loofia). Lip region in male usually set off. Spicules arcuate, semi-circular, U- or hook-shaped. Bursa covers one-third of tail. Female tail usually elongate-conoid but may be filiform, cylindrical or hemispherical, shorter than male tail.

Type subfamily: Hemicycliophorinae Skarbilovich, 1959

Other subfamily: Hemicriconemoidinae Andrássy, 1979

SUBFAMILY HEMICYCLIOPHORINAE SKARBILOVICH, 1959


Type genus: Hemicycliophora de Man, 1921

Other genera: Aulosphora Siddiqi, 1980
Colbranium Andrássy, 1979
Loofia Siddiqi, 1980
Hemicaloosia Ray & Das, 1979
GENUS AULOSPHERA SIDDIQI, 1980

Siddiqi (1980) established the genus Aulosphora for those species of Hemicycliophora which possess modified vulval lip and U- or hook-shaped spicules. He transferred five species of Hemicycliophora to this genus.

Diagnosis: Hemicycliophorinae. Body length varies from 0.8-2.0 mm. Body annules coarse, rounded not retrorse. Body just behind vulva slightly reducing in width. Vulval lips elongated, over three body annules long, almost parallel to body and directed backwards. Tail elongate, tapering. Spicules often very long (about 100 µm or more), U- or hook-shaped. Penial tube over one body width long, directed forward often touching ventral body surface. Bursa mostly pre-anal (pre- and post-anal parts in the ratio of 3-4:1).

Type species: Aulosphora penetrans (Thorne, 1955) Siddiqi, 1980

Other species: A. dahomensis (Germani & Luc, 1976) Siddiqi, 1980
A. indica (Siddiqi, 1961) Siddiqi, 1980
A. oostenbrinki (Luc, 1958) Siddiqi, 1980
A. osmani (Das & Shivaswamy, 1977) Siddiqi, 1980
A. utkali (Ray & Das, 1980) n. comb.

Aulosphora oostenbrinki (Luc, 1958) Siddiqi, 1980 was found in the soil samples collected from Assam.
AULOSPHERA OOSTENBRINKI (LUC, 1958) SIDDIQI, 1980

Dimensions:
Females (5): L = 0.92-0.96 mm; a = 23-28; b = 5.8-6.8; c = 6-8; V = 76-84; spear = 73-87; Rex = 62-69; RV = 88-102; RVan = 35-50; Ran = 52-62; R = 337-367; PV/ABW = 6.8-10.0; T/ABW = 4.4-6.0; VAT = 35-51.

Male: Not found.

Habitat and locality: Soil around roots of Citronella sp. (Ceylon variety) from Rajmai Tea Estate, Rajmai, Sibsagar district, Assam, India.

Remarks: The present specimens of Aulosphora oostenbrinki (Luc, 1958) Siddiqi, 1980 agree fairly well with the description and dimensions given by Luc (1958) except in having slightly longer spear and more body annules (spear = 70-75 um; body annules = 226-259 in the type specimens).

SUBFAMILY HEMICRICONEMOIDEAE, ANDRASSY, 1979

Type and only genus: *Hemicriconemoides* Chitwood & Birchfield, 1957

**GENUS HEMICRONEMOIDES CHITWOOD & BIRCHFIELD, 1957**

The genus *Hemicriconemoides* was erected by Chitwood & Birchfield (1957) with *H. wessonii* as its type species. Goodey (1963) synonymised it with *Hemicycliophora* but later Siddiqi & Goodey (1963) revalidated it on the basis of the differences in the number of body annules and in the shape of spear knobs which are anchor-shaped in *Hemicriconemoides* whereas spheroid and sloping posteriorly in *Hemicycliophora*. They placed it in the subfamily Criconematinae Taylor, 1936. Brzeski (1974) shifted *Hemicriconemoides* from Criconematinae to Hemicycliophorinae. Khan et al., (1976) agreed with Brzeski because of the presence of a sheath in the adult females and in the general resemblance of their body annules. Andrássy (1979) proposed a new subfamily Hemicriconemoidinae under Hemicycliophoridae for this genus.

In the present study *Hemicriconemoides mangiferae* Siddiqi, 1961 and a new species were found in the soil samples collected from Assam.

**Diagnosis:** Hemicriconemoidinae. Female body enclosed in an extra-cuticular sheath. Body annules smoothly rounded and usually less than 200 in number. Basal knobs of spear anchor-shaped with margins anteriorly directed (except *H. strictathecatus* where basal

Type species: *Hemicriconemoides wessoni* Chitwood & Birchfield, 1957

Other species:
- *H. aberrans* Phukan & Sanwal, 1982
- *H. affinis* Germani & Luc, 1970
- *H. alexis* Vovlas, 1980
- *H. annulatus* Pinochet & Raski, 1975
- *H. brachyurus* (Loos, 1949) Chitwood & Birchfield, 1957
- *H. brevicaudatus* Dasgupta, Raski & Van Gundy, 1969
- *H. californianus* Pinochet & Raski, 1975
- *H. chitwoodi* Esser, 1960
- *H. cocophillus* (Loos, 1949) Chitwood & Birchfield, 1957
- *H. communis* Edward & Misra, 1964
- *H. conicaudatus* Phukan & Sanwal, 1982
- *H. gaddi* (Loos, 1949) Chitwood & Birchfield, 1957
- *H. insignis* Dasgupta, Raski & Van Gundy, 1969
- *H. intermedius* Dasgupta, Raski & Van Gundy, 1969
- *H. kanayaensis* Nakasono & Ichinohe, 1961
- *H. litchi* Edward & Misra, 1964
- *H. longistylus* n. sp.
- *H. mangiferae* Siddiqi, 1961
H. mehdi Suryawanshi, 1971
H. microdoratus Dasgupta, Raski & Van Gundy, 1969
H. minutus Esser, 1960
H. neobrachyurus Dhanachand & Jairajpuri, 1960
H. nitida Pinochet & Raski, 1975
H. obtusus Colbran, 1962
H. parvus Dasgupta, Raski & Van Gundy, 1969
H. promissus Vovlas, 1980
H. pseudobrachyurus De Grisse, 1964
H. sacchariae Heyns, 1970
H. snoecki Doorsselaere & Samsoen, 1982
H. strictathecatus Esser, 1960
H. taiwanensis Pinochet & Raski, 1975
H. uralnoensis Yakoo, 1963
H. variondus Choi & Geraert, 1972

HEMICRICONEMOIDES LONGISTYLUS N. SP.
(Fig. 6)

Dimensions:
Paratype females (6): L = 0.37-0.50 mm; a = 13-18; b = 3.1-3.9; c = 10-14; V = 85-89; Rex = 35-37; RV = 16-18; RVan = 4-5; Ran = 11-14; R = 129-138; VL/VB = 2.2-2.6; T/ABW = 1.7-2.5; spear = 82-96 um.
Holotype female: \( L = 0.41 \text{ mm}; \ a = 15; \ b = 3.5; \ c = 9; \ V = 85; \ Rex = 38; \ RV = 17; \ RVan = 4; \ Ran = 13; \ R = 129; \ VL/VB = 2.1; \ T/ABW = 2.2; \) spear = 95 um.

Description:

Body ventrally curved upon fixation, tapering towards extremities. Cuticular sheath tightly enclosing the body. Body annules about 4 um apart at midbody, 35-40 annules up to oesophago-intestinal junction, 74-82 annules from oesophago-intestinal junction to vulva, 4-5 annules from vulva to anus and 11-14 annules from anus to tail tip. Annules with faint serrations becoming more prominent behind vulva. Lip region angular, slightly set off, marked with two annules, first lip annule inverted saucer-shaped, directed outward, 9-11 um wide, second lip annule 10-12 um wide, larger than first annule. Labial framework strongly sclerotized. Metenchium 68-75 um long or 80-84\% of total spear length. Basal knobs of spear anchor-shaped, 6-8 um across. Orifice of dorsal oesophageal gland 3-4 um from spear base. Pro-metacorpus 14-15 um wide, basal bulb 8-9 um wide. Nerve ring 99-116 um and oesophago-intestinal junction 116-128 um from anterior extremity. Excretory pore on 34-37th annule and hemizonid 1 or 2 annules anterior to excretory pore. Vulva wide, located on 16-18th annule and anus on 11-14th annule from posterior extremity. Vulva-amus 4-5 annules apart, the distance 13-18 um or less than vulval body width. Tail conoid, more sharply tapering from middle towards tail tip, about
two anal body widths or 2-3 times of vulva-anus distance long.

**Male:** Not found.

**Type habitat and locality:** Soil around roots of tree fern *(Cyathea* sp.) from Bhalukpung, Assam, India.

**Type material:** Collected in June 1981. Holotype female on slide *Hemicriconemoides longistylus* n. sp./1; paratype females on slides *Hemicriconemoides longistylus* n. sp./2-3;

**Relationship:** *Hemicriconemoides longistylus* n. sp. comes close to *Hemicriconemoides chitwoodi* Esser, 1960 and *H. variondus* Choi & Geraert, 1972. From the former it differs in having first lip annule smaller than second; longer spear; longer oesophagus; anteriorly located vulva; more annules between vulva-tail and anus-tail and in having longer and more sharply pointed tail (first lip annule larger than second; spear 78-90 um; b = 3.6-4.4; V = 88-92; RV = 12-16; Ran = 8-10; c = 13-22 and tail gradually tapering to a rounded tip in *H. chitwoodi*). From *H. variondus* it differs in shape of lip region, spear knobs; in having longer oesophagus; anteriorly located vulva; in having more annules between vulva-tail and anus-tail, and a longer tail (lip region with rounded annules; spear knobs mostly rounded with sloping anterior surface; b = 3.6-4.4; V = 90-93; RV = 11-15; Ran = 6-8; and c = 13-20 in *H. variondus*).
HEMICRICONEMOIDES MANGIFERAE SIDDIQI, 1961

Dimensions:

Females (4): L 0.51-0.53 mm; a = 19-20; b = 4.4-4.7; c = 19-21; V = 92-93; VL/VB = 1.5-1.6; Rex = 36-37; RV = 11-12; RVan = 3-4; Ran = 8; R = 132-140; T/ABW = 1.3; spear = 75 um.

Male: Not found

Habitat and locality: Soil around the roots of Piper betle from Jalukani, Sibsagar district, Assam, India.

Remarks: The present specimens of Hemicriconemoides mangiferae conform well with the description and dimensions given by Siddiqi (1961) and also the dimensions given by Dasgupta et al. (1969).