

NEMATODES OF VEGETABLES AND PULSES  
FROM PATNA DISTRICT, BIHAR—1

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ABSTRACT

The present communication deals with eighteen species of nematodes found associated with vegetables and pulses in Patna district, Bihar. Most of the species have been recorded for the first time from Bihar and many new hosts are also reported. The heteromorphic tail in *Hoplolaimus* is dealt with.

INTRODUCTION

Only a few stray papers dealing with nematodes of Bihar have been published by workers like those of Sen (1960), Mathur & Prasad (1971), Mulk & Jairajpuri (1974) etc. The present studies have been taken up to improve our knowledge of plant parasitic nematode fauna of Bihar.

Three surveys were conducted covering different parts of the Patna district, Bihar, in 1978-1979. In the course of surveys 46 villages were visited and 137 rhizosphere samples from about 40 hosts of vegetables and pulses (a few other crops eg. paddy, castor etc.) were collected from several fields. The present communication deals with eighteen species of tylenchid nematodes. As very little is known about nematodes of Bihar state, most of the species constitute new records of their occurrence in the region.

SYSTEMATIC ACCOUNT

Family TYLENCHIDAE Filipjev, 1934

1. *Tylenchus filiformis* Bütschli, 1873

*Tylenchus filiformis* Bütschli, 1873, *Nova Acta Acad. Caesar. Leop. Carol.*, 36(5) : 1-144.

*Dimensions* : ♀ ♀ (4) : L = 0.42-0.56 mm, a = 33-37, b = 5.7-6.9, c = 4-5, c' = 8-12, V = 62-65, stylet = 10-13  $\mu$ m.

♂ ♂ (6) : L = 0.37-0.57 mm, a = 30-36, b = 4.2-5.8, c = 4-7, c' = 8-15, stylet = 12-13  $\mu$ m, spicula = 11-13  $\mu$ m, gubernaculum = 5-6  $\mu$ m.

*Description* : *Female*—Body slender, tapering towards extremities, straight, cuticular striations very fine, interrupted by lateral field; latter marked with four incisures. Head continuous, narrower than neck. Oesophagus tylenchoid, median bulb valvate. Vulva postequatorial, gonad anterior, outstretched. Tail filiform, longer than vulva-anus distance.

*Male*—General characters same as those of females except male characters. Spicula tylenchoid, bursa adanal.

*Remarks*—The species seems to be widely distributed.

*Host*—Radish, smoothgourd, eggplant, chilli, pigeonpea, gram and castor.

*Locality*—Patot, Kanpa, Umerabad, English, Baikatpur, Bakhtiyarpur, Mosimpur, Nukunpura, Metra, Hathidah.

## 2. *Psilenchus* sp.

*Dimensions* : j ♀ ♀ (2) : L=59-61 mm, a=38-40, b=5-6, c=6-7, c'=8, V=?, stylet=13 μm.

♂ (1) : L=0.85 mm, a=43, b=6.5, c=6, c'=10, stylet=13 μm, spicula=26 μm.

*Description : Juvenile Female*—Body slightly curved ventrally after thermal killing. Cuticle transversely striated, striae fine, lateral field occupying more than  $\frac{1}{4}$  of body width, with four incisures. Head continuous with body. Stylet with round knobs. Procorpus longer than metacarpus and bulb together. Excretory pore opposite nerve ring, 80-98 μm from anterior end. Tail elongate, filiform, tip clavate. Vulva not developed. Gonads not developed, however, a cluster of germinal cells at about mid body.

*Male*—General characters same as those of female. Spicula tylenchoid ; gubernaculum thin, trough like. Bursa small, adanal.

*Remarks*—This genus is recorded from Bihar for the first time.

*Host*—Tomato, smooth gourd. Latter is a new host.

*Locality*—Maner, Lai.

## 3. *Ditylenchus* sp.

*Dimensions* : ♀ (1) : L=0.58 mm, a=30, b=6, c=8, c'=7, V=66, stylet—11 μm.

*Description : Female*—Body cylindroid, tapering on either end, arcuate ventrally. Cuticle finely striated transversely. Lateral field about  $\frac{1}{4}$  of body width, only two incisures discernible. Head continuous with body contour, cephalic framework feeble. Stylet short with round knobs. Procorpus 31 μm long, median bulb 8 μm joining posterior bulb through a narrow isthmus. Posterior bulb overlapping intestine more than one body width. Isthmus alongwith posterior bulb 38 μm. Nerve ring 57 μm and excretory pore 77 μm both from anterior end.

Vulva flush with body surface, post-equatorial. Gonad mono-prodelphic, post-uterine sac about half the vulval body width long. Vulva-anus distance slightly less than twice the length of tail. Tail elongate, tapering to a subacute terminus.

*Host*—Coriander. This is a new host record.

*Locality*—Hardasbigha.

## 4. *Ditylenchus* sp.

*Dimensions* : ♀ (1) : L=0.75 mm, a=29, b=7, c=15, c'=4, V=81, stylet=10 μm.

*Description : Female*—General morphology same as described in previous case. Procorpus 33 μm, median bulb 13 μm long, oval ; posterior bulb including isthmus 47 μm long. Nerve ring 65 μm and excretory pore 87 μm both from anterior end. Vulva much posterior. Postvulval sac more than one and half vulval body width long.

**Remarks**—The above two specimens were collected from the same host and same locality (one sample) yet they differ in their body size, size of post vulval sac position of vulva and the values of  $c$  and  $c'$ . However, with only one specimen of each type at disposal species could not be determined.

**Host**—Coriander.

**Locality**—Hardasbigha.

### 5. *Pseudhalenchus indicus* Sethi nad Swarup, 1967

*Pseudhalenchus indicus* Sethi & Swarup, 1967, *Indian Phytopath.*, 20(1) : 26-28.

**Dimensions** : ♀ (1) :  $L=0.64$  mm,  $a=35$ ,  $b=7$ ,  $b'=4.3$ ,  $c=14$ ,  $c'=9$ ,  $V=88$ , = stylet  $13\ \mu\text{m}$ .

♂ ♂ (2) :  $L=0.39-0.63$  mm,  $a=30-40$ ,  $b=5.7-6.0$ ,  $b'=5$ ,  $c=10.0-11.3$ ,  $c'=5.3-6.0$ , stylet =  $12-13\ \mu\text{m}$ , spicula =  $15.6\ \mu\text{m}$ , gubernaculum =  $6.5\ \mu\text{m}$ .

**Description** : *Female*—Almost straight and long body. Cuticle finely striated. Lateral field occupying  $\frac{1}{3}$  of body width, with four smooth incisures. Head continuous. Oesophagus typical of the genus. Vulva posterior, ovary single, anterior and outstretched. Postvulvar sac about one and half body width long. Tail conoid, tapering with acute terminus.

**Male**—General characters as in females. Spicula and gubernaculum as found in the genus. Bursa ending subterminally.

**Remarks**—Present specimens tally in all respect with the original description of the species by Sethi & Swarup (1967). However, these specimens show slightly longer spicule ( $14\ \mu\text{m}$ —Sethi & Swarup). This difference is considered as intraspecific difference

between two populations occurring in widely separated areas.

The present record of the species from Bihar is new.

**Host**—Mustard, tomato and castor.

**Locality**—Nukunpura, Nirpur, Bidhipur.

### 6. *Pseudhalenchus anchilisposomus* Tarjan, 1958

*Pseudhalenchus anchilisposomus* Tarjan, 1958, *Proc. helminth. Soc. Wash.*, 25(1) : 20-25.

**Dimensions** : ♀ (1) :  $L=0.49$  mm,  $a=35$ ,  $b=4.7$ ,  $c=12$ ,  $c'=5$ ,  $V=82$ , stylet =  $8\ \mu\text{m}$ .

**Description** : *Female*—Body straight, cuticle finely striated. Lateral field about  $\frac{1}{3}$  of body width having six incisures. Tail elongate-conoid with pointed tip. Postvulvar sac  $\frac{2}{3}$  the vulva—anus distance.

**Remarks**—This is a new record of the species from Bihar.

**Host**—Pigeonpea.

**Locality**—Patot.

Family TYLENCHORYNCHIDAE (Eliava, 1964)  
Golden, 1971

### 7. *Tylenchorhynchus mashhoodi* Siddiqi & Basir, 1959

*Tylenchorhynchus mashhoodi* Siddiqi & Basir, 1959, *Proc. Indian Sci. Congr.* : 35; Siddiqi, 1961, *Z Parasitkde.*, 21 : 46-64.

**Dimensions** : ♀ ♀ (4) :  $L=0.53-0.62$  mm,  $a=26-34$ ,  $b=4.8-5.6$ ,  $c=13-16$ ,  $c'=3.0-3.3$ ,  $V=53-56$ , stylet =  $13-16\ \mu\text{m}$ .

♂ ♂ (2) :  $L=0.52-0.55$  mm,  $a=30$ ,  $b=4.7-5.2$ ,  $c=14.8-15.7$ ,  $c'=2.7$  stylet =  $12\ \mu\text{m}$ , spicula =  $18-22\ \mu\text{m}$ , gubernaculum =  $9-10\ \mu\text{m}$ .

**Description** : *Female*—Body cylindrical, narrowing towards either ends. Cuticular striations moderat. Head continuous with

body. Lateral field marked with four incisures, occupying about  $\frac{1}{8}$  of body width. Tail cylindrical, tapering posteriorly, having a maximum of 30 annules on ventral side. Last annule large.

*Male*—General characters same as in female.

*Remarks*—The specimens fit in well with the original description of the species and those given by Chaturvedi & Khera (1979). The variations noted by Baqri & Jairajpuri (1970) were also observed in the present specimens.

The species is widely distributed in the eastern part of the district and associated with a large number of hosts.

*Host*—Okra, banana, onion, "sonf", tomato, "bakla", potato, Indian bean, coriander, cauliflower, eggplant, chilli, pea, mustard, pigeonpea, "masur" and castor.

Onion, "sonf", 'bakla', coriander and 'masur' are new hosts.

*Locality*—Kanpa, Nukunpura, Dargahitola, Baikatpur, Chhatarpur, Hardasbigha, Athmalgola, Nirpur, Pandarak, Bakhtiyarpur, Bidhipur, Hathidah, Adimpur, Aunta, Bahpura, Metra, Sahnaura.

### 8. *Tylenchorhynchus dubius* (Bütschli, 1873) Filipjev, 1936

*Tylenchus dubius* Bütschli, 1873, *Nova Acta Acad. nat. Curios.*, 36(5) : 1-124.

*Dimensions* : ♀ ♀ (8) : L=0.48-0.75 mm, a=24-36, b=4.9-6.8, c=12-16, c'=2.3-3.5, V=53-54, stylet=12-14  $\mu$ m.

♂ ♂ (5) : L=0.51-0.62 mm, a=30-36, b=5.1-5.9, c=13-16, c'=2.4-3.2, stylet=12-16  $\mu$ m, spicula=18-22  $\mu$ m, gubernaculum=9-12  $\mu$ m.

*Description* : *Female*—Body cylindroid, straight or curved ventrally after thermal killing, tapering on both ends. Cuticle with transverse striations, striae interrupted by lateral field. Latter about  $\frac{1}{8}$  of body width, marked with four incisures, which continue on tail. Phasmid in the anterior one third of tail. Tail cylindrical, tip round and striated, comprising 24-40 annules on ventral side. Head offset, hemispherical, consisting of 5-6 annules. Cephalic framework weakly sclerotized. Stylet knobs round, sloping posteriorly. Oesophagus typical of the genus. Vulva flush with body surface, gonads amphidelphic. Spermatheca functional.

*Males*—Except male characters all characters are same as those of females.

*Remarks*—The specimens fit well with the description of the species by Thorne (1961). The species is being recorded for the first time from Bihar.

*Host*—Eggplant, smooth gourd, tomato, "sonf", chilli, coriander, pigeonpea and castor. Smooth gourd, 'sonf' and coriander are new hosts.

*Locality*—Lai, Hardasbigha, Athmalgola, Nirpur, Nukunpura, Dargahitola, Bidhipur.

### 9. *Tylenchorhynchus clarus* Allen 1955

*Tylenchorhynchus clarus* Allen, 1955, *Univ. Calif. Publ. Zool.*, 61(3) : 129-166.

*Dimensions* : ♀ ♀ (2) : L=0.46-0.56 mm, a=32-33, b=4.1-5.5, c=15-17, c'=2.7, V=54-56, stylet=14-16  $\mu$ m.

Male not found.

*Description* : *Female*—Body curved ventrally. Head continuous with body contour, comprising 5 annules. Cuticle striated, lateral field  $\frac{1}{8}$  of body width, incisures four.

Cephalic framework weakly developed. Stylet knobs round. Procorpus cylindrical, 30-37  $\mu\text{m}$  long, median bulb subspherical 9-12  $\mu\text{m}$  in diameter, terminal bulb with isthmus measuring 43-48  $\mu\text{m}$  in length. Nerve ring 65-67  $\mu\text{m}$  and excretory pore 70-72  $\mu\text{m}$  both from anterior end. Intestinal sac present.

Vulva postequatorial, ovaries two, opposite and outstretched. Oöcytes arranged in a single row except in multiplication zone. Tail cylindrical, narrow behind, 28-35 annules on ventral side. Tail tip striated and pointed.

*Remarks*—The specimens fit well with the descriptions of the species by Allen (1955) and Tarjan (1964). This is the first record of the species from Bihar and "mung" and chilli are new hosts.

*Host*—Eggplant, chilli and "mung".

*Locality*—Hardasbigha, Patot, Metra.

Family BELONOLAIMIDAE (Whitehead, 1959)  
Golden, 1971

#### 10. *Telotylenchus indicus* Siddiqi, 1960

*Telotylenchus indicus* Siddiqi, 1960, *Nematologica*, 5 : 73-77.

*Dimensions* : ♀ (1) :  $L = 0.59$  mm,  $a = 30$ ,  $b = 5.5$ ,  $b' = 5$ ,  $c = 15$ ,  $c' = 2.6$ ,  $V = 56$ , stylet = 13  $\mu\text{m}$ .

♂ (1) :  $L = 0.52$  mm,  $a = 33$ ,  $b = 5.6$ ,  $b' = 5$ ,  $c = 16$ , stylet = 13  $\mu\text{m}$ , spicula = 19  $\mu\text{m}$ , gubernaculum = 11  $\mu\text{m}$ .

*Description : Female*—Body long, cylindrical, straight after fixation. Lateral field occupying  $\frac{1}{3}$  of body width, marked with four incisures. Phasmid in anterior one third of tail. Head continuous, narrow than neck. Oesophagus as described for the genus. Ovaries two, opposite and out-

stretched. Tail subcylindrical having approximately 50 annules ventrally, tip round.

*Male*—Male similar to female in general characters. Spicules tylenchoid, gubernaculum thin and curved. Phasmid tubular, in anterior half of the tail. Bursa entire.

*Remarks*—The species is being recorded for the first time from Bihar and castor is a new host.

*Host*—Tomato and castor.

*Locality*—Maner and Nirpur.

Family PRATYLENCHIDAE (Thorne, 1949)  
Siddiqi, 1963

#### 11. *Pratylenchus pratensis* (De Man, 1880) Filipjev, 1936

*Tylenchus pratensis* DeMan, 1880, *Tijdschr. Ned. Dierk. Ver.*, 5 : 1-104.

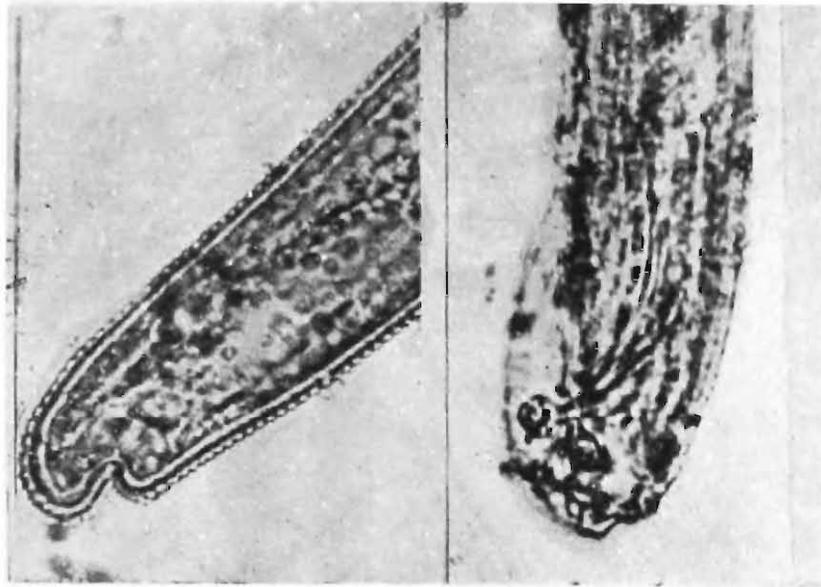
*Dimensions* : ♀ ♀ (3) :  $L = 0.48-0.53$  mm,  $a = 21-26$ ,  $b = 5.3-6.5$ ,  $b' = 4.6-5.5$ ,  $c = 18-19$ ,  $c' = 2.0-2.4$ ,  $V = 77-79$ , stylet = 14-16  $\mu\text{m}$ .

j ♀ ♀ (2) :  $L = 0.34-0.44$  mm,  $a = 20-26$ ,  $b = 4.0-5.3$ ,  $b' = 3.4-4.0$ ,  $c = 11-13$ ,  $c' = 2.0-2.4$ ,  $V = ?$ , stylet = 14-15  $\mu\text{m}$ .

Male not found.

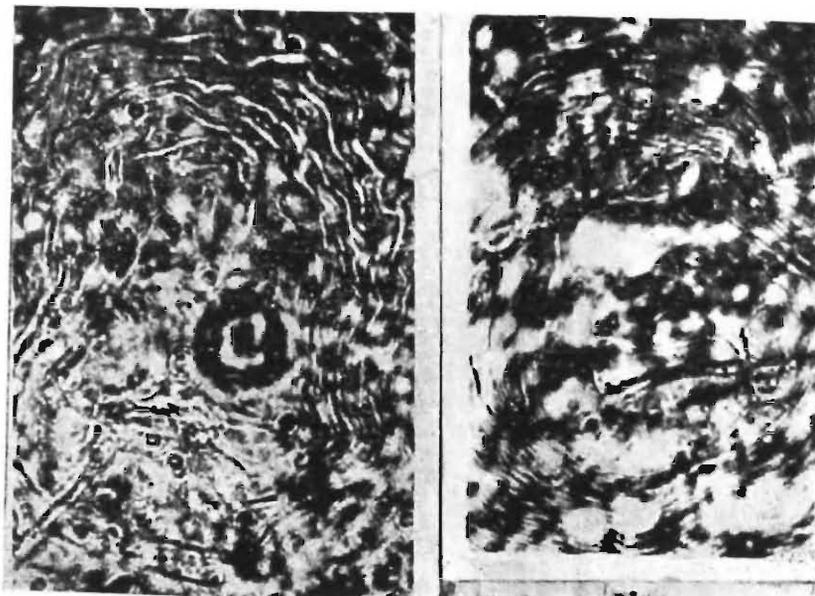
*Description : Female*—Ventrally curved body, specially posterior region. Head continuous, flat, having three annules. Cephalic framework strongly developed. Lateral field marked with four incisures. Tail cylindrical, tip round. Phasmid at about middle of the tail. Oesophagus pratylenchoid, oesophageal gland overlapping intestine ventrally. Stylet massive, knobs round.

Vulva flush with body surface, posterior ; vagina transverse about  $\frac{1}{2}$  vulvar body width long. Vulva to anus distance three times the tail length.



a

b



c

d

Figs. 1a. *Haplolaimus indicus*—Female tail  
1b. *Haplolaimus indica*—Male tail  
1c. *Meloidogyne incognito*—Perineal pattern  
1d. *Meloidogyne javanica*—Perineal pattern

*Remarks*—In one of the females a single egg measuring  $59 \times 17 \mu\text{m}$  was present.

*Host*—Smooth gourd, cucumber, eggplant and “mung” Except eggplant all others are new hosts.

*Locality*—Faridpur, Manpura, Lai, Maner, Patot, Baikatpur.

12. *Hirschmanniella oryzae* (Soltwedel, 1889) Luc & Goodey, 1963

*Tylenchus oryzae* Soltwedel, 1889, *Verlag van de Director vijfde Jversl. Proefstn Milden Java over 1888/1889*, pp. 15-16.

*Dimensions* : ♀ ♀ (3) :  $L=0.65-0.80$  mm,  $a=35-38$ ,  $b=6.5-8.5$ ,  $b'=4.2-4.4$ ,  $c=13-16$ ,  $c'=4.1-4.5$ ,  $v=54-57$ , stylet= $17 \mu\text{m}$ .

Male not found.

*Description* : *Female*—Body long, cylindrical, curved ventrally in different form. Head continuous, low, round, comprising 3-4 indistinct annules. Cephalic framework strongly cuticularised. Stylet stout, knobs round. Lateral field marked with four incisures, occupying  $\frac{1}{8}$  of body width, not aerolated. Phasmid in posterior third of tail. Tail conoid, tapering, annulated up to tip. Tail tip pointed. Vulva posterior to mid-body. Ovaries two, opposite. outstretched.

*Remarks*—Mathur & Prasad (1971) recorded the species from Bihar from paddy soil.

*Host*—Paddy.

*Locality*—Umerabed.

Family HOPILOLAIMIDAE (Filipjev, 1934) Wieser, 1953

13. *Hoplolaimus indicus* Sher, 1963

*Hoplolaimus indicus* Sher, 1963, *Nematologica*, 9 : 267-295.

*Dimensions* : ♀ ♀ (8) :  $L=0.98-1.24$  mm,  $a=27-32$ ,  $b=9-11$ ,  $b'=6.5-8.5$ ,  $c=46-56$ ,

$c'=0.6-0.9$ ,  $V=53-56$ , stylet= $34-35 \mu\text{m}$ ,  $0=11-12$ , anterior phasmid= $32-38\%$ , posterior phasmid= $62-85\%$

♂ ♂ (3) :  $L=1.04-1.05$  mm,  $a=35-36$ ,  $b=9.2-9.5$ ,  $b'=6.0-7.3$ ,  $c=40-45$ ,  $c'=1.2-1.5$ , stylet= $34-35 \mu\text{m}$ ,  $0=11-12$ , spicula= $39-41 \mu\text{m}$ , gubernaculum= $14-16 \mu\text{m}$ , anterior phasmid= $21\%$ , posterior phasmid= $83-92\%$ .

*Description* : *Female*—Body ‘C’ shaped after thermal killing. Cuticle thick, transversely striated, striae  $2.0-2.6 \mu\text{m}$  apart in midbody region. Head set off, sides sloping, comprising three annules. Cephalic framework strongly developed. Lateral field absent, single incisure seen only in caudal region. Phasmids large, placed erratically on either side of vulva. Spear knobs round, anterior margin projecting anteriorly. Excretory pore 4-6 annules above hemizonid,  $81-110 \mu\text{m}$  from anterior end. Nerve ring  $85-96 \mu\text{m}$  from anterior end. Oesophageal gland with six nuclei, sometime only 4 or 5 discernible. Intestine overlapping rectum. Tail comprising 12 annules ventrally, tip round.

*Male*—Head more round. Other characters, as in female. Tail conical, bursa enveloping tail.

*Remarks*—The heteromorphism in tail was observed in two specimens, one juvenile female and other a male. The two specimens showed the following measurements :—

j ♀ (1) :  $L=0.69$  mm,  $a=26$ ,  $b=7$ ,  $b'=5.3$ ,  $c=47$ ,  $c'=0.7$ ,  $V=?$ , stylet= $31 \mu\text{m}$ .

♂ (1) :  $L=0.91$  mm,  $a=26$ ,  $b=8$ ,  $b'=7$ ,  $c=64$ ,  $c'=0.9$ , stylet= $34 \mu\text{m}$ , spicula= $36 \mu\text{m}$ , gubernaculum= $15 \mu\text{m}$ .

The female tail (Plate IIIa) shows a deep notch on its dorsal side. At first glance,

notch gives the impression of anal opening but a careful examination shows that anus is situated on ventral side as in normal specimens. Such abnormalities in female tails have been reported by Gupta & Edward (1974) in *Hoplolaimus* sp. and Mulk & Jairajpuri (1975) in *H. dimorphicus*. However, in Gupta & Edward's specimens anus was reported to be terminal unlike in present case.

In case of male specimen tail (Plate IIIb) has become much shorter (C = 64 versus 40-45 in normal ones). There is a deep notch just posterior to anus. The tail tip is flattened with a somewhat conical stump over it. Bursa extends only up to flattened part leaving free the stumpy portion. The abnormal male tail is reported by Mulk & Jairajpuri (1975) which, however, differs from present one in morphological details.

*Host*—Okra, chilli, banana, onion, tomato, coriander, been, potato, cauliflower, "bakla", eggplant, "sonf", mustard, pea, pigeonpea, gram. 'Sonf', coriander and 'bakla' are new hosts.

*Locality*—Dariyapur, Kasimpur, Srinagar, Dilawarpur, Kanpa, Chhattarpur, Nirpur, Bakhtiyarpur, Nukunpura, Pandarak, Baikatpur, Athmalgola, Dargahitola, Bidhipur, Hardasbiga, Bahpura, Hathidah, Adimpur, Sahanaura and Metra.

#### 14. *Helicotylenchus indicus* Siddiqui, 1963

*Helicotylenchus indicus* Siddiqui, 1963, *Z. ParasitKde*, 23 : 239-244.

*Dimensions* : ♀ (1) : L = 0.57 mm, a = 21, b = 5, b' = 4.6, c = 44, c' = 0.8, V = 63, stylet = 23 µm.

*Description : Female*—Body curved spirally. Head conoid rounded, comprising 5 indistinct

annules. Cephalic framework moderately developed.

*Remarks*—The specimen fits well with the description of the species by Sher (1966) and Nandakumar & Khera (1970). This is the first record of the species from Bihar.

*Host*—Banana.

*Locality*—Bhedhari-english.

#### 15. *Helicotylenchus multicinctus* (Cobb, 1893) Golden, 1956

*Tylenchus multicinctus* Cobb, 1893, *Agric. Gaz. N. South Wales*, 4(10) : 808-833.

*Dimensions* : ♀ ♀ (2) : L = 0.50-0.58 mm, a = 24-26, b = 5.2-5.4, b' = 4.1-4.4, c = 48-49, c' = 1.0-1.1, V = 62-66, stylet = 22-24 µm.

♂ ♂ (3) : L = 0.46-0.49 mm, a = 28-29, b = 4.3-4.4, b' = 4.0-4.2, c = 36-37, c' = 1.0-1.1, stylet = 21-22 µm, spicula = 16-17 µm, gubernaculum = 6-7 µm.

*Description : Female*—Body curved spirally. Head conoid-round comprising 3-4 annules. Spermatheca functional, sperms seen in one female. Tail 7-8 annules long, terminus hemispherical with a suggestion of ventral projection.

*Male*—Males are similar to females except in male characters.

*Remarks*—The species is being recorded for the first time from Bihar.

*Host*—Banana.

*Locality*—Chhattarpur.

#### 16. *Helicotylenchus digonicus* Perry, 1959

*Helicotylenchus digonicus* Perry, 1959, (in Perry, Darling & Thorne), *Univ. Wisconsin Res. Bull.*, 207 : 1-24.

*Dimensions* : ♀ ♀ (3) : L = 0.48-0.57 mm, a = 23-24, b = 4.7-5.5, b' = 3.7-5.0, c = 39-44, c' = 1.0-1.2, V = 61-63, stylet = 23-26 µm.

*Description: Female*—Body spiral after thermal killing. Tail 9-11 annules with small ventral projection. Lateral field with four incisures,  $\frac{1}{5}$ - $\frac{1}{4}$  of body width. Incisures continuing up to tail tip. Phasmid 6-8 annules anterior to anus.

*Remarks*—The specimens fit well with the descriptions of the species by Sher (1966) except the head shape which is stated to be truncate by Sher (*loc.cit.*). However, this character is very variable as pointed out by Nanadakumar & Khera (1970) and Siddiqui (1972).

This is the first record of the occurrence of the species in Bihar.

*Host*—Cucumber, tomato, Indian bean, asparagus bean, eggplant, smooth gourd, bottle gourd, okra, pea and gram.

*Locality*—Manpura, Maner, Baikatpur, Bakhtiyarpur, Faridpur, Silhoura and Dariyapur.

Family HETERODERIDAE (Filipjev, 1934) Skarbilovich, 1947

17. *Meloidogyne incognita* (Kofoid & White, 1919) Chitwood, 1949

*Oxyuris incognita* Kofoid & White, 1919, *J. Am. Med. Ass.*, 72(8): 567-569.

Female Perineal pattern—Vulvar width = 16  $\mu$ m, vulvar length = 4-7  $\mu$ m, anus to tail terminus = 13-16  $\mu$ m, anus to centre of vulva = 16-20  $\mu$ m.

“*acrita* type” (Plate IIIc)—Striae coarse, widely spaced; dorsal arch high and flat, giving rather rectangular look. Ventral arches close and round. Lateral field absent.

“*incognita* type”—Striae closely spaced. Dorsal as well as ventral arches round. Lateral field absent.

*Host*—Eggplant, kora.

*Locality*—Nagwan.

18. *Meloidogyne javanica* (Treub, 1885) Chitwood, 1949.

*Heterodera javanica* Treub, 1885, *Meded. Land. Voor Dienst. Buitenz.*, 2: 1-39.

*Dimensions*: ♀ ♀ (3): L = 0.79-0.83 mm, body width = 0.42-0.48 mm, neck = 31.5-33.0  $\mu$ m, stylet = 27  $\mu$ m, median bulb = 36 × 30  $\mu$ m.

♂ (1): L = 1.18 mm, a = 30, b' = 8.3, c = 61, stylet = 19  $\mu$ m, spicula = 33  $\mu$ m, gubernaculum = 6  $\mu$ m.

Female Perineal pattern (Plate III d)—Vulvar width—20  $\mu$ m, vulvar length = 7  $\mu$ m, anus to tail terminus = 9  $\mu$ m, anus to centre of vulva = 14  $\mu$ m, interphasmidal distance = 39  $\mu$ m.

Striae fine, closely spaced and round. Lateral field wide, marked by two incisures. Anal fold and short striae on the sides of vulva present.

*Remarks*—Okra roots were found heavily infested by this species, causing very large size composite knots.

*Host*—Okra.

*Locality*—Silhoura.

#### ACKNOWLEDGEMENTS

We are thankful to Dr. B. K. Tikader, Director, Zoological Survey of India, Calcutta and the Officer-in-Charge, Gangetic Plains Regional Station, Patna for providing necessary facilities for the present work. We are also thankful to Shri R. B. Sharma, Photographer, P. R. Stn., Patna for the photographs.

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