

Soil and Plant Parasitic Nematodes of
Vegetable and Fruit Crops of Kashmir

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BY

ZAFFAR AHMED HANDOO, M. Sc.
POST GRADUATE DEPARTMENT OF ZOOLOGY

FACULTY OF SCIENCE
UNIVERSITY OF KASHMIR
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I

This is to certify that the Ph.D. Thesis
entitled, Soil and Plant Parasitic Nematodes of
vegetable and fruit crops of Kashmir, is the original
work of Mr. Zaffar Ahmad Handoo, M.Sc., Department of
Zoology, University of Kashmir, Srinagar, and that
the work has been submitted for the first time. The
work has been completed under my guidance.



(Dr. D.N. Fotedar)
Professor & Head
Post-graduate Department of
Zoology, University of Kashmir.

**P. G. Deptt. of Zoology
University of Kashmir Srinagar**

ABSTRACT

The thesis deals with the Taxonomy of soil and plant parasitic nematodes, parasitizing the economically important vegetable and fruit crops of Kashmir. All the important vegetables (Cabbage, cauliflower, 'Hak,' Potato, Tomato and Soya-bean) and fruits (Apple, pear, Plum, Peach, Almond and Walnut) have been surveyed for nematode association. It includes, in all, 29 new species representing 21 genera (including 4 new genera) belonging to 3 orders, 4 sub-orders, 10 super-families, 19 families and 11 sub-families.

For the sake of convenience the work has been divided into two parts. Part I deals with the systematic study of the nematodes of the order Tylenchida, and Part II deals the orders Dorylaimida and Aerolaimida.

In the super-family Tylenchoidea (Oerley, 1880) Chitwood and Chitwood, 1937, the families dealt with are Tylenchidae Oerley, 1880 and Psilenchidae Paramonov, 1968. In the family Tylenchidae, sub-family Tylenchinae (Oerley, 1880) Marcinowisky, 1909 Aerotylenchus safroni gen., et sp. nov. has been described. Family Psilenchidae, sub-family Psilenchinae Paramonov, 1967 includes two new species of the genus Psilenchus De Man, 1921, P. oleracei and P. haki.

In the super-family Hoplolaimoidea Filipjev, 1934, the families dealt with are Hoplolaimidae (Filipjev, 1934) Wieser, 1953, Pratylenchidae (Thorne, 1949) Siddiqi, 1963

and Tylenchorhynchidae (Eliava, 1964) Golden, 1971.

In the sub-family Rotylenchoidinae Whitehead, 1958, of the family Hoplolaimidae, four new species of the genus Helicotylenchus Steiner, 1945 have been described. These are: H.harwanensis, H.darbagensis, H.siddiqi and H.dasi.

In the sub-family Pratylenchinae Thorne, 1949 two new species of the genus Pratylenchus Filipjev, 1936, have been described. These are P.tuberosum, and P.ekrami.

In the sub-family Tylenchorhynchinae Eliava, 1964 of the family Tylenchorhynchidae, one new species of the genus Tylenchorhynchus Cobb, 1913, T.orientalis, has been described.

In the super family Criconematoidea (Taylor, 1936) Gerraert, 1966, the families dealt with are criconematidae (Taylor, 1936) Thorne, 1948 and Madinematidae Khan, Chawla et Saha, 1975. In Criconematidae one new species of the genus Variasquamata (Mehta et Raski, 1971) Khan et al, 1975, V.tuberosa has been described. In the family Madinematidae one new species of the genus Macroposthonia De Man, 1880, M.pyrusei has been described.

In the super-family Neotylenchoidea (Thorne, 1941) Jairajpuri et Siddiqi, 1969, the family dealt with is Nothotylenchidae Thorne, 1941. In the sub-family Nothotylenchinae Thorne, 1941, a new genus Nothotylenchoides has

been proposed for a new species N.fotedari, and in the sub-family Boleodorinae Khan, 1964, a new species of the genus Boleodorus Thorne, 1941, B.seshadrii, has been described.

Order Dorylaimida (De Man, 1876) Pearse, 1942 is represented by the super families Belondiroida Thorne, 1964 Dorylaimoidea (De Man, 1876) Thorne, 1934, Leptonchoidea (Thorne, 1935) Ferris, 1971 and Longidoroidea (Meyl, 1961) Ahmed et Khan, 1975. The families dealt with are Axonchidae (Thorne, 1964) Siddiqi, 1968, Kochinematidae new family. Sicagutteriidae (Ali et Prabha, 1973) n. rank, Belonchidae Thorne, 1964, Leptonchidae Thorne, 1935, Tylencholaimellidae (Jairajpuri, 1964) Siddiqi, 1969, Longidoridae (Thorne, 1935) Meyl, 1961 and Xiphinematidae.

In the sub-family Axonchinae Thorne, 1964 of the family Axonchidae, a new genus, Fotedaronema, has been proposed and a new species F.Kashmirensis described. A new family, Kochinematidae, has been proposed to accommodate two new species of the genus Kochinema Heyns, 1963, K.kanganensis, K.pahalgamensis.

A new sub-family, Parasicagutteriinae, has been proposed to be included under the family Sicagutteriidae (Ali et Prabha, 1973) n.rank. A new genus, Parasicagutter is proposed under the new sub-family and a new species, P.mehdii, has been described.

In the super-family Leptonchoidea (Thorne, 1935) Ferris, 1971, the families dealt with are Belonchidae, Leptonchidae, Tylencholaimellidae and Tylencholaimidae.

One new species of the genus Basirotyleptus Jairajpuri, 1964 B.kashmirensis, has been described under the family Belonchidae. One new species of the genus Leptonchus Cobb, 1920, L.pyrusei has been described under the family Leptonchidae. Under the family Tylencholaimellidae, two genera, namely Doryllium Cobb, 1920 and Tylencholaimellus Cobb, 1915 have been dealt with and two new species D.kashmirensis and T.brassicus have been described. Under the family Tylencholaimidae and sub - family Tylencholaiminae one new species of the genus Tylencholaimus, De Man 1876. T.orientalis has been described.

In the super-family Longidoroidea (Meyl, 1961) Ahmad et Khan, 1975, the families dealt with are Longidoridae and Xiphinematidae. Under the genus Longidorus (Micoletzky, 1922) Filipjev, 1934, of the family Longidoridae, one new species, L.ekrami, and under the genus Xiphinema Cobb, 1913 of the family Xiphinematidae, two new species, X.fotedari and X.kashmirensis, have been described.

Under the sub-order Monochina Kirjanova et Krall, 1922 (which has been raised to the rank of order Monchida by Jairajpuri, in 1969) family Mylonchulidae Jairajpuri, 1969 super family Monochoidea (Chitwood, 1937) Clark, 1961 has been dealt with, and one new species of the genus Mylonchulus (Cobb, 1916) Altherr, 1953, M.shamini, has been described.

Under the order Aerolaimida De Conink et Schurmanns Stekhoven, 1933, and super-family Plectoidea (Oerley, 1880) Chitwood, 1937, the family dealt with is plectidae

Oerley, 1880. Under the sub-family Plectinae (Oerley, 1880) Micletzky, 1922, two new species of the genus Chronogaster Cobb, 1913, C. anatnagensis and C. chaetolabius, has been described.

Besides the description of various species, mentioned above, a revised scheme of classification has been proposed for the orders Tylenchida and Dorylaimida on the basis of an upto-date information collected on the classification of the nematodes. Under the order Tylenchida, the sub-families Ditylenchinae, Aphasmatylenchinae and Rotylenchinae, have been raised to rank of families, and included in the revised scheme. Diagnostic features of these families have been given. New sub-families, Macrotriphurinae, Cynpanguininae, Acontylinae, Hirschmanillinae, Dolychorhynchinae and Nothanguininae have also been proposed and their diagnostic features given.

Under the order Dorylaimida, two new families Kochinematidae and Parasicagutturiidae, have been proposed, and the sub-family Sicagutturiinae has been raised to the rank of a family. Diagnostic features of the families have also been given.

Regrouping of several genera under the two orders, has also been undertaken, wherever felt necessary, and these genera shifted to the appropriate families. The diagnostic features of the genera have been amended to accomodate them under the families. The changes, thus incorporated, are found to make the classification practically easier to handle.

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I N T R O D U C T I O N

Nematodes constitute one of the most important and abundant group of animal kingdom which are highly adaptable and capable of surviving in any environment that can be conceived of. In number, the nematodes are considered to rank only next to insects on the surface of earth. Andrassy (1976) has estimated an expected total number of one million species as against one thousand five hundred species known so far. Besides the nematodes as parasites of animals and man, there are large number of nematodes as parasites attacking plants or associated with them, and free living nematodes in soil, fresh water and seawater. Cobb (1913) considered the study of free living and plant parasitic nematodes important enough to be recognised as a separate discipline. This group of nematodes is now commonly referred to Nematology.

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Earlier, insect pests were known to cause damage to agriculture but with the increased knowledge it was found that nematodes caused a considerable loss to our food, vegetable and fruit crops. Nematology now occupies the same place and importance that Entomology did previously. The economic consequences of crop losses due to nematode born diseases are many and varied. These involve reduction in quality and quantity of crop yield,

the uncertainty which the farmer faces, and the increase in price of crops due to shortage of yield when the demand is increasing year after year due to the increased rate of human population.

One of the earliest reports of observations on plant parasitic nematodes was in 1743 when Needham in England observed Anguina tritici in wheat galls commonly known as cockles, causing considerable loss to wheat crop. In 1855 was the year of discovery of Root Knot nematode, Meloidogyne by Berkley in Cucumber plants. Now this genus of the plant parasitic nematodes has been found to cause considerable damage to many plants. Heterodera schacti was discovered in 1859 as a parasite of sugar beat plant. The genus Heterodera which includes large number of commonly known cyst nematodes, also ranks as one of the important parasite of plants. Similarly in (1957) another economically important plant parasitic nematode, the stem and bulb nematode, now known as Ditylenchus dipsaci was recorded in teasel. Latter this parasite and other species of the genus were found to cause considerable damage to large number of other economically important plants. This was followed by the contributions made by large number of workers on plant parasitic nematodes, amongst whom a few important ones are:-
Bastian (1865), Bostcheli (1873-1876); Daday (1893-1910), Cobb (1873-1933), Chitwood (1953-1957), Filipjev (1917-1943), Goodey (1922-1953), Goodey. J.B. (1951-1963),

Brown (1956-1968), Raski (1952-1976), Sher (1953-76), Andrassy (1952-onwards) Christie (1940-1950), Oostenbrink (1950-onwards), Steiner (1924-1945), Thorne (1923-1935). *Golden (1952-onwards)*.

In India the first report on plant parasitic nematodes can be traced back to 1901, when Barber (1901) reported an 'ell worm' found infesting tea plantations. This was followed by Buttler (1913) and Dastur (1930) who made further reports on the nematodes of plants. Systematic studies started about two decades back in India. Important contributions have since then been made by Edwards and Misra (1963, 1968) Siddiqi (1959-onwards), Jairajpuri (1963-onwards), Khan (1964-onwards), Singh (1967-1971) and Das (1960-onwards). Seshadri (1970) reported that the total number of species described till then from India was about one hundred ¹⁵⁶ fifty six species representing twenty six genera. So far major work in India has been concentrated on Nematode Taxonomy which is an important pre-requisite for devising measures for the control of the nematodes and plant protection work. In this connection it is found desirable to conduct extensive state-wise surveys of plant parasitic nematodes in an organised manner, and work out exact species of nematodes associated with different crops. Some of the important surveys known so far on plant parasitic nematodes in India are by Prasad (1960) on vegetable and fruit crops in I.A.R.I. Farm, Siddiqi (1963) on nematodes of

citrus plants in 13 districts of Utter Pradesh, Swarup et al (1964) on horticultural orchards of I.A.R.I., Prasad and Chawla (1965) on Tylenchus semipenetrans from soil around roots of Citrus, Prasad et al (1965) on the nematodes of onion, Yadav & Naik (1966) in Rajasthan, Swamy and Govindu (1966) on Meloidogyne in Mysore, Dutt and Panda (1968) on Meloidogyne in west Bengal, Khan and Wadhwa, (1969) on the nematodes of vegetables, cereals, fruits and other plants of Delhi, Khuntia and Das (1969) on fruit trees in Orissa, Yadav et al (1969) on plant parasitic nematodes in some districts of Rajasthan, Bhatnagar and Kadyan (1969) on nematodes associated with Bringel in Punjab, Mukhopadhyay (1970) on the nematodes associated with fruit trees and vegetable crops in Himachal Pradesh including speices of Tylenchus associated with Citrus plant, Mathur and Prasad (1971) on Hirschmanniella oryzae, RAshid and Khan A.M. et al (1973) on the plant parasitic nematodes associated with vegetables, fruits, cereals and other crops of Utter Pradesh and Mukhopadhyay and Haque (1974) on stylet bearing nematodes of 7 districts of West Bengal.

Seshadri and Swarup (1974) have given the latest figures on the record of plant parastic nematodes in India. As many as One hundred thirteen genera and Five hundred fiftyfive species of plant parasitic nematodes have been reported in India. Out of these twentynine genera and

Three hundred twentyone species have been recorded as
 new ^{to} science.

In the state of Jammu and Kashmir, practically no work on plant parasitic nematodes was known till recently. Some isolated records were made by Siddiqi (1963), Khan and Siddiqi (1963) and Jairajpuri (1964, 1965). Systematic survey on the plant parasitic nematodes was initiated by Fotedar and Mahajan in Kashmir _____ Fotedar and Mahajan (1972 a & b, 1973 a, b & c and 1974). Mahajan (1970, 1971, 1972 and 1973), Fotedar & Handoo (1974) and Mahajan and Bijral (1973).

The present work promises to partly fill up the lacuna in our knowledge on plant parasitic nematodes so that researches on other branches in the field can be initiated after making available the relevant information about the nematode fauna of the State. The present work deals with the taxonomy of soil and plant parasitic nematodes of vegetable and fruit crops of Kashmir. In all, 29 new species representing 21 genera (including four new genera) belonging to 19 families and 11 sub-families have been described. On the basis of available literature, a revised scheme of classification has been proposed for the orders Tylenchida and Dorylaimida. The changes incorporated are found to make the classification practically easier to handle.

MATERIALS AND METHODS

SAMPLING

Soil samples were collected from time to time from around the roots of fruit trees and vegetable crops at different places of Kashmir. Samples from superficial layers were collected with the help of a boarer having 1 inch bore. Usually 3 or 4 inches deep samples from the field were lumped together and processed in the laboratory. Soil samples from deeper layers particularly in case of fruit trees were collected by digging the ground with the help of a spade and soil collected with the trowel. Each sample consisted of 5-6 sub samples and the selection of samples were mainly from around the roots. Infected plant roots too were examined and were carefully brought to the laboratory along with 2 or 3 kilograms of adhering soil to recover both the free living and parasitic stages.

The samples thus collected from different areas were put in polythene bags and their open ends properly closed with a thread to avoid evaporation of moisture. These were then properly labelled in respect of the location, name of associated plant, date and any other information regarding their apparent disease symptoms. The samples were then brought to the laboratory and preserved in refrigerator of 4°C to avoid dehydration.

PROCESSING SOIL AND PLANT MATERIAL

The soil samples were brought to the laboratory and processed by either of the following methods.

1. COBB'S SIEVING AND DECANTING METHOD (COBB, 1918)

A modification of the original Cobb's Sieving method (1918) was used. The soil sample to be used was thoroughly mixed with water and uniform quantity of 250 gm. was used for processing. The sample was soaked in water for about 15 minutes or even for a longer time depending upon the texture of the soil.

The container used for the purpose was a bucket. After soaking, the soil was crushed in between the fingers to break down all the lumps, etc. The mixture was stirred thoroughly and then after a very short pause poured through a sieve of 25 mesh/square inch into a second bucket, leaving behind the heavy debris settled during the pause. More water was added to the residue and the process was repeated 2 - 3 times to ensure good results. The material on the sieve was rinsed with a gentle jet of water, collecting the washings in the second bucket. The residue left on the sieve was discarded.

The contents of second bucket were stirred thoroughly once again and poured through a sieve of 100 mesh/square inch into the first bucket leaving the heavy material again. The sieve was rinsed as before but this time residue was carefully washed into a 250 mls. beaker using a gentle stream of water applied to the underside of inclined sieve. This was to get a good population of large nematodes. The same process of sieving was repeated with sieves having 200 and 300 mesh/square inch and collected the sievings each time in an appropriately labelled beaker.

A round piece of cloth with 125 mesh/square inch was taken and put in the Baermann's funnel and used as a filter. The funnel was partly filled with water. The sievings collected in the beaker was poured over the filter cloth and left in that for

24 hours or more if necessary. The nematodes passed through the filter cloth and settled at the bottom of the stem of the funnel from where they were drawn off from time to time.

2. BAERMANN'S FUNNEL METHOD

The apparatus consists of a 4 inch funnel with a piece of rubber tubing attached to the stem and closed with a clamp. The funnel was partly filled with water and the soil or plant material was tied in a terylene cloth which was put in the funnel and allowed to remain there for a couple of days. The nematodes came out of the sample and settled down in the stem of funnel and were collected by opening the clamp.

EXTRACTION OF NEMATODES FROM PLANT MATERIAL

1. Small portions of infested plant parts were examined directly for nematodes under a stereoscopic microscope. Washed roots were teased apart with needles in an open petridish containing clean water. Nematodes released in water were picked up with a quill pick.

2. The roots were washed in running water to remove the adhering soil particles. Then they were shredded into small pieces by any sharp instrument. These were put into a beaker which was then tied off by a terylene cloth. This beaker was inverted over a Baermanns funnel which had been partly filled with water. They were left like that for 24 hours and nematodes were collected by opening the clamp. A similar method was followed for the examination of corns, bulbs, wheat ears etc.

The galls on the roots were teased on a slide and

the nematodes so obtained were killed and fixed.

KILLING AND FIXING NEMATODES

A. The nematodes were taken on a slide in a drop of water and gently heated over a flame. The heat relaxed and killed the nematodes which were then fixed in a proper fixative.

B. To avoid wastage of time nematodes were killed and fixed in one operation (Seinhorsts, 1966) by adding equal volume of boiling hot, double-strength fixative to the concentrated nematodes suspension. The different fixatives used were :-

TAF (Courtney, Polley and Miller, 1955)

- Formaline (40% Formaldehyde) - 7 ml.
- Glacial acetic acid - 2 ml.
- Distilled water -91 ml.

F : A 4:1

- Formaline (40% Formaldehyde) -10 ml.
- Glacial acetic acid - 1 ml.
- Distilled water - upto 100 ml

Lugol's Iodine

0.1% solution of the fixative was used which was made by using the following composition.

- Iodine - 0.1 gm.
- Pot. Iodide - 0.2 gm
- Distilled water - 100 cc.

An equal amount of this fixative was added to living suspension of the nematodes

which were killed very quickly.

4% Formaldehyde

Hot 4% solution of formaldehyde was also used for fixing the nematodes . It is prepared as under:-

Formaline (40% Formaldehyde)	- 1 part
Distilled water	- 9 parts

SEINHORST'S FIXATIVE (SEINHORST, 1962)

This fixative was used with great success. Invariably this was used hot except when the details of stylet etc. were to be studied. When it was used cold it gave comparatively better results as against other fixatives which resulted in the shrinkage of nematodes. It was prepared as under:-

40% Formaldehyde	- 10 cc.
Glacial Acetic Acid	-1 or 1/2cc.
Distilled water	-Upto 100 cc.

PROCESSING NEMATODES FOR PREPARATION OF PERMANANT MOUNTS

After fixing, the nematodes were processed and mounted. The procedure followed in the present work is the one devised by Seinhorst(1959).

GLYCEROL - ETHANAL METHOD (SEINHORST, 1959)

Nematodes from fixative were picked with the help of a quillpick under Stereoscopic microscope and were transferred to cavity block containing 0.5 ml. of the following:

SOLUTION I

96% ethanol	- 20 parts
Glycerol	- 1 part
Distilled water	- 79 parts

The cavity block was placed in a saturated atmosphere of 96% ethanol for about 12 hours in a dessicator which in turn was kept in oven at 35-40°C. Thus dehydration commenced leaving nematodes in a more concentrated volume of a mixture of glycerol and ethanol. Then cavity block was topped up with solution II which is composed of :

Glycerol	- 5 parts
96% ethanol	-95 parts

The cavity block was put in a thermostat at 40°C which was covered with a petri dish to ensure slow evaporation of alcohol leaving behind nematodes in pure glycerine which were then mounted.

STAINS

Sometimes it was found necessary to stain the nematodes for differentiating various structures. The stain used were :

1. Lugol's Iodine

This was used both as killing as well as a staining medium. It gave good results with certain species only.

2. Cotton Blue and Acid Fuchsin

These stains were used after being incorporated in the Lactophenol. 0.0025% solution of cotton Blue or Acid Fuchsin as the case may be was used.

3. Acetic Orcin

Hirschmann(1962) made temporary mounts of nematodes to study the details of the reproductive system. The nematodes were killed by gentle heat and then fixed in Carnoy's fixative for 10-20 minutes. After this they were stained in Acetic Orcin for about an hour and then mounted in 45% acetic acid. However, it was found that while using this method the cuticle of the nematodes invariably swelled up when mounted in 45% acetic acid. So, instead of mounting in acetic acid the stained nematodes were washed in water and dehydrated by using the glycerine-water method and mounted in pure glycerine. Thus, instead of temporary mounts of Hirschmann, permanant mounts were made.

MOUNTING

Glass slides (76 x 25 mm) were used for preparing permanant mounts in dehydrated glycerol. A small drop of pure dehydrated glycerol was placed in the middle of clean glass slide, keeping the drops as convex as possible. A glass fibre (greater in diameter than nematode) was cut into three small pieces (1 mm.

each) . Both the cleared nematodes and glass fibres were transferred with a quill pick to the drop of glycerol on the slide. The nematodes were arranged in the middle of the drop so that their heads all pointed in the same direction and that they rested on glass surface, not floating in it. Three cut glass wool fibres were arranged radially and peripherally at 120 degrees. A warm round cover slip was applied to the drop because warmed glass settled over the drop more quickly. Excess of glycerol was removed with a blotting paper. The cover slip was fixed down at three points with small drops of Glyceel. When it dried, the cover slip was ringed on a turntable with a thin layer of glycee-1. Before storing, slides were ringed thickly twice or thrice.

MOUNTING A NEMATODE HEAD FOR END-ON VIEW

A large drop of glycerol was used on a slide and a previously cleared nematode was transferred to it. When it was ensured that the nematode rested on surface of slide, it was beheaded by a sharp blade using a vertical chopping action. The cut head was not more than 2-4 head widths from anterior end. A piece of hard glycerine jelly was melted over a gentle flame, avoiding overheating. The drop was spread thinly and evenly with a warmed needle and keeping it slightly convex. Care was taken that the piece of hard glycerine jelly was large enough to spread along the cover slip with no excess. About 1/4 inch of hair, cut off from a camel hair brush, was thrust into melted jelly to act as a pointer. The

jelly was melted again with a warmed steel needle and to it was transferred the several head of nematodes with the help of quill pick. By careful manipulation, it was brought into an upright position with lip region uppermost. A very thin cover slip was placed on the drop and examined under microscope. When head was found not exactly in end in view, the cover slip was moved with a gentle lateral pressure to bring the head into a perfectly upright position. Finally the glass was ringed with glyceel.

HARD GLYCERINE JELLY

Gelatin	- 10 gms.
Distilled Water	- 60 mls.
Glycerine	- 70 mls.
Concentrated Phenol	- 1 gm.

The gelatin was dissolved in water, heating just enough to dissolve gelatin and to it was added glycerine and phenol.

LIST OF LOCALITIES COVERED DURING
THE SURVEY

- | | |
|-------------------|-----------------------|
| 1. Anantnag | 25. Sopore |
| 2. Aru | 26. Sonamarg |
| 3. Bandipora | 27. Tral |
| 4. Baramulla | 28. University Campus |
| 5. Darbagh | 29. Wazir Bagh |
| 6. Duksum | 30. Zadibal |
| 7. Ganderbal | |
| 8. Gulmarg | |
| 9. Handwara | |
| 10. Harwan | |
| 11. Hawal, | |
| 12. Idgah | |
| 13. Jawahar Nagar | |
| 14. Kangan | |
| 15. Kupwara | |
| 16. Lal Bazar | |
| 17. Naranag | |
| 18. Narwara | |
| 19. Pahalgam | |
| 20. Pampore | |
| 21. Patan | |
| 22. Pulwama | |
| 23. Safapora | |
| 24. Shalimar | |

LIST OF VEGETABLE AND FRUITS
INVESTIGATED

Brassica oleracea Var. botrytis L.

Brassica oleraceae var. Capitata L.

Brassica oleracea var. Haka Javied

Crocus sativus L.

Glycine max (L) Miller

Juglans regia L.

Lycopersicon esculentum Miller

Solanum tuberosum L.

Prunus amygdalus Batsch

Prunus domestica L.

Prunus persica (L) Batsch

Pyrus communis L.

Pyrus malus L. Syn. Malus pumila Miller

Q

SYMBOLS AND ABBREVIATIONS USED IN THE THESIS

- L = Total body length
- a = Total body length divided by maximum body width
- b = Total body length divided by Oesophageal length
- c = Total body length divided by tail length
- v = Position of vulva from anterior end expressed as percentage of body length
- o = Distance of dorsal Oesophageal gland orifice from spear base expressed as percentage of spear length
- E_1 = Distance from anterior end to the base of basal bulb
- E_2 = Distance from anterior end to the position where basal bulb attains its full width
- DO = Dorsal oesophageal gland orifice
- DN = Dorsal oesophageal gland nucleus
- DO-DN = Distance between DO to DN
- S_1N_1 = Right sub-ventral gland nucleus
- S_1N_2 = Left subventral gland nucleus
- S_2N = Second pair of subventral gland nuclei
- S_2O = Orifice of second pair of subventral gland nuclei

" From E_1 to S_2O all are expressed as percentage of oesophageal length

Das et al (1969)

1938 - 1939

THE ORDER OF TYLENCHIDA

PART ONE

ORDER TYLENCHIDA

1. Tylenchida - 1 family
2. Tylenchida - 1 family
3. Tylenchida - 1 family

The name given by Steiner (1938) to the order Tylenchida, which includes the Tylenchida and the Tylenchida, is here used.

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ORDER : TYLENCHIDA THORNE, 1949

PREVIOUS WORK

The oldest plant parasitic nematode ever observed was wheat gall nematode, (Anguina tritici) by Needham in 1743. Fifty years later, this nematode was named as Vibrio tritici by Steinbuch. Orley's work can be taken as a mile stone in the taxonomy of free living nematodes including plant parasitic ones. He published his monumental monograph of Anguillulidae in 1880, which is a remarkable and highly commendable piece of work. Infact, this is the first comprehensive taxonomic survey of free living nematodes which includes keys to the genera and species of the group. He listed 47 genera in his work of which 18 were discussed at length. Oreley divided Nematoda into three main groups :

1. Parasita(endoparasites) - 4 families
2. Rhabditiformae(Transitional forms) -
1 family
3. Anguillulidae(free living forms) -
5 families

The names given by Orley(1880) to the families Rhabditidae, Tylenchidae, Plectidae and Leptolaimidae are still in use.

De Man can be regarded as the first modern nematologist. His well illustrated monograph still continues ^{to} be an important reference for a Nematologist. De Man laid the taxonomy of plant

parasitic nematodes on a sound footing. It is mainly based on body dimensions and provides a sound basis for modern specific and generic description. De Man's formula of body measurements forms the main basis of taxonomic approach.

N.A. Cobb was one of the finest researcher in Nematology. Right from his first paper on Tylenchus and root galls in the agricultural gazette of new South Wales and his subsequent publication 'new nematode genera found inhabiting fresh water and brakish soil' in 1913, will remain a great event in the taxonomy of free living and plant parasitic nematodes. His later writings 'con-tributions to science of nematology' are among the most outstanding contributions in nematology. The term nematology dealing with the study of soil and plant parasitic nematodes was coined by Cobb who also suggested its seperation from Helminthology. The term Nema to replace nematodes was also coined by him.

Micoletzky who wrote voluminous monograph known in the literature of free living and non marine nematodes in 1922, listed 142 valid genera and 931 sps. Micoletzky did not accept the classification of Cobb and did not catagorize the genera and families into higher groups. He discussed five families Alaimidae, Trilobidae, Rhabditidae, Odontopharyngidae and Tylenchidae. Although his classification is most based upon heterogenity, the value of his work is still not disputable.

T. Goodey (1933) provided the general classification of stylet bearing nematodes. The credit for the first methodical classification goes to Filipjev (1934) who defined and differentiated class Nematoda into seven orders, i.e. Anguillulata, Monhysterata, Enoplata, Chromadorata, Desmoscolecata, Diptophymata and Trichurata. In the order Anguillulata, he included sub-order Anguilluloidea which was further divided into five families. Filipjev proposed and defined the family Tylenchidae to include stylet bearing nematodes. The family Tylenchidae was sub-divided into five sub-families : Aphelenchinae, Tylenchinae, Heteroderinae, Ogminae and Sphaerulariinae. The family Tylenchidae was upgraded to the rank of super family, Tylench^oidea by Chitwood in 1937. Filipjev and Schurmans Stekhovan (1941) made valuable contribution to the classification of nematodes. They placed the free living genera under 17 families. Pearse (1942) divided the nematodes into nine orders including the two orders of free living nematodes. The overall contribution of Chitwood to the morphology and taxonomy of nematodes remains unparalleled so far. He divided the nematodes on the basis of anatomical features into two large natural groups i.e. class Phasmidia and Aphasmidia and considered nematoda as a Phylum. The class Phasmida embraced all the stylet bearing Plant Parasitic and free living nematodes. Thorne (1941, 1943) made very

valuable contribution in the study of two major groups of Tylenchid nematodes i.e. Neotylenchids and Criconematids.

Thorne(1949) proposed the order Tylenchida for those plant parasitic nematodes which possessed a protrusible Stylet, Oesophagus made up of Procorpus, Metacorpus, Isthmus and Terminal bulb. The order Tylenchida was further divided into 2 superfamilies i.e Tylenchoidea and Aphelenchoidea.

J.G. Goddey in (1963) thoroughly revised and enlarged his father's monograph on soil and fresh water nematodes. The class Phasmidia and Aphasmidia have been dropped and the free living non marine nematodes have been grouped under nine orders including Tylenchida the later containing two super families Tylenchoidea and Aphenchoidea. Seven families have been included under Tylenchoidea. Tylenchidae, comprised of 16 genera; Hoplolaimidae(sub family Hoplolaiminae 4 genera, Rotylenchoidinae 1 genus, Belonolaiminae 2 genera, Dolichodorinae 1 genus, Pratylenchinae 5 genera and Naccobinae 2 genera); Tylenchulidae (Tylenchulinae 2 genera and Sphaeronematinae 2 genera); Criconematidae (Criconematinae 3 genera and Paratylenchinae 2 genera); Neotylenchidae (Neotylenchinae 3 genera, Nothotylenchinae 5 genera, Paurodontinae 2 genera and Ecphyadophorinae 1 genus); Allantonematidae (Allantonematinae 1 genus, Itonchinae 1 genus and Fergusobinae 1 genus).

Under superfamily Aphelenchoidea he listed

four families i.e. Aphelenchidae, Aphelenchoiidae, Paraphelenchidae ^{and} Anomyctidae of which the first two include only soil and plant parasitic forms.

Gercaert (1966) suggested that Tylenchulidae is very close to Criconematidae because they resemble each other in characters of stylet, body shape and the oesophagus, the development of sub median lobes, stylet knobs, position of dorsal oesophageal gland opening, poor development of rectum and anus, the structure of gonad, position of vulva and degenerate oesophagus and spear in male. Gercaert also pointed out that the oesophagus in Criconematid nematodes is very unique and does not occur in any other group of Tylenchids. Moreover the members of Criconematidae shows much larger variation than any other family of Tylenchoidea. He therefore, felt the need to raise Criconematidae to the rank of a super family and proposed that different sub families be raised to the rank of families. He also upgraded super family Tylenchoidea and Aphelenchoidea to the rank of sub orders. In his scheme of classification the new sub order Tylenchina included two super families. Super family Criconematoidea included the families Criconematidae, Hemicyclophoridae, Paratylenchidae, Sphaeronematidae and Tylenchulidae and super family Tylenchoidea included the families Tylenchidae, Neotylenchidae, Hoplolaimidae, Heterodridae.

Paramonov (1967) gave a critical review of the sub order Tylenchina and suggested to up grade the

family Hoplolaimidae to a super family rank and further sub divide it into 2 groups of Hoplolaimini and Criconematini.

Allen & Sher (1967) in their scheme of classification of Phytoparasitic Tylenchida pointed out some of the areas of confusion in the existing classification. They are of the opinion that this may be due to the importance attached to certain morphological ~~ex~~ characters and the interpretations given by various workers. It has been accepted by them that a reasonable approach to the problem would be ^{to} recognise a minimum number of groups at the family level, retaining only those which are markedly distinguishable. They also did not agree with Gerraert's (1966) proposition of the elevation of the Taxonomic Categories as justifiable. They preferred to consider Tylenchida to contain two super families and to maintain various families till the time their relationship was better understood by the added knowledge of many undescribed species. They also rejected the idea of splitting of Criconemoides into six genera as had been proposed by Loof and De Grisse (1965). They confessed that ~~veal~~ real problem was felt in working out the taxonomy of complex forms placed under the families Tylenchidae and Hoplolaimidae. The rest of the families (Atylenchidae, Criconematidae, Tylenchulidae, Neotylenchidae and Mynenchidae, however, appeared to be natural groups based upon Phylogenetic relationship and hence posed no problem. In their revised scheme of classification of Tylenchida they recognized 2 super

families Tylenchoidea and Aphdenchoidea. In Tylenchoidea they include eight families, i.e. Tylenchidae, Heteroderidae, Tylenchulidae, Criconematidae, Atylenchidae, Neotylenchidae, Sphaerulariidae and Myenchidae (1) Family Tylenchidae comprised of Tylenchinae 9 genera, Tylenchorhynchinae- 4 genera, Dolichodorinae- 1 genus Telotylenchinae- 3 genera; Belonglaiminae- 2 genera, Pratylenchinae- 2 genera; Nacobbinae- 1 genus, Radopholinae -4 genera, Hoplolaiminae- 6 genera, Aphasmatylenchinae- 1 genus, Rotylenchoidinae- 2 genera, Nacobbinae-1 genus, Radopholinae- 4 genera, Hoplolaiminae- 6 genera, Aphasmatylenchinae- 1 genus, Rotylenchoidinae-1 genus, Rotylenchulinae- 1 genus and Tylodorinae- 1 genus. (2) Heteroderidae included one sub family Heteroderinae with five genera (3) Tylenchulidae (Tylenchulinae- 1 genus and Sphaeronematinae- 2 genera) (4) Criconematidae (Criconematinae- 4 genera, Hemicycliophorinae- 2 genera and Paratylenchinae- 2 genera) (5) Atylenchidae with only sub family Atylenchinae including - 2 genera (6) Neotylenchidae (Neotylenchinae- 5 genera, Nothotylenchinae- 6 genera, Paurodontinae- 2 genera, Boleodorinae 2 genera, Ecphyadophorinae- 2 genera, Boleodorinae- 2 genera, Ecphyadophorinae- 2 genera) (7) Sphaerulariidae (Sphaerulariinae- 3 genera, Allantonematinae 18 genera, Fergusobiinae- 1 genus, and Iotonchinae- 1 genus (8) Myenchidae with only 2 genera. Super family Aphelenchoidea included 4 families i.e., Aphelenchidae including 1 genus only, Aphelanchoidea 15 genera, Paraphelenchidae -2 genera and Anomyctidae - 1 genus.

Jairajpuri and Siddiqi (1969) proposed a new super family Neotylenchoidea for Neotylenchid nematodes which lack a valvular metacarpus. They included five families of Neotylen-

chidae, Paurodontidae, Nothof^{ol}enchidae, Eephyadophoridae, and Sphaerulariidae under this super family.

Golden (1971) accepted the inclusion of sub orders Tylenchina and Aphelenchina under Tylenchida. He made a synthesis of the earlier schemes of classification incorporating all the valid taxa and making it upto-date by including the valid super families, families, sub-families and genera. In all, he listed 5 super families, 18 families, 35 sub-families and 90 genera.

Wuts (1972) redefined the family Heteroderidae and the sub families Heteroderinae and Meloidoderinae. The sub-family Meloidogyninae has been raised to the rank of family Meloidogynidae. He did not accept the elevation of Heteroderidae to rank of super family Heteroderoidae for incorporating the families Heteroderidae and Naccobidae. His classification of family Heteroderidae is basically the same as proposed by Paramonov (1967) except that besides Heteroderinae and Meloidogyninae a new sub-family Meloidoderinae has been recognised. The present author is in full agreement with Golden (1971) in recognizing super family Heteroderoidae. However, he is of the opinion that the sub-family Rotylenchulinae which deserves the rank of a family, should also be included in it.

Andrassy (1976), giving a revised classification of nematodes, includes the order Tylenchida under the sub class Secernentia which he diagnosed by the absence of somatic

setae, presence of lateral fields, striated cuticle, minute amphid on lip, absence of hypodermal chordal and caudal glands, phasmids primarily present, and stoma with generally having protrusible spear. Besides Tylenchida, Rhabditida is included under Secernentia. The order Tylenchida includes two sub-orders of Tylenchina and Aphelenchina. Aphelenchina includes one super family which comprises of 4 families, 7 sub-families and 25 genera whereas sub-order Tylenchina includes four super families which are comprised of 19 families, 38 sub-families and 123 genera .

ORDER TYLENCHIDA Thorne, 1949

DIAGNOSIS (emended): Secernentia. Body cylindrical and tapering at either end or variously swollen in Heteroderoidea, Allantonematidae, Sphaerulariidae. Cephalic and somatic setae absent except in Atylenchoidea. Lateral field present. Body cuticle finely or coarsely striated, sometimes the cuticle variously ornamented. Head with six or eight sectors, bearing six lips of which the sublaterals being sometimes reduced. In Criconematoidea the lips are replaced by submedian lobes. Stoma bearing protrusible stylet. Proximal end of spear bearing generally three rounded anteriorly or posteriorly directed knobs. Amphids degenerate located in the lateral lips, opening through small pore except in Psilenchidae where amphids are located below the lateral lips opening through oblique slit like apertures. Hypodermal and caudal glands absent. Phasmid primarily present except in Aphasmatylenchidae. Deirids generally present. Oesophagus consisting of procorpus, valvate metacarpus (except in Neotylenchoidea) isthmus and basal bulb. Procorpus and metacarpus amalgamated with reduced Isthmus and basal bulb in Criconematoidae. The Oesophageal gland nuclei numbering 3-6 and are lodged in the basal bulb. Basal bulb either set off from the intestine with a distinct Oesophago-intestinal valve or without valve when the basal bulb overlaps the intestine in the form of lobe. Excretory pore, hemizonid and hemizonion generally present. Female genital organ paired or unpaired, ovary outstretched. Male

gonad unpaired, ductus ejaculatorius muscular. Bursa often present with or without papillae. Gubernaculum present.

Fungal bacterial or plant feeders living in the soil as free living, feeding on lower organisms or on roots of higher plants as ectoparasites or migratory endoparasites. Members of Heteroderoidea are obligate parasites and their feeding results into giant cell formation.

DISTINGUISHING CHARACTERS OF SUBORDERS OF
TYLENCHIDA Thorne, 1949.

	APHELENCHINA	TYLENCHINA
Oesophagus terminus	: Generally lobed	: Generally bulb like
Opening of dorsal Oesophagus gland	: In median bulb	: Behind buccal spear
Bursa	: absent (except- : ionally present)	: Present
Male Genital papillae	: Present	: absent

SUBORDER TYLENCHINA (Orley, 1880) Geraert, 1966

DIAGNOSIS (emended): Tylenchida. Body shape vermiform or swollen in obligate parasitic forms. Body cuticle finely striated except in members of criconematoidea. Buccal spear small weakly developed (measuring 6-7 microns to moderately long and strongly developed or very long and flexible (Xenocriconemella). Elongation and strengthening of spear is not helpful in the evolution of mode of feeding. Procorpus

not differentiated in groups which show a tendency towards amalgamation with metacarpus. Dorsal Oesophageal gland generally opening at the base of buccal spear, or located considerably posterior as far as upto the middle of Procorpus, e.g. in Rotylenchulus. Median Oesophageal bulb represented by merely a slight swelling, hardly distinguishable either from procorpus or isthmus, and this condition occurs in forms where the associated valvular structure i.e. the characteristic cuticularization of the lumen in the middle or metacarpus, is also absent (Neotylenchoidea). Isthmus is reduced considerably in forms where the posterior bulb is reduced, or in the form of lobes overlapping the anterior part of the intestine dorsally, dorsalaterally or dorsoventrally. One dorsal Oesophageal gland nucleus and paired subventral gland nuclei is generally encountered in the group but the number of nuclei reaches upto six, in Hopeolaimoidea. Female genital organs paired or single. When the gonad being paired the vulva is mostly equatorial except in Trophurus which has a single ovary, whereas in monodelphic forms the vulva is post equatorial. Posterior uterine sac is invariably present in all the groups except criconematoidea. In Pratylenchidae, sometimes the rudimentary posterior ovary is also present. Bursa generally present, rudimentary in some groups of Tylenchidae; well developed covering the entire tail or subcaudal. In Dolichodoridae the bursa is bilobed, papillae absent. Tail in females varying from long filiform to short

rounded terminus. Soil inhabitant, ecto or endoparasites of higher plants rarely parasitizing insects. Eight super families are included which are key^ed out as follows:

REVISED KEY TO THE SUPER FAMILIES OF
TYLENCHINA (Orley, 1880) Geraert, 1966

- 1. Head with Setae Atylenchoidea (Skarbilovich, 1955)
Golden, 1971
- Head without Setae2
- 2. Valvular median Oesophageal bulb absent.....
- Neotylenchoidea (Thorne, 1941) Jairajpuri & Siddiqi,
1969
- Valvular median Oesophageal bulb present.....3
- 3. Procorpus enlarges gradually and merges with metacorpus
forming an amalgamated bulb.....6
- Procorpus well defined not merging with metacorpus,
amalgamated bulb absent.....4
- 4. Females inactive, swollen, sessile attached to or within
plant roots, with pronounced sexual dimorphism, eggs may
be retained in body or often deposited in gelatinous
matrix; males vermiform with or without caudal alae.....
- Heteroderoidea (Filipjew, 1934) Golden, 1971
- Both sexes active, vermiform nematodes. Free living,
ectoparasites or migratory endoparasites usually with
or without sexual dimorphism; eggs deposited outside
body not in gelatinous matrix.....5
- 5. Cephalic frame work cuticularized. Spear well developed
with large knobs. Terminal bulb mostly absent. Female
tail short rounded or elongate with rounded terminus.
Bursa reaching near tail tip.....

- Hoplolaimoidea, Filipjev, 1934
 Cephalic frame work weakly sclerolized. Spear weak with
 or without knobs. Terminal bulb generally set off from
 intestine . Female tail long, bursa small.....
- Tylenchoidea (Orley, 1880) Chitwood & Chitwood, 1937
6. Female with coarse body annules either smooth or retrorse
 with or without ornamentation. Some times additional
 cuticular sheath also present.....
-Criconematoidea (Taylor, 1936) Geraert, 1966
 Female with fine body annules neither retrorse nor smooth
 bearing ornamentation. Additional cuticular sheath absent..
-7
7. Caudal alae well deveoped extending to terminus.....
- Tylenchocriconematoidea, Raski & Siddiqi, 1975
 Caudal alae lacking or very reduced.....
- Tylenchulidoidea, Raski & Siddiqi, 1975

SUPER FAMILY: TYLENCHOIDEA (Orelay, 1880)
 Chitwood & Chitwood, 1937.

DIAGNOSIS (emended): Tylenchina. Both sexes vermiform. Body
 cuticle striated. Lateral field present having generally 2-6
 incisures. Deirids present. Cephalic frame work weakly
 cuticularized, six setae; lips generally six of which the
 two laterals are sometimes reduced. Papillae obscure, amphid
 located in the lateral lips generally inconspicuous opening
 by small pore, but sometimes these are comparactively more
 developed located sublabially opening through oblique slits.
 Spear length varying considerably, weakly developed generally
 knobbed but in some groups knobs are absent. Oesophagus
 with a distinctly differentiated procorpus which may be located

either in middle or anterior or posterior half of Oesophageal length, intermediate bulb weak to moderately developed with distinct or indistinct cuticularized valve; Isthmus long terminating into cylindrical, pyriform or abutting bulb. Oesophago-intestinal junction often marked, but the Oesophago-intestinal valve sometimes lacking. Female genital organ paired or unpaired. Posterior-uterine-sac generally present in monodelphic forms except in Dipterⁿchus. Vulva post equatorial when single gonad present. Vulval-membrane mostly present. Phasmid invariably present as small pore like structure on the tail. Tail in both sexes elongate filiform or long and conoid. Bursa generally not enveloping the entire tail.

TYPE FAMILY: TYLENCHIDAE. Orley, 1880

REVISED KEY TO THE FAMILIES OF TYLENCHOIDEA

1. Amphids distinct, located below the sub lateral lips.
 Amphidial aperture oblique slit like-
 Psilenchidae Paramonov, 1967
 Amphids indistinct located in the sub lateral lips.
 Amphidial aperture minute pore like 2
2. Oocytes usually arranged in multiple series arranged
 about the rachis-..... Anguinidae Nicoll, 1935
 Oocytes not in multiple rows, and not arranged about
 the rachis..... 3
3. Lip region striated, basal bulb pyriform set off from
 the intestine. Oesophago-intestinal valve present.....
 Tylenchidae Orley, 1880

Lip region not striated, basal bulb abutting or overlapping the intestine. Oesophago intestinal valve absent.
..... Ditylenchidae (Golden, 1971) n.rank.

FAMILY TYLENCHIDAE Orley, 1880

DIAGNOSIS (emended): Tylenchoidea. Vermiform nematodes without sexual dimorphism, about 1 mm. or generally less. Head elevated; cephalic frame work absent or only weakly developed except distinct and finger like in Dactylotylenchinae. Stylet generally small, rarely elongated as in Tylodorinae, with or without basal knobs. Deirids usually present and distinct. Phasmid below anus sometimes difficult to see. Oesophageal gland enclosed in a basal bulb generally with cardia. Ovary single, posterior uterine sac small or rudimentary. Male with reduced or adanal bursa. Female tail attenuate, filiform or conoid elongate, rarely short and stout (then bursa envelops tail), with thick cuticle as in Tnophurinae. Free living or feeders of lower plants.

TYPE SUB-FAMILY:TYLENCHINAE (Orley, 1880)Marcinowski, 1909

KEY TO THE SUB-FAMILIES OF TYLENCHIDAE

- 1. Stylet very long.....Tylodorinae Paramonov, 1967
 - Stylet not very long.....2
- 2. Head with finger like sclerotization.....
 - Dactylotylenchinae Wu, 1969
 - Head without finger like sclerotization.....3
- 3. Vulva median, female tail swollen in posterior portion with thick cuticle; bursa enveloping tail.....

..... Trophurinae Paramonov, 1967.
vulva not median, female tail filiform, bursa small
adanal.....4

- 4. Body cuticle deeply striated, backwardly directed, a ventral flap overhanging the vulva, lateral vulval membrane absent.....Pleurotylenchinae Andrassy, 1976.
Body cuticle not so deeply striated, (Excepting Aglenchus).
No backwardly directed ventral flap overhanging the vulva, lateral vulval membrane commonly present.....
..... Tylenchinae (Orley, 1880) Marcinowski, 1909.

SUB-FAMILY TYLENCHINAE (Orley, 1880) Marcinowski, 1909

DIAGNOSIS (Emended): Tylenchidae. Vermiform body long and slender. Body cuticle generally finelly striated except in Agelenchus, Plenurotylenchus and Aerotylenchus. Sometimes longitudinal striations also present. Cephalic Sclerotization weakly developed, finger like in Dactylotylenchinae. Lip six, papillae reduced, amphid indistinct, amphidial aperture pore like located in lateral lips. Spear generally weakly developed with reduced basal knobs, moderately developed with rounded knobs in Aglenchus and Aerotylenchus. Opening of dorsal-Oesophageal gland located at base of spear or half to one spear length behind spear base, and by the ventral junction of Oesophageal lumen with the spear base (Irantylenchus). Lateral field with refractive bands, comprising of two, four or six lines; areolated in Aerotylenchus.

Oesophagus typical of the family. Gonads single prodelphic, post-uterine-sac rudimentary or sometimes one

vulval body width long. Lateral vulval membrane generally present. In Pleurotylenchinae there is a backwardly directed ventral flap overhanging the vulva. Phasmids often not visible but distinct in Aerotylenchus. Male with adanal bursa which is sometimes absent.

TYPE GENUS TYLENCHUS Bastian, 1865

REVISED KEY TO THE GENERA OF TYLENCHINAE

- 1. Orifice of dorsal-Oesophageal gland axial.....2
 Orifice of dorsal-Oesophageal gland not axial.....
Irantylenchus Kheri, 1972
- 2. Cuticle heavily annulated.....3
 Cuticle not heavily annulated.....6
- 3. Longitudinal lines on cuticle present.....4
 Longitudinal lines on cuticle absent.....5
- 4. Lateral vulval membrane present.....
 Aglenchus (Andrassy, 1954)
 Meyl, 1961
 Lateral vulval-membrane absent.....
 Pleurotylenchus Szczygiel, 1969
- 5. Lateral field areolated with four crenated lines.....
 Aerotylenchus N.Gen.
- 6. Lateral field plain band often with two lines.....
 Malenchus Andrassy, 1968
- 6. Head off set, lateral field with six incisures.....
 Cephalenchus (Goodey, 1962)
 Golden, 1971
 Head not off set, lateral field with less than six
 incisures.....7

- 7. Tail short and ventrally hooked, spear well developed....
Tylenchus Bastian, 1865
 Tail long and filiform, spear weakly developed.....8
- 8. Males without visible bursa.....Miculenchus Andrassy, 1959
 Males with moderately developed adanal bursa.....
 Filenchus (Andrassy, 1964) Meyl, 1961.

AEROTYLENCHUS GEN. NOV.

DIAGNOSIS: TYLENCHINAE. Body long and robust, ventrally arcuate, body cuticle strongly striated. Lateral field with four incisures, aerolated throughout the body. Head continuous striated. Spear well developed with slightly asymmetrical knobs, opening of dorsal oesophageal gland close to spear base. Oesophagus with a distinct elongate oval median bulb. Isthmus long and narrow terminating into a slightly overlapping pyriform basal bulb. Dorsal oesophageal gland nucleus well developed. Excretory pore cuticularized leading into a quite thickened convoluted excretory duct which ends into a large renette cell. Cardia present. Ovary single anteriorly outstretched with oocytes mostly in double rows. Post-uterine-sac present. Tail long and distinctly ventrally curved ending with a small mucro at tip.

Type and only sps. Aerotylenchus safroni n.sp.

AEROTYLENCHUS SAFRONI GEN. ET. SP. NOV.

(Plate 1, Fig. A-F)

7 females and 4 males were recovered from soil around roots of Crocus sativus L. from Pampore, Kashmir. A new genus, Aerotylenchus is proposed for their accomodation.

Measurements:

Females (6 paratypes) L = 0.88-0.95 mm; a = 33-38;

b = 6.1-8.3; c = 6.3 -7.5; v= 65-68%

spear = 12-14 microns

Female (Holotype) L = 0.90 mm; a = 36; b= 7.8; c= 6.6

v= 67%; spear = 13 microns

Male (4 paratypes) L = 0.89 -0.94 mm; a = 32-36; b=6.0-7.5
 c= 6.1- 7.1; Spicule = 27-30 microns;
 Gubernaculum = 8-10 microns.

Male (holotype) L = 0.91 mm; a = 33; b= 6.5; c= 6.5;
 Spicule = 27 microns; Gubernaculum =
 9 microns.

DESCRIPTION:

The body assumes strongly ventrally arcuate shape, moreso in the posterior third region when killed by hot water. Body robust, cylindrical tapering from neck base gradually to a continuous rounded lip region which measures about half of body width at metacarpus. Lateral field arising as a thin streak in the region of procorpus and is completely interrupted by body striations in the neck region, which becomes completely aerolated in the rest of the body, having 4 incisures the outer ones being deeply crenate while the two inner ones also show crenation. Lateral field assuming a maximum width of 1/3 of body at mid body region. Deirids present.

Head measuring 7 microns across x 2 microns in height. Labial sclerotization weakly developed. Spear measuring 13 microns in length having anterior part measuring 6 microns in length and smaller in size than posterior part, which measures about 7 microns. Spear knobs rounded asymmetrical the ventral being slightly larger than dorsal. Dorsal-oesophageal gland opening located at 2 microns from spear base. Vestibulum forming a funnel shaped indistinct spear guide extending upto 7 microns anterior end. Spear muscles

well developed. Procorpus a cylindrical tube slightly convoluted measuring about 30 microns in length, and having a maximum width of about 5 microns, terminating into an oval elongate metacarpus; the later measuring 16x7 microns in dimension. A distinct cuticularized valve present in the anterior half of metacarpus. Isthmus a cylinder tube, slightly convoluted in its posterior half measuring 33 microns in length, and ending posteriorly into an almost pyriform basal oesophageal bulb which has a large sub ventral sector with distinct nuclei and is slightly smaller than dorsal gland nuclei, which lies near the anterior part of the bulb. Nerve ring located at 11 microns behind base of metacarpus. Excretory pore located in level with the post. half of the basal bulb. i.e. 27 microns behind nerve ring and is fairly cuticularized; excretory duct very broad cuticularized, convoluted, leading to a large renette cell located at about 35 microns behind excretory pore. Oesophageal bulb slightly overlapping in anterior part of intestine. Cardia conoid rounded.

Vulva transverse slit. Vagina at right angles to body axis, occupying about half of the vulval body diameter. Post uterine branch about as long as the vulval body width. Gonad single, anteriorly outstretched. Oocytes mostly in double rows. Spermatheca present. Phasmid located at about 1 anal body diameter posterior to anus. Lateral field completely aerolated in tail. Tail ventrally curved striated till the end with the terminal fine micro.

MALE:

Similar to female in general body excepting the lip region which is slightly narrow and elevated. Lesser developed

knobs and a cylindrical basal bulb. Testes single anteriorly outstretched. Spicule well developed arcuate measuring 27 microns. Gubernaculum keel shaped, thick. Bursa strongly crenate arising later anterior to spicular head and continuing to about one and a half spicular length behind. Lateral field aerolated. Tail ventrally arcuate, striated terminus having a small central mucro.

Holotype: Female on slide No: PN/Tyl/1 in author's collection.

Holotype: Male on slide No. PN/Tyl/2 in author's collection.

Paratypes: 5 females and 3 males on Slide Nos. PN/Tyl/(3-5) deposited in the Department of Zoology, University of Kashmir.

HOST: From soil around roots of Crocus sativus L.

LOCALITY: Pampore, Kashmir.

DISCUSSION:

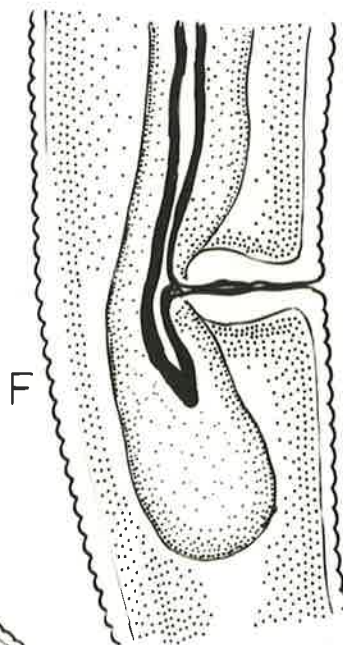
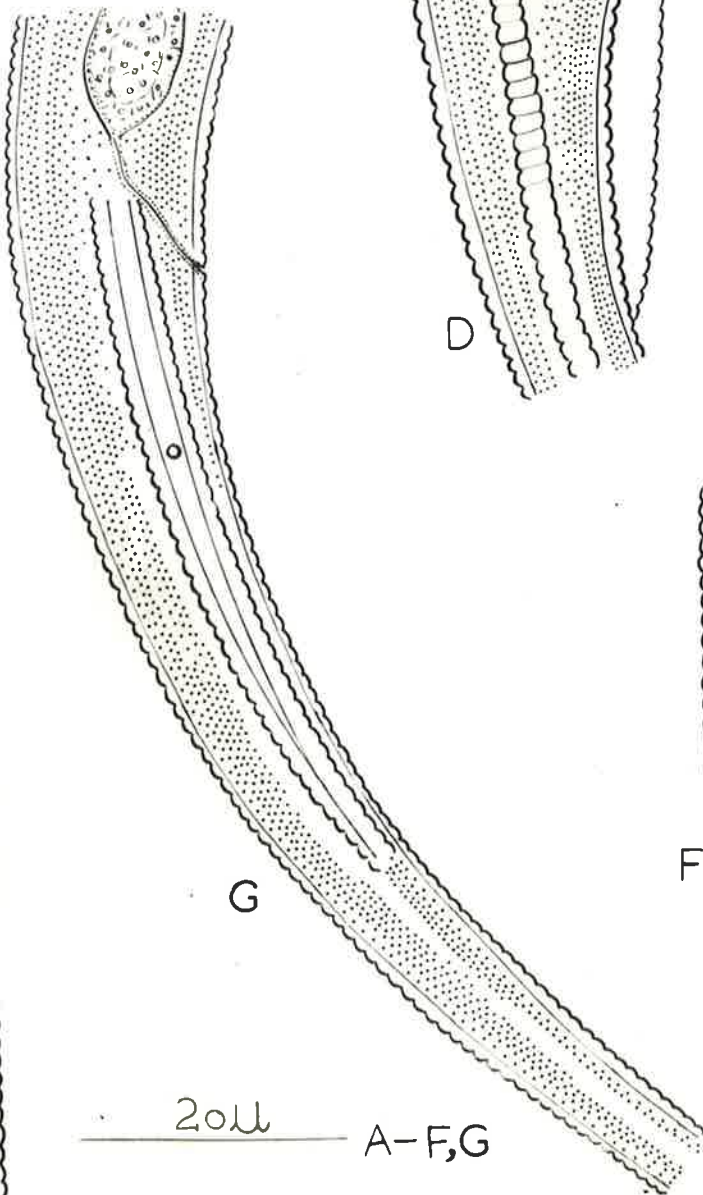
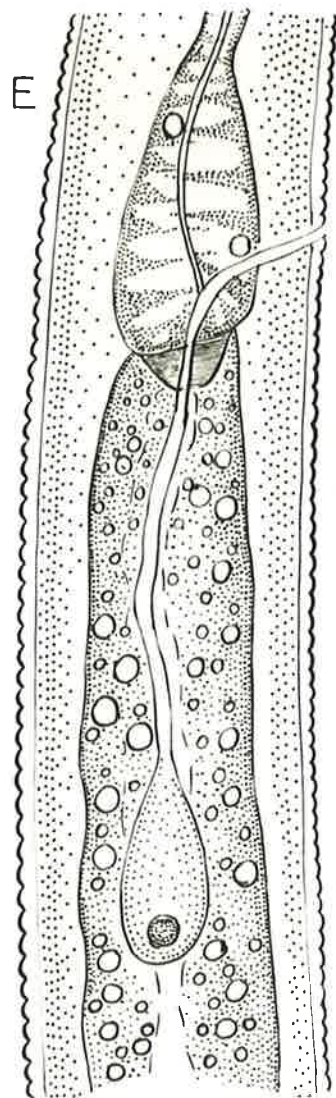
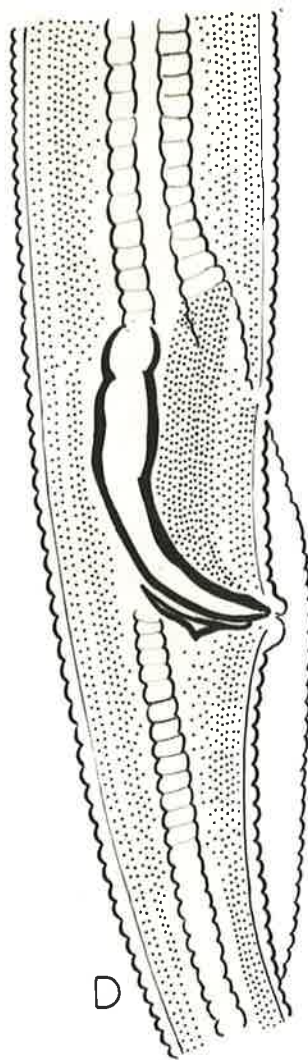
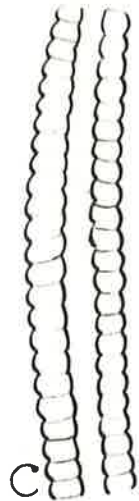
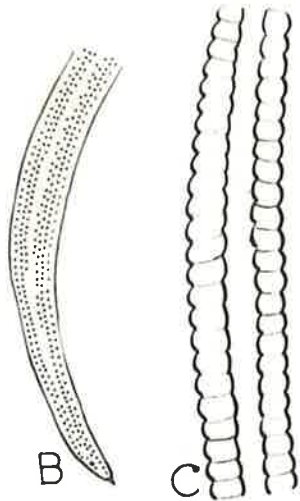
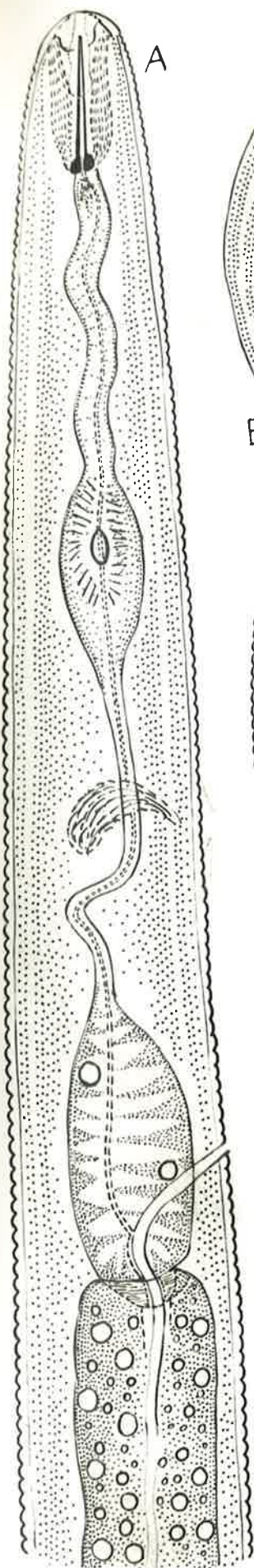
When compared with the existing genera of Tylenchidae, the present form is found to be distinct by the presence of deeply annulated cuticle, presence of areolation in the lateral field, excretory pore cuticularized leading into a quite thickened convoluted excretory duct which ends into a large renette cell, well developed spear, phasmid and by the ventrally curved tail. However, it comes close to Iranitylenchus Kheri, 1972 from which it differs in the general structure of the spear knobs, position of dorsal-Oesophageal gland orifice, thick and cuticularized excretory duct terminating into a large renette cell, areolation of the lateral field and by the shape of the female tail.

In view of the above differences, the present form is placed in a new genus for which the name Aerotylenchus is proposed.

PLATE -I

AEROTYLENCHUS SAFRONI N.GEN, N.SP.

- Fig. A : Oesophageal region of female
- B : Hinder part of tail
- C : Aerolated nature of lateral field
- D : Tail region of male
- E : Posterior part of neck region showing excretory duct and Rennett cell
- F : Vulval region showing post-uterine bran
- G : Tail region of female showing position and of phasmid and aerolated lateral field.



20μ

A-F,G

FAMILY DITYLENCHIDAE (Golden, 1971) n.rank

DIAGNOSIS:

Body vermiform averaging less than 1 mm. Body cuticle finely striated, lateral field with plain band having four to six lines. Lip region with or without striation. Median Oesophageal bulb valvular. Basal oesophageal bulb either Pyriform and set off with definite oesophago-intestinal valve or in the form of abutting bulb or overhanging in the form of long lobes. Aphidial aperture pore-like located in the lateral lips. Cephalic sclerolization weak. Spear small and weakly developed with small knobs. Gonads prodelphic, ovary outstretched, sometimes flexed. Post-uterine-sac present, except in Diptenchus. Vulva sometimes very posteriorly located reaching upto 9/10 of body length. Female tail conoid with acute or sub-acute terminus, except in Neoditylenchus and Sychnotylenchus where female tail is short and rounded, and bursa surrounding the male tail, where as in others the bursa does not reach upto the tail tip.

Free living, parasites of higher plants and insect parasites.

TYPE SUB-FAMILY:- DITYLENCHINAE. Golden, 1971.

REVISED KEY TO THE SUB-FAMILIES OF DITYLENCHIDAE

Oesophageal gland enclosed in a bulb, small cardia present
Sychnotylenchinae (Paramonov, 1967)
 Golden, 1971.

Oesophageal gland either enclosed in basal bulb or may be variously expanded and sometimes lobe like extending over

the intestine. cardia absent.....
 Ditylenchinae Golden, 1971

SUB-FAMILY DITYLENCHINAE Golden, 1971

DIAGNOSIS: Tylenchidae. Body cuticle thin, annulated. Head continuous or off set, with or without annules. Amphid apertures usually pore like. Stylet small often within 7-15 microns. Oesophageal gland either enclosed in basal bulb which may be variously expanded and sometimes with a small lobe extending over intestine; or not enclosed, forming a large lobe overlapping^p anterior end of intestine. Cardia absent or reduced. Ovary prodelphic, with Oocytes generally in single file, occasionally in two rows. Tail commonly elongate conoid. Bursa adanal to subterminal.

TYPE GENUS: DITYLENCHUS Filipjev, 1936

SUB-FAMILY SYCHNOTYLENCHINAE (Paramonov, 1967) Golden, 1971.

DIAGNOSIS: Tylenchidae. Body cuticle thin, finely annulated. Stylet small. Oesophageal glands enclosed in basal bulb. Ovary single. Vulva usually far posterior. Female tail generally rather stout and short, cylindroid to conoid, Bursa well developed, not lobed, typically enveloping tail.

TYPE GENUS:- Sychnotylenchus Ruhm, 1956.

FAMILY PSILENCHIDAE Paramonov, 1967

DIAGNOSIS (emended): Tylenchoidea. Free living in soil around plant roots. Vermiform body, size averaging 1 mm. Cuticle finely striated. Head with six sectors unsclerotized, amphids distinct placed below the head, aperture slit like situated outside sub lateral lips. Spear small and weakly developed with or without knobs or long and attenuated. Oesophagus with a distinct procorpus, median bulb muscular, sometimes oval and weakly developed, situated either anterior to the middle of oesophagus, or located in posterior half of oesophageal length. Isthmus long and tubular. Basal oesophageal bulb pyriform, distinctly set off from the intestine by an oesophago-intestinal-valve (Cardia), Excretory pore hemizonid distinct. Deirids present. Gonad single or double. In case of monodelphic forms, the vulva is post-equatorial and small. Post uterine-sac present. Tails in both sex long and filiform, with clavate or sub-clavate terminus excepting Macrotrophurinae, where the female tail is short hemispherical and the male tail is short conoid with pointed terminus and bursa reaching upto the tail tip.

TYPE SUB-FAMILY Psilenchinae Paramonov, 1967

REVISED KEY TO THE SUB-FAMILIES OF PSILENCHIDAE

- 1. Spear very long, female tail short rounded with thick cuticle. Male tail short with bursa enveloping tail....
Macrotrophurinae n.sub.fam.
 Spear small, female and male tail filiform ending into a clavate or sub-clavate terminus. Bursa sub caudal....2

2. Female with two ovaries.....Psilenchinae Paramonov, 1967
 Female with one ovary.....Basirinae Andrassy, 1976.

SUB-FAMILY PSILENCHINAE Paramonov, 1967

DIAGNOSIS (emended): Psilenchidae. Cuticle and sub cuticle well striated, head without sclerotized skeleton. Spear slender, fairly long, without basal knobs. Opening of dorsal-oesophageal gland close to the spear base or it may even shift to half or one spear length behind the spear. Deirids and Phasmids prominent. Lateral field with plain refractive bands or with inner incisures; the lateral fields sometimes with oblique and broken outer lines. Procorpus tends to be longer than length of Isthmus and terminal bulb; median bulb well developed with thick cuticularized valve; terminal bulb pyriform well distinguished from the intestine. Oesophago-intestinal valve prominent. Postanal-intestinal lobe present or absent. Vulva median. Gonad paired, ovaries outstretched. Spicules tylenchoid, slightly cephalated and arcuate; Gubernaculum thin and trough like. Bursa narrow and short ending at level of Phasmids. Tails long and filiform ending to finely rounded, bluntly rounded or clavate terminis.

TYPE AND ONLY GENUS: PSILENCHUS Deman, 1921

GENUS PSILENCHUS De Man, 1921.

PREVIOUS WORK:

The genus Psilenchus was erected by De Man, 1921. This he proposed for the species having paired ovaries, spear without knobs, transverse elliptical amphid apertures, adanal bursa and long filiform tail with clavate terminus. (It can be differentiated from Tylenchus Bastian, 1865 because of having single ovary, knobbed spear and filiform tail with an acute terminus). Then afterwards Thorne, 1949 revised description of Psilenchus, which is characterized by the elongate slit-like amphid apertures, slender frequently clavate tails of both sexes, prominent deirids and phasmids, sclerotized labial frame work absent, elongate spear and by the presence of median bulb which is situated at middle or posterior to middle of oesophageal length. Thorne, 1949 also added four new species in the genus: P. striatus, P. magnidens, P. gracilis and P. aberrans. He also included Tylenchus clavicaudatus Micoletzky, 1922 in this genus. Because of having slit like amphidial apertures he differentiated P. magnidens, P. gracilis and P. aberrans from Tylenchus.

Hagemeyer and Allen (1952) modified the generic definition of Psilenchus, so as to accommodate P. duplexus. They included species having median bulb situated above the middle of oesophagus. But afterwards Andrassy, 1954 shifted P. duplexus to Tylenchus (Filenchus). Hagemeyer and Allen, 1952 also described two species of Psilenchus, : P. duplexus having amphid apertures about a quarter head width, which is located

near base of lip; and P.terextremus close to didelphic species of Psilenchus, except for the tail (terminus finely rounded).

R.Siddiqi, 1959 described Basiria which was separated from Psilenchus, by the dorsal oesophageal gland orifice.

Colbran, 1960 described P.tumidus and Andrassy, (1962, a,b), described two more species P.alsturius and P.noctiscriptus. Then afterwards Goodey, 1962 retained under Psilenchus, only those species which were didelphic and having a clavate tail terminus, and placed P.magnideus, P.aberrcus and P.gracilis under Tylenchus (Filenchus) as T.(F) neoaberrans and T.(F) neogracilis.

Jairajpuri and Siddiqi (1963) described P.neiformis, and R.Siddiqi, (1963 a,b) also described two new species P.hilarus and P.minor. All these three species are similar to P.hilarulus, but the dorsal-oesophageal-gland orifice is half to one spear length below spear base. Thus the genera cannot be separated because of position of dorsal Oesophageal gland orifice which has only specific use. R.Siddiqi (1963,a) disagreed with Goodey, 1963 and provided emended diagnosis of Psilenchus and Basiria. In Psilenchus he left only those species that had knobless spears, lateral lips wider than the others and one or two gonads, and then to Basiria he transferred P.gracilis and P.aberrans, which had knobbed spears, lateral lips narrower than others and only a single gonad.

Geraert, 1965 remarked that amphidial apertures should not be considered character good enough for differentiating at generic level and also stressed that there is a gradation of variation regarding the structure in the species of Tylenchus. He simultaneously pointed out that even the hexagonal outline of the head, can be influenced by the development of those parts of the lip where the cephalic papillae end, and by the size and direction of the amphidial apertures.

Jairajpuri 1966 did not consider any of the characters on the basis of which Siddiqi distinguished Basiria, from the related taxa. He therefore, agreed with Goodey and considered Basiria, a synonym of Tylenchus (Filenchus), and pointed out that Psilenchus, can be easily separated on the basis of the number of female gonad. He also proposed Clavilenchus as a new sub-genus under Tylenchus, with P. tumidus as type species.

Thorne and Malek, 1968 splitted the genus Psilenchus on the basis of the presence or absence of spear knobs, location of median bulb, position of vulva and the number of Gonad. They proposed two genera i.e. Neopsilenchus, and Basiroides, and also raised Clavilenchus to generic rank. The genus Basiria was considered valid.

Geraert, 1970 discussing the significance of various structures used in differentiating Psilenchus, Tylenchus and Basiria, revised his earlier statement of 1965

and accepted without any reservation that shape and structure of amphid and spear are of great taxonomic importance.

Andrassy, 1976 accepted Basiria, Basiroides and Neopsilenchus as valid genera under the family Psilenchidae Paramonov, 1967. He accepted two valid sub-families i.e. Psilenchinae Paramonov, 1967 and Basirinae, Andrassy, 1976 of which the latter was proposed as a new sub-family.

The author agrees with Andrassy, 1976 and accepts the above mentioned taxa but it is considered keeping in view the structure of the amphid, that one more sub-family which is being proposed in this work as Macrotrophurinae should also be accommodated under the family Psilenchidae. The elongation of the spear in the represented genus Macrotrophurus only depicts the phenomena of convergence.

PSILENCHUS OLERACEI SP. NOV.

(Plate II, Fig. A-G)

6 Females and 3 males were recovered from the soil around roots of Glycine max (L) Miller from Wazir Bagh, Srinagar, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS

Females (5 paratypes) L= 1.2 - 1.7 mm; a= 38-43;
b= 4.7 -6.5 c= 6.1 - 8.0;
v = 46-48 %; spear = 22-24 mic.

Female (Holotype): L = 1.2 mm; a = 42.3; b= 4.7;
c= 6.3; v= 47%;Spear = 23 mic.

Male (2 Paratypes) L = 1.1- 1.5mm; a = 37-41.5;
b = 4.5 -4.6; c = 6.1 -6.3;
Spear = 22-23 mic.Spicule =
25-27 mic. Gubernaculum = 7-9 mic.

Male (Holotype): L = 1.1 mm; a = 40.5; b = 4.5;
c = 6.1; Spicule = 27 mic.
Gubernaculum = 7 mic.

DESCRIPTION

Body almost striaght when the "eel w^Yom" is killed by hot water, and only the posterior part of the body i.e. tail gets a slight ventral curvature. Body cuticle marked by fine transverse striations, each striae measuring about 1 mic. at mid body, inner layer of cuticle marked by even finner striae. Lateral field about 1/5th of body width at mid body, which originates in the region of metacorp^us and is marked by 4 incisures, and extends upto a little posterior to phasmid.

Amphid apertures slit like measuring about 1/3rd of head width located behind lateral lips. Deirids slightly anterior to excretory pore.

Lip region conoid measuring 8x6 microns in dimension, and is not striated. Outer margins of the labial frame work distinctly sclerotized and extending upto 6 annules into the body. Spear slender 23 microns long, anterior portion shorter than half the length of the spear. Orifice of dorsal oesophageal gland at base of spear. Procorpus a cylindrical tube measuring 65 microns in length. Median Oesophageal gland well developed with a prominent valvular apparatus in the middle. Isthmus is shorter than Procorpus, the former encircled by a nerve ring located at 105 microns from anterior end. Excretory pore located at 127 microns from anterior end. Hemizonid 4 microns anterior to Excretory pore. Basal Oesophageal bulb pyriform 23 microns long and 13 microns wide i.e. occupying about half of corresponding body width. Cardia rounded distinct.

Vulva transverse slit. Gonads paired, opposed, outstretched. Vagina at right angles to body axis extending to slightly less than 1/3rd of corresponding body width into the body. Uteri with oval offset spermetheca, filled with the sperms. Ovaries with developing oocytes mostly arranged in double rows. Rectum a little more than half anal-body-width in length. Post anal blind sac well developed extends to about one rectal length behind anus. Tail elongate, measuring about 10 anal-body-width in length tapering to a slightly swollen terminus.

MALE

Similar to female in body morphology except the gonads. Spicules well developed, ventrally arcuate measuring 27 microns in length. Gubernaculum Zigzag in shape measuring 7 microns in length. Bursa finely crenate originating in front of spicules, and extends to about half of spicule length behind cloaca.

Holotype: Female on slide No: PN/ Tyl/6 in author's collection.

Holotype: Male on slide No: PN/Tyl/7 in author's collection

Paratypes: 5 females and 2 males on slide No. PN/Tyl/8-9 deposited in Department of Zoology, University of Kashmir.

HOST: Collected from soil around roots of Glycine max (L) Miller.

LOCALITY: Wazir Bagh, Srinagar, Kashmir.

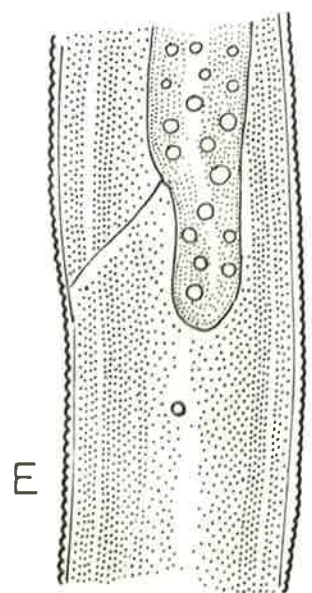
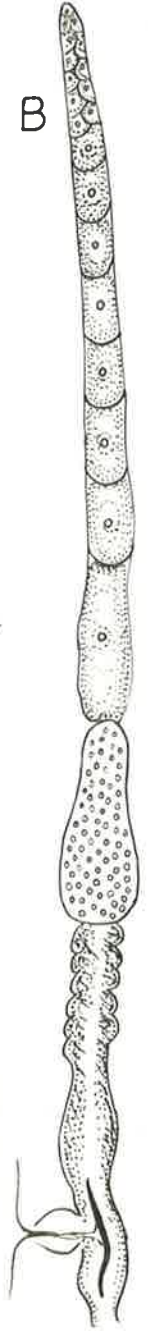
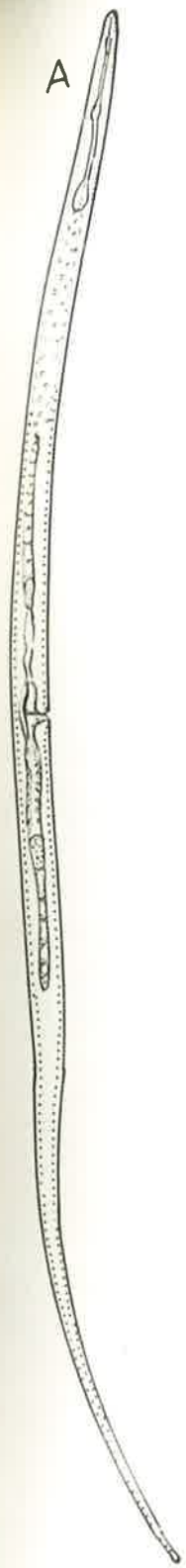
DIAGNOSIS AND RELATIONSHIP :

Psilenchus oleracei Sp. nov. is distinctive by having a 23 microns long spear, finely striated body, unstriated lip region, lateral field with 4 incisures, Excretory pore located well below the nerve ring and by the presence of distinct post anal blind sac. The new species comes close to P. hilarulus De Man, 1921 from which it can easily be distinguished by distinct labial sclerotization extending upto 6 body annules, the more posterior position of excretory pore in relation with nerve ring, shape of spermatheca, presence of distinct post anal gland sac, position of Phasmid in female and longer tail (Labial sclerotization faint, Excretory pore

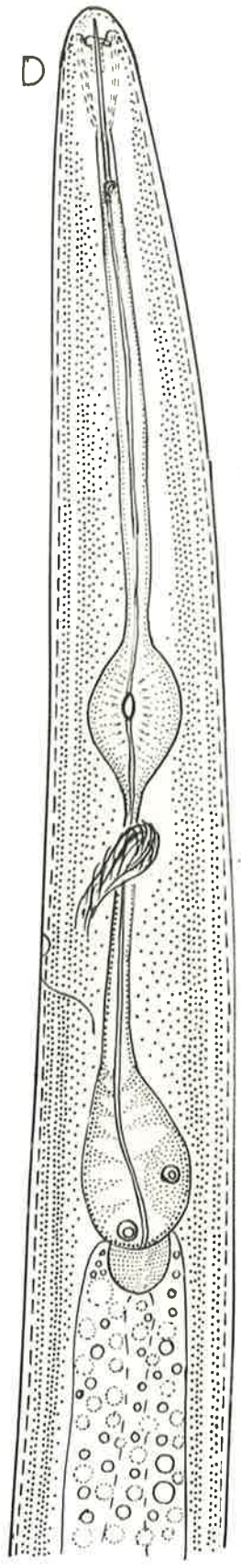
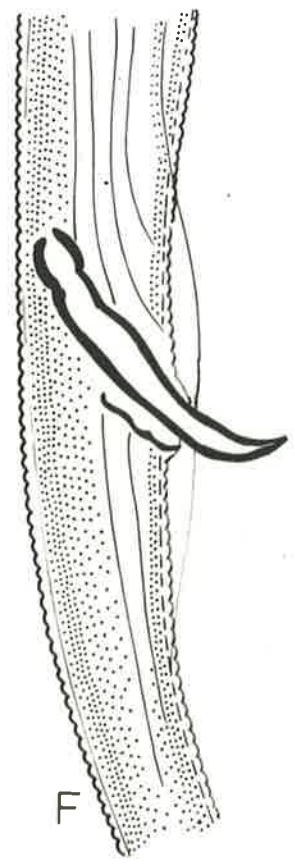
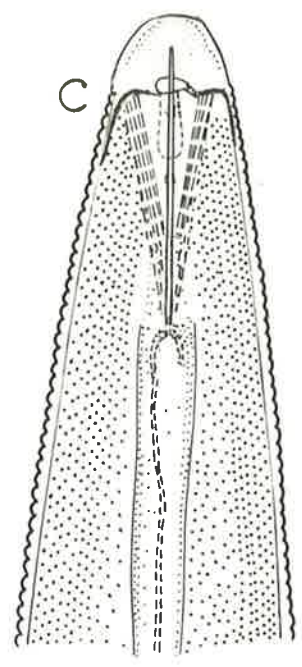
PLATE - II

PSILENCHUS OLERACEI SP. NOV.

- Fig. A : Entire female
B : Anterior gonad
C : Anterior end of male
D : Oesophageal region of female
E : Posterior part of female
F : Posterior part of male
G : Tail terminus



10μl C, E, F, G
 20μl D
 30μl B
 200μl A



almost anterior to middle Isthmus, spermatheca elongate
 contineous, post anal gland sac absent, and $c = 8 - 8.5$ microns
 in P. hilarulus)

In view of these differences the present form is
 considered herein to constitute the new species for which the
 name P. oleracei is proposed.

PSILENCHUS HAKI SP. NOV.

(Plate III, Fig. A-E)

9 females were recovered from soil around roots of
 local cultivar (Hak) of Brassica oleracea from Idgah, Srinagar
 Kashmir. These are considered herein to constitute new species.

MEASUREMENTS:

Paratypes (8 females): $L = 0.9 - 1.3$ mm; $a = 43-51$;
 $b = 6-7.2$; $c = 6.0-7.5$;
 $v = 44-46\%$; Spear = 12-15 mic.

Holotype (female) $L = 1$ mm; $a = 50$; $b = 7.1$;
 $c = 7.6$; $v = 45\%$;
 Spear = 14 microns.

DESCRIPTION:

Body ventrally arcuate assuming a c-shape when
 killed by hot water. Cuticle marked by transverse striations,
 each striae measuring about 1.4 microns apart on mid body,
 inner layer of cuticle marked by slightly coarser striae.
 Body tapering from neck base anteriorly to a conical head
 region. Lateral field originating in region of metacarpus
 occupying 1/4th of body width at mid body, and is marked by
 4 incisures. The outer ones strongly crenate

especially in the tail region where it becomes distinctly aerolated, and extends posteriorly a little behind Phasmids. Amphids slit like located outside lateral lips measuring about half of lip width. Deirids not seen.

Lip region not striated continuous with body contour, tapering anteriorly and measures 8x4 microns in dimension. Outer margins of labial sclerotization weakly developed extending upto 3 body annules. Spear slender measuring 13-14 microns in length. Anterior portion less than half the length of the shaft. Opening of dorsal oesophageal gland located about 2 microns behind spear base. Procorpus is a cylindrical tube measuring about 57 microns in length, median oesophageal bulb oval measuring 13x6 microns in dimension. Isthmus cylindrical tube measures about 42 microns in length and is shorter than Procorpus. Nerve ring surrounds Isthmus and is located at 92 microns from anterior end. Excretory pore located anterior to middle of Isthmus i.e. 13 microns behind nerve ring. Hemizonid located adjacent to excretory pore. Basal oesophageal bulb spatulate, measuring 15x9 microns in dimension i.e., occupying less than half of corresponding body width. Three gland nuclei observed. Cardia elongate conoid. A distinct cavity surrounds the basal bulb as is seen in the species of Paurodontus.

Vulva transverse slit. Vagina, at right angles to body axis. Reproductive system didelphic-amphidelphic. Uteri with a columellate cell and distally with an^coval spermathea[↑]

filled with sperms. Ovaries well developed, outstretched with oocytes arranged in double rows. Rectum longer than one anal body width in length. Post anal-gland sac absent. Tail with coarser^s striations than the body, measuring about more than 10 anal body width in length with a bluntly rounded semi clavate terminus.

Male : not found.

Holotype: Female on slide No. PN/Tyl/10 author's collection.

Paratypes: On slide Nos. PN/Tyl/11-12 deposited in the Department of Zoology, University of Kashmir.

HOST: Collected from soil around roots of local cultivar (Hak) of Brassica oleracea.

LOCALITY: Idgah, Srinagar, Kashmir.

DIAGNOSIS & RELATIONSHIP

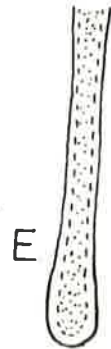
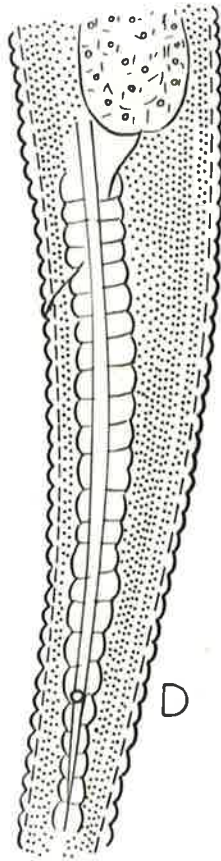
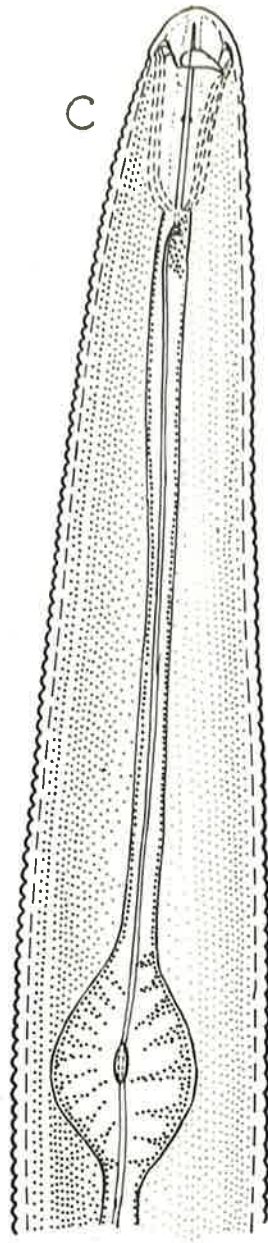
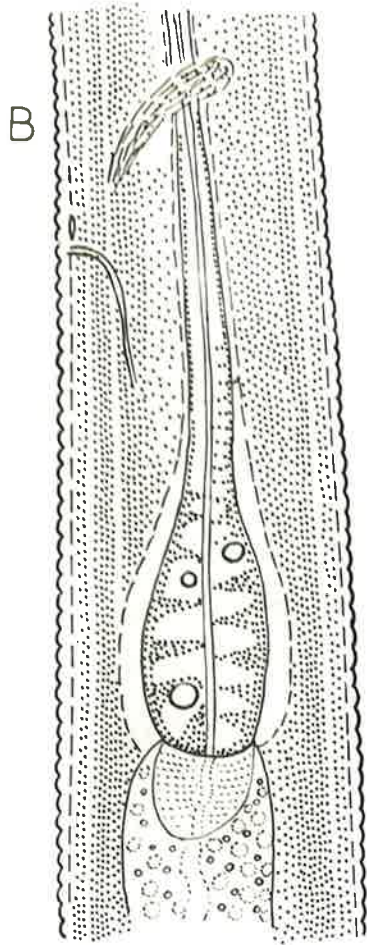
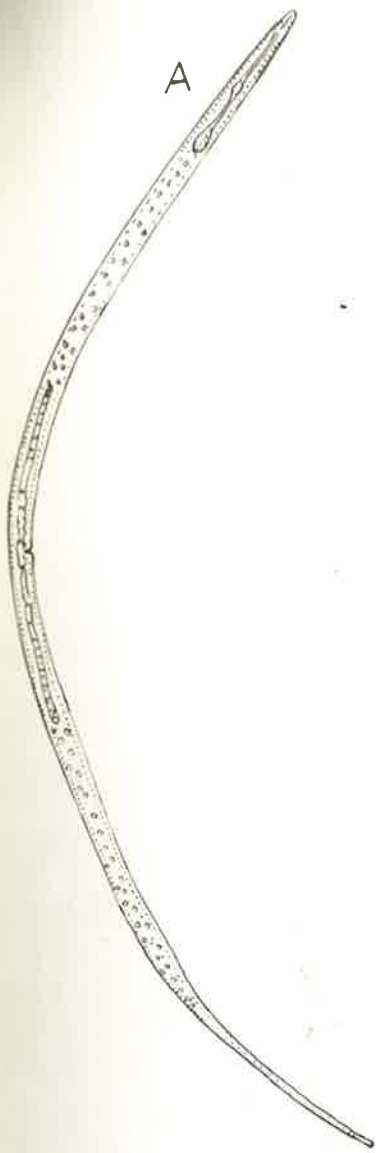
Psilenchus ^{Hakei} oleracei Sp. nov. comes close to P. hilarulus, De Man, 1921 and P. minor, Siddiqi, 1963. From P. hilarulus present species differs by having a shorter spear, broader amphidéal aperture, anterior position of vulva and in the deeply crenated nature of lateral field in the tail region. From P. minor it differs by the position of dorsal oesophageal gland opening and shape of tail terminus.

In view of the above differences the present form is considered here to constitute new species for which the name Psilenchus oleracei is proposed.

PLATE - III

PSILENCHUS HAKI SP.NOV

- Fig. A : Entire female
B : Neck region showing chamber
C : Anterior end of female
D : Posterior part of female
showing lateral lines
E : Semi clavate terminus of female



100 μ — B-E
200 μ — A

SUB-FAMILY MACROTROPHURINAE NEW SUB-FAMILY

DIAGNOSIS: Psilenchidae. Body vermiform averaging over 1 mm. Body cuticle, distinctly striated. Lip region not off set from body and cephalic frame work weakly developed. Spear very long, the anterior part measures $2\frac{1}{2}$ times as long as the shaft, the later being small/^{with} rounded knobs. Procorpus appears swollen when the spear is retracted. Median bulb rounded, isthmus long and slender, terminal bulb pyriform not overlapping the intestine. Female tail short rounded with thick terminal cuticle. Vulva median. Gonads paired opposed and outstretched. Male tail short with large bursa enveloping the entire tail. Phasmids located at about the middle of tail length in both the sexes. Spicules proximally knobbed. Gubernaculum present.

TYPE & ONLY GENUS: MACROTROPHURUS Loof, 1958

FAMILY: ANGUINIDAE. NICOLL, 1935

DIAGNOSIS: (emended): Tylenchoidea. Stout or obese forms sometime with female often coiled ventrally. Body tapering at both the ends. Cuticle finely annulated. Head low with weakly developed sclerotization, annulated, hardly off set from the body. Lateral field plain or with four incisures which sometimes contain longitudinal transverse and oblique striae also. Deirids usually indistinct or invisible. Amphid apertures pore like, labial. Stylet weak and short with spear knobs. Median bulb with crescentic valves. Isthmus crossed by nerve ring; basal oesophageal bulb swollen or having a digit like process with internal lumen extending posteriorly from the swollen glandular position of the oesophagus.

Oesophageal glands enclosed in the large basal bulb generally numbering three. In Paranguina there are four oesophageal glands located about half way between median bulb and junction of oesophagus or seperated at their base.

TYPE SUB-FAMILY : ANGUININAE Nicoll, 1935

REVISED KEY TO THE SUB-FAMILY OF ANGUINIDAE

- 1. Basal oesophageal bulb enlarged, broadly pyriform-.....
 Anguininae Nicoll, 1935
 Basal oesophageal bulb with a digit like process, with internal lumen extending posteriorly from the swollen glandular portion.....
 Cynipanguininae n.sub-fam.

SUB-FAMILY CYNIPANGUININAE NEW SUB-FAMILY

DIAGNOSIS: Anguinidae. Body in females is coiled, very stout, tapering rapidly to both extremities a = 12.1- 16.2. In males body is crescentic. The stoma is armed with slender stylet, metacarpus ovate with small but distinct valve; digit like process with internal lumen extends posteriorly from swollen glandular portion of oesophagus. Lateral field contains longitudinal transverse and oblique striae. Oocytes arranged around a rachis, post uterine sac present. Males with capitulum-calamus one third spicule length, gubernaculum present. Caudal alae, leptoderan.

TYPE GENUS: CYNIPANGUINA Maggenti, et al, 1974.

SUPER FAMILY HOPLOLAIMOIDEA Filipjev, 1934

DIAGNOSIS (emended): Tylenchina. Vermiform nematodes. Body cuticle distinctly striated. Lateral field marked by crenate incisures which becomes aerolated especially in the neck and tail region. Labial frame hexaradiate, generally strongly sclerotized. Head generally deeply off set with transverse or even longitudinal striations; head may be lobed in certain cases. Spear strongly moderately long with well developed spear knobs which may be anteriorly cupped. Opening of dorsal oesophageal gland, located either at the base or half to 2/3rd of spear length below the base of spear. Amphidial apertures pore like, labial in position. Procorpus well defined with a rounded vascular metacarpus, the latter with strongly developed valve; isthmus short encircled by nerve ring. Oesophageal gland numbering 3-6, located in the form of lobes which overlap the intestine. Female gonads generally paired. Vulva median or located in the posterior third of body in case of monodelphic forms. Male tail short, conoid completely enveloped by bursa. Strongly sexual dimorphism encountered in some groups. Phasmid large (Scutellae) located in anal region or even anterior to vulva; sometimes phasmids are small located in anal or pre anal region. Phasmids are absent in Aphasmatylenchidae. Female tail short, rounded or short conoid with broadly rounded or subacute terminus. Testis single outstretched. Spicules and gubernaculum present. Bursa terminal or subterminal.

TYPE FAMILY: HOPLOLAIMIDAE Filipjev, 1934.

FAMILY : HOPLOLAIMIDAE (Filipjev, 1934) Wieser, 1953

DIAGNOSIS (emended): Hoplolaimodia. Long and stout cylindrical body. In Acontylinae swollen in posterior part of female. Body cuticle strongly annulated. Head distinct generally set off, elevated with strong cephalic sclerotization which is hexaradiate. Lip region transversally striated sometimes with longitudinal striae also. Buccal spear strongly developed with metonchium and telonchium almost of equal length, the latter bearing strongly developed anteriorly directed or rounded knobs. Opening of dorsal oesophageal gland located at the base or half to 3/4th of spear length behind the base of knobs. Oesophagus with a distinct procorpus, rounded metacarpus which is strongly valvulated, short Isthmus and overlapping^p Oesophageal gland numbering 3-6. Phasmid large (scutella) located at anal latitude, anterior or posterior to vulva. Phasmids may also be pore like located in level or anterior to anus. Tail in both sexes short annulated. Male tail short with bursa enveloping the tail.

Ectoparasites of higher plants.

TYPE SUB-FAMILY : HOPLOLAIMINAE (Filipjev, 1934)

REVISED KEY TO THE SUB-FAMILIES OF HOPLOLAIMIDAE.

1. Phasmid small pore like. Body comparatively shorter and less stout.....2
 Phasmids large (scutella). Body long stout
 Hoplolaiminae Filipjev, 1934.
2. Distinct sexual dimorphism present. Female swollen in posterior half of body..... Acontylinae n. sub-family
 Sexual dimorphism absent. Female not swollen in posterior

part of body.....Rotylenchoidinae Whitehead, 1958

SUB-FAMILY: ACONTYLINAE NEW.SUB-FAMILY

DIAGNOSIS : Hoplolaimidae. Small vermiform nematodes with very distinct sexual dimorphism, sometimes swelling in posterior part of female. Cephalic sclerotization well developed in female, while lesser developed in male. Opening of dorsal Oesophageal gland located at least half of spear length behind spear base. Lateral field well developed with four incisures. Phasmids pore like located near anal latitude or posterior to anus. Ovary prodelphic. Post-utrine sac present. Tail short.

TYPE GENUS: ACONTYLIUS Megher, 1968

SUB-FAMILY: ROTYLENCHOIDINAE Whitehead, 1958

DIAGNOSIS (emended): Hoplolaimidae. Vermiform nematodes reaching upto a maximum of 1.5 mm in length. Body cuticle distinctly annulated. Head conoid, truncate or rounded elevated and set off, with strong hexaradial sclerotization. Lip region with or without transverse striation. Longitudinal striae sometimes present in lip region. Opening of dorsal oesophageal gland located from 1/4th of the spear length to almost one spear length behind the base of the spear. Spear strongly developed, with rounded or anteriorly directed knobs. Oesophageal glands tend to overlap the intestine on dorsal and lateral sides or ventrally; or having a large dorsal oesophageal gland lobe containing the dorsal and one sub ventral lobe and a smaller ventral lobe. Lateral field with

four incisures. Ovaries amphidelphic with equatorial vulva, or with prodelphic ovary having vulva situated in posterior fourth of the body. Phasmids small pore like, situated in anal region. Female tail short, either ventrally curved with a hemispherical or elongated terminus or having a tapering pointed tail.

Ectoparasites of higher plants.

TYPE GENUS: ROTYLENCHOIDES Whitehead, 1958

KEY TO THE GENERA OF ROTYLENCHOIDINAE

1. Female tail tapering to a pointed terminus.....
.....Antratylenchus Sher, 1973
- Female tail not tapering to a pointed terminus.....2
2. Ovaries paired, vulva equatorial.....3
- Ovary single, vulva in posterior fourth of the body.....
.....Rotylenchoides Whitehead, 1958
3. Oesophageal gland overlapping^b the intestine dorsally
laterally and ventrally but the longest overlap is usually
ventral, basal plate without longitudinal striations.....
.....Helicotylenchus Steiner, 1945
- Oesophageal gland overlapping intestine dorsally and
laterally, the largest overlap is on the dorsal side,
basal plate having longitudinal striation.....
.....Rotylenchus Filipjev, 1936.

GENUS HELICOTYLENCHUS Steiner, 1945

PREVIOUS WORK

The species of genus Helicotylenchus were previously placed in Genus Rotylenchus by Filipjev, in 1934 which infact was firmly established by Filipjev in (1936). Steiner (1945) felt this placement of Helicotylenchus species in Rotylenchus to be incorrect and thus he raised the new genus Helicotylenchus taking mainly the characters of overlapping glands. Steiner considered the type specimens of Rotylenchus, R. robustus (de Man, 1880), to have an enclosed terminal oesophageal bulb. However, numerous workers- Goodey (1932), Thorne (1949) Golden (1956) and Sher (1961) have shown that R. robustus has overlapping glands. This resulted in some confusion in the diagnosis of these two genera.

Thorne (1949) seperated Helicotylenchus from Rotylenchus on the basis of the position of amphid apertures at the base of the lip region.

T. Goodey (1951) doubtfully synonymised Rotylenchus and Helicotylenchus.

Golden (1956) considered the two genera distinct primarily on the basis of the position of dorsal-oesophageal gland orifice being 1/3rd or more the length of the spear in Helicotylenchus and usually less than 1/3rd in Rotylenchus.

Andrassy (1958) seperated Rotylenchus from Helicotylenchus on the basis of the 'O' value and by the presence of the titillae in the male. He raised Gotholdsteineria Andrassy, 1958 and seperated it from Rotylenchus by the not set off lip

region and the absence of titillae in males.

Perry, Darling and Thorne (1959) proved 'O' valve invalid as a generic character and synonymised Gottholdstein-eria to Helicotylenchus. They also proposed to place all species of spiral nematodes, except those with large Phasmid or Scutella in the genus Helicotylenchus. Emended diagnosis was proposed which however did not indicate any difference between Helicotylenchus and Rotylenchus.

Perry (1960) differentiated Helicotylenchus and Rotylenchus by the shape of the lip region, cephalic frame work and the shape of the female body on relaxation.

Sher (1961) in a revision of the Hoplolaiminae, considered the prominent dorsal overlap of the oesophageal gland as a primary diagnostic feature of Rotylenchus while the overlap is ventral in case of Helicotylenchus. Gottholdstein-eria was synonymised with the genus Helicotylenchus.

The genus Helicotylenchus has been kept in various categories by various workers, sometimes in Tylenchidae or in Hoplolaimidae and so on. The genus completely fits in the diagnosis of the super family Hoplolaimidae Paramonov, 1967 and also in the diagnosis of Hoplolaimidae (Filipjev, 1934) Weiser, 1953. It differs from Hoplolaiminae Filipjev, 1934 which includes Hoplolaimus Daday, 1905, Aorolaimus Sher, 1936 Peltamigratus Sher, 1963 and Scutellonema Andrassy, 1958 in having continuous conoid truncate head, lesser developed spear, larger 'O' value, the smaller Phasmid in vicinity of

anus and the spiral body shape. It also shows some affinity towards Rotylenchulinae in having longer 'O' valve but differs in not having so much sexual dimorphism.

Khan (1970) considered the validity of Hoplolaimoidea Paramonov, 1967, while Siddiqi (1971) did not recognise Hoplomaimoidea, he placed Helicotylenchus in sub-family Rotylenchoidinae separating from Hoplolaiminae giving importance to oesophagus overlapping character, where it is dorsal and dorso lateral in Hoplolaiminae and ventral and ventro laterally in Rotylenchoidinae under family Hoplolaimidae of super family Tylenchoidea.

The genus shows closest affinities to Rotylenchus and Rotylenchoides and fits in the diagnosis of the sub-family Rotylenchoidinae Whitehead, 1958.

[Faint, illegible text, likely bleed-through from the reverse side of the page]

HELICOTYLENCHUS HARWANENSIS SP. NOV.

(Plate IV, Fig. A-F)

9 females and 3 males were recovered from soil around roots of Lycopersicon esculentum from Harwan, Srinagar, Kashmir. These are considered here to constitute new species.

MEASUREMENTS:

Females (8 paratypes) L = 0.80-0.85 mm; a = 27.5 -29;
b = 4.7 -4.9; c = 26.6 -32.3;
v = 59-61%; Spear = 30-32 mic.

Female (Holotype) L = 0.80 mm; a = 27.5; b = 4.7;
c = 26.6 ; v = 60% Spear = 31 mic.

Male (2 paratypes) L = 0.72- 0.76 mm; a = 32.6-33.7;
b = 4.1 -4.7; c = 35-38;
Spicule = 30-32 mic.
Gubernaculum = 10-12 mic.
Spear = 30- 31 mic.

Male (Holotype) L = 0.72; a = 32.6; b = 4.1;
c = 38; Spicule = 30 mic.
Gubernaculum = 12 mic;
Spear = 31 mic.

DESCRIPTION

Body cylindrical taking a strong ventral curvature assuming the shape of a close 'C'. (Paratypes sometimes assume single Spiral). Body tapering from the base of the neck gradually into a sharply conoid truncate head, measuring about slightly half of body width at median oesophageal bulb. Labial scleroti-

zation strongly developed, hexradiate, its lateral margins extending upto 3 body annules posteriorly. Body cuticle coarsely striated, each striae measure 1.8 microns at mid body. Lateral field marked by 4 incisures occupying about 1/3rd of body width at mid body. Derids not seen.

Head conoid truncate measuring 10x5 microns in dimension, marked by six distinct striations. Vestibulum forming an inverted funnel like spear guide, extending upto 8 body annules posteriorly. Buccal spear strongly developed measuring 31 microns in length; its anterior part measures 17 microns in length. Basal knobs of spear well developed anteriorly cuped. Orifice of dorsal oesophageal gland located at 10 microns from base of spear knobs. Procorpus cylindrical measuring 45 microns in length, its maximum width being 7 microns. Median oesophageal bulb well developed and is about half of corresponding body width, and measures 16x10 microns in dimension extending upto 9 annules. Isthmus cylindroid narrower than procorpus enveloped by nerve ring at about middle of its length. Excretory pore in level with oesophago-intestinal-junction. Hemizonid not present. Oesophageal gland lobe like enveloping intestine dorsolaterally.

Vulva transverse slit. Vagina at right angles to body axis, measuring slightly more than half of body width in depth. Uteri with oval rounded spermatheca filled with minute rounded sperms. Both branches of reproductive organs equally developed. Tail straight with the slight dorsal curvature bearing

15 annules on the ventral side. Phasmid located at sixth annule anterior to annus. Lateral field fusing with the terminal tail striations.

MALE :

Body 'C' shaped, smaller than the female. Transverse striae of cuticle measuring 1.7 microns apart at mid body. Head and oesophagus same as described for female.

Testes single, anteriorly outstretched on right side of intestine. Spicule paired, similar, ventrally arcuate. Spicule measuring 30 microns. Gubernaculum simple measuring 12 microns in length. Tail tapering to a ventrally some what offset, subacute terminus.

HOLOTYPE: Female on Slide No: PN/Hel/1 in author's collection.

PARATYPE: Females on Slide No. PN/Hel/2-3 deposited with Department of Zoology, University of Kashmir,

MALE HOLOTYPE: On Slide No. PN/Hel/4 in author's collection.

HOST: Collected from soil around roots of

Lyconpersicon esculentum Miller

LOCALITY: From Harwan, Srinagar, Kashmir.

DIAGNOSIS AND RELATIONSHIP: H.harwanensis n.sps is distinctive by having sharply conoid truncate head with six distinct striations. Buccal spear strongly developed measuring 31 microns in length, absence of hemizonid, straight tail with short projection at tip bearing 15 annules and lateral fields fusing with the tail annules. However, it comes close to H.exallus Sher, 1966

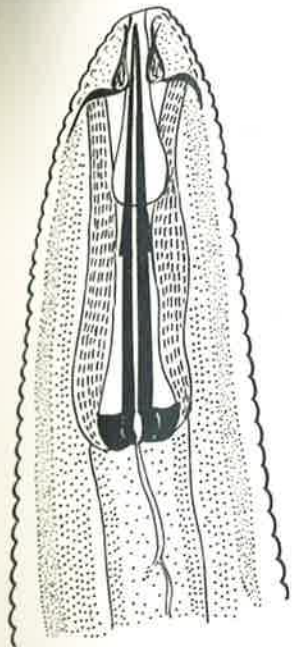
from which it differs by the possession of longer spear, truncate shape of lip region (Hemispherical in H. exallus), lip annules 6 as against 4 in H. exallus, shape and number of annules of tail. Tail straight with short projection bearing 15 annules (12 in H. exallus) and by the fusion of lateral fields with the tail annules.

In view of the above differences the present form is considered herein to constitute a new species for which the name H. harwanensis is proposed.

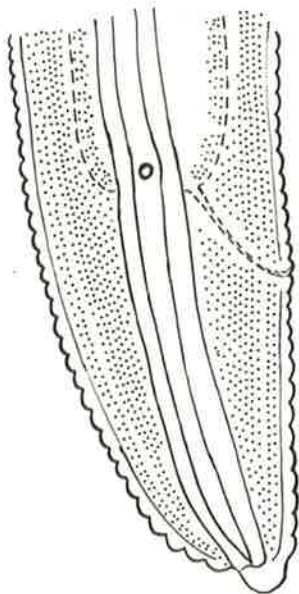
PLATE - IV

HELICOTYLENCHUS HARWANENSIS SP. NOV

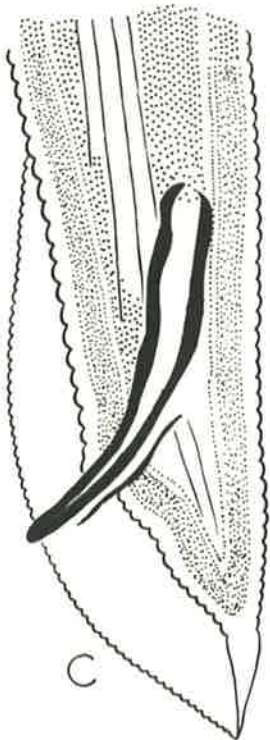
- Fig. A : Anterior end of female
B : Tail region of female
C : Tail region of male
D : Oesophageal region of male
E : Entire female
F : Entire male



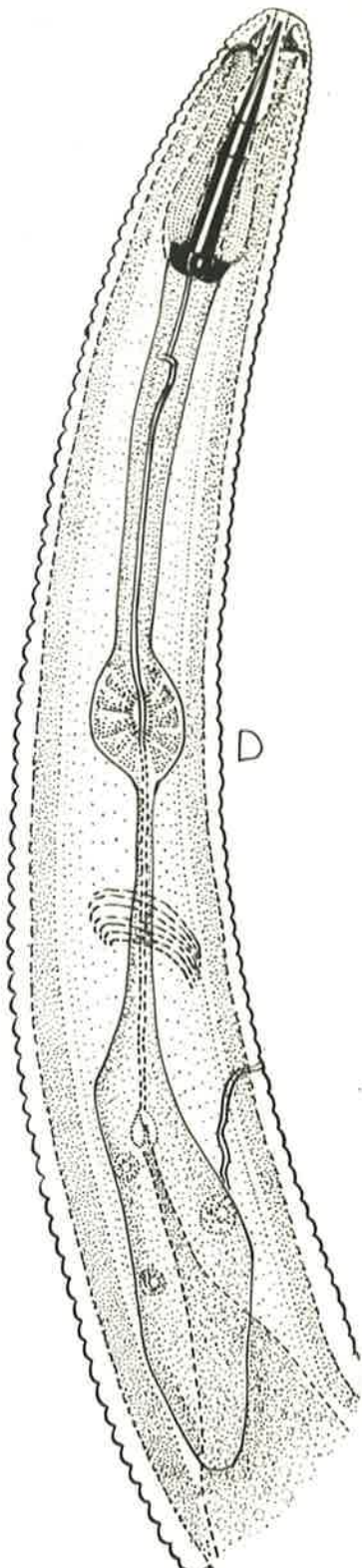
A



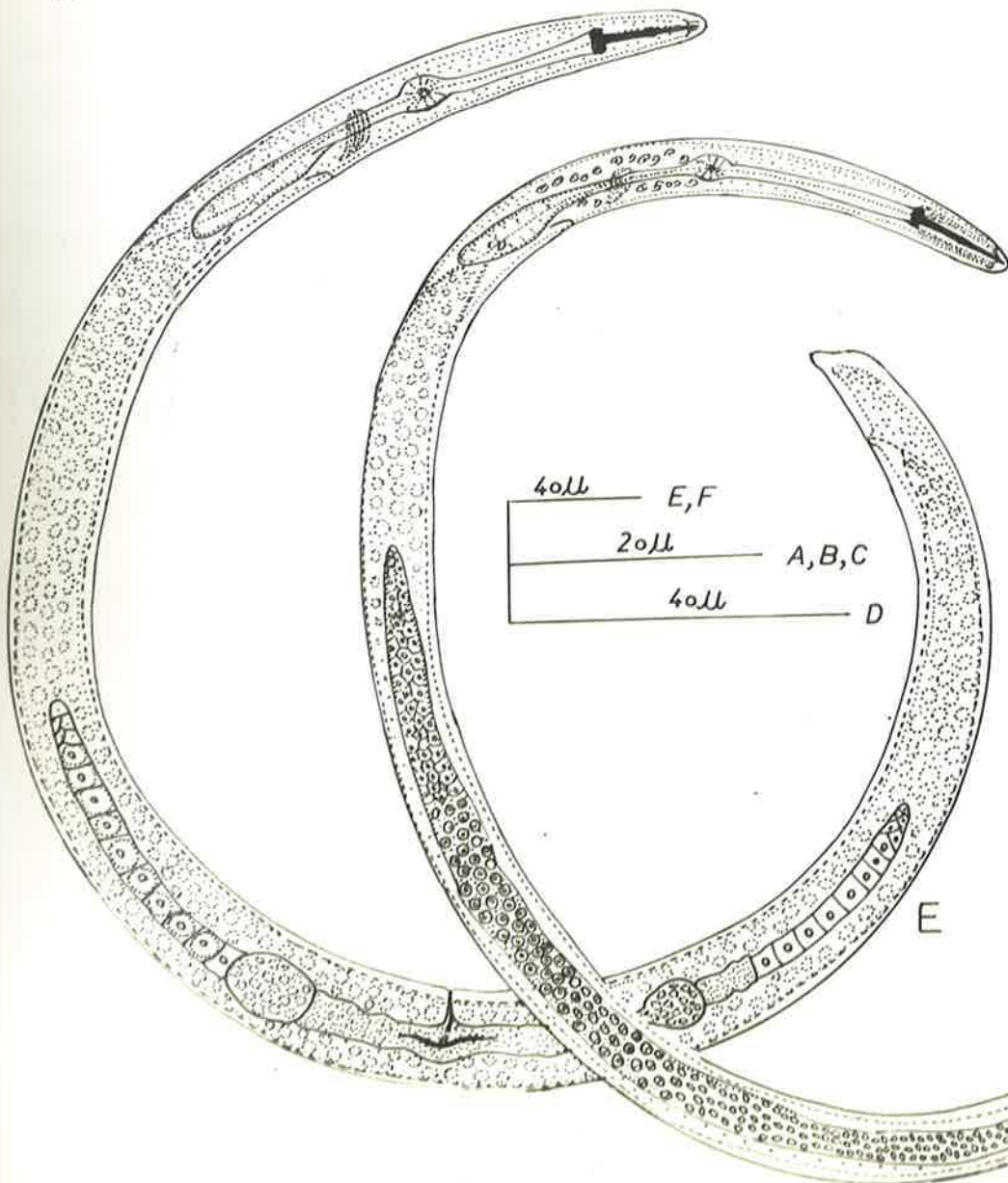
B



C



D



4oll	E, F
2oll	A, B, C
4oll	D

E

F

HELICOTYLENCHUS DARBAGENSIS SP. NOV.

(Plate V, Fig. A-E)

11 females were recovered from soil around roots of *Brassica oleracea* var. *capitata*, L. from Dar Bagh, Srinagar Kashmir. They are considered here in to constitute new species.

MEASUREMENTS:

Female (10 paratypes) L = 0.66-0.69 mm; a = 22.1 -24.2;
b = 4.1 -5.7; c = 45.1 -48.3;
v = 62-63%; Spear = 24-26 mic.

Female (Holotype) L = 0.68 mm; a = 23.4 ; b = 4.6;
c = 48.3; v = 63% Spear = 25 mic.

DESCRIPTION:

Body cylindrical, ventrally forming a single spiral when relaxed in hot water. Anteriorly it tapers regularly in front region to head which is slightly less than 1/3rd as wide as body at median oesophageal bulb. Body cuticle finely striated, each striae measuring about 1.4 microns at mid body. Lateral field marked by 4 distinct incisures, occupying slightly more than 1/3rd of body width at mid body. Deirids not seen. Head conoid truncate, almost continuous with body contour. Labial striations indistinct. Labial frame work strongly cuticularized, hexaradiate, with its outer margin extending to about 1 body annule. Vestibulum forming an inverted funnel shaped spear guide, which extends upto 8 body annules posteriorly.

Buccal spear well developed measuring 25 microns in length; its anterior part being slightly more than posterior part. Basal knobs rounded flattened measuring about 5 microns across. Orifice of dorsal oesophageal gland located at about 11 microns posterior to basal knobs. Oesophagus with a cylindrical procorpus measuring 52 microns long x 6 microns wide; median oesophageal bulb measures 14x9 mic. in dimension, extending upto about 11 annules. Cuticular thickening of median oesophageal bulb not very prominent. Isthmus cylindrical but narrower than the procorpus, enveloped by the nerve ring in its anterior half, joining the intestine through a rounded valvular junction. Excretory pore located at about 108 microns from anterior, end. Hemizonid one annules anterior to excretory pore. Oesophageal gland lobe like; overlap being dorsolateral. Vulva transverse slit. Vagina at right angle to body axis. Uteri with a proximal muscular and distinct columnar part having oval spermatheca containing minute rounded sperms. Ovary paired and outstretched. Phasmid located at anal altitude. Tail dorsally convex conoid with a bluntly acute terminus.

Male: not found.

Paratypes: Females on Slide No. PN/Hel/5-7 deposited with Department of Zoology, University of Kashmir.

Holotype: Female on slide No. PN/Hel/8 in author's collection.

Host: Collected from soil around roots of Brassica oleracea var. capitata L.

Locality: Dar Bagh, Harwan, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

When compared with existing species of the genus the present form comes close to H. exallus Sher, 1966 and H. harwanensis n.sps. From H. exallus it differs by the shape of lip region and indistinct striations on lip, position of phasmid which is at anal latitude as against 3-5 annules anterior to anus in H. exallus.

From H. harwanensis it can be differentiated by nature of ^tstriations on lip which are deeply striated in H. harwanensis numbering 6 as against indistinct in new species, presence of hemizonid in present form as against absent in H. harwanensis, position of phasmid (anal latitude in present as against 6 annules anterior to anus in H. harwanensis) and in shape of tail.

In view of the above differences the present form is considered herein to constitute new species for which the name H. darbagensis is proposed.

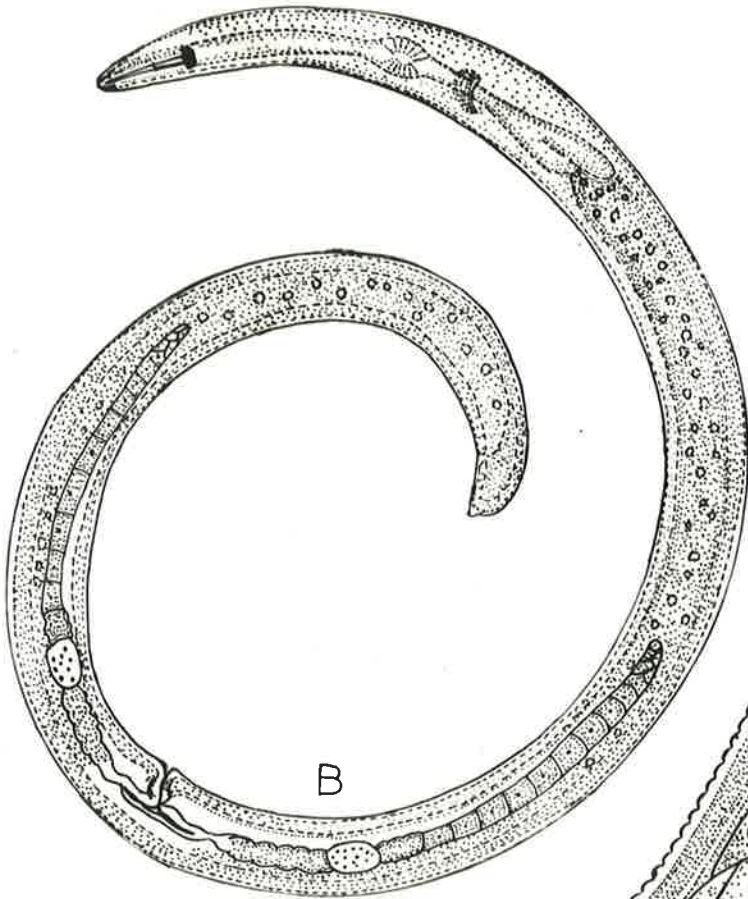
PLATE - V

HELICOTYLENCHUS DARBAGHENSIS SP. NOV

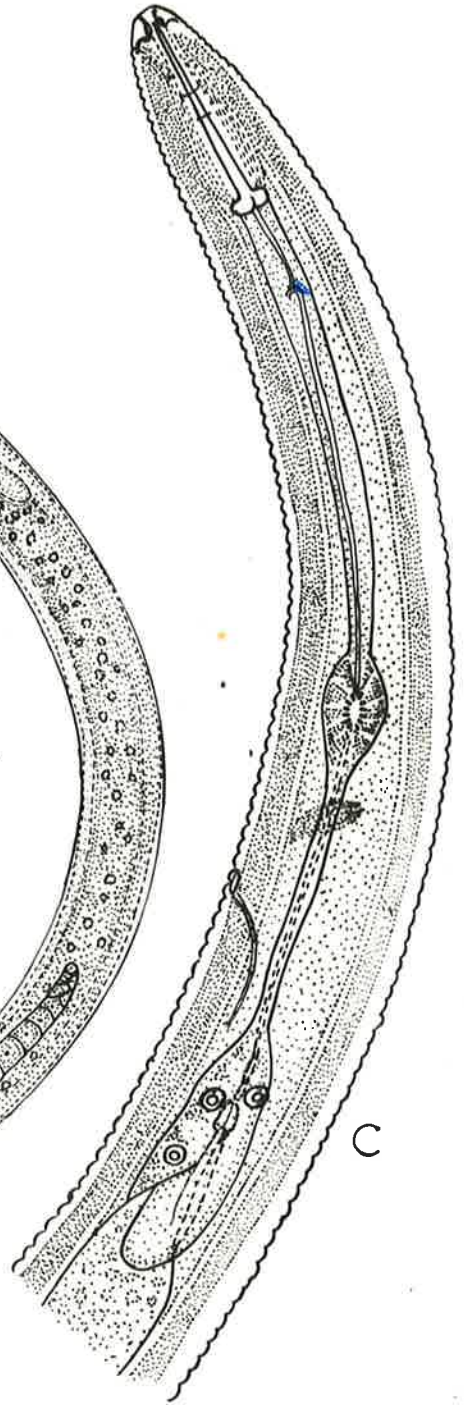
- Fig. A : Anterior end of female
B : Entire female
C : Oesophageal region of female
D : Vulval region showing Gonds
E : Tail region of female



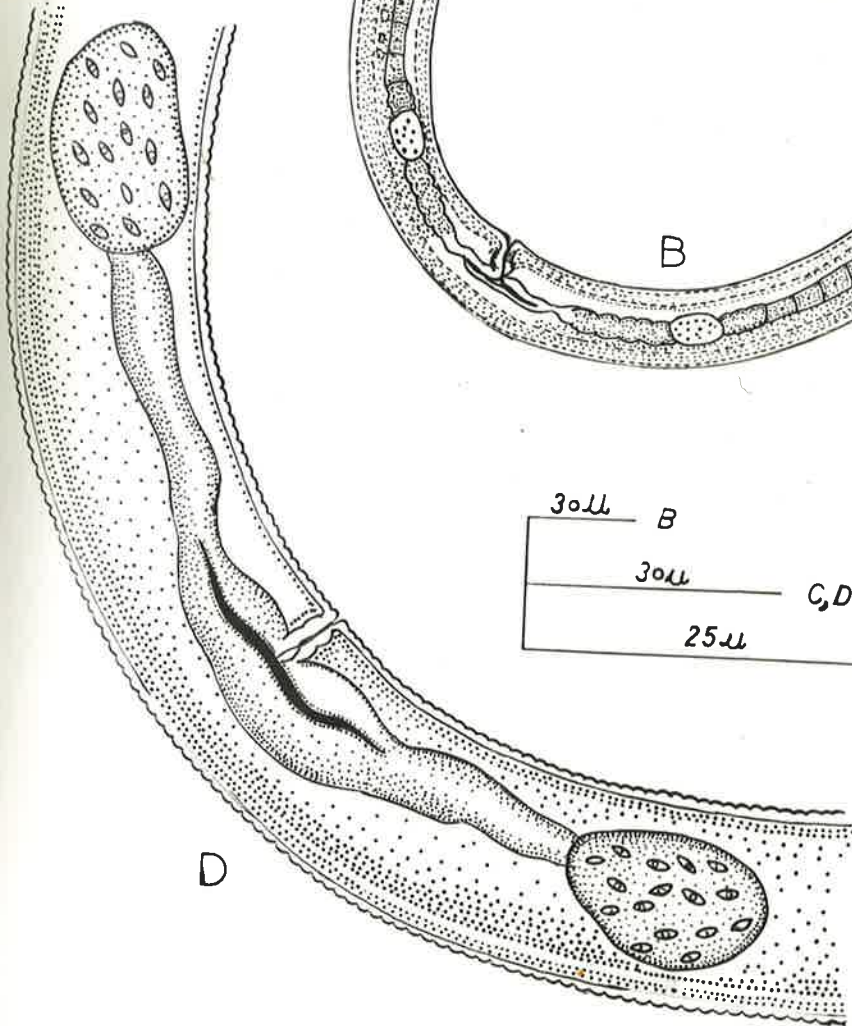
A



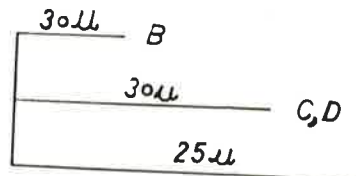
B



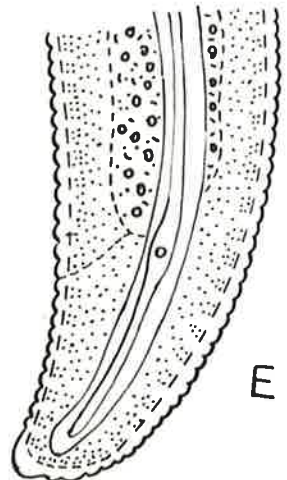
C



D



A,E



E

HELICOTYLENCHUS SIDDIQII SP.NOV.

(Plate VI, Fig. A-E)

10 females were recovered from soil around roots of Glycine max (L) Miller. from University Campus, Srinagar, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS:

Females (9 paratypes) L = 0.59-0.64; a = 22.1-25.5;

b = 4.9- 5.8; c = 40-42.7;

v = 67-69%; Spear = 23-24 mic.

Female (Holotype) L = 0.62 mm; a = 24.8; b = 5.1;

c = 41.3; v = 68%;Spear = 23 mic.

DESCRIPTION:

When killed the eel assumes the single spiral. The curvature being very strong in the posterior thid region of body especially behind vulva. Body tapering the the anterior region from base of neck regularly to a conoid head, which measures slightly more than half of the body width at the level of median bulb. Cuticle transversally striated, each striae measuring 1.7 microns at mid body. Lateral field marked by incisures. Peirids not seen.

The head conoid truncate with indistinct striations and is contineous with the body contour. Labial sclerotization hexaradiate, not very strong, lateral margins extending to about two body annules. Vestibulum forming an inverted funnel shaped spear guide extending upto 6 annules into body.

Buccal spear robust 23 microns in length. Metonchium measuring 12 microns and the telonchium measuring 11 microns in

length. Basal knobs of spear anteriorly cuped. Orifice of dorsal oesophageal gland located at 8 microns behind spear base. Procorpus cylindrical measuring 36 microns in length x 5 microns in width. Metacarpus well developed measuring 13x 8 microns, filling more than half of the corresponding body with and extends upto 7 body annules. Nerve ring located at 85 microns from anterior and enveloping the Isthmus, which measures about 18 microns in length. Excretory pore located at 90 microns from anterior end and is in level with the oesophago intestinal junction. Hemizonid absent. Terminal bulb ventro laterally enveloping anterior part of intestine. Four gland nuclei observed in the oesophageal overlap.

Vulva transverse slit. Vagina at right angles to body axis slightly protruded lips. Vulval membrane present. Uteri with off set empty spermatheca. Tail dorsally convex with a bluntly rounded terminus; regularly striated, number of striae in the tail on ventral side are six (6-8 in paratypes). Phasmid located at 3 annules anterior to anus. The lateral field merges with the tail striations.

MALE : Not found

HOLOTYPE : Female on Slide No. PN/Hel/9-11 in author's

PARATYPES: Female on Slide No; PN/Hel/10-12 deposited with Department of Zoology, University of Kashmir, Srinagar.

HOST: Collected from soil around roots of Glycine max (L) Miller from University Campus, Srinagar.

LOCALITY: University Campus, Srinagar, Kashmir.

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DIAGNOSIS AND RELATIONSHIP:

When compared with the existing species of the genus the present form comes close to H. diagonicus Perry et al., (1959) and H. delhiensis Khan et al., (1970). From H. diagonicus it differs by shorter spear, shape of tail, position of vulva and by faintly striated lip region.

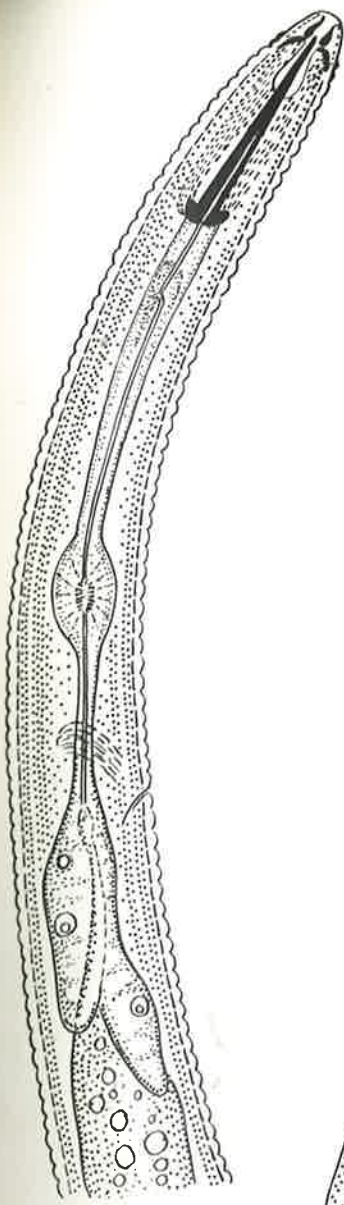
From H. delhiensis it can easily be differentiated by longer spear, shape of lip region, position of vulva, position of Phasmid, and by the lateral lines in the tail region.

In view of the above differences the present form is considered herein to constitute the new species for which the name H. siddiqii is proposed.

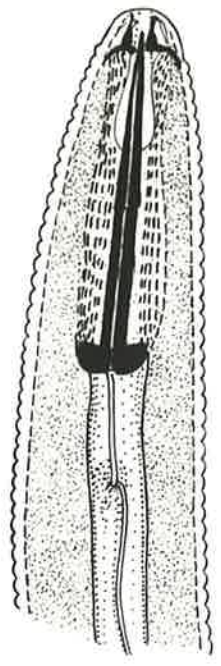
PLATE - VI

HELICOTYLENCHUS SIDDIQII SP. NOV.

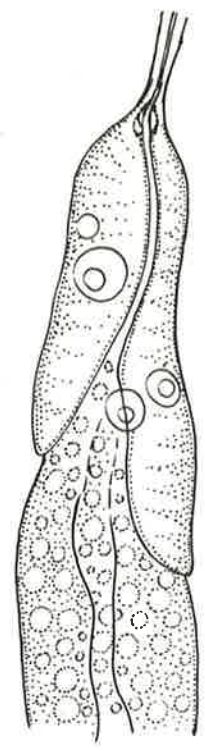
- Fig. A : Oesophageal region of female
B : Anterior end of female
C : Basal bulb of oesophagus
D : Entire female
E : Tail region female



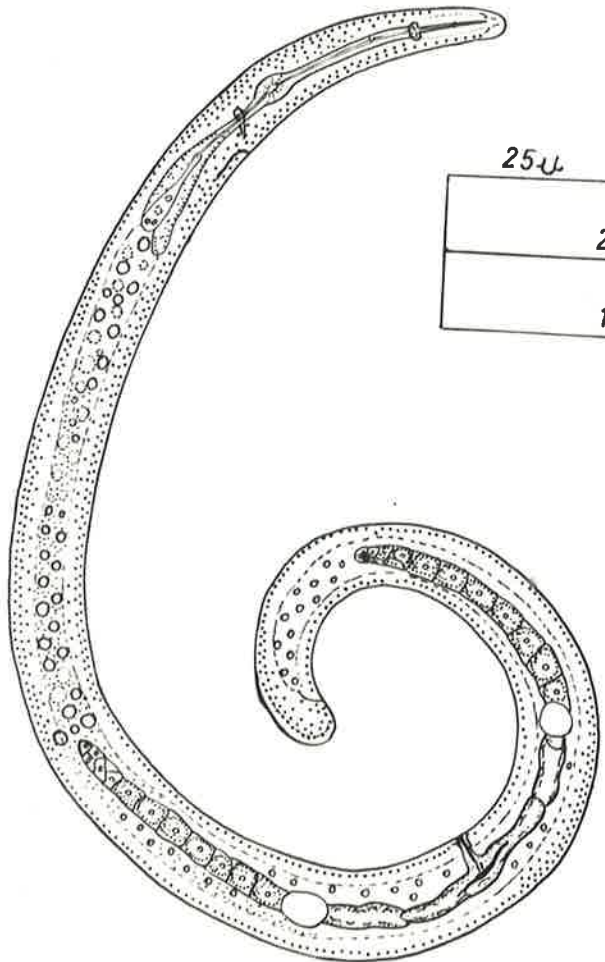
A



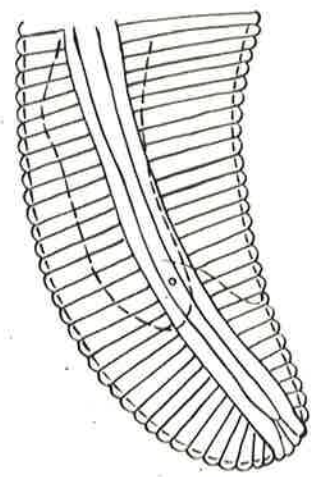
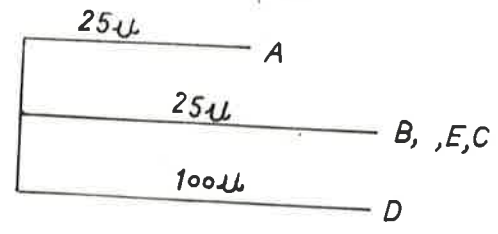
B



C



D



E

HELICOTYLENCHUS DASI SP. NOV.

(Plate VII, Fig. A-D)

12 females were recovered from soil around roots of Brassica oleracea var. botrytis L. from Zadi Bal, Srinagar, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS:

Female (11 paratypes) L= 0.51-0.62; a = 20.9-22.1;
 b = 4.2 -5.2; c = 31.4 -33.5;
 v = 60-62 %; Spear = 26-28 mic.

Female (Holotype) L = 0.59; a = 21.1; b = 4.6;
 c = 32.7; v = 62 %; Spear = 27 mic.

DESCRIPTION:

Body cylindrical ventrally strongly arcuate, forming an almost double spiral when killed in hot water. Anteriorly it tapers from base of neck in front region to head, which becomes about slightly less than 1/3rd as wide as body in the region of metacarpus. Cuticle finely striated, each striae measures about 1.4 microns apart at mid body. Lateral field measuring slightly less than 1/5th of body width at mid body and is marked by 4 incisures. Lateral field originates from the base of metonchium and is distinctly areolated upto the metacorporal region. Deirids not seen.

Head not strongly conoid bearing 4-5 faint striations. Labial frame work moderately cuticularized, hexaradiated, with its outer margins extending 3 annules in the body. Vestibulum inverted funnel like structure extending upto 12 microns from anterior end. Protractor muscles of the spear

attached to spear guide.

Buccal spear strongly developed measuring 27 microns in length; the metanochium measures 14 microns in length where as Telonchium 13 microns in length. Orifice of dorsal oesophageal gland located at 10 microns behind spear base. Basal knobs of spear anteriorly cuped, indented, measuring 5 microns across. Procorpus cylindrical tube measuring 62 microns in length and 5 microns wide. Metacorpus powerfully developed measuring 25 x 9 microns in dimension i.e., occupying more than half of corresponding body width. Cuticular thickening of intermediate bulb prominent. Isthmus cylindrical measuring 25 microns in length and is 4 microns broad, enveloped by nerve ring located in anterior half of the Isthmus. Excretory pore located almost in level with oesophago-intestinal-junction. Hemizonid weakly developed anteriorly adjacent to excretory pore. Basal oesophageal bulb enveloping the intestine ventro laterally; 3 gland nuclei observed.

Vulva depressed transverse slit. Vagina at right angles to body axis. Uteri with collumelate part distally continuous with a rounded spermatheca filled with rounded sperms. Ovaries paired outstretched, oocytes mostly in double rows. Gonads didelphic, symmetrical.

Tail dorsally convex conoid with a digitate unstriated tail terminus, Tail length more than one anal body widths, bearing 12 striae on its ventral sides with terminal striae not of uniform width. Phasmid located in level with the anus. Outer insicures of lateral field fusing in posterior half of tail where as inner incasures fusing in

anterior half of tail.

MALES : not found

Holotype: Female on Slide No. PN/Hel/13 in authors collection.

Paratypes: Female on Slide Nos. PN/Hel/14-16 deposited with the Department of Zoology, University of Kashmir, Srinagar.

HOST: Collected from soil around roots of Brassica oleraceae var. botrytis L.

LOCALITY: Zadi Bal, Srinagar, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

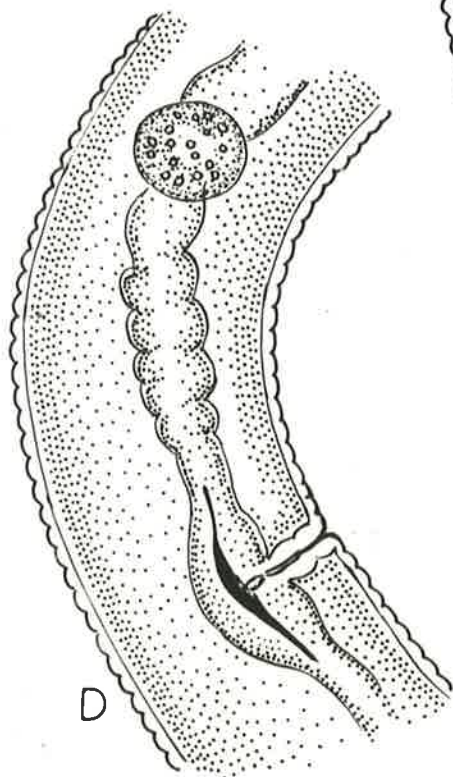
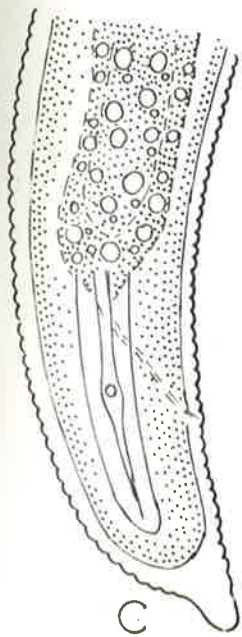
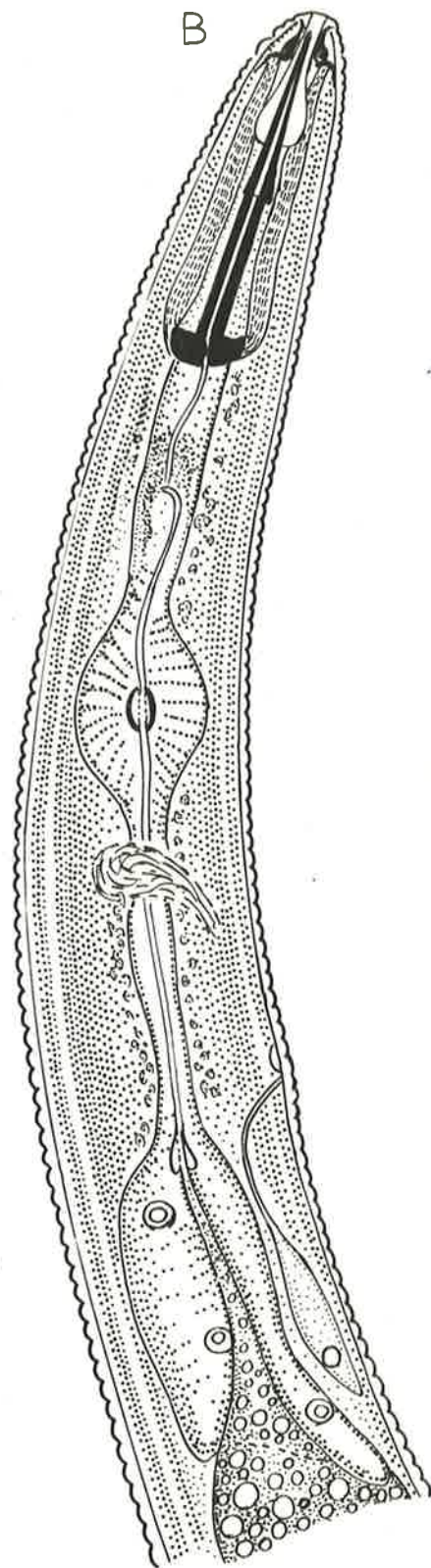
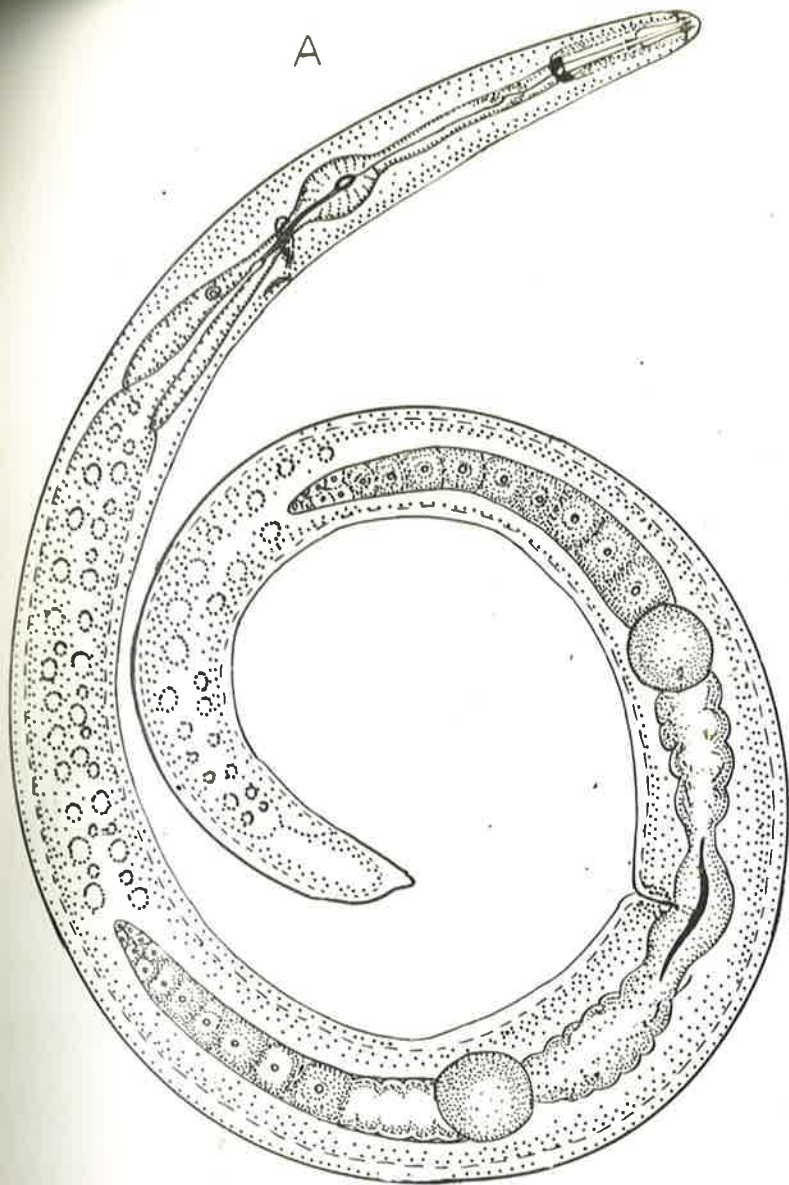
Helicotylenchus dasi n.sp. is distinctive by having conoid head with 4-5 faint striations, buccal spear measuring 26 -28 microns, contineous rounded spermatheca filled with minute sperms and dorsally convex conoid tail with a digitate unstriated tail terminus. However, it comes close to H. crenacauda Sher, 1966 and H. tropicus Roman, 1965. From H. crenacauda it differs by the shape of lip region, oesophago-intestinal-junction which is in level with the excretory pore as against anteriorly located in H. creacauda, Shape of the tail and by the position of phasmid. From H. tropicus it differs by the shape of lip region, number of libial striations in the lip region; position of hemizonid; position of phasmid and by the tail shape.

In view of the above differences the present form is considered here in to constitute a new species for which the name Helicotylenchus dasi is proposed.

PLATE - VII

HELICOTYLENCHUS DASI SP. NOV.

- Fig. A : Entire female
B : Oesophageal region of female
C : Tail region of female
D : Vulval region showing gonad.



30μ A
20μ B, C, D

FAMILY APHASMATYLENCHIDAE (Sher, 1965) n.rank.

DIAGNOSIS: Hoplolaimoidea. Head annulated, set off, with well developed cephalic frame work. Six lips. Amphid apertures elongated. Labial disc present. Stylet well developed, slender, with basal knobs. Oesophageal lobe narrow, which is overlapping the intestine ventrally. Lateral field with 4 incisures, imcompletely aerolated. Ovaries amphidelphic, outstretched. Phasmids and deirids absent. Female tail short, less than two anal-body-widths with hemispherical terminus. Bursa enveloping tail.

FAMILY: PRATYLENCHIDAE (Thorne, 1949) Siddiqi, 1963.

DIAGNOSIS (emended): Hoplolaimoidea. Median sized vermiform nematodes. Body cuticle finely annulated. Head low and flat in general, where as rather high with conoid to flat labial surface in hoplotylinae. Labial sclerolization fairly strong. Stylet well developed with anteriorly directed or rounded knobs. Lateral field with incisures. Oesophageal gland surrounding the anterior part of intestine or in the form of sub cylindrical bulb or overlapping anterior part of intestine ventrally or dorsally. Ovary prodelphic, outstretched, or didelphic with a median vulva. Female tail cylindrical with a rounded or sub acute terminus with or without annules. Males when present have bursa enveloping the entire tail.

SUB-FAMILY : PRATYLENCHINAE Thorne, 1949.

DIAGNOSIS (emended): Pratylenchidae. Small vermiform nematodes less than 1 mm. in length. Head and body striated. Spear 15-20 microns in length. Strongly developed in both the sexes. Lateral field with incisures. Oesophageal gland overlapping^b the intestine ventrally. Vulva in posterior third of body. Posterior uterine sac well developed sometimes with rudimentary posterior ovary prodelphic out^{*} stretched. Phasmid at about middle of tail. Tail short conoid with rounded or sub acute terminus striated or smooth. Males with bursa enveloping the tail.

TYPE AND ONLY GENUS: PRATYLENCHUS Filipjev, 1936.

KEY TO SUB-FAMILIES OF PRATYLENCHIDAE

1. Ovary prodelphic 2
 Ovary amphidelphic.... Hirschmannillinae n.sub-family.
2. Oesophageal gland lobe overlapping^b the ~~the~~ intestine ventrally..... Pratylenchinae Thorne, 1949.
- Oesophageal gland lobe overlapping intestine dorsally.....
 Hoplotylinae Khan, 1969.

80.

PRATYLENCHUS TUBEROSUM SP. NOV.

(PLATE VIII, Fig. A-G)

7 females and 2 males were recovered from the roots of *Solanum tuberosum* L. from Narwara, Srinagar Kashmir. These are considered here in to constitute new species.

MEASUREMENTS:

Female (6 paratypes) L = 0.43 -0.51; a = 31-36;

b = 4.1 -5.2; c = 21.3- 23.2;

v = 78-80%; Spear = 13-14 mic.

Female (Holotype)

L = 0.47; a = 34; b = 4.7;

c = 22.6; v = 79%; Spear = 13 mic.

MALE (Holotype)

L = 0.49; a = 35; b = 4.7;

c = 22.7; Spear = 14 mic.

Spicule = 17 mic.; Gubernaculum = 6 mic.

DESCRIPTION:

Body cylindrical, slender, tapering slightly from mid body to a flat head. When killed the "eel" worm assumed "J" shaped. The ventral arcuature is more in posterior third region of body. Lateral field originates in the region of procorpus assuming a maximum width of 1/3rd the corresponding body width at mid body and is marked by 4 incisures. The outer ones being slightly crenate.

Head low and massive flattened anteriorly, set off from the body by distinct depression and is marked by 3 labial annules. Lateral margins of cephalic sclerotization extends to about 2 annules into the body. Spear well developed made

up of 2 parts (total spear 13-14 microns), the anterior part measures about 8 microns in length with rounded basal knobs measuring 3 microns across.

Excretory pore located at 73 microns from anterior end and is located slightly posterior to oesophago-intestinal-junction. Hemizonid not seen. Nerve ring located at 53 microns from anterior end. Procorpus is a cylindrical tube measuring 28 microns in length and is 3 microns broad. Median oesophageal bulb measures 12 x 9 microns in dimension, and is provided with a powerful valve in the middle region. Isthmus short measures 12 microns in length distally forming overlapping lobe like oesophageal bulb which overhangs the intestine on the ventro-lateral side. Three distinct gland nuclei have been observed in the oesophago overlap.

Vulva depressed transverse slit. Vagina extending to a little less than one third of the corresponding body width into the body. Uteri with a muscular reniform region containing distally into the columellate region, the later bearing a distinct oval offset spermatheca filled with minute sperms. Oocytes mostly in single rows. Ovary single anteriorly outstretched. Post-uterine-sac a little over one vulvar body width in length without showing rudimentary posterior ovary. Tail elongate conoid with a subacute unstriated terminus measuring 2 anal body width in length and bears about 24 fine striations on ventral side.

MALE:

Slightly slender than the female. Head comparatively more higher than the females, otherwise resembles female in general

body morphology except gonads. Testis outstretched with spermatosites arranged in single row. Spicule arcuate measuring 17 microns and gubernaculum measuring 6 microns in length.

Paratypes: Female on Slide No. PN/Praty/1-2 deposited with Department of Zoology, University of Kashmir.

Holotype male and female: On slide No. PN/Praty/3 in author's collection.

HOST: Collected from the roots of Solanum tuberosum L.

LOCALITY: Narwara, Srinagar, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

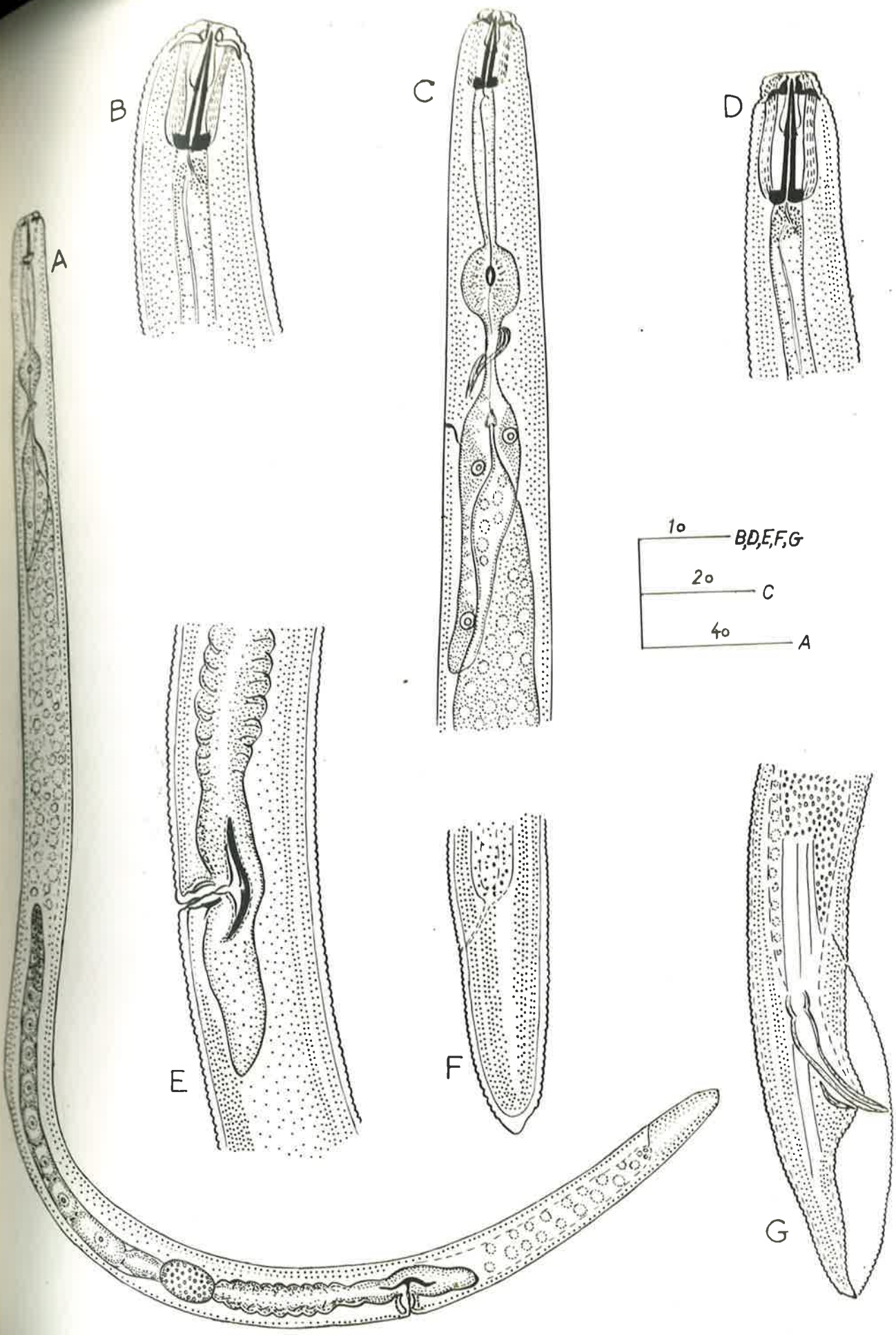
Pratylenchus tuberosum n.sp. is distinctive by having flat head with three annules, shorter spear with anteriorly cuped knobs, longer overlap, vulva about 80% and tail elongate conoid with subacute unstriated terminus. However, it comes close to P. vulnus Allen and Jensen (1951) from which it differs by the possession of shorter spear which is 13-14 microns long as against 16-19 microns in P. vulnus; opening of oesophagus into intestine i.e, oesophage-intestinal-junction in level or anterior to excretory pore; longer overlap and by the shorter post uterine sac.

In view of the above differences the present form is considered here to constitute a new species for which the name Pratylenchus tuberosum is proposed.

PLATE - VIII

PRATYLENCHUS TUBEROSUM SP. NOV.

- Fig. A : Entire female
B : Anterior end of female
C : Oesophageal region of female
D : Anterior end of male
E : Vulval region showing anterior gonad
F : Tail region of female
G : Tail region of male



PRATYLENCHUS EKRAMI SP. NOV.
(Plate IX, Fig. A-E)

11 females were recovered from the roots of Prunus amygdalus Batsch. from Badamwari, Hawal, Srinagar, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS:

<u>Paratypes</u>	L = 0.54 - 0.59 ^{mm.} ; a = 24-26; b = 4.9-5.7 c = 20.5 - 21.3; v = 76-77 %; Spear = 16-17 mic.
<u>Holotype</u>	L = 0.54 ^{mm.} ; a = 25; b = 4.9; c = 20.7; v = 77%; Spear = 16 mic. <i>found</i>

DESCRIPTION

"Eel worm" only slightly arcuate after being killed by hot water. Body is cylindrical, slightly tapering anteriorly to form a low flat head; while posteriorly behind the vulva the reduction in the body width is gradual to form the tail. Body annulation coarse. Each striae being 1.6 microns apart at mid body. Lateral field originating in the region of pro-corpus, assuming a maximum width of 1/3rd body width at mid body, and is marked by five to six incisures, one of which occasionally gets fused in the region of vulva.

Head low and massive off set from the body contour, bearing 2 unequal annules of which the anterior one is being larger. Head measures 8x 3 microns in dimension i.e. 1/2 of the body width at metacarpus. Labial sclerotization strongly developed with lateral margins extending to about 2 annules

into the body. Spear strongly developed measuring 16 microns in length with anterior portion measuring about 7 microns and the posterior being slightly longer measures 9 microns in length. Spear knobs massive anteriorly cuped measuring 5 microns across. Orifice of dorsal oesophageal gland located at 4 microns posterior to base of spear knobs. Vestibulum forming an inverted funnel like spear guide, extending upto 11 microns from anterior end. Procorpus cylindrical tube measuring 25 microns in length and is about 4 microns in width. Metacorpus located at 44 microns from anterior end, is oval in shape and measure 8 microns x 5 microns in dimension. Isthmus cylindrical tube 10 microns in length ending into overlapping^p oesophageal bulb which overhangs intestine ventro laterally. Oesophago-intestinal-junction located at about 4 microns anterior to excretory pore. Nerve ring located at 42 microns from anterior end and excretory pore located 12 microns posterior to nerve ring.

Vulva a depressed transverse slit. Vagina with fewly developed lips. Lateral vulval membrane absent. Uteri with a muscular part distally continuous with columellate region, the later having at its distal end an oval rounded contineous spermatheca filled with sperms. Gonads single, anteriorly outstretched. Oovocytes mostly arranged in single row. Post-uterine branch small, undifferentiated measuring less than one vulval body width in length. Tail elongate cylindrical measuring slightly more than two anal body widths in length, bearing 17 annules on its ventral side. Tail tip smooth, and

sub acute. Phasmid located slightly anteriorly to middle of tail. Lateral field in tail areolated and continuing upto tail terminus.

MALES: not found.

PARATYPE: ON slide No. PN/Praty/5-6 deposited with the Department of Zoology, University of Kashmir.

HOLOTYPE: On Slide No. PN/Praty/7 in author's collection.

HOST: Collected from the roots of Prunus amygdalus Batsch.

LOCALITY: Badamwari, Hawal, Srinagar, Kashmir.

DIAGNOSIS AND RELATIONSHIP

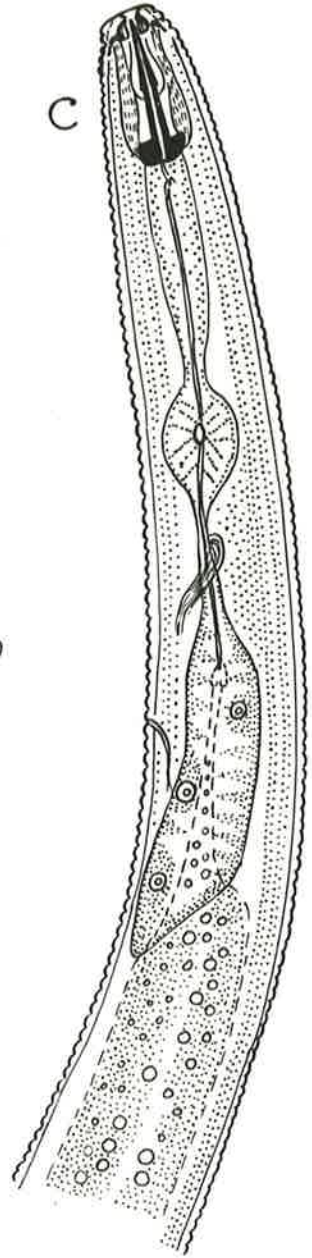
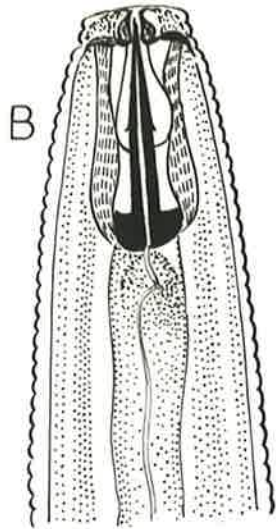
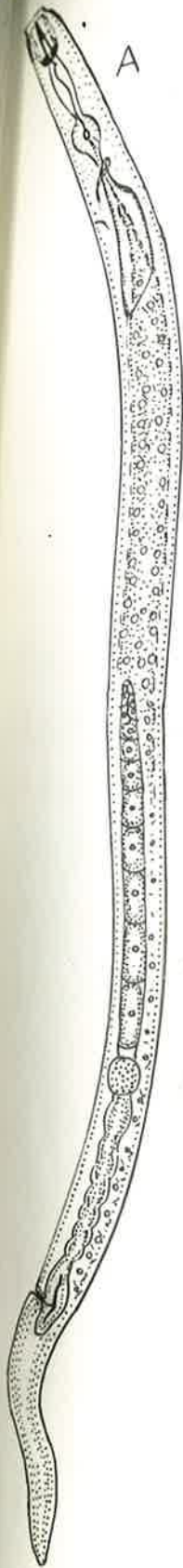
Pratylenchus ekrami sp.nov. is distinctive by having flat head which is off set from the body contour, bearing two unequal annules of which the anterior one is larger, lateral field with 5-6 incisures one of which gets fused in region of vulva and tail tip smooth and sub acute. However, it comes close to P. loosi Loof, 1960 from which it differs by having a robust body (a = 24-26) coarse body striations, anteriorly located vulva and by the presence of shorter tail.

In view of the above differences the present form is considered here to constitute a new species for which the name Pratylenchus ekrami is proposed.

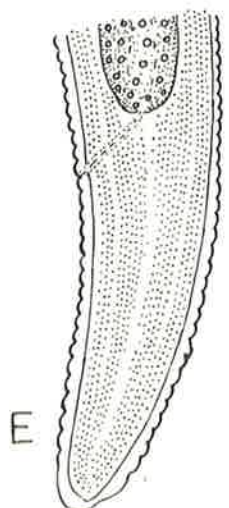
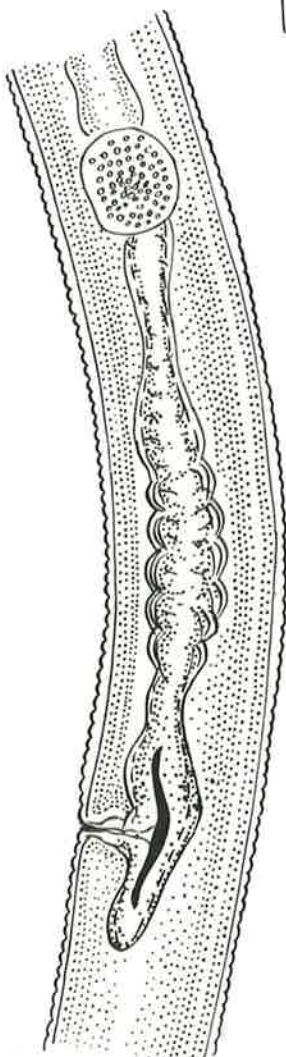
PLATE - IX

PRATYLENCHUS EKRAMI

- Fig. A : Entire female
B : Anterior end of female
C : Oesophageal region of female
D : Vulval region of female showing
anterior gonad
E : Tail region of female



10μ	B, E
20μ	C, D
50μ	A



D

E

SUB-FAMILY: HIRSCHMANNIELLINAE NEW SUB-FAMILY

DIAGNOSIS: Pratylenchidae. Small cylindrical or large vermiform nematodes, the body length reaches upto the maximum of 4.2 mm. Head flattened hemispherical or sometimes conical but always flattened anteriorly. Cephalic sclerotization conspicuous. Lateral field with incisures. Stylet strong with well developed basal knobs. Oesophageal gland either in the form of a sub-cylindrical compact bulb with dorsal gland extending a short distance over anterior end of intestine or the gland surrounding anterior end of intestine, and extending posteriorly as long lobe on ventral side, or even there is an elongated ventral gland lobe. Ovaries amphidelphic outstretched. Female tail short cylindrical or elongated conoid with a rounded smooth terminus or with a pointed mucro-respectively. Phasmid either in middle of tail or in posterior 3rd of tail. Male tail is sub-terminal or terminal bursa.

TYPE GENUS: HIRSCHMANNIELLA Luc & Goodey, 1963.

FAMILY : DOLICHODORIDAE (Chitwood and Chitwood, 1950) Skarbilovich, 1959.

DIAGNOSIS (emended) : Hoplolaimoidea. Moderately to large vermiform nematodes without sexual dimorphism. Head lobed or unlobed with moderately developed to heavily developed sclerotization. Head likely or completely set off from the body. Body cuticle, distinctly transversally striated, sometimes longitudinal striations also present. Lateral field present.

Spear moderately or strongly developed with prominent basal knobs. Deirids may be absent. Ovaries amphidelphic outstretched. Female tail elongate attenuated or rounded to conical pointed. Bursa enveloping tail, wither notched at the tip or trilobed.

TYPE SUB-FAMILY : DOLICHODORINAE Chitwood & Chitwood, 1950.

SUB-FAMILY : DOLICHORHYNCHINAE NEW SUB-FAMILY

DIAGNOSIS: Dolichodoridae. Body less than 1 mm length marked with fine transverse and longitudinal striations, crossing each other to form small squares. Head bilobed set off from the body. Labial frame work moderately sclerotized. Spear 15-17 microns in length, with small posteriorly directed knobs. Metonchium and telonchium almost equal in length. Oesophagus typical of Tylenchoid with set off bulb and conoid and sometimes bilobed cardia. Gonads amphidelphic outstretched. Tail elongate conoid, annulated except the tail tip region. Phasmid near middle of tail. Male tail completely enveloped by bursa which has a characteristic notch, leaving the hind part of the tail uncovered.

TYPE AND ONLY GENUS DOLICHORHYNCHUS Mulk & Jairajpuri, 1974

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FAMILY : TYLENCHORHYNCHIDAE (Eliava, 1964)
Golden, 1971

DIAGNOSIS (emended): Hoplolaimoidea. Medium sized vermiform nematodes. Body length not going beyond 1.5 mm, without sexual dimorphism. Head elevated or sometimes provided with a conspicuous disc. Lip region continuous with body, slightly to distinctly off set flattened anteriorly without striations. Cephalic frame work weak to moderately developed. Body cuticle finely to coarsely striated with or without longitudinal striae. Lateral field plain or aerolated with 3-6 lines. Stylet well developed moderately long with or without basal knobs. Deirids inconspicuous or invisible. Phasmid distinct located middle to posterior 3rd of tail. Oesophageal gland enclosed in a distinct basal bulb often with cardia. Female tail cylindrical, conoid, usually with rounded, swollen or tapering to a pointed terminus. Bursa not lobed, enveloping tail or not enclosing the entire male tail.

TYPE SUB-FAMILY: TYLENCHORHYNCHINAE Eliava, 1964.

SUB-FAMILY : TYLENCHORHYNCHINAE Eliava, 1964.

DIAGNOSIS (emended): Tylenchorhynchidae. Median sized vermiform nematodes. Lip region continuous or set off with moderately sclerotized cephalic frame work. Sometimes there is a conspicuous labial disc present. Head with or without striation. Spear moderate to long with prominent knobs. Lateral field with 3-5 incisures. Deirids present. Phasmids prominent. Female

Gonad amphidelphic outstretched 'O' tail verifying from conoid to cylindroid, blunty rounded with rounded or sub-acute terminus. Spicules ventrally arcuate, distal portion pointed and ventrally flanged. Gubernaculum large protrusible through cloaca. Bursa well developed enveloping the entire male tail.

TYPE GENUS TYLENCHORHYNCHUS Cobb, 1913

KEY TO GENERA OF TYLENCHORHYNCHINAE

- 1. Lip region with a conspicuous labial disc
 Saurtylenchus Sher, 1974.
 Lip region without conspicuous labial disc.....2
- 2. Lateral field areolated with three incisures.....
 Uliginotylenchus Siddiqi, 1971.
 Lateral field not areolated with more than three incisures
3
- 3. Lateral field with four incisures, body only slightly
 curved..... Tylenchorhynchus Cobb, 1913
 Lateral field with five incisures, female body strongly
 curved..... Quinsulcius Siddiqi, 1971

TYLENCHORHYNCHUS ORIENTALIS SP. NOV.

(Plate X, Fig. A-E)

Measurement:

9 females and 5 males were recovered from soil around roots of *Lycopersicon esculantum* Miller, Safapur, Kashmir. These are considered hereinto constitute new species.

MEASUREMENT:

Female (8 paratypes) L = 0.70 -0.77 mm; a = 30.2 -32.3; c = 14-17; v = 53-56%;Spear =20-21 mic.

Female (Holotype) L = 0.72 mm; a = 31.3; b= 5.2; c =16; v = 55% Spear = 20 mic.

Male (Allotype) L = 0.71; a = 30; b = 4.9; c =13; Spear = 21 mic. Spicule = 23 mic. Gubernaculum = 12 mic.

DESCRIPTION:

"Eel worm" assumes almost a stright shape when killed by hot water. Body tapering regularly anterior to vulva, especially from neck base rather sharply to a cap like head, which is about 1/3rd of body at neck base. Body cuticle strongly striated, each striae measuring 1.9 microns at mid body region. Lateral field arising from base of spear and is completely interrupted by body striations, occupying a maximum width of 1/3 rd of body at mid body region and is areolated in the greater part of body. Head set off cap like, rounded without annules measuring 7x 4 microns in dimension. Labial sclerolization weakly developed. Vestibulum funnel

like with a distinct depression at about middle of its length and extends upto about 13 microns from anterior end i.e., 7 annules into body. Spear measuring 20 microns in length; anterior part very slender and fine measuring 12 microns in length, while the posterior part measures 8 microns in length and is provided with posteriorly sloping knobs measuring 3 microns across. Opening of dorsal oesophageal gland located at 2 microns behindⁿ spear knobs. Procorpus cylindrical tube measuring 24 microns in length, having a maximum width of 5 microns. Metacarpus oval rounded, measuring 94 x 6 microns in dimension, and is provided with strongly developed musculature and thickened cuticularized valve. Isthmus long and exceedingly narrow tube measuring 18 microns in length, terminating upto a pyriform elongate bulb lodging three gland nuclei. Nerve ring located at 53 microns from gland nuclei. Excretory pore located 11 microns posterior to nerve ring i.e., in level with neck of basal bulb. Hemizonid clear, anteriorly adjacent to excretory pore and extends to 3 body annules. Cardia conoid rounded.

Vulva a transverse slit. Vagina at right angles to body axis extending to about half of body width across. Uteri with a muscular region, the later having a rounded continuous empty spermetheca. Gonads didelphic; ovary anteriorly outstretched; oocytes arranged in single row. Tail sub-cylindrical, bluntly pointed with smooth terminus measuring $3\frac{1}{2}$ times anal body width in length, bearing about 22 annules on its ventral side which are deeply grooved. Phasmid located at about 1 anal width from anus. Rectum measuring less than

1 anal body width.

MALE:

Similar to female in general body structure. Head set off not annulated. Labial sclerotization more developed than female. Head measuring 7 x 4 microns in dimension. Spear measuring 21 microns in length. Anterior part fine as in female. Basal knobs small rounded, slightly posteriorly directed. Metacarpus and Basal bulb similar to female. Testes single anteriorly outstretched, spermatocytes arranged in multiple rows. Spicula strong ventrally arcuate. Gubernaculum rod shaped with prominent halves slightly curved upwards. Phasmid located slightly anterior to middle of tail. Bursa deeply crenate arising about 2 spicular length anterior to spicule and overlapping the entire tail.

Holotype: Female on Slide No. PN/Tyl/A in author's collection

Paratypes: Female on Slide No. PN/Tyl/B-C deposited with the Department of Zoology, University of Kashmir.

Male (Allotype): On Slide No. PN/Tyl/D in authors' collection.

HOST: Collected from soil round roots of Lycopersicon esculentum Miller.

LOCALITY: Safapur, Kashmir.

DIAGNOSIS AND RELATIONSHIP: Tylenchorhynchus orientalis n.sp.

with above general characters and measurements, comes close to T. nudus Allen, 1955, from which it differs by having a smooth lip region which is set off from the body, position of excretory pore and the shape of the female tail. (lip region

contineous with two annules, excretory pore mid way between median oesophageal bulb and posterior oesophageal bulb and tail clavate and bluntly rounded in T. nudus).

In view of the above differences the present form is considered to constitute a new species for which the name Tylenchorhynchus orientalis is proposed.

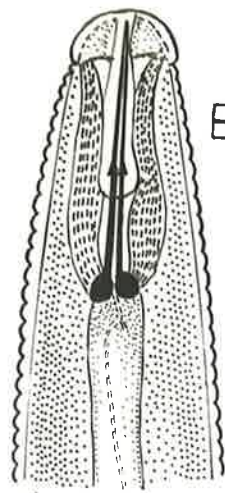
PLATE - X

TYLENCHORHYNCHUS ORIENTALIS SP. NOV.

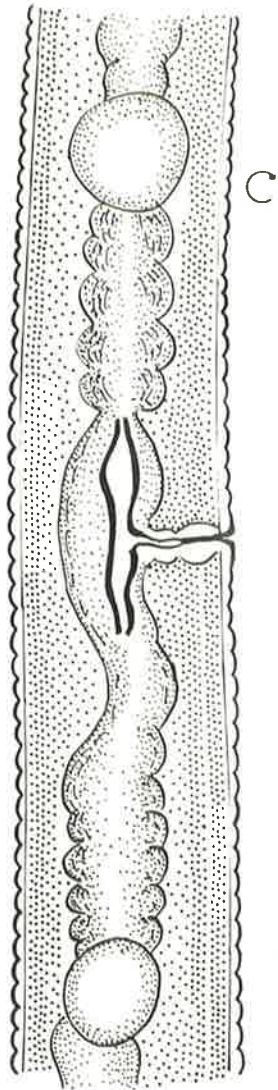
- Fig. A : Oesophageal region of female
B : Anterior end of male
C : Vulval region showing didelphic gonad
D : Tail region of female
E : Tail region of male



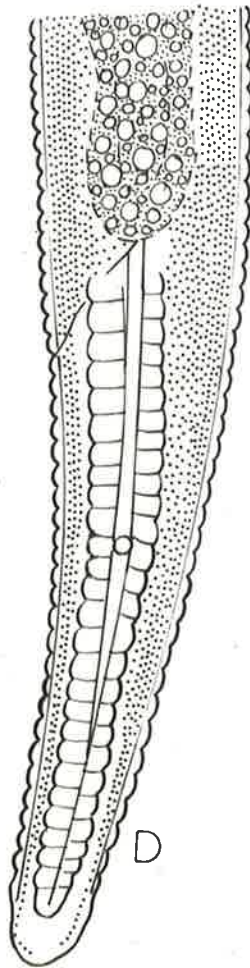
A



B



C



D



E

20 μ A,C,E
20 μ B,D

SUB-FAMILY MERLININAE SIDDIQI, 1971

DIAGNOSIS (emended) Tylenchorhynchidae. Lateral fields with six incisures. Deirids usually present; Phasmids prominent. Ovaries paired, outstretched. Female tail sub-cylindroid to rounded terminus, lacking abnormally thickened cuticle. Spicules rather cylindroid, with distal end broadly rounded, notched and devoid of ventral flanges; gubernaculum small, not protrusible through cloaca; bursa is present but is moderately developed which is enveloping the tail.

SUB-FAMILY LEIPOTYLENCHINAE Sher, 1973

DIAGNOSIS (emended) Tylenchorhynchidae. Vermiform nematode moderately long. Body cuticle annulated. Lip region not set off, striated, flattened anteriorly with weakly developed cephalic frame work. Amphid apertures rounded located in the lateral lips. Stylet moderately developed with or without knobs. Deirids present, lateral field with 3-4 incisures. Basal oesophageal bulb enclosing the oesophageal glands. Oesophageal intestinal valve large. Female gonad amphidelphic, outstretched. Female tail tapering elongate conoid. Male tail similar to female. Caudal alae adanal. Phasmid located on tail.

SUPER FAMILY: NEOTYLENCHOIDEA (Thorne, 1941) Jairajpuri
&
Siddiqi, 1969.

DIAGNOSIS (emended): Tylenchina. Body of mature female either strongly swollen, sac like (Sphaerulariidae) or vermiform nematodes, sometimes extremely slender forms. Sometimes there is a strong sexual dimorphism in the head shape, in females the head may be spherical where as in males dorsoventrally flattened and ventrally curved. Cephalic frame work commonly with six or eight sectors. Cephalic frame work without conspicuous sclerotization. Oesophagus without distinct and differentiated median bulb lacking a valve; the fusiform metacarpus swollen sometimes present where the subventral glands open. Isthmus differentiated. Posterior bulb pyriform lobe like, surrounding the anterior part of intestine or extending in the form of long lobes. Basal bulb can also be set off from the intestine with a distinct Cardia. Female Gonad single. Post-uterine-branch present or absent. Bursa in male varying in form, adanal or reaching to tail tip. Phasmids not visible. Sometimes spicules have a thin caudal process (Itonchidae).

Associates or parasites of plants or insects, rarely of any other invertebrates.

TYPE FAMILY : NEOTYLENCHIDAE Thorne, 1941.

KEY TO FAMILIES OF NEOTYLENCHOIDEA

- 1. Body of mature females strongly swollen, sac like; parasites in insects..... Sphaerulariidae Lubbock, 1861
 Body of females never so swollen; free living.....2
- 2. Head marked by sexual dimorphism, that of females spherical, and of males dorsoventrally flattened and ventrally curved; spicule with thin caudal process
 Iotonchidae Goodey, 1953
 Head not showing sexual dimorphism. Spicule without caudal process.....3
- 3. Terminal bulb asymmetrical, dorsally elongate; or oesophageal gland lying free in coelom.....4
 Terminal bulb regular, symmetrical, if lobed elongate ventrally.....5
- 4. Body extremely slender (a = 70 to 100); bursa very short but protrudable.....
 Ecphyadophoridae Skarbilovich, 1959
 Body never so slender (a = 40 or less); bursa of other type Neotylenchidae Thorne, 1941
- 5. Proximal bulb penetrating by an extension into lumen of gutPaurodontidae Thorne, 1941
 Proximal bulb rounded, without extension.....
 Nethotylenchidae Thorne, 1941

FAMILY : NOTHOTYLENCHIDAE Thorne, 1941

DIAGNOSIS (emended): Neotylenchoidea. Body in most of the cases vermiform, sometimes swollen with highly developed gonads. Body striations fine to coarse. Lip region low, flat not set off, striated. Head with six lips, sclerotization weak. Spear small to moderately developed with small rounded knobs. Lateral field present with four to six incisures. Basal oesophageal bulb enclosing the oesophageal glands with distinct cardia, or the bulb overlaps the intestine. Cardia absent. Female gonads single, outstretched. Tail in both the sexes either elongate-conoid, cylindrical or filiform. Bursa not enclosing the tail tip. Gubernaculum generally present, except in Nothanguinae.

TYPES SUB-FAMILY: NOTHOTYLENCHINAE Thorne, 1941

REVISED KEY TO SUB-FAMILIES OF NOTHOTYLENCHIDAE

- 1. Oocytes arranged around the rachis, body somewhat swollen, gubernaculum absent; causing galls on leaves, stems and flowers.....Nothanguinae n.sub.fam.
- Oocytes not arranged around the rachis, body vermiform.
- Parasitic or forming galls.....2
- 2. Amphids slit like, conspicuous, spear knobs flanged.....
- Boleodorinae Khan, 1964
- Amphids minute, inconspicuous, Spear knobs rounded
- Nothotylenchinae Thorne, 1941.

SUB-FAMILY : NOTHOTYLENCHINAE

DIAGNOSIS (emended): Nothotylenchidae. Slender vermiform nematode. Body slightly stouter in Dorsalla. Body cuticle transversally striated, striae generally fine but abnormally ~~thick~~ thick in Thada, Where longitudinal striations are also present. Lip region continuous with truncate contour, bearing striations. Lip region with six sectors and six lips. Spear short, stout with rounded basal knobs. Oesophagus with a fusiform valveless swelling anterior to middle of oesophagus. Basal oesophageal bulb pyriform or overlapping^p the anterior part of intestine. Cardia present or absent. Excretory duct and pore fairly cuticularised. Ovary prodephic^p outstretched. Oocytes in single or multiple rows. Post uterine sac present or absent spicule and gubernaculum tylenchoid.

TYPE GENUS: NOTHOTYLENCHUS Thorne, 1941.

REVISED KEY^{TO} GENERA OF SUB-FAMILY NOTHOTYLENCHINAE

1. Body with a peculiar dorsally arcuate; posture, oocytes, in multiple rows, post uterine sac absent.....
 Dorsalla Jairajpuri, 1966
 Body without peculiar dorsally arcuate posture, oocytes not in multiple rows, post uterine sac absent..
 2
2. Basal oesophageal bulb overlapping^p intestine cardia absent.....Nothotylenchoides N.Gen.

Basal oesophageal bulb pyriform not overlapping
intestine Cardia present.....3

3. Body cuticle thick with deep transverse and longitu-
dinal striation.....Thada Thorne, 1941

Body cuticle not thick with fine transverse striations,
longitudinal striations absent.....4

4. Female tail extremely long; with males having extremely
short bursa..... Sakia, Khan, 1964

Female tail ~~not~~ not extremely long with males having
comparatively larger bursa.....
..... Nothotylenchus Thorne, 1941.

NOTHOTYLENCHOIDES GEN. NOV.

DIAGNOSIS: Nothotylenchinae. Body slender cylindrical, less than 1 mm in length, curving slightly on the ventral side. Body cuticle finely striated interrupted by lateral field having six incisures in two refractive bands. Head continuous striated, with six lips. Spear slender with only slight thickening at base. Dorsal oesophageal gland close to spear base. Procorpus cylindrical continuing with a fusiform valveless structure which is almost of the same width as that of the procorpus, and is not differentiated on either sides. Isthmus long ending into overlapping^b oesophageal bulb. Renette cell distinct. Cardia absent. Intestinal lumen distinct. Gonads single, anteriorly outstretched. Oocytes mostly in double rows. Post uterine sac more than one vulval-body-width in length, gradually narrowing behind vulva upto posterior half of tail, thereafter abruptly ending into subacute terminus. Male similar to female. Bursa sub caudal.

Type and only species Nothotylenchoides fotedari n.sp.

NOTHOTYLENCHOIDES FOTEDARI GEN. ET SP. NOV.

(Plate XI, Fig. A-E)

9 females and 3 males were recovered from soil around roots of *Solanum tuberosum* L. from Baramulla, Kashmir. On examination these were found to be distinct and were

placed in a new genus for which the name Nothotylenchoides is proposed.

MEASUREMENT:

Female (8 paratypes) L = 0.65 -0.74 mm;
 a = 34.1 - 37.4; b = 5.4-
 7.2; c = 9.2 - 12.5
 v = 79-82 % Spear = 7-8 mic.

Female (Holotype) L = 0.66; a = 37; b = 5.7
 c = 12.1; v = 82% Spear = 7 mic.

Male (Allotype) L = 0.71 mm; a = 37.3; b = 6.7
 c = 9.5; spear = 8 mic.;
 Spicule = 22 mic.

DESCRIPTION:

Body slender cylindrical, tapering gradually anterior to vulva ending with a ^δcutaneous broadly rounded head which measures about 1/3 rd of body width at base of oesophagus. Lateral field originating in the anterior half of procorpus, gradually broaden in the middle of body and assumes a maximum width of 1/3rd of body and contains six refractive incisures in two bands. Deirids not seen. Head with slightly coverging lateral margins measuring 3 x6 microns in dimension and bearing 3 annules. Labial sclerotization weak. Vestibulum fine funnel, like, structure forming the spear guide and extending upto 4 microns from anterior end. Spear weakly developed measuring 7 microns in length with anterior part measuring about 3 microns in length and is

provided with faint flange like thickenings at its base. Opening of dorsal oesophageal gland located at 2 microns behind spear base. Procorpus a cylindrical tube measuring 35 microns in length and having a maximum width of 3 microns continuing distally into a fusiform cylindrical valveless structure which measures about 16 x 5 microns in dimension. Isthmus slightly narrower than the fusiform valveless structure and measures 22 microns in length which expands at its base into abutting bulb surrounding the intestine on the dorsal and lateral sides. Oesophago-intestinal-juention distinct located in the anterior region of the bulb. Nerve ring located at 66 microns from the anterior end. Excretory pore located 24 microns below the nerve ring i.e., almost in level with the middle of basal bulb. Excretory duct fairly cuticularized, convoluted, terminating into an oval renette cell located at the base of the oesophageal bulb. Hemizonid anteriorly adjacent to excretory pore and extends upto 2 body annules. Cardia absent. Two gland nuclei observed in the oesophageal bulb. Intestine lumen broad and distinct.

Vulva a transverse slit. Vagina at right angles to body axis, extending upto about 1/3rd of vulval-body-width into body. Post-uterine sac measures more than one vulval-body-width in length. Uterus with a muscular part distally having columellate region, the later having an elongate spermatheca. Ovary single anteriorly outstretched. Ovocytes mostly in double rows. Tail gradually narrowing till its posterior 3rd region, thereafter narrowing abruptly

and ends into subacute pointed terminus. Striations on tail region distinct and uniform. Tail measures about slightly less than five anal-body-diameters in length.

MALE:

Similar to female in body morphology. Body annulated. Head continuous slightly more elevated than female measuring 6 x 3 microns in dimension. Spear measuring 8 microns in length. Oesophagus typical as that of female. Testis single anteriorly outstretched. Spermatocytes mostly in multiple rows. Lateral field with six incisures; four of which expand and end in spicular region, while only two extend posterior to spicule. Spicules measuring 22 microns in length. (along the median curved line) Gubernaculum simple, trough like measuring 5 microns in length. Bursa crenate arising slightly anterior to spicular head and extends posteriorly to about 2 spicular lengths behind cloaca. Tail similar to female.

Female (Paratypes) On Slide No. PN/NOTH/1-3 deposited with the Department of Zoology, University of Kashmir.

Female (Holotype) On Slide No. PN/NOTH/4 in authors collection.

Male (Allotype) On slide No. PN/NOTH/5 in author's collection.

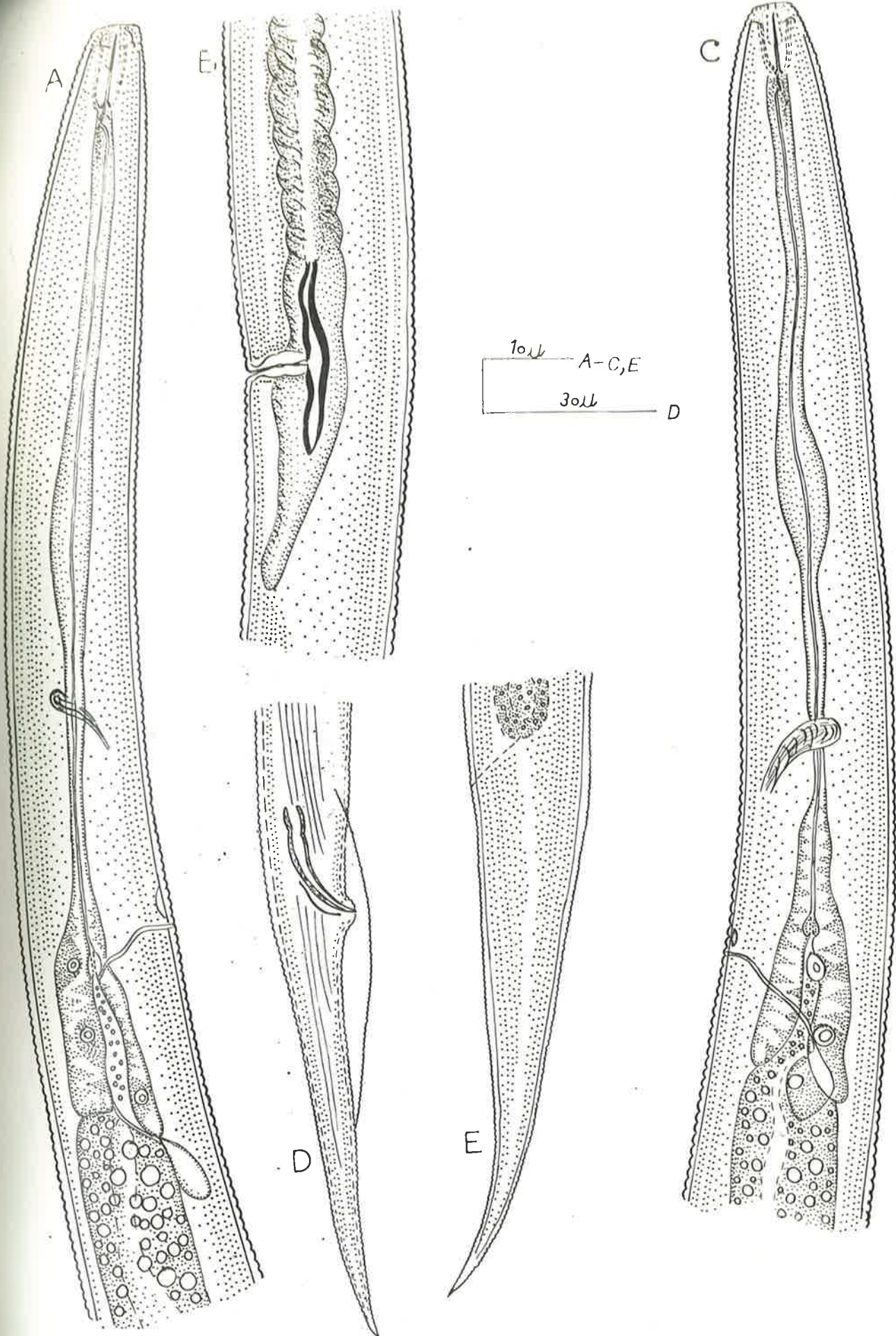
HOST: Collected from soil around roots of Solanum tuberosum L.

LOCALITY: Baramulla, Kashmir.

PLATE - XI

NOTHOTYLENDHOIDES FOTEDARI N.GEN; N.SP.

- Fig. A : Oesophageal region of male
B : Vulval region showing pore uterine sae
C : Oesophageal region of female
D : Tail region of male
E : Rail region of female



SUB-FAMILY : NOTHANGUININAE NEW SUB-FAMILY

DIAGNOSIS: Body in both sexes somewhat swollen. Cuticle with fine transverse striation. Lateral field with incisures. Head low and flat continuous with the body. Spear small with well developed rounded knobs. Procorpus cylindrical slightly swollen posteriorly to form the fusiform metacarpus without valve. Isthmus crossed by nerve ring. Terminal bulb swollen sometimes irregularly. Ovary prodelphic, anteriorly with one or two flexures. Spermatheca absent. Oocytes in multiple rows arranged round the rachis. Both ovary and testes with a cap cell. Vulva posterior. Post-vulval-sac present. Spicule elaborate. Gubernaculum absent.

^PTYPE AND ONLY GENUS: NOTHANGUINA Whitehead, 1959.

SUB-FAMILY: BOLEODORINAE Khan, 1964.

DIAGNOSIS: Body very cylindrical, ventrally arcuate with single or double spiral. Body cuticle marked by transverse striations. Lateral field interrupted by incisures with 4-6 lines. Lip region elevated, conical with truncate contour not striated. Amphid located outside the sub-lateral lips with opening through oblique slits. Dorsal oesophageal gland opening either at base of spear or half to three fourth of spear length posterior to spear base. Spear small weakly developed, flanged at base. Oesophagus having the fusiform valveless metacarpus, swelling either

anterior to the middle or posterior to the middle of oesophagus. Basal oesophageal bulb pyriform, set off with distinct cardia. Ovary prodelphic anteriorly outstretched. Post-uterine sac small rudimentary. Oocytes in more than 2 rows. Testes single anteriorly outset retracted. Tails in both sexes either elongate-clacae, or conical strongly ventrally curved. Spicules tylenchoid. Gubernaculum simple, trough like. Bursa weakly developed not covering the entire male tail.

GENUS : BOLEODORUS Thorne, 1941

PREVIOUS WORK

The genus Boleodorus was proposed by Thorne, 1941 to contain two species i.e., B.thylactus and B.clavicaudatus. After 1963 several species were described in the genus. Incidentally the majority of them were reported by workers from India. Important contribution to the species of this group has been made by Khan & Basir, 1963, Siddiqi, 1963, Khan, 1964; Hussain and Khan (1965, 1967) Lima and Siddiqi, 1963.

The genus Boleodoroides was described by Mathur, Khan and Prasad (1966) and was mainly differentiated from genus Boleodorus by the location of median oesophageal bulb and tail shape. The species B.clavicaudatus Thorne, 1941 was also transferred to this genus. Thorne approved of this change. Gerraert 1971 compared all the eleven species in the genus Boleodorus and two of Boleodoroides, in the light of his

study of large population of nematods of these genera collected from Belgium, Iran and U.S.A. He also made evaluation of the various characters used for distinguishing the nominal species. He shifted B. clavicaudatus back to genus Boledorus and considered B. hyderi, B. similis as synonyms of B. thylactus. He recognised only genus Boleodorus to be the member of sub-family Boleodorinae Khan, 1964.

Discussing the relationship of genus Boleodorus and sub-family Boleodorinae, Gerraert pointed out these have several characters in common with the genera of sub-family Psilenchinae Paramonov, 1967 and simultaneously remarked that unfortunately wide gap has been created by the proposition of super family Neotylenchoidea by Jairajpuri and Siddiqi, 1969 under which they accommodated the sub-family Boleodorinae as being member of family Nothotylenchinae. According to him it should be better to withdraw Boleodorinae from Neotylenchidae Khan, 1949 (or Neotylenchoidea Jairajpuri and Siddiqi, 1969) and place it next to Psilenchinae under the family Tylenchidae.

The present author however, thinks that the action of Gerraert is ^a little hasty and Premature and it would be better for the time ^{being} to maintain the statusquo as proposed by Jairajpuri and Siddiqi till more forms are described to fill the gap.

BOLEODORUS SESHADRI SP. NOV.

(Plate XII, Fig. A-E)

11 females and 3 males were recovered from soil around roots of *Glycine max* (L) Miller from Aru, Kashmir. These are considered here in to constitute new species.

MEASUREMENTS:

Female: (10 paratypes) L = 0.41 -0.51; a = 28.2-29.4
c = 4.2 -4.9; c = 6.0 -8.1;
v = 67-68%; Spear = 12-13 mic.

Female (Holotype) L = 0.47; a = 29.3; b = 4.7;
c = 7.5; v = 68%; Spear = 12 mic.

MALE (Allotype) L = 0.45; a = 28.1; b = 4.1;
c = 9.1; Spicule = 17 mic.
Gubernaculum = 5 mic.

DESCRIPTION:

The 'Eelworm' when killed by hot water assumes an open-c-chape. Body tapering at either ends anteriorly from neck base to a conoid head, while posteriorly behind vulva to arcuate tail with a rounded terminus. Body cuticle finely striated each striae measuring about 0.7 microns apart at mid body (.07 - 1 micron in paratypes). Lateral field arising in the region of anterior half of procorpus, assuming a maximum width of about 1/4th of body width at mid body, having 4 refractive incisures in two bands. Head conoid, with distinctly converging lateral sides ending with

a flat slightly depressed contour; lip region continues with body not striated; labial sclerotization weak. Lateral margins not distinct. Vestibulum forming a small inverted funnel shaped spear guide extending about 4 microns from head end. Spear slender measuring 12 microns in length its anterior region measuring 5 microns in length where as the posterior part measures 7 microns in length, and is distally provided with inverted Y shaped with thickened arms. Opening of dorsal oesophageal gland located at about 3 microns behind spear base. Procorpus cylindrical tube measuring 28 microns in length having a maximum width of about 4 microns, distally continuing with a fusiform valveless spindle shaped swelling slightly wider than procorpus. Isthmus slightly set off from the anterior fusiform structure and measures about 25 microns in length, ending distally into a cylindrical basal oesophageal bulb the later measuring about 22 microns and assuming maximum width of 10 microns which has two gland nuclei. Nerve ring located at about middle of Isthmus; excretory pore located 11 microns behind nerve ring. Excretory duct fairly cuticularized, convoluted, ending into a renette cell located behind the cardia. Hemizonid not seen. Basal bulb and part of Isthmus enclosed in a clear area.

Vulva transverse slit with lateral vulval membrane. Vagina at right angles to body axis extending across 1/3rd of body. Post uterine sac small less than one vulval body in length. Uteri with a muscular part

continuing distally into a columellate region, the latter with a set off oval spermatheca filled with minute sperms. Ovary single short anteriorly outstretched with oocytes in multiple rows. Tail dorsally curved elongate ending to a rounded terminus. The tail measures about $5\frac{1}{2}$ times the anal body width and is striated uniformly till the tip. Phasmid located about one anal-body-width behind anus.

MALE:

Body shape smaller to that of female. Head more elevated and broad measuring 5 x 5 microns in dimension. Amphid broad over rounded slit measuring 2 microns across. Spear 10 microns in length having an inverted Y shaped base. Procorpus and fusiform valveless structure typical of female. Basal bulb more elongate and cylindrical with a slightly overlapping base. Carida small conoid rounded. Excretory pore and nerve ring almost same as in female. Testes single anteriorly outstretched. Spermatocytes in multiple rows. Spicules tylenchoid measuring 17 microns in length (across the median curved line) Gubernaculum trough shaped measuring about 5 microns in length. Spicular lips raised and prominent. Tail dorsally convex about 5 times cloaca body diameter in length and is striated uniformly till the tip. Bursa adanal arising slightly anterior to head of the spicule and extending to about 1 spicular length behind the cloaca.

Paratypes: Female on slide No. PN/BOL/1-2 deposited with the Department of Zoology, University of Kashmir.

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Holotype Female on Slide No. PN/BOL/3 in author's collection.

Holotype Male on Slide No. PN/BOL/4 in Author's collection.

HOST: Collected from soil around roots of Glycine max(L) Miller.

LOCALITY: Aru, Pahalgam, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

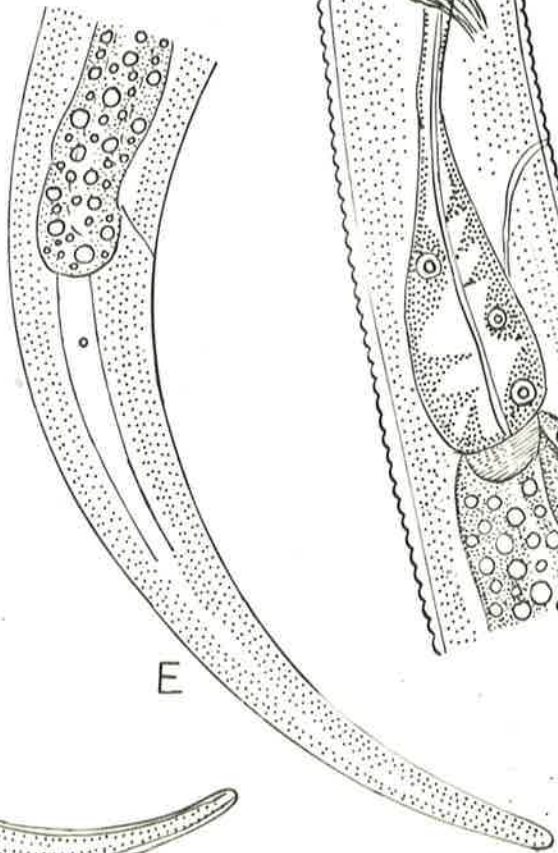
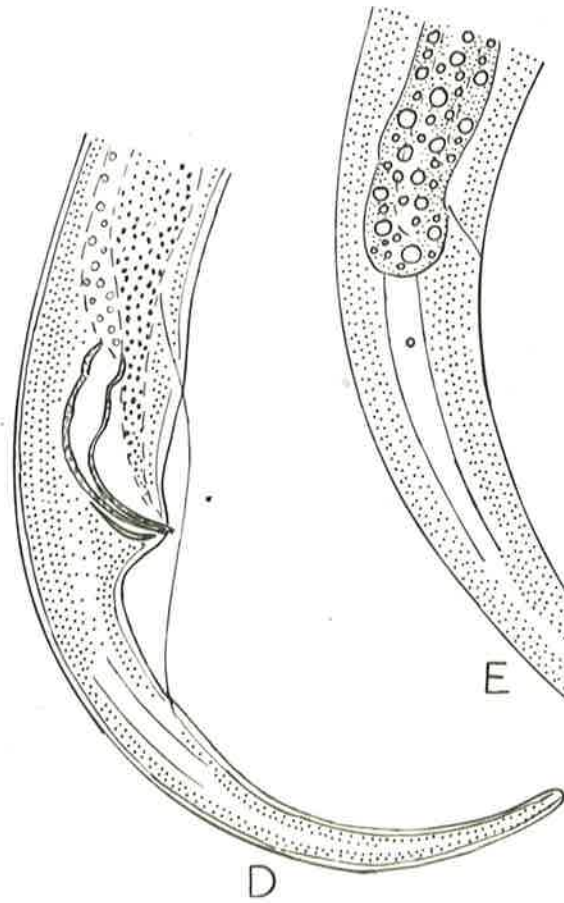
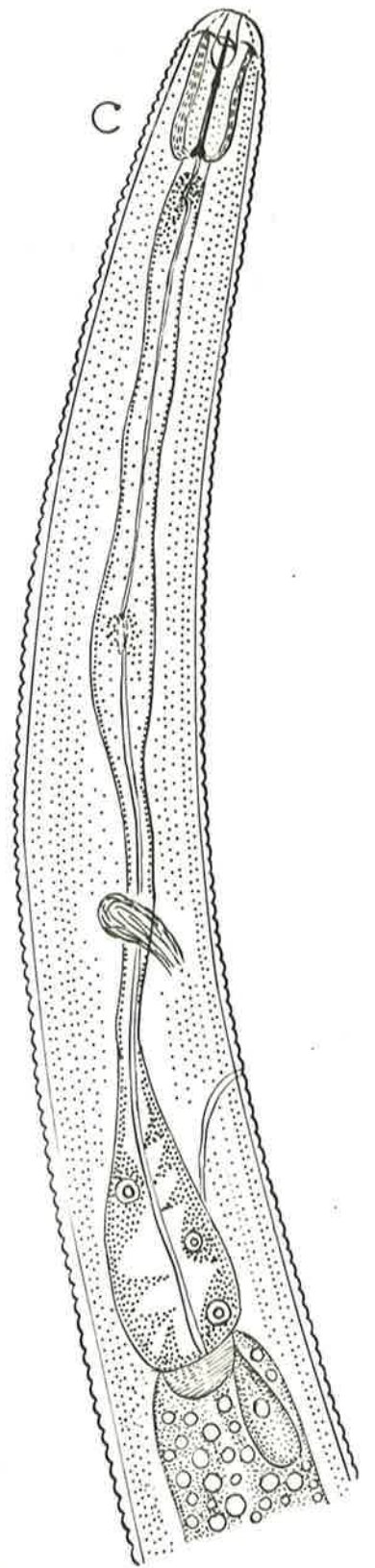
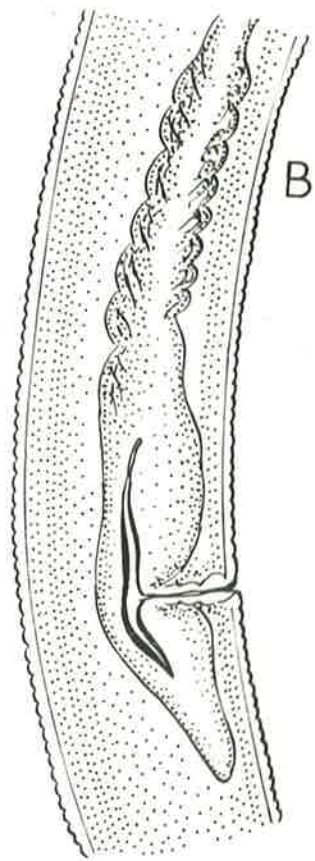
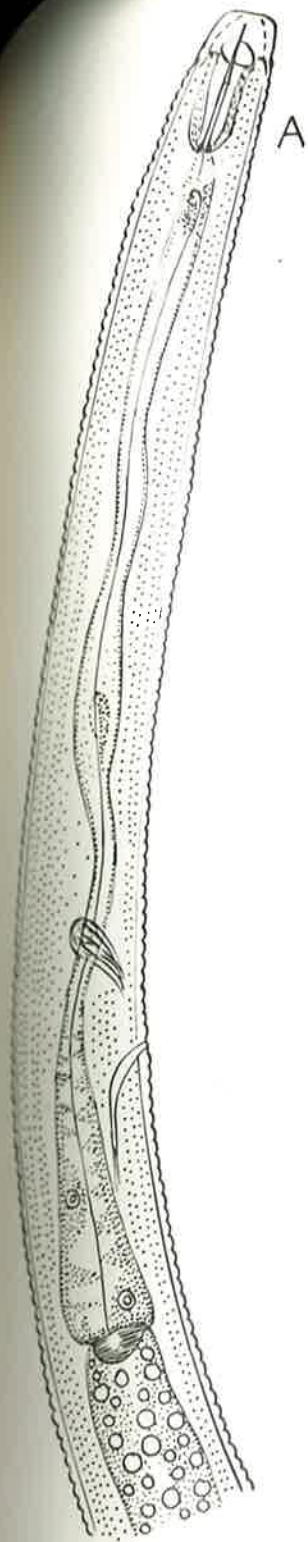
Boleodorus seshadri sp.nov. is distinctive from all the nominal species of genus Boleodorus by the inverted Y shape spear base. However, ~~the~~ with regards to general body morphology comes close to B.teres Nanjappa and Khan, 1970 but differs from the same by finer body striations, closely located opening of dorsal oesophageal gland, longer post-uterine sac and shape of the spermatheca. (Body striations 1.5 microns wide, opening of dorsal oesophageal gland located at 5 microns from spear base, post~~u~~terine sac 2/3rd body width and spermatheca rounded in B.teres).

In view of the above differences the present form is considered here in to constitute new species for which the name B.seshadri is proposed.

PLATE -XII

BOLEODORUS SESHADRI SP. NOV.

- FIG. A : Oesophageal region of male
B : Vulval region showing posterior
uterine sac
C : Anterior end of female
D : Tail region of male
E : Tail region of female showing phasmid



10 μ A, D
20 μ B, C, E

SUPER FAMILY : CRICONEMATOIDEA (Taylor, 1936)
Geraert, 1966

PREVIOUS WORK

De Man, 1880 proposed the genus Macroposthonia for some male specimens which were having rather short body with anterior tapering contour. The head was not off set and annulated. Oesophagus and spear was ill defined; lateral field was shown to be present and the tail was described as shortish conical with a bursa, spicules were long slender and ventrally arcuate. A single Gubernaculum was found to be present. The type species of genus was assigned as Macroposthonia annulata De Man, 1880. A long gap followed after the first report De Man in 1921, reported another male of this genus. Filipjev in 1936 pointed out that the males described De Man in 1880 and 1921 might be representing the male of Paratylenchus. This view was accepted by Goody in 1963. In 1956 Kishkey described some similar males from Germany which were interrupted to belong to Criconemoides enulifer by De Grissee and Loof in 1965.

De Man, 1921 collected some male specimens which had semicircular spicules, but were lacking in characters of spear and oesophagus. For these male specimens he proposed the genus Hemicycliophora and considered it close to the other Criconematids, because of indeterminate oesophagus and spear. The genus Paratylenchus was described by Micoletzky in 1922. The genus Procriconema was proposed

by Micoletzky in 1922. ~~for some~~ some female specimens which had doubled cuticular sheath with wide annulation, long spear and criconematid oesophagus. Loos 1949 collected Procriconema of Meoleizky, where as the males were in close confirmity with genus Hemicycliophora described by De Man. On the advise of Goodey Loos considered the Genus Procriconema as synonyma of Hemicycliophora.

The Genus Criconemoides was described by Taylor in 1936 and he kept Criconemoides margenee as a type species. He also erected the sub-family Criconematinae to accomodate the thick annulated tylenchid nematodes often bearing spines or scales and amalgamated procorpus with metacorpus forming median oesophageal bulb, and a short spatulate or rounded posterior ^{bulb} end a long well developed spear with anchor shaped spear knobs; Prodelphic out-stretched ovary, absence of postero-uterine sac, absence of phasmid and functional anus and rectum. He in this sub-family besides genus Criconemoides also incorporated the genus Criconema and Procriconema. The Criconemoides margense, the geno type species of genus Criconemoids has been so ill defined and moreover the type specimens also could not be located even after a long and intensive search by Loof and De Grisse in different museum of Europe. In order to over come this short commin De Grisse and Loof 1965 synonymized genus Criconemio-
ides with that of Macroposthonia De Man 1880.

During the last 50 years an unusual attention has

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been given by many workers all over the world to the study of nematodes of this group. Unfortunately still our knowledge regarding some of the groups is far from complete. Incidentally some of these species have been proposed as type of important groups. The genus Criconema was described by Hoffman and Menzel 1914 and Sequvini was kept as type species.

Unfortunately the type specimens were not preserved properly resulting into unavailability of the accurate information on its morphology which is so far a mystery. Certes 1889 collected some nematodes in fresh water and described them as a new species under the name Eubostrichus guernei distinguishing it by the robust spear and six rows of appendages on the body annules. Richters 1904 reported collecting the species from the Antarctic, but could not give the detailed information regarding its identity. The genus Criconema was proposed by Hoftmen and Menzel and the type for this genus was based on specimens collected from Switzerland but wrongly identified as Guernei.

The genus Iota was proposed by Cobb for a nematode species Iota squamosum. He latter in 1914 added another species Iota octangulare. Southern 1940 proposed genus Ogma with O. murrays as type. Micoletzky 1925 synonymized ogma with Iota and considered all these species with cuticular ornamentation to be members of Iota, where as those with smooth annules as members of Criconema.

Taylor 1936 pointed out that Iota was a homonym and ogma, had no standing because its type species was congeneric with Cricomena guernei. All the 8 species with spines or scale like appendages on posterior edge of body known till then were included in Criconema.

Chitwood and Birchfield 1957 proposed genus Hemicriconemoides for criconematid nematodes having coarsely annulatea smooth body cuticle, long robust spear with anchor shaped knobs tightly fitting additional cuticular sheath. The genera Sphaeronema Raski & Sher 1952, Trophonema Raski, 1951 Trophotylenchus Raski, 1957 differ by having saccate or swollen bodies against vermiform shape of Tylenchid nematodes but in characters of oesophagus and sexual dimorphism in male they show close affinities with Criconematids.

Goodey 1963 considered them under family Tylenchulidae (Skarbilovich, 1957) Kirajanova, 1955 of super family Tylenchoidea. Gerraert, 1966 did not agree with this and considered the family Tylenchulidae under the super family Criconematoidea.

The genus Gracilacus was proposed by Raski, 1962 and Caloosia by Siddiqi and Goody 1963. The sub-families of Criconematoidae i.e., Criconematinae Taylor, 1936. Paratylenchinae Thorne, 1949, Hemicyclophorinae Skarbilovich, 1959, Sphaeronematinae Raski and Sher 1952 were all upgraded to family rank by Gerraert, 1966.

Raski 1973 proposed genus Paratylenchoides under Paratylenchidae and Genus Xenosphaeronema was proposed by De Grissee in 1972.

Raski and Siddiqi, 1975 psoposed the super family Tylenhocriconematoidea which showed a combination of characters of both Tylenchoidea and Criconematoidea. They also propsed a super family rank for Tylenchulidae and included under it family Tylenchulidae and Paratylenchidae which were removed from Criconematoidea. In their work they recognised 7 super families under sub order Tylenchina.

Different workers by giving several contradictory views complicated the taxonomy of Criconemoides and related genera. De Grissee and Loof 1965 revised the genus Criconemoides, and they regrouped 90 species described till then into six genera. The views given by DeGrissee & Loof for the soundness of generic identification were criticized by Tarjan, 1966, Raski and Golden, 1966 and Luc, 1970, and they synonymized them with Croconemoides. Heyns 1970 also agreed to it.

Heyns (1970) also found the views of DeGrisee and Loof (1965) and De Grissee 1969 useful, but for assigning south african species into respective genera, and in order to obviate the overlapping nature of generic definitions, he emended the diagnosis of genera Discocriconemella.

Khan, Chawla and Saha, 1975 also prefered further simplification of taxonomy of this group and they endorsed

the views of Heyns 1970 in retaining the genera proposed by DeGrèsse and Loof, 1965 which were re-established by Loof and De Grissee in 1973. They also proposed a new genus Madinema for the specimens having characters of both Macroposthonia and Discocriconemella. So, instead of lumping all the genera under genus Criconemoides, they preferred it better and also proposed a new family Madinematidae for the inclusion of new genus Madinema and other related genera previously placed in Criconematidae.

FAMILY CRICONEMATIDAE (Taylor, 1936) Thorne, 1949.

DIAGNOSIS: Criconematoidea. Body annules of adult females bearing fringe of spines and scales or other cuticular configurations. Juveniles with scales.

KEY TO GENERA OF CRICONEMATIDAE

- 1. Adult females with cuticular outgrowths on annules membranous, disappearing in glycerine mounts.....
..... Bakernema Wu, 1964.
Adult females with cuticular outgrowths on annules not membranous, not disappearing glycerine mounts..
..... 2
- 2. Head with four sub-median lobes..... 3
Head without sub-median lobes..... 6
- 3. Body annules very coarse numbering less than 50..... 4
Body annules not conspicuously coarse, numbering 45-89
..... 5
- 4. Body annules marked by fringe of continuous serrations arranged in the form of either four lobes with deep lateral grooves or in the form of twelve lobes; vulva simple closed..... Neolobocriconema Mehta & Raski, 1971
Body annules smooth to irregular not marked by fringe of continuous serrations arranged in the form of either four lobes with deep lateral grooves or in the form of twelve lobes; vulva open..... Lobocriconema DeGrise & Loof, 1965

- 5. Spines/scales arranged in 6 longitudinal rows
Criconema, Hofmanner & Menzel, 1914
 Spines/scales arranged in more than longitudinal rows ..
Variasquamata (Mehta & Raski, 1971)
 Khan Chawla & Saha, 1975.
- 6. Head with one distinct annule.....7
 Head with more than one annule.....8
- 7. Basal annule large, discoid and directed forward
Pateracephalanema Mehta & Raski, 1971
 Basal annule reduced....Blandicephalanema Mehta & Raski, 1971
- 8. Body annules with contineous fringe of spines or scales
 Crossonema (Mehta & Raski, 1971) Khan, Chawla
 & Saha, 1975.
 Body annules without contineous fringe of spines or
 scales.....9
- 9. Body annules with retrose spine like Protuberances
 arranged in longtudinal rows.....
 ... Speriminnula (Mehta & Raski, 1971) Khan, Chawla and
 Saha, 1975.
 Body annules with palmate scale like protuberances
 alternating in position in adjacent annules.....
 Croserinema Khan, Chawla & Saha, 1975.

VARIASQUAMATA TUBEROSA SP. NOV.

(Plate XIII, Fig. A-H)

10 females were recovered from soil around roots of *Solanum tuberosum* L. from Sonamarg, Kashmir. These are considered here in to constitute new species.

MEASUREMENTS:

Female (9 paratypes) L = 0.41 -0.47 mm; a = 11.1-12.9;
c = 7.2-9.1; v = 79-81 %; total
body annules = 59-65
Spear = 70-77 mic.

Female (Holotype) L = 0.43; a = 12.4; b = 4.5;
c = 7.3; v = 81%;Spear = 73 mic.

DESCRIPTION:

'Eel worm' when killed assumes an almost straight shape. Some of paratypes have almost a slightly ventrally arcuate shape. Body tapering at both the ends, anteriorly very gradually from the base of neck to a set off head which measures about 1/3rd of body at the level of basal oesophageal bulb. Head annules not retrose. The 1st annule forwardly directed measuring 17 microns in diameter, where as 2nd annule slightly smaller than first has a rounded smooth outline measuring about 16 microns in diameter. Both the head annules are smooth. The rest of the body annules numbering 59 are strongly retrose. Body annules with distinctly rhomboidal scales which in neck region numbering from 6-8 on each annule, where as the number increases to ten in the

mid body region. These scales are sometimes connected with each other, each scale is thick triangular and at different focuses appear diamond shaped. In a cross section at mid body these rows appear as ten equal spaced convolutions.

Enface-view showing completely fused sub-median lobes on dorsal ventral and lateral sides; amphidial apertures large oval slits; labial disc absent; oral aperture 'I' shaped centrally located. Labial sclerotization moderately developed. Spear long and robust measuring 73 microns in length, the anterior part measures about 61 microns whereas posterior part 12 microns in length; provided basally with strongly developed anteriorly cuped spear knobs, measuring 6 microns in diameter. Opening of dorsal oesophageal gland located at about 6 microns behind spear base. Oesophagus with a cylindrical procorpus, amalgamated distally to form an oval bulb with strongly developed musculature accommodating the basal part of the spear, thick crescentic valve and convoluted oesophageal lumen. Isthmus indistinguishable terminating into a small bulb. Excretory pore located one annule posterior to oesophagus i.e., on the 17th annule. The oesophagus extends upto 16th body annule whereas spear upto 11th annule. Vulva transverse slit located on the 10th annule (10-12 in Paratype) from tail tip. Vagina sigmoid with body annules getting modified into lip like structures. Uterus with muscular part distally continuing into the columellate region which possess a ~~serot~~ rounded spermatheca, filled with rounded sperms. Anus located on 8th body

annule from tail terminus. Tail regularly narrowing upto the 6th annule, thereafter sharply narrowed to a pointed terminus.

MALES: Not found

Paratypes: Female on Slide No. PN/VAR/ 1-2 deposited in the Department of Zoology, University of Kashmir.

Holotype: Female on Slide No. PN/VAR/3 in author's collection.

HOST: Collected from soil around roots of Solanum tuberosum L.

LOCALITY: Sonamarg, Kashmir.

DIAGNOSIS AND RELATIONSHIP

Variasquamata tuberosa n.sp. is distinctive by having a strongly retrose body annules numbering from 59 -65, well developed spear, enface view showing completely fused sub median lobes on dorsal, ventral and lateral sides and by the presence of sharply pointed tail terminus. However, it comes close to Criconema (Variasquamata) rhombosquamatum Mehta and Raski 1971 and V. simlaensis (Jairajpuri, 1963) Mehta and Raski, 1971. From Criconema (Variasquamata) rhombosquamatum it differs by having a smaller spear, fewer body annules and anteriorly located vulva, while from V. simlaensis it can easily be differentiated by the complete fusion of the sub median lobes, the presence of rhomboidal scales and

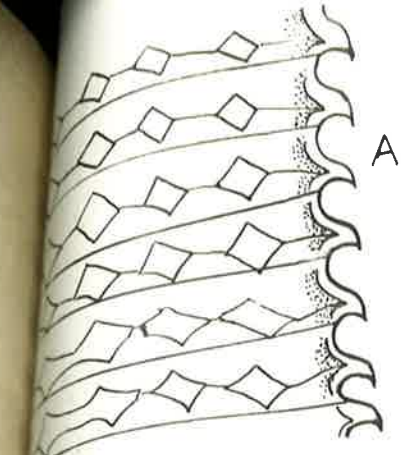
anteriorly located vulva and anus.

In view of the above differences the present form is considered here to constitute new species for which the name Variasquamata tuberosa is proposed.

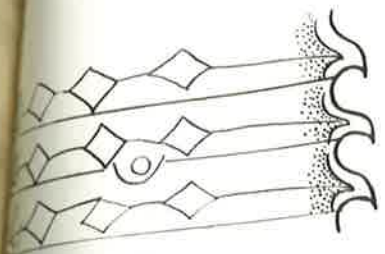
PLATE - XIII

VARIASQUAMATA TUBEROSA SP. NOV.

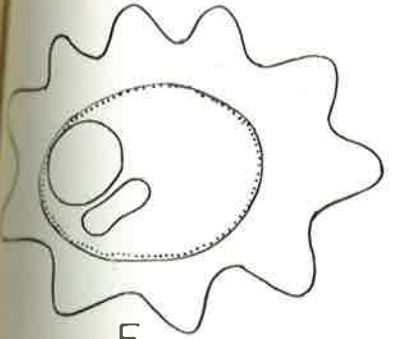
- Fig. A : Body annules showing cuticular pattern
- B : Anterior end of female
- C : En-face view of female
- D : Neck region of female showing excretory pore
- E : Body section of female showing the scales
- F : Tail ventral view
- G : Tail lateral view
- H : Entire female



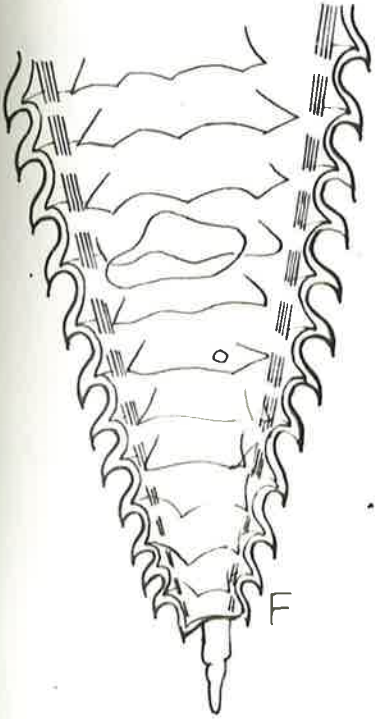
A



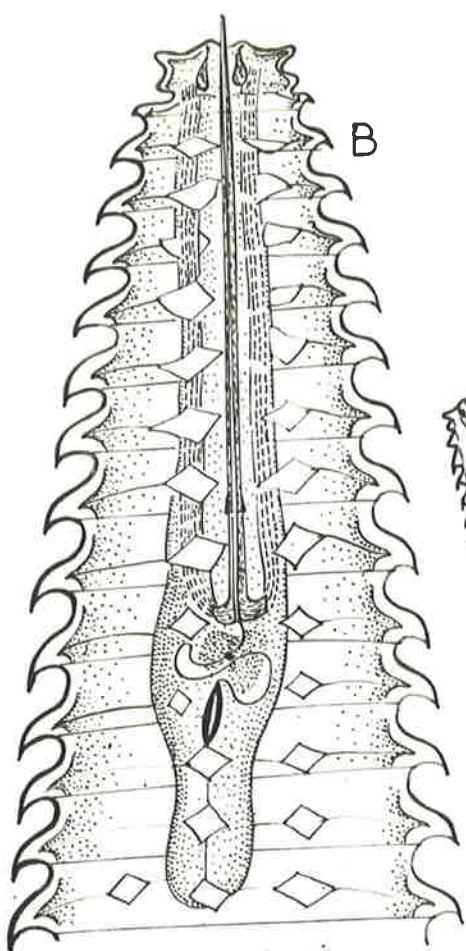
D



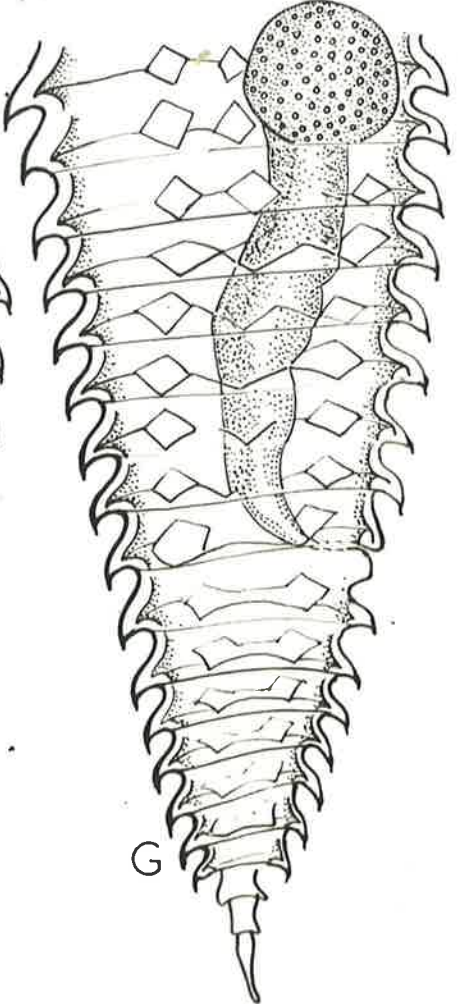
E



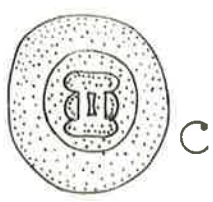
F



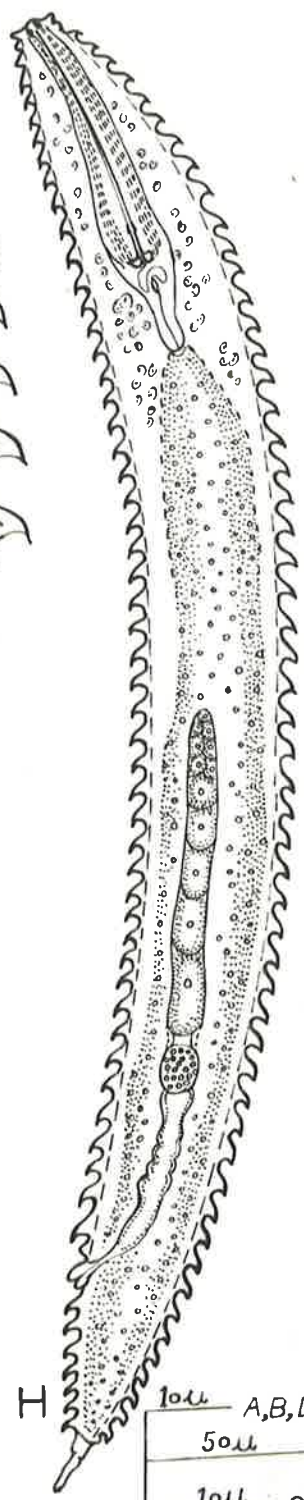
B



G



C



H

10μ	A,B,D-G
50μ	H
10μ	C

FAMILY: MADINEMATIDAE Khan, Chawla & Saha, 1975

DIAGNOSIS: Criconematoidea. Body annules of females smooth, irregular or crenate, never with distinct fringe, scale 8 or spines, body usually transparent; vulva closed or open.

KEY TO GENERA OF MADINEMATIDAE

1. Female with head annules differentiated.....2
 - Female with head annules not differentiated.....5
2. Female body annules smooth, without numerous anastomoses..... Discocriconemella Degrisee & Loof, 1965
 - Female body annule smooth, without numerous anastomoses3
3. Sub median lobes present.....4
 - Sub median lobes absent.....
 - Nothocriconema Degrisee & Loof, 1965
4. Head of female with 3 differentiated annules, off set by collar like narrow third annule, vulva closed.....
 - Nothocriconemoides Mass, Loof & Degrisee, 1971
 - Head of female with only one differentiated annule, first annule modified, other body annules, retrose, vulva open..... Madinema Khan, Chawla, Saha, 1975 .
5. Spear very long about 40% of body length, flexible
 - Xenocriconemella De Grisee & Loff, 1965
 - Spear short, not flexible 6

- 6. Female body small under 0.3 mm.....
 Criconemella De Grises & Loof, 1968
 Female body length more than 0.3 mm7
- 7. Vulva closed, sub median lobes lip like.....
 Criconemoides Taylor, 1936
 Vulva open, sub median lobes with well developed lip
 cone Macroposthonia De Man, 1880.

[Faint, mostly illegible text, likely bleed-through from the reverse side of the page. Some words like "Macroposthonia" and "Criconemella" are faintly visible.]

MACROPOSTHONIA PYRUSEI SP. NOV.

(Plate XIV, Fig. A-E)

11 females were recovered from soil around roots of Pyrus malus L. from University Campus, Srinagar, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS:

Females (10 paratypes) L = 0.45-0.51 mm;
 a = 12-15; b = 3.6-4.3;
 c = 15-17; v = 91-93%;
 Total number of body annules = 65-72.

Female (Holotype) L = 0.47 mm; a = 12;
 b = 3.6; c = 15-17;
 v = 91%; Total number of body annules = 65

DESCRIPTION:

"Eel worm When killed assumes a slightly ventrally arcuate shape. Body cylindrical fusiform, tapering in the anterior region from the neck base to a flat head, which measures about 1/4th of body at neck base. Body cuticle strongly annulated numbering 65, (65-72 in paratypes) of which the first body annule has a rounded edge whereas the rest of body annules have retrorse. The outer margins of annules have slightly coarse and rough margins. Head annule single measuring 12 microns across. Labial sclerotization strongly developed. En-face view showing a centrally located 'Y' shaped oral aperture enclosed in an oval labial disc, which lodges the slit like amphidial apertures on

its lateral margins. Sub median lobes strongly developed, fusing on the dorsal and ventral slides. Spear robust measuring 70 microns in length, the anterior part measuring 55 microns in length where as posterior part is considerably smaller and measures only 15 microns in length, the later bears distally well developed anchor shaped spear knobs measuring 11 microns across. Oesophagus criconematid. Basal bulb measuring 32 x 22 microns in dimension with strongly developed cuticularized valve and convoluted oesophageal gland lumen; the opening of dorsal oesophageal gland located at about 140 microns behind base of spear. Isthmus indistinguishable, basal bulb spatulate. Nerve ring located at about 110 microns from anterior end i.e., on the 16th body annule. Excretory pore located on the 18th body annule being one annule anterior to oesophageal base. Cardia small rounded.

Vulva a transverse slit with open lips located on 6th annule (5-6 in paratypes) from tailterminus. Vagina sigmoid. Uterus continuing distally into a columellale region; spermatheca not seen, ovary single anteriorly outstretched. Oovocytes mainly single rows. Body gradually tapering behind the vulva to a conoid rounded tail. Tail having a button like terminus.

MALES: not found.

Paratypes: Females on Slide No. PN/MAC/1-3 deposited in the Department of Zoology, University of Kashmir.

Holotype: (Female) on Slide No. PN/MAC/4 in author's collection.

HOST: Collected from soil around roots of Pyrus
Malus L.

DIAGNOSIS AND RELATIONSHIP:

Macroposthonia pyrusei n.sp. is distinctive by having a strongly annulated cuticle numbering 65-72, robust spear measuring 70 microns in length, with well developed anchor shaped knobs and by the presence of a conoid rounded tail. However, it comes close to M.similis (Cobb, 1918) De Grisse & Loof 1965 and M.xenoplax (Raski, 1952) De Grisse and Loof 1965. From M.similis, the present species differs by lesser number of body annules, longer spear, location of vulva (body annules 90-100; spear 60-64 and vulva on 7th annule in M.similis).

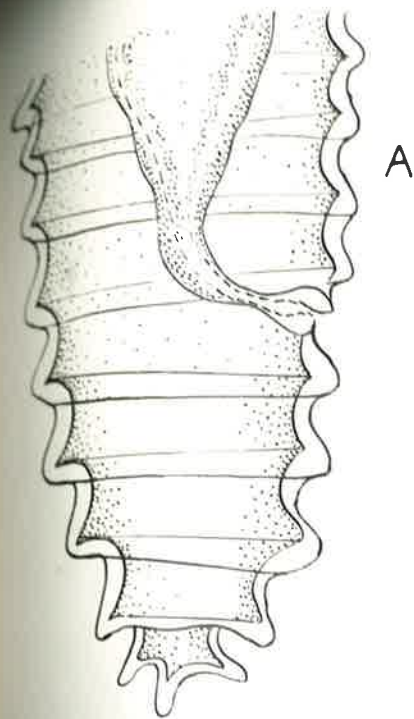
From M.xenoplax it can easily be differentiated by lesser number of body annules and in the shape of the sub-median lobes (Annules 87-100; sub-median lobes separate in M.xenoplax).

In view of the above differences the present form is considered here to constitute a new species for which the name M.pyrusei is proposed.

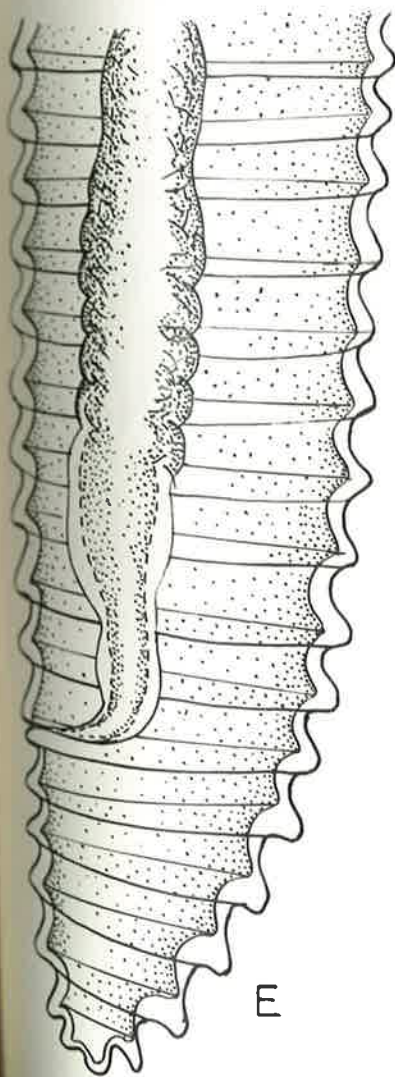
PLATE - XIV

MACROPOSTHONIA PYRUSEI SP. NOV.

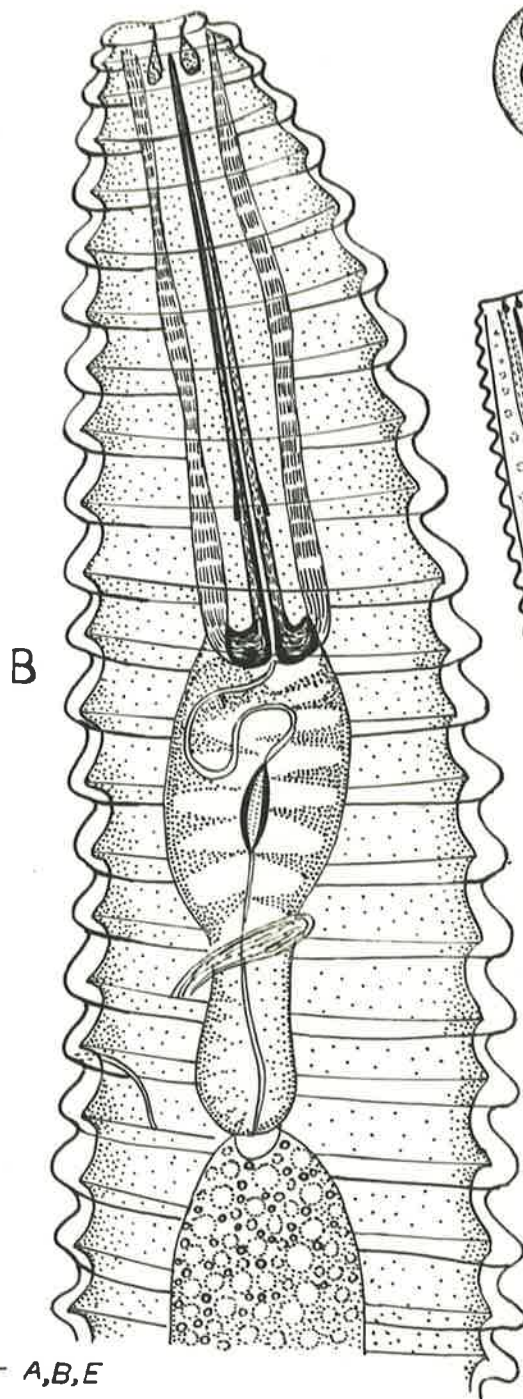
- Fig. A : Female tail lateral view
B : Anterior end of female
C : En-face view of female
D : Entire female
E : Female tail lateral view



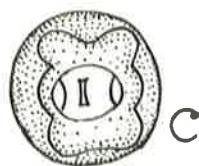
A



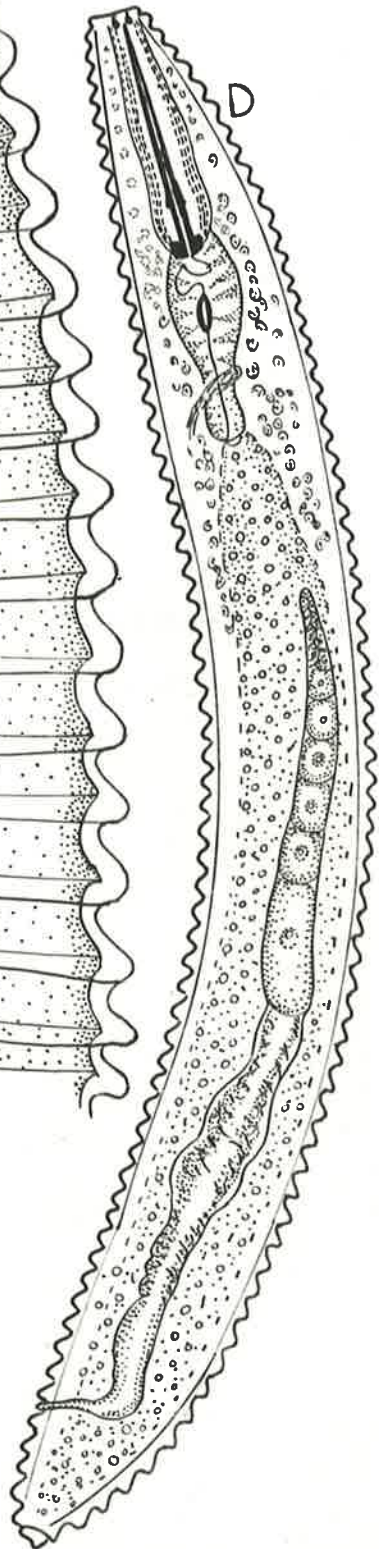
E



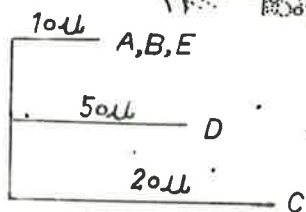
B



C



D



SUPER FAMILY : HETERODEROIDEA (Filipjev, 1934)
Golden, 1971

DIAGNOSIS (emended): Tylenchina. Adult females swollen to sub spherical, sedentary dideph^{ic}. Cuticle annulated or non annulated. Tail generally absent, except in Rotylenchulidae. Anus located terminally or subterminally. Excretory pore generally opposite or anterior to median bulb. Basal plate sub divides head into six sectors, of which two lateral sectors are narrower than the four others. Stylet reaches upto length of 25 microns. Procorpus and median bulb not amalgamated. Median bulb ovate to spherical with well developed crescentic valve plates. Oesophagus glands overlapping intestine ventrally. Infective stage: Second stage larva in case of Meloidogynidae and Heteroderidae, where as immature female in Rotylenchulidae. Second stage juveniles have the basal plates which sub divides the head as in female. Stylet moderate to well developed. In immature females of Rotylenchulidae opening of dorsal oesophageal gland more than half of stylet length behind the base of spear.

REVISED KEY TO FAMILIES OF HETERODEROIDEA

1. Female becoming cysts or remaining soft-bodied; pyriform-saccate, spheroid, or lemon shaped; cephalic frame work of females not sclerotized; males cylindrical, well developed, and without bursa.....
..... Heteroderidae (Filipjev, 1934) Golden, 1971.

PART - I

REVISED SCHEME OF CLASSIFICATION
UPTO GENERA FOR ORDER TYLENCHIDA

ORDER TYLENCHIDA Thorne, 1949

Sub order

Super families.

Tylenchina (Orley, 1880) Geraert, 1966

Atylenchoidea (Skarbilovich, 1959) Golden, 1971

Criconematoidea (Taylor, 1936) Geraert, 1966

Heteroderoida (Filipjev, 1934) Golden, 1971

Hoplolaimoidea Filipjev, 1934

Neotylenchoidea (Thorne, 1941) Jairajpuri & Siddiqi, 1969

Tylenchocriconematoidea Raski & Siddiqi, 1975

Tylenchoidea (Orley, 1880) Chitwood & Chitwood, 1937

Tylenchulidoidea Raski & Siddiqi, 1975

Aphelenchina (Fuchs, 1937) Geraert,
1966

Aphelenchoidea (Fuchs, 1937) Thorne, 1949.

SUPER FAMILY (1) TYLENCHOIDEA (ORLEY, 1880) Chitwood & Chitwood, 1937

Family

Sub-family

Genera

- a) Tylenchidae Orley, 1880 Tylenchinae (Orley, 1880) Aglenchus (Andrassy, 1954) Meyl, 1961
Marcinowski, 1909 (Syn. Telechus (Aglenchus Andrassy, 1954))
Cephalenchus (Goodey, 1962) Golden, 1971
(Syn. Tylenchus Cephalenchus Goodey, 1962)
Filenchus (Andrassy, 1954) Meyl, 1961
(Syn. Tylenchus (Filenchus) Andrassy, 1954)
Iranitylenchus (Kheri, 1972) Andrassy, 1976
(Syn. Tylenchus (Iranitylenchus) Kheri, 1972)
Malenchus, Andrassy, 1968
Miculenchus Andrassy, 1959
Tylenchus, Bastian, 1865
Ottolenchus (Hussain & Khan, 1967) Wu, 1967
(Syn. Tylenchus (Ottolenchus) Hussain & Khan, 1967)
Aerotylenchus N.gen.

Tyloporinae Paramonov, 1967.
Tylodorus Meagher, 1963

Trophurinae Paramonov, 1967
Trophurus Loof, 1956
Paratrophurus Arias, 1970

.....
SUPER FAMILY (1) TYLENCHOIDEA (ORLEY, 1880) Chitwood & Chitwood, 1937
.....

Family

Sub-family

Genera

Dactylotylenchinae
Wu, 1969

Dactylotylenchus Wu, 1968

Pleurotylenchinae
Andrassy, 1976

Pleurotylenchus Szczygiel, 1969

b) Ditylenchidae (Golden,
1971) n.rank.

Ditylenchinae Golden,
1971

Ditylenchus Filipjev, 1936

Pseudhalenchus Tarjan, 1958

Sychnotylenchinae
(Paramonov, 1967)
Golden, 1971

Diptenchus Khan et al., 1969

Sychnotylenchus Ruhm, 1956

Neoditylenchus Meyl, 1961

c) Psilenchidae
(Paramonov, 1967

Psilenchinae
Paramonov, 1967

Psilenchus De Man, 1921

Basirinae Andrassy,
1976

Basiria Siddiqi, 1959 (Syn-Tylenchus (Clavilenchus
Jairajpuri, 1966; Clavilenchus
(Jairajpuri, 1966) Thorne &
Maleak, 1968)

Basiroides Thorne, Maleak, 1968

Neopsilenchus Thorne, & Malek, 1968

SUPER FAMILY (1) TYLENCHOIDEA. (ORLEY, 1880) Chitwood & Chitwood, 1937

Family

Sub-family

Genera

Macrotrophurinae n. sub. fam. Macrotrophurus Loof, 1958

d) Anguinidae (Nicoll, 1935)

Anguininae Nicoll, 1935

Anguina Scopoli, 1777

Paranguina Kirjanova, 1955

Subanguina Paramonov, 1967

Cynipanguininae,

n. sub. fam.

Cynipanguina Maggentietal, 1974

(2) Super Family : ATYLENCHOIDEA (SKRABILOVICH, 1959) Golden, 1971

Atylenchidae

(Skrabilovich, 1959)

Atylenchinae

Skrabilovich, 1959

Atylenchus Cobb, 1913

Etylenchus Cobb., 1913

(3) SUPER FAMILY ; HOPLOLAIMODIA Filipjev, 1934

Family

Sub-family

Genera.

Hoplolaimidae
(Filipjev, 1934)
Wieser, 1953

Hoplolaiminae
Filipjev, 1934

Hoplolaimis Daday, 1905
(Syn. Nemonchus Cobb., 1913)

Aorolaimus Sher, 1963

Scutellonema Andrassy, 1958

Peltamigratus Sher, 1965

Acontylinae n. sub-fam.

Acontylus Meagher, 1968

Rotylenchoideinae
Whitehead, 1958

Rotylenchoides Whitehead, 1958

Helicotylenchus Steiner, 1945

Antratylenchus Sher, 1973

Rotylenchus Filipjev, 1936
(Syn. Gothodstoineria Andrassy, 1958)

b) Aphasmatylenchidae
(Sher, 1965) n. rank

Aphasmatylenchinae
Sher, 1965

Aphasmatylenchus Sher, 1965

c) Pratylenchidae (Thorne,
1949) Siddiqi, 1963

Pratylenchinae Thorne,
1949

Pratylenchus Filipjev, 1936

Hirschmanniellinae
n. sub-fam.

Hirschmanniella Luc & Goodey, 1963
(Syn. Hirschmannia Luc & Goodey, 1963

(3) SUPER FAMILY & HOPLOLAIMOIDEA Filipjev, 1934

Family

Sub-family

Genera

Pratylenchoides Winslow, 1958

Zygotylenchus Siddiqi, 1963
(Syn. Mesotylus de Guiran, 1964)

Apratylenchoides Sher, 1973

Hoplotylinae Khan, 1969

Hoplotylus S'Jacob, 1959

d) Radopholidae Khan &
Nanaajapa, 1972

Rodopholinae Allen &
Sher, 1967

Radopholus Thorne, 1949

Radopholooides de Guiran, 1967

e) Dolichodoridae (Chit-
wood & Chitwood, 1950)
Skarbilovich, 1959

Dolichodorinae,
Chitwood & Chitwood,
1950

Dolichodorus Cobb, 1914

Brachydorus de Guirar & Germani, 1968

Neodolichodorus Andrassy, 1976

Dolichorhyncinae
n. sub-fam.

Dolichorhynchus Mulk & Jairajpuri, 1974

(3) SUPER FAMILY HOLOLAIMOIDEA Filipjev, 1934

Family

Sub-family

Genera

f) Belonolaimidae
(Whitehead, 1959)
Siddiqi, 1970

Belonolaiminae
Whitehead, 1959

Belonolaimus Steiner, 1949

Morulaimus Sauer, 1966

Carphodorus Colbran, 1965

Telotylenchinae
Siddiqi, 1960

Telotylenchoides

Histotylenchus Siddiqi, 1971

Telotylenchus Siddiqi, 1960

Tricotylenchus Whitehead, 1959

g) Tylenchorhynchidae
(Eliava, 1964)
Golden, 1931

Tylenchorhynchinae
Eliava, 1964

Tylenchorhynchus Cobb, 1913

Uliginotylenchus Siddiqi, 1971

Quinsulicius Siddiqi, 1971

Sauertylenchus Sher, 1974

Merliniinae,
Siddiqi, 1971

Merlinius Siddiqi, 1970

Geocenamus Thorne & Malek, 1968

(3) SUPER FAMILY HOPLALAIMOIDEA Filipjev, 1934

Family
Sub-family Genera

Nagelus Thorne, & Malek, 1968

Leipotylenchus Sher, 1973

Triversus Sher, 1973

Leipotylenchinae
Sher, 1973

(4) SUPER FAMILY : CRICONEMATOIDEA (Taylor, 1936) Geraert, 1966

a) Criconematidae
(Taylor, 1936)
Thorne, 1949

Criconema Hofmanner & Menzel, 1914

Bakernema Wu, 1964

Croserinema Khan, Chawla & Saha, 1975

Crossonema (Mehta & Raski, 1971) Khan, Chawla & Saha, 1975

Lobocriconema De Grisse & Loof, 1965

Neolobocriconema Mehta & Raski, 1971

Pateracephalanema Mehta and Raski, 1971

Seriespinula (Mehta & Raski, 1971) Khan, Chawla & Saha, 1975

(4) SUPER FAMILY CRICONEMATOIDEA (Taylor, 1936) Geraert, 1966

Family

Sub-family

Genera

b) Madinematidae, Khan,
Chawla & Saha, 1975

Variasquamata (Mehta & Raski, 1971) Khan, Chawla
and Saha, 1975

Madinema Khan, Chawla & Saha, 1975

Criconemella De Grisse & Loof, 1968

Criconemoides Taylor, 1936

Discocriconemella De Grisse & Loff, 1965

Macroposthonia De Man, 1880

Nothocriconema De Grisse & Loof, 1965

Nothocriconemoides

Nothocriconemoides Mass, Loof & De Grisse, 1971

Xenocriconemella De Grisse & Loof, 1965

c) Hemicycliophoridae

Hemicycliophorinae
Skarbilovich, 1959

Caloosia Siddiqi and Goodey, 1963

Hemicycloiphora De Man, 1921
(Syn. Procriconema, Micoletzky, 1925)

Hemicriconemoides Chitwood & Birchfield, 1957-
Syn. Iota Cobb, 1931

(5) SUPER FAMILY HETERODEROIDEA (Filipjev, 1934) Golden, 1971

Family	Sub-family	Genera
1. Heteroderidae (Filipjev, 1934) Golden, 1971	Meteroderinae Filipjev, 1934	<u>Heterodera</u> Schmidt, 1871 <u>Sarisodera</u> Wouts & Sher, 1971
	Meloidoderinae, Golden, 1971	<u>Meloidodera</u> Chitwood, Hannon & Esser, 1956 <u>Cryphodera</u> Colbran, 1966 <u>Zelandodera</u> Wouts, 1973
	Ataloderinae Wouts, 1973	<u>Atalodera</u> Wouts & Sher, 1973 <u>Sherodera</u> Wouts, 1973
2. Meloidogynidae (Skarbilovich, 1959) Wouts, 1973	Meloidogyninae (Skarbilovich, 1959) Wouts, 1972	<u>Meloidogyne</u> Goeldi, 1892 <u>Meloinema</u> Choi & Geraert, 1973 <u>Meloidederita</u> Poghossain, 1966
3. Naccoboderidae (Chitwood & Chitwood, 1950) Golden, 1972	Naccobinae Chitwood, & Chitwood, 1950 Naccoboderinae Golden & Jensen, 1974	<u>Naccobus</u> Thorne, & Allen, 1944 <u>Naccobodera</u> Golden & Jensen, 1974

(5) SUPER FAMILY : HETERODEROIDEA (Filipjev, 1934) Golden, 1971

Family

Sub-family

Genera

4. Rotylenchulidae
(Hussain & Khan,
1967) n. rank

Rotylenchulus Linford & Oliveira, 1940

(6) SUPER FAMILY : TYLENCHULIDOIDEA Raski & Siddiqi, 1975

Paratylenchidae Thorne, 1949

Paratylenchoides Raski, 1973

Cacopaurus Thorne, 1943

Paratylenchus Micoletzky, 1922
(Syn. Trophonema Raski, 1957)

Gracilacus Raski, 1962

Tylenchulidae
Skarbilovich, 1947

Sphaeronematinae
Raski & Sher, 1952

Sphaeronema Raski & Sher, 1952

Tylenchulinae
Skarbilovich, 1947

Tylenchulus Cobb, 1913
(Syn. Trophotylenchulus Raski, 1957)

Trophotylenchus

(7) SUPER FAMILY : TYLENCHOCRICONEMATOIDEA (Thorne, 1941) Raski & Siddiqi, 1975

Family

Sub-family

Genera

Tylenchocriconematidae

Tylenchocriconema Raski & Siddiqi, 1975

(8) SUPER FAMILY : NEOTYLENCHOIDEA

a) Nothotylenchidae
Thorne, 1941

Nothotylenchinae
Thorne, 1941

Dorsalla Jairajpuri, 1966

Nothotylenchus Thorne, 1941

Thada Thorne, 1941

Sakia Khan, 1964 - Syn. Basilioophora
Hussain & Khan, 1965

Nothotylenchoides N.gen

Nothoanguinae
n. sub-family

Nothanguina Whitehead, 1959

Boleodorinae Khan, 1964

Boleodoroides Mathur, Khan, & Prasad, 1966

Boleodorus Thorne, 1941

..... (8) SUPER FAMILY: NEOTYLENCHOIDEA (Thorne, 1941) Jairajpuri & Siddiqi, 1969

Family

Sub-family

Genera

b) Paurodontidae Thorne, 1941

Paurodontinae Thorne, 1941

Bealius Massey & Hinds, 1971

Paurodontella Hussain & Khan, 1968

Paurodontus Thorne, 1941

Stictylus Thorne, 1941

(Syn. Paurodontoides Jairajpuri & Siddiqi, 1969

Misticlinae, Massey, 1967

Anguillonema Fuchs, 1938

Misticlius Massey, 1967

c) Neotylenchidae Thorne, 1941

Neotylenchinae, Thorne, 1941

Deladenus Thorne, 1941

Dotylaphus Andrassy, 1958

Gymnotylenchus Siddiqi, 1961

Hardrodenus Nulvey, 1969

Hexatylus Goodey, 1926

Scytaleum Andrassy, 1961

(Syn. Neopauodontus, Tikyani & Khara, 1968

Halenchinae Jairajpuri & Siddiqi, 1969

Halenchus Cobb in Cobb, 1963

(Syn. Anguillulina (Halenchus Cobb in Cobb, 1933) Schneider, 1939

..... (8) SUPER FAMILY: NEOTYLENCHOIDEA (Thorne, 1941) Jairajpuri & Siddigi, 1969

Family

Sub-family

Genera

d) Ecpyadophoridae
Skarilovich, 1959

Ecpyadophorinae
Skarbilovich, 1959

Ecpyadophora De Man, 1921

Ecpyadophoroides Corbett, 1964

e) Iotonchiidae Goodey,
1953

Iotonchinae Goodey,
1953

Iotonchium Cobb, 1920

(Syn. Anguillulina (Totonchium Cobb, 1920)
Schneider, 1939

f) Sphaerulariidae
Lubbock, 1861

Obligate parasites in insects. The 21 genera belonging to 3 sub-families,
not free living animals, an enumeration of sub-families and genera will
be abandoned here.

..... ORDER TYLENCHIDA Thorne, 1949

Sub-order

Super-family

Family

Aphelenchina

(Fuchs, 1937) Geraert, 1966

Aphelenchoidea
(Fuchs, 1937) Thorne,
1949

Aphelenchidae (Fuchs, 1937) Steiner, 1949

Paraphelenchidae (Goodey, 1951) Goodey, 1960

Aphelenchoididae (Skarbilovich, 1947) Paramonov,
1953

Entaphelenchidae Nickle, 1970.

..... SUPER FAMILY : APHELENCHOIDEA (Fuchs, 1937) Thorne, 1949

Family	Sub-family	Genera
1. Aphelenchidae (Fuchs, 1937) Steiner, 1949	Aphelenchinae Fuchs, 1937	<u>Aphelenchus</u> Bastian, 1865- Syn. <u>Isonchus</u> Cobb., 1913; <u>Metaphelenchus</u> Steiner, 1943
2. Paraphelenchidae (Goodey, 1951) Goodey, 1960	Paraphelenchinae Goodey, 1951	<u>Paraphelenchus</u> Micoletzky, 1922) Micoletzky, 1925 (Syn. <u>Aphelenchus</u> (Paraphelenchus Micoletzky, 1922)
3. Aphelenchoideidae Skarbilovich, 1947	Aphelenchooidinae	<u>Aphelenchoides</u> Fischer, 1894 <u>Aprutides</u> Scognamilio, Talame & S'Jacob, 1970 <u>Laimaphelenchus</u> Fuchs, 1937 <u>Megadorus</u> Goodey, 1960 <u>Paphaphelenchus</u> Andrassy, 1973 <u>Paraseinura</u> Timm, 1961 <u>Ruehmaphelenchus</u> Goodey, 1963 <u>Schistonchus</u> (Cobb, 1927) Fuchs, 1937 <u>Sheraphelenchus</u> Nickle, 1970 <u>Tylaphelenchus</u> Ruhm, 1956 <u>Bursaphelenchus</u> Fuchs, 1937 <u>Huntaphelenchoides</u> Nickle, 1970
	Bursaphelenchinae Paramonov, 1964	

..... SUPER FAMILY: APHELENCHOIDEA (Fuchs, 1937) Thorne, 1949

..... Family

..... Sub-family

..... Genera

Omemea Massey, 1971

Parasitaphelenchus Fuchs, 1920-Syn. Aphelenchoides
(Parasitaphelenchus Fuchs, 1929) Filipjev, 1934

Rhadinaphelenchinae
Paramonov, 1964

Rhadinaphelenchus Goodey, 1960

Ektaphelenchinae
Paramonov, 1964

Cryptaphelenchus (Fuchs, 1937) Rukm, 1954-

Ektaphelenchus (Fuchs, 1937) Skarjabin, et al, 1954

Peraphelenchus Wacheck, 1955

Anomyctinae, Goodey,
1960

Anomyctus Allen, 1940

4. Entaphelenchidae
Nickle, 1970

Entaphelenchus Wacheck, 1955

Nickle, 1970

Praecocilenchus Poiner, 1969

Roveaphelenchus Nickle, 1970.

PART TWO
ORDER DORYLAIMIDA
&
AEROLAIMIDA

ORDER; DORYLAIMIDA (De Man, 1876) Pearse, 1942

PREVIOUS WORK:

Nematodes included in the order Dorylaimida were for a long time considered to be non-parasitic and therefore this group received very little attention. It was only recently that the pathogenic nature of some of the members of this group was brought to light. The discovery that some of these members also act as vectors and are responsible for transmitting soil born plant viruses, ultimately causing severe damage to crops of economic importance all over the world resulted in creating interest in the study of this group.

Dorylaims constitute one of the largest group of free living nematodes found in the soil. Population of 200,000,000 to 500,000,000 per acre are not unusual. These nematodes inhabit almost all types of ecological niches which can be concieved off. Since the publication of monographs by Thorne, & Swanger, 1936 and Thorne, 1939, considerable work has been done on this group. Andrassy 1959, 1960 revised the taxonomy of Dorylaimus by splitting the genus into seven new genera. This created new awakening in the study of these nematodes and resulted into swelling of literature. A brief review of the few important groups is felt desirable.

The largest genus Dorylaimus was Irastically reduced by Andrassy, 1960 and was further limited by Goodey, 1963 to contain only 10 species, having longitudinal ridges

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on cuticle. Most of the species removed from Dorylaimus have been accommodated in Mesodorylaimus. Siddiqi proposed Laimydorus for the larger species which have double guiding ring thus further reducing the number of species Mesodorylaimus. Endorylaimus being one of other larger genus containing about 170 species.

In contrast to the larger groups there are also few genera like Afrodorylaimus, Andrassy, 1964, Willinema (Bagri & Jairajpuri, 1967) Drependorylaimus, Jairajpuri, 1966 Withholdinema Brezeski, 1960. Goodey, 1963 synonymised the latter with Labronema Thorne, 1939. The genus Drepandorus Alther, 1954 and Torymanova Yeates, 1967 have three cardiac glands typical of Nygolaimids, but also share the characters of Dorylaimoidea and hence have been considerably contravertial regarding their placement. The author strongly feels that they fit better in Dorylaimidae, sub-family Dorylaiminae, since the cardiac glands have even been observed in species of Endorylaimus. Discolaimus, Discolaimium and Discolaimoides are also considered under Dorylaimidae in sub-family Discolaiminae (Siddiqi, 1969) Ferris, 1971. Chrysonema, Chrysonemoides, Carteronema, Amphidorylaimus, Lordellonema and Poronemella which have been incorporated by Siddiqi, 1969 in a separate family Chrysonematidae is not been recognised. The family crateronematidae is recognised to include Chrysonema, Chrysonemoides and Crateronema. Amphidorylaimus is considered under Prodorylaimidae Andrassy, 1969, whereas Lordellonema and Porone-

-mella under Lordellonematinae of Dorylaimidae.

Thornia, Thornella and Willinema are being considered under family Thorniidae. The family Thornenmatidae is recognised to include only monodelphic forms with filliform tail whereas sicagutteridae, a new family is being proposed to contain the genera Sicagutter Siddiqi, 1971 under Sicagutteriinae Ali and Prabha, 1973 and Sub family Paraicagutterinae n.sub.family to include parasicagutter and Indodorylaimus.

Meyl, 1960 published a futher revision of this group containing nemerous changes. Clark, 1961 while dealing with revised classification of the order Enoplida made the taxonomy of this group more harmonious and logically understandable. Goodey's contributions in brining up a balanced taxonomic presentation of this group is highly commendable. Further splitting of super family Dorylaimoidea was brought forward by Thorne, (1964 and 1967), when he proposed two new super families i.e, Belondiroidea and Actinolaimoidea which resulted in considerable shrinkning of the original Dorylaimoidea, only to contain six families viz., Dorylaimidae de Man, 1876 Longidoridae (Thorne, 1935) Meyl, 1967; Leptonchidae Thorne, 1935; Aulolaimoididae Jairajpuri, 1964; Belonenchidae Thorne, 1964 (Syn. Basirotyleptidae Siddiqi & Khan, 1965) and Aporcelaimidae Heyns, 1965. The family opailaimidae Kirjanova, 1957 has been synonymised with Belondiridae by Andrassy, 1967.

Siddiqi, 1969 while providing a revised classification of the Dorylaimoidea, divided it into 17 different families six out of which have been proposed as new families. He also raised two sub-families viz. Tylencholaiminae and Tylencholaimellinae to family rank i.e., Tylencholaimiidae and Tylencholaimellidae. Besides he also added seven new sub-families and two new genera in the list of the super family Dorylaimoidea.

Jairajpuri, 1969 proposed Order Mononchida and ranked it equal to Dorylaimida.

Cooman's and Loof, 1970 proposed a revised classification ^{of} order Dorylaimida in which 5 sub-orders have been recognised. This classification is mainly based on the structure of the Oesophagus i.e., the overall thickness, the position of dorsal oesophageal gland nucleus and its orifice and also the sub-ventral gland orifice and nuclei and shape of stoma. The five sub-orders which have been recognised are 1) Monochina, 2) Bathydontina, 3. Dorylaimina; 4. Diptherophorina and 5. Trichosyringina.

Ferris, 1971 did not agree fully with the classification proposed by Siddiqi, 1969 and therefore made considerable changes in his new classification scheme.

Andrassy, 1976 in his revised classification of Nematodes divided the Phylum Nemathelminths into two classes i.e., Nematoda and Nematomorpha. Nematoda has been divided further into 3 sub-classes viz., Torquentia, Secernentia and Peneterantia. Dorylaimida

has been included as one of the orders of Penetrantia and is stated to have 4 sub-orders i.e., Monochina, Dorylaimina, Diptherophorina and Mermithina. Under the sub-order Dorylaimina six super-families i.e. Encholaimoidea, Nygolaimoidea, Dorylaimoidea, Belonidiroidea, Actinolaimoidea and Leptonchoidea have been recognised.

Under the present study the author examined large number of specimens of Dorylaimid nematodes which also necessitated a critical perusal of the available literature on this group. As discussed earlier, the classification of Dorylaimids is in a state of confusion. All the available classification schemes are complicated with intricate morphological characters and ambiguous terminology which are not very helpful for the identification. The other serious drawback is preferential and subject bias of different workers.

The author strongly feels that the main purpose of taxonomy is identification, and therefore has endeavoured to work out a scheme of classification so as to make the identification of Dorylaimida easier. The new scheme of classification of Dorylaimida (sub-order Dorylaimina) studied in this work is being provided in the table in detail, which is identification oriented. This scheme of classification is mainly based on the data obtained from published record. Emended diagnosis of taxa are being incorporated wherever changes are made.

ORDER DORYLAIMIDA (De Man, 1876) Pearse, 1942

DIAGNOSIS (amended) Free living nematodes inhabiting soil or fresh water or parasites of Arthropodes or vertebrates on some stages of their life cycle. Body generally large to over 1 mm in length. Body cuticle smooth or heavily annulated divided into plates. Sub-cuticle finely striated. Longitudinal striations rarely present. Setae absent excepting in Encholaimoidea where horn like seta on head are present. Cephalic setae absent. Amphids generally sub labial in position, stirrup shaped rarely labial in position (Kochinemidae). Sensillar sac connected with the amphidal pouch through narrow neck excepting in Diptherophorina, where the pouch and sensillar sac connected without neck amphidal apertures slit like (transverse of longitudinal) Labial papillae distinct sometimes projecting beyond the lip contour this providing the head with a disc like structures (Leptonchoidea). Buccal cavity narrow or wide bearing teeth or protusible stylet. Spear guide single or double. Stoma in Aliamina is unarmed. Oesophagus strongly muscular, throughout cylindroid or divided into two parts, the anterior tabular part with or without developed musculature and the posterior bulbs part measuring half or less the oesophageal length and encloses the five oesophageal glands and their nuclei. In longidoroidea the posterior pair of sub-ventral gland nuclei are absent, oesophago-intestinal-junction generally demarcated with distinct valve; three celled

valve is encountered in some members of Nygolaimoidea. Ecretory pore absent or rudimentary. Female gonad one or two. Males with two testes and ejaculatory duct, the latter not differentiated in Diptherophorina. Spicule paired free and robust. Lateral guiding piece and gubernaculum present or absent. Pre anal supplement paired or single and a ventro sub median series of supplements present, their number reduced in Leptonchoidea. Pre-rectum usually distinguishable. Caudal glands and terminal duct present in Monochina.

Type sub order : Dorylaimina (De Man , 1876) Thorne, 1934

KEY TO SUB- ORDERS OF DORYLAIMIDA

1. Oesophagus cylindrical of uniform thickness all over, caudal gland and terminal duct present..... 2
 Oesophagus not of uniform thickness, caudal gland and terminal duct absent..... 3
2. Stoma large and wide not embeded in oesophageal tissue..... Monochina Kirajanova & Krall, 1969
 Stoma narrow embeded almost wholly in oesophageal tissue Bathydontina, Coomans & Loof, 1970
3. Oesophageal glands forming a stichosome, parasitic in arthropods or vertebrates in some stage of life cycle..
 Trichosyringina Ward, 1917
 Oesophageal gland not forming a stichosome, not parasitic in arthropods or vertebrates..... 4
4. Male with single testes with paired adanal supplements Diptherophorina.

Male with two testes with paired adanal supplement

..... Dorylaimina (Micoltezky, 1922) Clark, 1961

SUB-ORDER : DORYLAIMINA (Micoltezky, 1922) Clark, 1961

DIAGNOSIS (emended). Free living in soil or inhabitants of fresh water. Largish nematodes but some times smaller forms with body length less than 1 mm. also encountered. Body cuticle thick made up of 3 layers, sub cuticle finely striated, longitudinal ridges and wing like areas found in some members. Head continuous or set off some-times greatly expanded. Amphids tubular or striup shaped with pore like or slit like apertures located outside the lateral lips; cephalic setae absent, sometimes spines . may be present on head. Labial pappilae generally distinct and well developed numbering sixteen in two circlets (10 + 6). Labial disc is a manifestation of the projecting outer circlet of labial pappilae. Lips amalgamated or separate numbering six. Mouth cavity tubular quite narrow bearing proturble stylet which originates from the stoma or from a cell in the oesopha-gus (Odontestylet). Spear surrounded by a thin guiding ring or sheath. Buccal cavity in Actinolomoidea heavily cuticularized with mural tooth. Oesophagus made up of two parts i.e., anterior tubular less muscular part and and posterior bulbous muscular part, the latter enclosing the five oesophageal gland nuclei and their orifices. The basal oesophageal bulb is sometimes surrounded by sheath of radial muscles. The oesophago-intestinal-juction well marked with a flat or rounded

conoid cardia, sometimes the cardia consists of 3 cells. Intestine oligocytus or polycytus. Pre-rectum generally differentiated. Gonads single or double. Ovaries reflexed at the oviduct. Sexual dimorphism in tail shape often encountered. The tail in both the sexes varied from short rounded to filiform. Male with two tests. Pre-annal-supplement present and series of ventro submedian pappilae also present. Gubernaculum mostly absent, lateral guiding piece mostly present. Bursa and caudal gland absent.

Type Super-family : Dorylaimoidea (De Man, 1876)
Thorne, 1934

KEY TO THE SUPER-FAMILIES OF DORYLAIMINA

1. Body cuticle heavily annulated divided into two plates, head bearing horn like setae.....
..... Encholaimoidea Golden & Murphy, 1967
Body cuticle not heavily annulated and divided into plates, head without horn like setae.....2
2. Walls of the pharynx or vestibule or both heavily cuticularized..... Actinolaimoidea Thorne, 1967
Walls of the Pharynx or vestibule or both not heavily cuticularized.....3
3. Buccal spear long and attenuated with fine lumen and aperture, the 2nd pair of sub ventral gland nuclei absent....Longidoroidea (Meyl, 1961) Ahmed & Khan, 1975.

- Buccal spear not long and attenuated, lumen of spear and aperture broad, all the five gland nuclei present4
4. Buccal armature a mural tooth located in the left subventral wall of the stoma with or without aperture Nygolaimoidea Thorne, 1935
- Buccal armature not a mural tooth located on the left subventral wall of the stoma and always with aperture5
5. Basal oesophageal bulb enclosed by a sheath of radial musculature Belondiroidea Thorne, 1964
- Basal oesophageal bulb not enclosed by a sheath of radial musculature6
6. Anterior tubular part of oesophagus with reduced musculature, basal oesophageal bulb short not measuring more than one third of oesophageal length.....
-Leptonchoidea(Thorne, 1935) Ferris, 1971.
- Anterior tubular part of oesophagus without reduced musculature, basal oesophageal bulb long, its length more than one third of oesophageal length
- Dorylaimoidea(De Man, 1876) Thorne, 1934.

SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934

DIAGNOSIS (emended): Dorylaimina. Generally large nematodes with thick cuticle made up of 3 layers. Body cuticle smooth or sub cuticle bearing fine transverse striations or sometimes longitudinal ridges. Head continuous but often set off by a profound constriction, with lips either distinctly separated or moderately amalgamated. In cases where lips are completely amalgamated then the head takes a rounded outline. The lip region sometimes greatly expanded forming a large disc, or sometimes six inarching lip flaps present over the entrance of the stoma. Cuticularized platellets surround the stomal opening, or cuticle on lateral side of head becomes exceptionally thickened. Mouth cavity narrow its walls not sclerotized, Amphids stirrup shaped located outside the lateral lips with distinct slit like aperture, rarely the amphid is labial in portion. Spear generally short with broad lumen and aperture, and is axial. In some members the stylet is a mural tooth set in the left subventral wall of the pharynx, in such cases the pharynx is eversible in three sections with thickened walls. The axial stylet sometimes very heavily sclerotized or contrary to it is thin and long with fine aperture and lumen or even the spear may be slender or weakly developed. Stoma with single or double guiding ring, simple or complex. Oesophagus consisting of two parts of which the posterior bulbous part measures always more than one third of the total oesophageal length

4. Lip region conoid with a heavily sclerotized frame work Sicagutturidae (Ali & Prabha, 1973) n.rank.
Lip region not conoid without heavily cuticularized frame work5
5. Spear slender or weakly developed6
Spear not slender and strongly developed7
6. Tail in both sexes bluntly rounded.....
..... Thorniidae Deconinck, 1965.
Tail in both sexes not rounded but elongate.....
.....Crateronematidae Siddiqi, 1969.
7. Female gonad single Thornenematidae Siddiqi, 1969.
Female gonad generally paired8
8. Distinct sexual dimorphism in tail shape
.....Dorylaimidae De Man, 1876.
No distinct sexual dimorphism in tail shape.....9
9. Tail of both sexes filiform
..... Prodorylaimidae Andrassy, 1969.
Tail of both sexes not filiform10.
10. Opening of spear relatively very large occupying half of spear length or more, guiding ring a weak fold Aporcelaimidae Heyns, 1965.
Opening of spear small, occupying only 2/5th of spear length or less guiding ring well formed and ring like*Quadsinematidae Jairajpuri, 1965.

*Foot note: This family is not very well defined and even the type genus has been synonymized to Eudorylaimus. This view was also upheld by Ferris, 1971. However the author feels that till more information about the taxon included in the family, the family name can be retained.

FAMILY: KOCHINEMATIDAE NEW FAMILY

DIAGNOSIS : Dorylaimoidea. Medium sized nematode. Body length averaging 1 mm. Outer cuticle smooth, inner finely transversally striated. Lip region expanded but not discoid. Spear long and slender almost twice lip width. Spear extension well developed red like almost equal to spear length. Guiding ring conspicuous, double. Amphid situated far forward on the lips, stirrup shaped, amphidial aperture slit like on the anterior contour of the lip. Oesophagus beginning with a spindle like swelling surrounding junction of spear extension to lumen, then more or less cylindrical muscular tube expanding at about half of oesophageal length forming the bulbous posterior part. Oesophageal gland nuclei dorylaimoid. Cardia conoid rounded. Female gonad amphidelphic, reflexed. Vulva transverse slit. Testes, spicula and supplements dorylaimoid. Lateral guiding piece present. No sexual dimorphism in tail shape, which is short conoid.

Type Genus Kochinema Heyns, 1963

GENUS: KOCHINEMA Heyns, 1963

PREVIOUS WORK

The genus Kochinema was described by Heyns, 1963 from soil collected from peanut field Lechtenburg transal. Heyns rightly pointed out the uniqueness of the position of amphid in these nematodes and even went to the

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extent in stating, that theoretically on the basis of character of amphid, these nematodes could not even be fitted in the Adenphoria. However, he also pointed out that in all other aspect the genus Kochinema exhibited affinities with genera of both the Dorylaiminae and Tylencholaiminae. The expanded lip region was shown by him to be a remainiscent of Discolaimoides Heyns, 1963. The long and slender spear of Kochinema with possession of double guiding ring shows distinct affinities with Enchodelus Thorne, 1939. In the structure of the amphid the members of this group have no parallel in Dorylaimina. Although Heyns gave all indications of a higher taxonomic category in Dorylaimoidea but he only proposed a generic rank for either in the family Dorylaiminae Or Tylencholaiminae. Later on more species were added to this genus by Siddiqi from India and by Argo and Vanderburg from South Africa. The author also came across two undescribed species belonging to this genus which incidently marks the second record of these worms from India and the first record from Kashmir. In all the species so far known and especially with wide distribution, the uniqueness in the structure of the amphid as originally described by Heyns in 1963, still holds good. The author is of the opinion that amphid being one of the most important character especially in the free living group of nematodes should be given a more weightage in the classification. The un-usual position of the amphid as represented in

the genus Kochinema merits a higher taxonomic ranking. Hence the author feels justified in proposing a new family Kochinimidae for the accomodation of the genus Kochinema. Heyns, 1963 and considers it within the frame work of super family Dorylaimoidea.

KOCHINEMA PAHALGAMENSIS SP. NOV.

(Plate No. xv Fig. A-F)

7 females were recovered from Soil around roots of local cultivar (Hak) of Brasica oleraceae from Pahalgam Kashmir. They are considered herein to constitute new species.

MEASUREMENTS

Female (6 paratypes) L = 0.62-0.67 mm,

a = 31.1to 32.9; b = 4-4.8

c = 28.1-29.5; v = 47-49% ,

Spear = 13 -15 mic.;

Spear extension = 9-11 mic.

Female (Holotype) L = 0.65 mm; a = 32.5 ;

b = 4.1; c = 29.5;

Spear = 13 mic; Spear -

extension = 9 mic.;

DESCRIPTION: The " Eel worm" when killed assumes an open "C" shape. Body slender cylindrical tapering^{at} both the ends, anteriorly from neck base to a knob like head which measures 2/3rd of body at neck base. Body cuticle interrupted by transverse striations. Amphid stirrup shaped its aperture

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measuring 5 microns across i.e., about 55% of head width, stoma weakly sclerotized, tubular, forming a spear guide located at 10 microns from anterior end. Spear slender measuring 13 microns in length, its lumen measuring 1 microns in width. Spear extension simple rod like measuring 9 microns in length. Oesophagus made up of two parts; an anterior tubular slender part, measuring 84 microns in length which proximally in the region of spear extension forms a spindle like swelling and distally expanding to form the basal oesophageal bulb which measures 60 microns in length, and having maximum width of 12 microns. Nerve ring located at 50 microns from anterior end. The five oesophageal gland nuclei and thier openings are lodged in the basal oesophageal bulb. The unpaired dorsal oesophageal nuclei located at 7 microns where as 1st pair of sub-ventral gland nuclei at 28 and 29 microns (right and left) and 2nd pair of sub-ventral gland nuclei at 37 and 39 microns from where the basal oesophageal bulb starts expanding. Cardia hemispherical measuring 8x8 microns in dimension.

Vulva transverse slit at 47%; vagina at right angles to body axis extending to 1/3rd of body across. Gonads didelphic, symmetrical; ovaries reflexed at the oviduct; oocytes mostly arranged in single row except in zone of multiplication. Pre rectum not differentiated. Rectum measuring about one anal-body-width in length.

A small post-anal-blind sac present. Tail elongate conoid with a small pretruberance at the tip, the former measuring a little less than 2 anal-body-widths in length. Two pairs of caudal pores present.

MALE : Not found.

Paratypes . Females on Slide No:PN/KOC/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype. Female on Slide No. PN/KOC/3 in author's collection.

HOST: Collected from soil around the roots of local cultivar (Hak-) of Brassica oleracea.

LOCALITY Pahalgam Kashmir.

DIAGNOSIS AND RELATIONSHIP

Kochinema pahalgamensis n.sp.

is distinctive by having a knob like head, stirrup shaped amphid, hemispherical cardia, post anal blind sac and by the presence of an elongate conoid tail with a small protruberance. However, it comes close to K.proamphidium Heyns, 1963 and K.tenuis Bergetal, 1971 and K.kanganensis n.sp. From K.proamphidium and K.tenuis, the new species differs in the smaller body size and spear, anteriorly located vulva (L = 0.82- 0.98mm; spear = 25.8 microns; v = 56-59% in K.proamphidium; L = 0.81 -0.87 mm; spear = 17 microns; v = 55 % in K.tenuis). From K.Kanganensis, the new species

differs in having a smaller body and spear, posteriorly located vulva, widely open vulva, and shape of cardia.

In view of the above differences the present form is considered here to constitute the new species for which the name K. pahalgamensis is proposed.

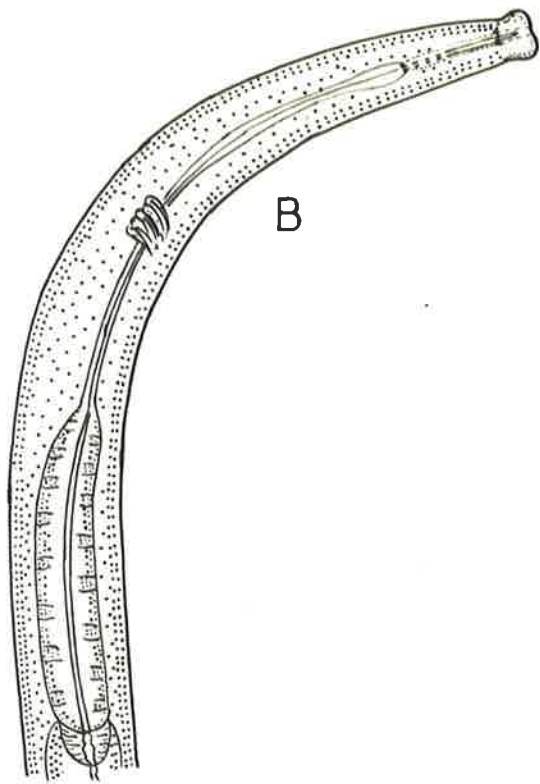
PLATE - X V

KOCHINEMA PAHALGAMENSIS SP. NOV

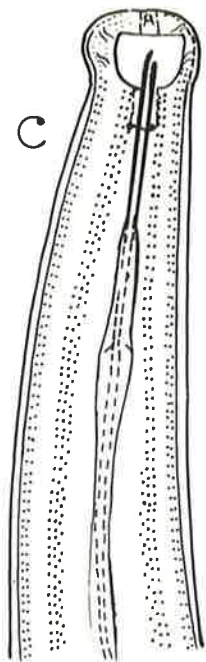
- Fig. A : Entire female
B : Oesophageal region of female
C : Anterior end showing amphid
D : Vulval region showing didelphic gonad
E : Posterior part of oesophagus showing basal bulb and cardia
F : Tail end of female



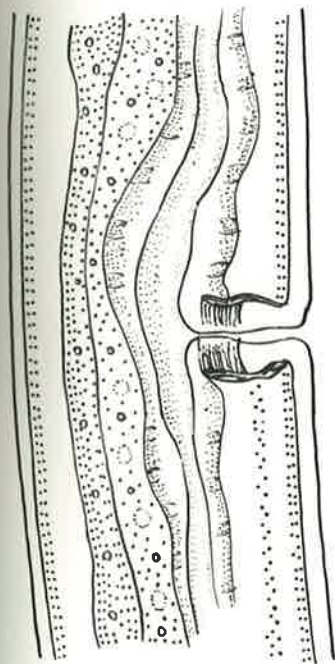
A



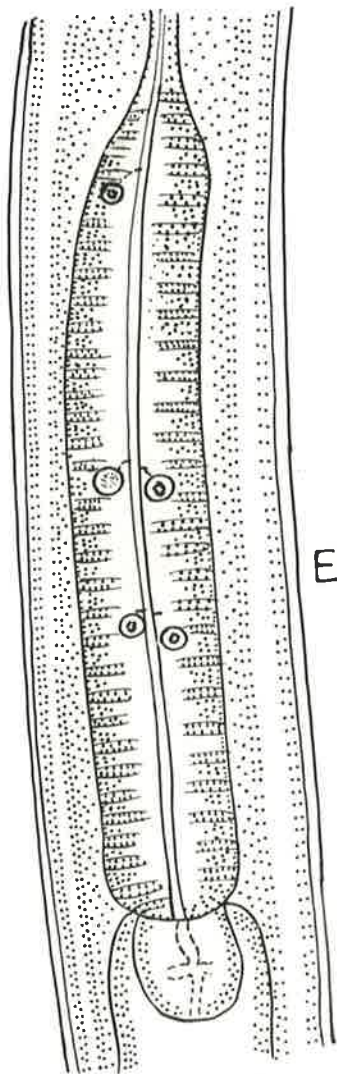
B



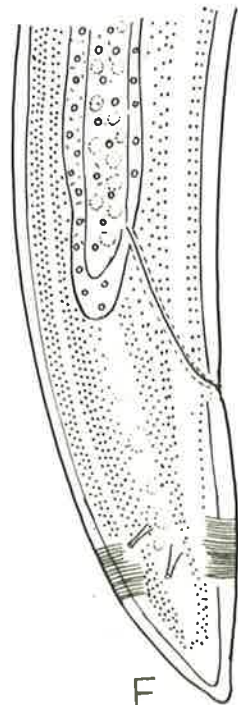
C



D



E



F

100μ	C-F
400μ	B
2000μ	A

KOCHINEMA KANGANENSIS SP. NOV.

(plate XVI Fig. A-G)

11 females were recovered from soil around roots of Lycopersicon esculentum Miller from Kangan Kashmir. These are considered herein to constitute new species.

MEASUREMENTS

Female (10 paratypes) L = 0.71 -0.75 mm;

a = 27.7 -29.6; b = 4.3-5.1;

c = 29.1 -29.8; v = 43-45%;

Spear = 20-23 microns;

spear extension = 15-17 mic.

Female (Holotype) L = 0.74 mm; a = 29.6,

b = 4.7; c = 29.6; v = 44%;

Spear extension = 16 mic.

Spear = 20 mic.

DESCRIPTION: The body assumes an arc like shape on being killed by hot water. Body cuticle moderately thickened more so in the head and tail region. Body cylindrical tapering at both the ends anteriorly from neck base to form the head which is about 1/3rd body width at **neck** base. While posteriorly behind the vulva to a elongate conoid tail. Cuticle finely transversally striated. Head expanded and knob like set off by deep constriction from the adjacent body and measures 9x5 mic. in dimension. Amphid funnel shaped located anteriorly in the head region, its aperture

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measuring 4 microns across i.e., 44% of lip width. Spear measuring 20 microns in length and the extension measures 16 microns in length, the latter being slightly smaller than the former and is rod like. Anterior part of oesophagus swelling in a spindle like shape, at the base of the extension, and thereafter becoming tubular measuring 120 microns in length being coiled distally and expands gradually to form the basal oesophageal bulb. The latter measuring 60 microns (55-70 microns in paratypes) long and 11 microns wide (10-14) microns in paratypes. Cardia well developed elongate conoid (8-10 microns in paratypes). Five gland nuclei i.e., unpaired dorsal gland nucleus located at 13 microns from where the basal bulb starts expanding, the first pair of sub-ventral gland nuclei located at 36 and 37 microns respectively (right and left) from where oesophagus starts expanding and 2nd pair of gland nuclei located at 54 mic. where the oesophagus expands, their opening lie close to the gland nuclei.

Vulva transverse slit, vagina at right angles to body axis measuring a little less than 1/2nd of body width across. Gonad paired amphidelphic; ovaries reflexed at oviduct; oocytes mostly arranged in single row excepting the zone of multiplication. Rectum about 1 anal-body-width in length. Tail dorsally convexed conoid measuring about 1 times the anal-body-width in length ending with a sub-acute rounded terminus bearing two pairs of caudal pores.

100

MALES: Not found.

Paratypes Females on slide No. PN/KOC/4-5 deposited with the Department of Zoology, University of Kashmir.

Holotype Female on Slide No. PN/KOC/6 in author's collection.

Host: Collected from soil around roots of Lycopersicon esculentum Miller.

LOCALITY Kangan, Kashmir.

DIAGNOSIS AND RELATIONSHIP

Kochinema kanganensis n.sp. is distinctive by having knob like set off head, funnel shaped amphid, well developed elongate conoid cardia and dorsally convex conoid tail. However, it comes close to K.tenue Berg et al, 1971 and K.secutum Siddiqi, 1965. From K.tenue, the new species differs by its smaller body, longer spear and anteriorly located vulva (L = 0.81 - 0.87 mm; spear = 17 microns; v = 55 in K.tenue), while from K. secutum the present species differs by shorter body, longer spear and anteriorly located vulva (L = 1.03 mm; spear = 15 microns; v = 53% in K.secutum).

In view of the above differences the present form is considered here to constitute a new species for which the name K.kanganensis has been proposed.

FAMILY ; SICAGUTTERIIDAE (Ali & Prabha, 1973) n.rank

PREVIOUS WORK

The genus Sicagutter was proposed by Siddiqi, 1970 for medium sized nematodes with thick body cuticle having continuous considerably narrowed lip region with heavily sclerotized frame work and simple single guiding ring. He accomodated his new genus in family Thornenematidae Siddiqi, 1969. This does not appear very logical becuae family Thornenematidae is characterised by having monodelphic gonad and the head region is unsclerotized. Ali and Prabha , 1973 in their studies on the genera Sicagutter and Indodorylaimus, the latter being new rightly shifted Sicagutter and also placed their new genus in a new sub-family Sicagutturinae under the family Prodorylaimidae Andrassy, 1969 which is characterised by presence of double guiding ring, paired gonad and lip region without scleretization.

The author also collected and studied specimens^e of this group and hence feels that the only similarity between Sicagutterinae and members of Prodorylaimidae lies in tail shape. This does not warrant the placement of Sicagutterinae in family Prodorylaimidae. The abnormally thick sclerotization in the lip region is so distinctive character that even recognising the nematodes of this group, under stereoscopic microscope is simple an easy task. The group in itself shows considerable variation in regard to other characters like number of gonad,

shape of cardia and amphid which clearly reflects that these nematodes form a natural group like other families of Dorylaimoidea. The author therefore feels justified in upgrading the sub family Sicagutteriinae to family rank Sicagutteriidae having two sub-families i.e. Sicagutterrinae and Parasicagutturiinae, the latter being new.

FAMILY SICAGUTTERIIDAE (Ali & Prabha, 1974) n. rank

DIAGNOSIS: Dorylaimoidea. Free living nematodes inhabiting soil. Body length varying from 1-2 mm. Body cuticle thick with fine transverse striations, lateral hypodermal chord without having distinct glandular bodies. Lateral body pores well spaced appearing to fall in line. Dorsal and ventral body pores prominent in neck region, limited in number. Amphid funnel shaped with slit like aperture, sub labial in position. Lip region conoid considerably narrowed, continuous with the body contour and with a heavily sclerotized frame work which is prominent even under low magnification and appears as dark brown in colour. Sometimes small cuticularized plates surrounds the oral opening. Spear guiding ring single in the anterior end of the body, spear robust cylindroid with wide lumen and aperture, extension dorylaimid. Oesophagus narrow muscular tube gradually enlarge behind middle. Five oesophageal gland nuclei.

and their opening located in the basal bulb. The dorsal oesophageal gland nucleus located at about the level where the oesophagus starts expanding. Cardia simple or transverse. Gonad single or paired. Tail elongate filiform.

MALES: Not known

Type sub-family Sicagutterinae Ali and Prabha, 1973.

SUB FAMILY SICAGUTTERINAE Ali & Prabha, 1973

DIAGNOSIS: Sicagutteridae. Medium sized nematodes. Body cuticle thick. Sub-cuticle transversally striated. Lateal hypodermal chords exceedingly narrow with indistinct glandular bodies. Lateral pores well spaced appearing to fall in line. Ventral pores also well spaced, spread over the body. Dorsal pores limited in number located in the anterior part. Spear with wide lumen, cylindrical, wide lumen and aperture measuring under half of its length. Oesophagus enlarging at about 58% of its length, enlarged part with thick inner lining.

Anterior sub-ventral gland nuclei and their opening located in anterior half of the oesophagus, whereas the posterior sub-ventrals along with the openings are located in posterior half. Oesophago-intestinal valve elongate, sub digitate. Vulva transverse. Gonads amphidelphic, ovaries symmetrical with numerous oocytes. Tail elongate filiform with terminal portion devoid of Protoplasmic core.

Type genus: Sicagutter Siddiqi, 1971

SUB FAMILY PARASICAGUTTERIINAE NEW SUB FAMILY

DIAGNOSIS: Sicagutteriidae. Body almost straight or coiled ventrally when relaxed. Body cuticle thick, specially thickened in the region of head, inner body cuticle may bear transverse striation. Lip region narrow, tapering, strongly sclerotized, not off set from the body. Four cuticularized platelets surround oral aperture (Parasicagutter). Amphid funnel like or cyathiform, amphidial aperture is fairly cuticularized in Parasicagutter. Guiding ring single. Spear robust, dorylaimoid measuring 2 head widths in length its aperture measuring from one quarter to one seventh of spear length. Spear extension longer than spear with or without flanges. Anterior part of oesophagus have gradually expanded into the bulbous part, the latter measuring about 40% of spear length. Dorsal oesophageal gland nuclei located in level with the point where the basal bulb starts expanding. Cardia simple or with stem like projection jutting into the anterior part of intestine, vulva transverse. Gonad monoopisthodelphic. Tail long and filiform with protoplasmic core running till the tail tip or stops shorter to it.

Type genus Parasicagutter New. genus

PARASICAGUTTER GEN. NOV.

DIAGNOSIS: Parasicagutteriinae. Body almost straight, cuticle thick interrupted by transverse striations. Lip region conoid smooth, continuous. Four cuticularized small platelets surrounded the oral opening. Amphid funnel like located at the base head, with fairly cuticularized aperture. Body cuticle in the anterior region of the head (near the head) exceptionally thickened. Stoma moderately cuticularized, inverted funnel like forming a single guiding ring.

Spear robust measuring about 2 head widths in length, with its lumen about 1/7th of spear length in width; spear extension less than two spear length long basely glanged. Anterior part of oesophagus narrow, then expanding generally to the main muscular part which is about 40% of total oesophageal length and lodges the five oesophageal gland nuclei and their openings; the dorsal oesophageal gland nucleus located almost at the level where the oesophagus start expanding. Cardia large measuring about 30 microns in length having distally a stem like projection which is jutting into the beginning of intestine. Pre rectum differentiated about two rectal length long. Vulva pre equatorial in position; gonad single posterior, ovary reflexed. Tail long and filiform with a protoplasmic core running till the tip.

Type and only species Parasicagutter mehdii Gen.et.sp, Nov

PARASICAGUTTER MEHDII GEN. ET SP. NOV

(Plate XVII Fig. A-G)

9 females were recovered from soil around roots of Pyrus malus L. from Pattan, Kashmir. On examination these were found to be distinct and were placed in a new genus for which the name Parasicaqutter is proposed.

MEASUREMENTS:

Female (8 paratypes) L = 1.1-1.5 mm; a = 25.3 -27.7;
b = 4.3 -5.1, c = 9.6 -9.9,
v = 32-34%; Spear = 13-14 mic.;
spear extension = 24-25 mic.

Female (Holotype) L = 1.2 mm; a = 26; b = 4.3;
c = 9.7; v = 34%; spear = 13 mic.;
Spear extension = 24 mic.

DESCRIPTION

"Eel worm" when killed assumes a slightly ventrally curved posture (body straight in some paratypes). Body robust, cylindrical distinctly transversally striated throughout its length. Body cuticle thick, special thickenings present below the head. Head continuous low and round measuring 6 microns across with four cuticularized platelets surrounding the oral aperture. Labial papillae indistinct. Stoma weakly developed, inverted funnel like extending upto 9 microns from anterior end and forming a single guiding ring. Spear assymetrical 13 microns in length and with its lumen 2 microns broad.

Spear extension glanged measuring 24 microns in length. Anterior tubular part of oesophagus measuring about 211 microns in length, expands gently at its distal end to form the cylindrical basal oesophageal bulb which measures 142 microns in length having a maximum width of 25 microns. Dorsal oesophageal gland nucleus almost at the level where the basal bulb starts expanding, where as the first pair of sub-ventral gland nuclei are located anterior to the middle of bulb and posterior pair of sub-ventral gland nuclei is situated in the posterior 3rd of bulb. The gland opening lie close to the gland nuclei. Oesophago-intestinal junction well marked. Cardia large measuring about 30 microns in length having distally a stem like projection which is jutting in the begining of intestine.

Vulva transverse slit located at 33% of body length. Gonad single, posterior, ovary reflexed at oviduct arranged in double row in zone of reproduction while as single row in zone of maturation. Anterior uterine-sac small, rudimentary. Vagina extending little less than half of vulval body width into the body. Tail filiform gradually narrowing and measuring 9 anal-body widths in length. Tail terminus finely rounded.

MALES: Not found

Paratypes (8 females) on Slide No. PN/PAR/1-2

deposited in the Department
of Zoology, University of Kashmir.

Holotype (female) on slide No. PN/PAR/3 in authors' collection.

Host: Collected from soil around roots of Pyrus malus L.

LOCALITY: Pattan, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

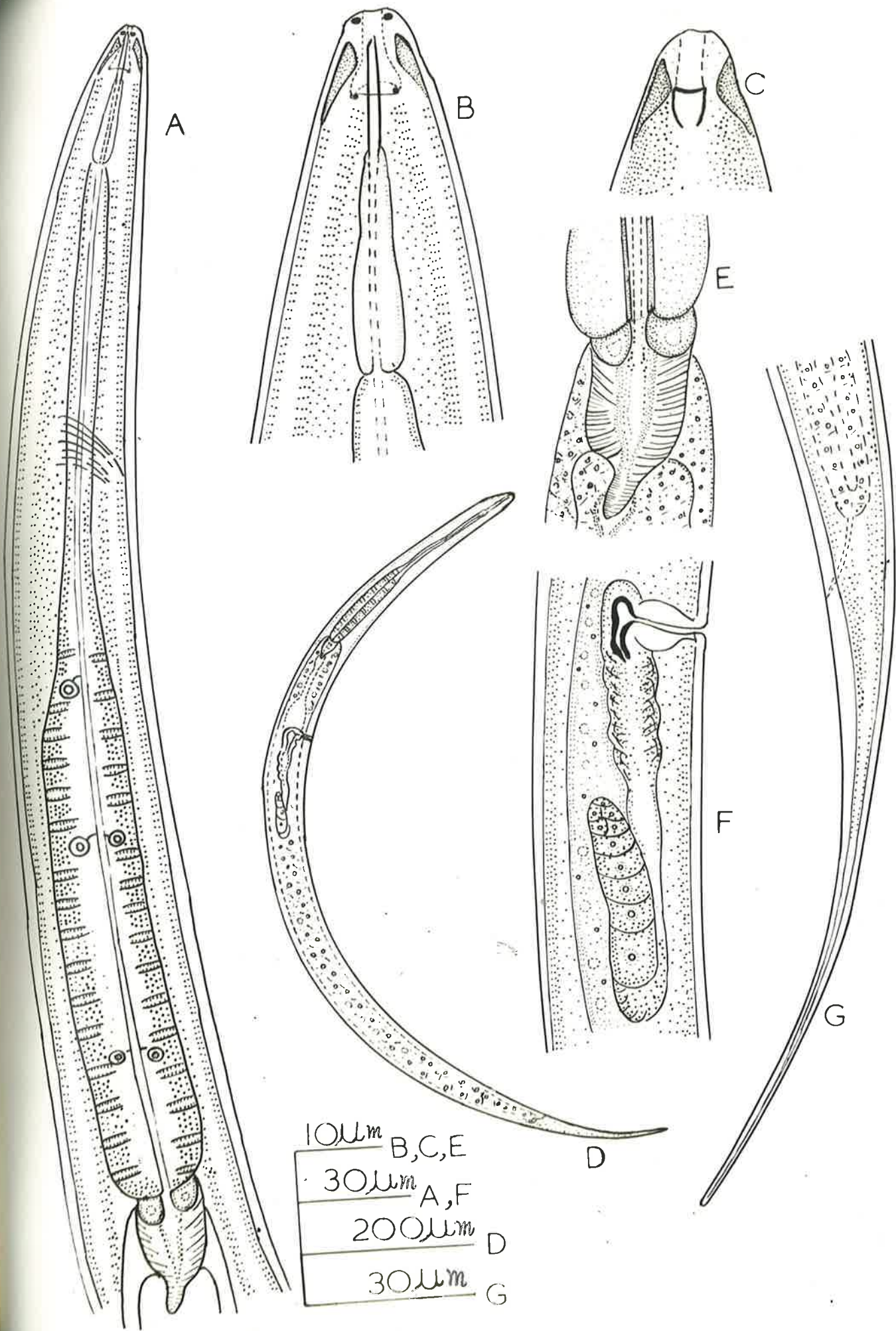
The new genus Parasicagutter resembles Punguntus Thorne & Swanger, 1936, Thornema Andrassy, 1959 and Siccagutter Siddiqi, 1970. From Punguntus, n. genus differs in the shape of lip region, shape of amphid, number of guiding ring and by the presence of lateral cuticularization below the head. (head off set by sharp constriction, guiding ring double, amphid stirrup shaped, cuticularization absent below the head in Punguntus). From Thornema the present genus differs by the thick cuticularization below the head. The new genus however, comes close to Siccagutter from which it differs by the assymetrical spear, flanged extension, large and complexed cardia and by the single gonad. It also comes close to Indodorylaimus Mehdi Ali et al, 1973 but can be distinguished by the striated nature of body cuticle, presence of four cuticularized platelets around the oral aperture, assymetrical spear, flanged extension and by the long and complex nature of cardia.

In view of the above differences, the present form is considered to be distinct and a new genus Parasicagutter is proposed for its accomodation.

PLATE - XVII

PARASICAGUTTER MENDII N.GEN: N.SP.

- Fig. A : Oesophagel region of female
B : Anterior end of female
C : Amphid showing sclerotization
D : Entire female
E : Cardia showing stem like
 projection Jutting into inestine
F : Vulval region Shosing posterior
 Gonad reflected at oviduct
G : Tail end of female



PREVIOUS WORK

Nematodes included in super family Leptonchoidea are somehow quite distinctive from all Dorylaimid nematodes so much so that one can easily be deceived in wrongly identifying them as Tylenchids. This happens because of their gross resemblance with Tylenchs in the body granulation, texture, short oesophageal bulb and the cuticle to the extent that even an experienced worker can be misled especially when working under lowest magnification. Nematodes of this group are quite distinctive by having a small body size, cuticle with the distinct transverse and radial striation, dense granulation of the body, low and rounded lip region, reduced papillae, short or long but thin and acicular spear with fine lumen, anterior tubular part of oesophagus thin and tubular with reduced musculature and a short oesophageal bulb which generally is cylindroid. The musculature in these nematodes is meromyrian. It was rightly pointed out by Thorne, 1964 that these nematodes in all probability might be feeding on the higher plants as they are always found associated with the Rhizosphere. Even at the moment the super-family comprises a large number of nematodes which infact may be a fraction of their actual number.

The genus Leptonchus was described by Cobb, in 1920. Thorne, 1935 proposed the sub family Leptonchinae which he upgraded to the family rank i.e. Leptonchidae.

simultaneously he also proposed the sub-family Campydorinae to incorporate the genus Campydora Cobb, 1920. The genus Aulolaimoides was proposed by Micoletzky in 1914 and which was considered by Thorne to have an uncertain affinity with the family Leptonchidae, under which Thorne included Leptonchinae and Campydorinae. Regarding the inclusion of the sub-family Campydorinae in Leptonchidae, Thorne himself was doubtful. Thorne in 1939 included in genera Leptonchus Cobb, 1920; Tyleptus, Thorne, 1939 Tylolaimophorus DeMan, 1880 Doryllium Cobb., 1920 and Tylencholaimellus M.V. Cobb, 1915. The genus Proleptonchus, which was described by Lordelloe in 1955, but could not get wide recognition until Timm, 1964 and Jairajpuri, 1964 further strengthened the diagnostic characters and established the genus on a sound footing. Both the authors pointed out that most outstanding diagnostic feature of the genus was the strongly cuticularised. Bell shaped spear guide, and as result of their study they independently synonymised the genus Anphrostoma, Clark, 1962 with Proleptonchus. However, the above action is not considered fully justified as has been rightly pointed out by Ferris in 1971. The structure of the spear in the various species of this complex resemble species of Leptonchus or sometimes becoming exceedingly thin as encountered in Belonenchidae. The genus Buttalium was described by Heyns in 1963 and was included in the family Leptonchidae. The sub-family campydora Cobb, 1920, Tyleptus and Aulolaimodes. He simultaneously shifted Tylolaimophorus to the family Diptherophoridae. Goodey 1963 fully agreed with Clark's classification and rather doubtfully added the genus Funaria

Van Den Linde, 1938 in the family Leptonchidae.

Jairajpuri, 1964 also agreed with Clark's action in the proposition of family Campydoridae further stressing that the genus Campydora is all together different from rest of the Leptonchidae, but he questioned the inclusion of Tyleptus and Aulolaimoides in the family Campydoridae. He set aside Clark's classification and shifted back Tyleptus in the family Leptonchidae, and regarded Anlolaimoides as an independent group, stating that it should be placed in a separate family just like campydoridae on the basis of the fact, that the group is quite distinctive from all the members of the Leptonchidae in the structure of spear, oesophagus, presence of gubernaculum and pharyngeal valve supported by minute ribs. Thus he gave a new scheme of classification in which he proposed Anlolaimoididae as a separate family for the only genus Anlolaimoides. The family Leptonchidae was rediagnosed and subdivided into three sub-families i.e., Leptonchinae, Tyleptinae and Tylencholaimellinae, last two were new. Under the sub-family Tyleptinae he included genus Tyleptus and a new genus Basirotyleptus. Sub-family Tylencholaimellinae was stated to comprise the genera Tylencholaimellus, Doryllium and Batallium, where as under the sub-family Leptonchidae he retained the genera Leptonchus, Proleptonchus, Dorylaimoides and Funaria as genus in Inquirenda. Loof also in 1964 preferred to place the genus Tyleptus back in the Leptonchidae. Jairajpuri, 1964 considered his new genus Dorella as a member of Tylencholaimellinae but he transferred

Botalium to a new sub-family Xiphinemellinae along with the genus Xiphinemella Loof, 1950 as the type. The sub-family Xiphinemellinae was incorporated in family Leptonchidae. Jairajpuri in 1965 proposed genus Oostenbrinkella and considered it close to the genera of Xiphinemellinae and the genus Doryllium, but he did not formally place this genus and Leptonema Jairajpuri (1964 E) in any of the sub-families.

The genus Trichonchium was proposed by Siddiqi & Khan, 1964, in the same year Thorne described two new genera i.e., Belonenchus and Poncenema and they were placed in a new family Belonenchidae, he also suggested that Trichonchium is better fitted in Belonenchidae rather than Campydoridae. Thorne also added Agmodorus and Doryschota to Leptonchinae where as Phellonema in the sub-family Tylencholaimellinae. Two more genera i.e. Vanderlencia and Calolaimus were proposed by Heyns (1964) and Timm (1964) and were accommodated under Tylencholaiminae and Leptonchinae respectively.

Siddiqi and Khan, 1964 discussed in length the morphological structure of both Tyleptinae and Leptonchinae. They pointed out that the main distinguishing character on the basis of which Jairajpuri separated Tyleptinae from Leptonchinae was the presence of six peri-oral liplets. Infact, according to them there is no speciality in this character and the peri-oral liplets are nothing but the raised labial papillae which exhibit considerable degree of variation. The next important character for distinguishing

Tyleptinae was the presence of narrow Triquetrous chamber in the terminal bulb of the oesophagus, which infact is the inner cuticular wall of the terminal bulb becoming fairly thickened to give a impression of a Triquetrous chamber, and hence does not merit to be identified as a special character. Therefore in the opinion of Khan and Siddiqi 1964 as discussed above both the characters have been found to be shared by members of Leptonchinae. They therefore synonymized Tyleptinae with Leptonchinae and placed back Tyleptus again Leptonchinae.

Siddiqi & Khan, 1965 emended the generic diagnosis of Basirotyleptus and considered beter to place it (Trichonchium was placed as a junior synonym of Basirotyleptus) in a new family Basirotyleptidae, based upon the uniqueness in the structure of the spear which when compared with other dorylaims was shown to be solid needle like lacking aperture and therefore has no parallel in the entire dorylaimina. However, in the related sub-order Diptherophorina the genus Trichodorius has a similar spear though of different origin.

Siddiqi, 1965 proposed the genus Galophenema under Leptonchidae. Khan, Chawla & Prasad, 1965 found that since the name Leptonema was preoccupied, hence they proposed a new name Shamimonema.

The sub-family Tylencholaiminae which was proposed by Filipjev, 1934 and considered under Dorylaimidae Goodey, 1963 was transferred by Loof, and Jairajpuri, 1968 under the

family Leptonchidae. They transferred the genera Tylencholaimus, Botallium, Discomyctus, Xenochium and Xiphinemella from Dorylaimidae to Leptonchidae. They further considered Xiphinemellinae a synonym of the sub-family Tylencholaiminae.

While giving a revised classification of Dorylaimoidea Siddiqi ~~in~~ 1969 included Leptonchus (= Funaria) Proleptonchus, Doryschota and Tyleptus in the family Leptonchidae and also synonymized Leptonchinae and Tyleptinae with Leptonchidae. He upgraded the sub-family Tylencholaiminae to family rank i.e., Tylencholaimidae to include the sub-families Tylencholaiminae consisting of Tylencholaimus, Discomyctus (= Oostenbrinkela) and Xiphinemella (= Taprobanus Loos, 1949, Botallium), the sub-family Vanderlininae incorporated Vanderlindia and Metadorylaimus Jairajpuri and Goody, 1966 and Utanematinae comprising of Utanema, Chitwoodius Furstenberg and Heyns 1966 and Xenochium. Under the family Belonenchidae (= Basirotyleptidae) he placed the genus Basirotyleptus (= Trichonchium, Belononchius and Foöncenema). The sub-family Tylencholaimellidae to include the genera Tylencholaimellus (= Pharetrolaimus De Man, 1921) Doryllium, Dorella and Phellonema. He proposed a new family Miranematidae to incorporate the genera Miranema and Calolaimus (= Galaphinema). Dorylaimoides, Agmodorus and Nygolaimoides were included in new family Dorylaimoididae. The status of family Anlolaimoididae was retained as has been proposed by Jairajpuri, Khera in 1970 upheld the action of

Clark, 1961 in transferring Tylolaimophorus to Diptherophoridae. He also emphasized that the character of the Triquetrous valvular chamber in the basal oesophageal bulb is a character good enough for defining at family rank. Khera did not agree with the am^endation of Diagnosis of family Campydoridae and stressed that original definition of Campydoridae as given of Clark, 1961 be restored. He suppressed the family Aulolaimoididae and instead a new sub-family Aulolaimoidinae was proposed to contain genera Aulolaimoides and Tyleptus where as sub-family Campydorinae has also been retained to contain the only genus Campydora. According to his scheme of classification the family Campidoridae was considered to include two sub-families i.e., Aulolaimoidinae and Campydorinae, under the family Leptonchidae six sub-families were accepted i.e., Leptonchinae, Tylencholaiminae, Tylencholaimellinae Dorylaimoidinae, Miranematinae and Belonenchinae. The families Tylencholaimellidae Dorylaimoididae, Miranematidae and Belonenchidae have all be^yensynon^ymized with Leptonchidae and the sub-families Xiphinemellinae, Uthanematinae and Tylencholaimidae were synon^ymized with sub-family Tylencholaiminae.

Ferris, 1971 raised the family Leptonchidae to super family rank i.e., Leptonchoidea. He accepted and retained all the families compr^sing of genera considered to be Leptonchid under the super family Leptonchoidea. To justify his action in elevating Leptonchidae to super family rank he rightly pointed out that this act would not

only preserve the relationship between otherwise heterogeneous group but somehow would also depict the sharing of some of the basic characters. The author agrees with this upgradation and is confident that this step would be a further step which will not only straighten out some of the taxonomic bottle necks but also simplify the process of identification in view of the fastly increasing literature on this group.

The following scheme of classifying Leptonchoidea was proposed by Ferris, 1971

<u>Family</u>	<u>Genus</u>
1. Leptonchidae	Genus <u>Leptonchus</u>
2.	<u>Proleptonchus</u>
	<u>Tyleptus</u>
	<u>Doryschota</u>
2. Belonenchidae	<u>Belonenchus</u>
	<u>Poneenema</u>
	<u>Basirotyleptus</u>
3. Dorylaimoididae	<u>Dorylaimoides</u>
	<u>Shamimonema</u>
	<u>Calolaimus</u>
	<u>Agmodorus</u>
4. Tylencholaimellidae	<u>Tylencholaimellus</u>
	<u>Doryllium</u>
	<u>Phellonema</u>
	<u>Dorella</u>

L E P T O N C H O I D E A

-LEPTONCHOIDEA-

- | | |
|--------------------|----------------------|
| 5. Anlolaimoididae | <u>Aulolaimoides</u> |
| 6. Campydoridae | <u>Campydora</u> |
| 7. Encholaimidae | <u>Encholaimus</u> |

Andrassy, 1976 accepted the super family Leptonchoidea. Under this super family he incorporated six families i.e., Belononchidae, Tylencholaimidae, Campydoridae, Aulolaimoididae, Tylencholaimellidae and Leptonchidae. The family Encholaimidae which was proposed by Golden and Murphy, 1967 with Encholaimus Golden and Murphy 1967 as type genus has been raised to super family rank. He also proposed several changes and presented an upto date record of all the available literature on this group.

The present author is in full agreement both with Ferris, 1971 and with Andrassy, 1976 in considering Leptonchoidea a valid taxa in this work which is considered to incorporate eight families. A original scheme of classification which has been followed in this work is detailed out in the table.

SUPER FAMILY : LEPTONCHOIDEA (Thorne, 1935) Ferris, 1971

DIAGNOSIS (emended) Meromyarian. Small to moderately large nematodes generally found associated with Rhizosphere of higher plants. Suspected plant parasitic. Cuticle generally distinctly transversally striated. Sometimes becoming loose with fixation folds and radial elements. Its inner layer and sub cuticle forming coarse transverse slit. Head continuous or often angular and set off with labial papillae projecting beyond the lip contour, which has been referred by Thorne as perioral liplets. Lips amalgamated or distinct. Aphids generally stirrup or funnel like with slit like aperture. Stoma generally inverted funnel like. Spear guide generally single, weakly developed. Spear often thin weakly developed with reduced aperture except in Dorylaimoididae where the spear carries large diversion, basal process especially on its dorsal sector which makes spear extension look angular. Spear extension simple rod like, flanged or with basal knobs. In the family Belonenchidae which have a solid needle like spear without aperture. Oesophagus consists of two parts the anterior tabular slender part with the reduced musculature expanding basally into an short expanded bulb measuring not more than 1/3rd of oesophageal length containing three gland nuclei. In several groups the anterior part of oesophagus becomes distinctly set off from the posterior bulbous part. The oesophago-intestinal- junction well marked with distinct cardia. Intestine

oligocytus. Gonad single or double, reflexed. When ovary single it is either pro or opisthodelphic. Supplements reduced to few in number. Tail in both sexes similar.

Type Family: Leptonchidae Thorne, 1935

KEY TO THE FAMILIES OF SUPER FAMILY LEPTONCHOIDEA

1. Spear solid needle like Belonenchidae, Thorne 1964
Spear not solid needle like.....2
2. Pharyngeal wall supported by minute ribs.....
..... Aulolaimoididae Jairajpuri, 1964.
Pharyngeal wall not supported by minute ribs.....3
3. Spear a mural tooth placed dorsally in the stoma.....
..... Campydoridae, (Thorne, 1935) Clark, 1961.
Spear not mural tooth but axial in nature.....4
4. Oesophagus with an anterior non-muscular slender part,
posterior bulbous part less than one fourth of
oesophageal length.....5
Oesophagus with anterior tubular part thickened, and
posterior bulbous part measures about one third of
oesophageal length.....6
5. Spear short dorylaimid, posterior oesophageal bulb set
off from the anterior tubular part.....
..... Tylencholaimellidae (Jairajpuri 1964)
Siddiqi, 1969
Spear not so short thin and fine, oesophageal bulb not
set off from the anterior tubular part.....
..... Leptonchidae Thorne, 1935.
6. Spear extension rod like with distinct basal knobs....
..... Tylencholaimidae (Filipjev, 1934)
Siddiqi, 1969.
Spear extension not rod like.....7

7. Spear extension heavily sclerotized supplements
 numerous Miranematidae Siddiqi, 1969.
 Spear extension not heavily sclerotized angular,
 supplements few Dorylaimoididae Siddiqi, 1969.

FAMILY : TYLENCHOLAIMELIDAE (Jaipajpuri, 1964)
 Siddiqi, 1969

DIAGNOSIS (emended): Leptonchoidea. Small sized nematodes.
 Lip amalgamated with 16 papillae, sometimes the outer
 projecting are fused to form a disc like structure. Stoma
 simple unsclerotized, tubular or funnel shaped in anterior
 region. Amphid large stirrup shaped with slit like
 openings located below the lateral lips. Spear axial,
 spear extension bearing flanges or rounded knobs some-
 times an extra dorsal or ventral stiffening piece on
 spear present. Oesophagus with anterior tubular part and
 set off posterior bulbous part. Oesophago-intestinal
 junction with a distinct valve. Ovaries single anterior
 or posterior. Vulva pre or post equatorial with a trans-
 verse slit. Anterior or posterior rudimentary branch
 present. Prerectum present. Spicula paired, Dorylaimoid
 with lateral guiding piece. Ventero sub-median supplement
 reduced (0-3), tails of both sexes similar, hemispheroid,
 convex conoid or short and rounded.

TYLENCHOLAIMELLUS BRASSICUS SP. NOV.

(Plate XVIII Fig. A - F)

9 females were recovered from soil around the roots of Brassica oleracea var. Capitata L. from Pulwama Kashmir. They are considered herein to constitute new species.

MEASUREMENTS

Female (8 Paratypes) L = 0.50-0.59 mm;

a = 20.2-22.3; b = 3.9-4.7;

c = 20.3-22.7; v = 38-40%

Spear = 9 microns ;

Spear extension = 10 microns

Female (Holotype) L = 0.53; a = 21.2; b = 4.1;

c = 21.0; Spear = 10 microns;

Spear extension = 9 microns

v = 41%.

DESCRIPTION:

Body almost straight in the anterior half of its length with a slight ventral curvature in the posterior 3rd region. Body cuticle distinctly transversally striated and having a radial elements in the tail region. Cuticle thick made up of 3 layers getting very much thickened at the tail terminus, the inner most layer being two and a half microns thick. Body tapering at either ends anteriorly from neck base to a slightly set off head measuring a little less than one fourth of the body at neck base.

Lateral hypodermal chord arising as a thin striae below the spear extension assuming a maximum width of one fifth of body at mid body. Lateral pores arranged generally in lip region thereafter arrangement becomes irregular. Head angular in outline with distinctly projecting outer circlet of papillae giving a faint indication of labial disc. Head measuring 6 microns x 2 microns in dimension, stoma weakly cuticularized tubular, guiding ring single located at 4 microns from head end. Spear measuring 10 microns in length with its aperture measure 2.5 microns i.e. one fourth of spear length. A distinct dorsal stiphin is present. Spear extension measuring 10 microns provided with small flang like knobs at its base. Oesophagus consisting of 2 parts; the anterior tubular non muscular part measuring 90 microns in length encircled by nerve ring located 60 microns from anterior end. Hemizonid present. Basal oesophageal bulb measuring 20 x 10 microns in dimension, set off by constriction from anterior tubular part. Cardia conoid rounded. Intestine oligocytus with a broad lumen running throughout its entire length. Pre rectum distinct and well marked measuring 73 microns in length i.e. 5.6 times the anal-body-width in length.

Vulva depressed transverse slit. Vagina wall distinctly cuticularized, with vagina extending upto about half of vulva body-width across. Gonad single, posterior ovary reflexed at oviduct with anterior end

extending upto the vagina. Anterior uterine branch small and rudimentary. Rectum measuring 13 microns in length being slightly less than one anal body width in length. Tail cylindrical mostly clavate measuring 23 microns in length i.e. 1.4 times the anal body width in length, with two pairs of caudal pores.

MALES : Not found.

Paratypes Females on slide No. PN/TYL/A deposited with the Department of Zoology, University of Kashmir.

Holotype Female on slide no. PN/TYL/C in authors collection.

Host Collected from soil around roots of Brassica oleracea var. Capitata L.

Locality Pulwama, Kashmir.

DIAGNOSIS AND RELATIONSHIP

Tylencholaimellus brassicus n.sp. is distinctive by having head angular in outline with distinctly projecting out circlet of papillae giving a faint indication of labial disc, presence of a dorsal stiphin, conoid rounded cardia and clavate rounded tail. However, it comes close to T. rotundoconicus Komozova, 1966 and T. eskei Siddiqi & Khan 1964. From the former the new species differs by having a smaller spear and spear extension ratio (Spear extension equal in length) and shape of tail (which is clavate rounded in present species) (Spear = 9.14 and extension = 6.8 and tail conoid rounded

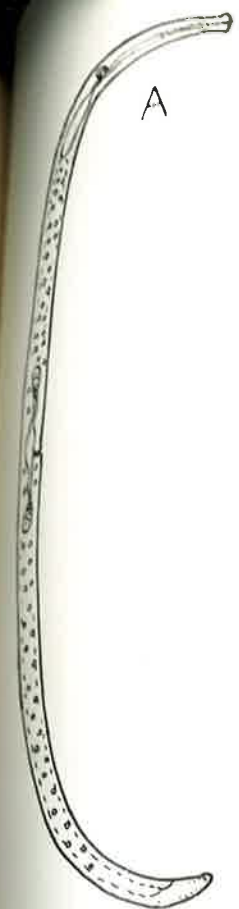
in T. rotundoconicus . From T. eskei, the new species differs by smaller spear extension, position of vulva and longer and differently shaped tail (Spear = 17-19 microns, $v = .33-.37$; $c = 24-28$; and tail conoid rounded in T. eskei) .

In view of the above differences the present form is considered here in to constitute a new species for which the name T. brassicus is proposed. .

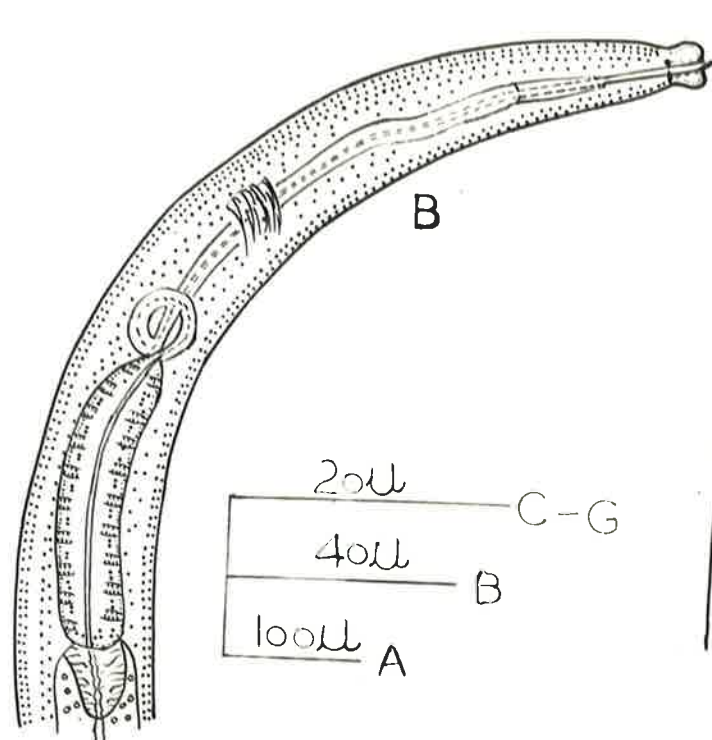
PLATE-XVI

KOCHINEMA KANGANENSIS SP. NOV.

- Fig. A : Entire female
B : Oesophageal region of female
C : Anterior end showing amphid
D : Vulval region showing didelphid gonad
E : Basal bulb showing gland nuclei
F : Elongate conoid cardia
G : Tail end of female

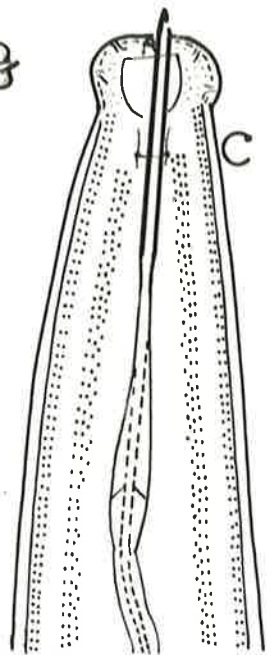


A

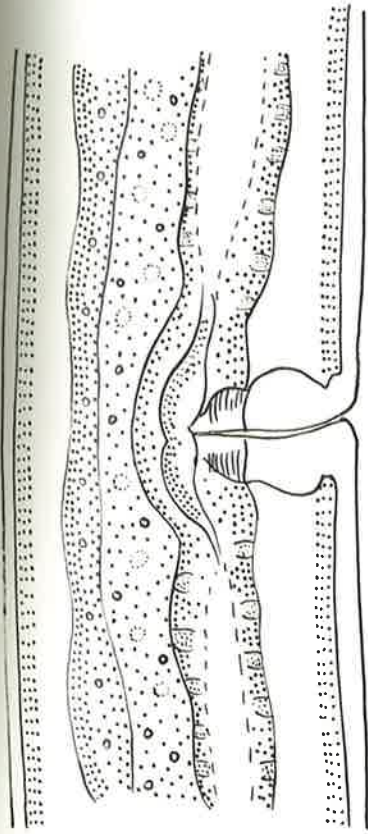


B

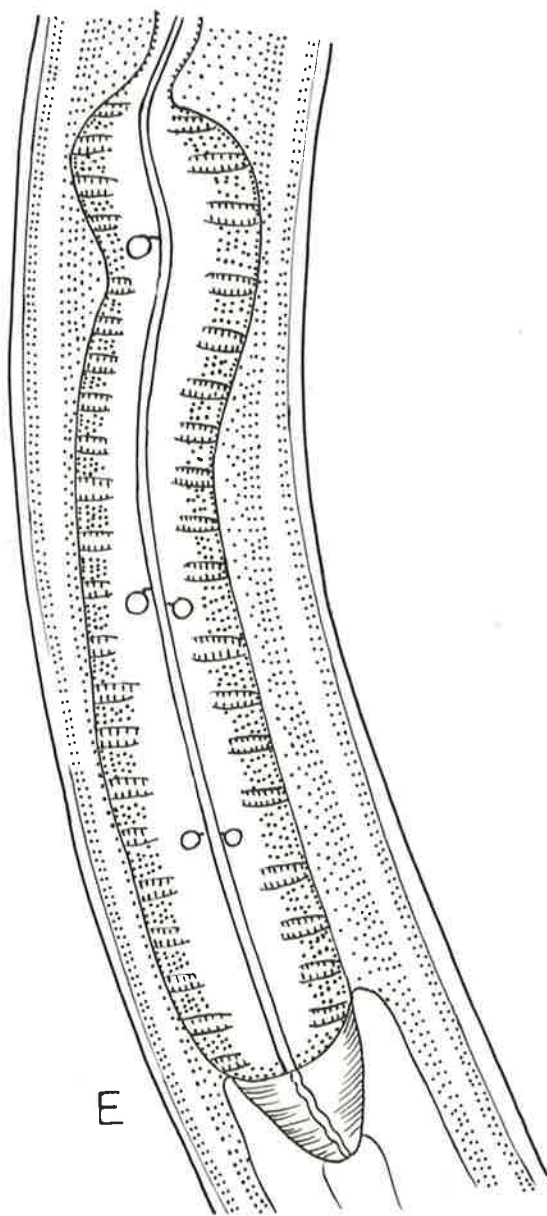
20μ — C-G
40μ — B
100μ — A



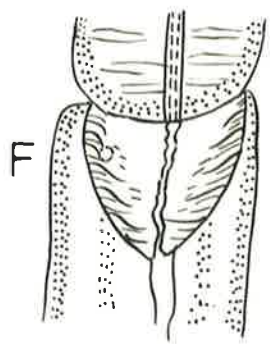
C



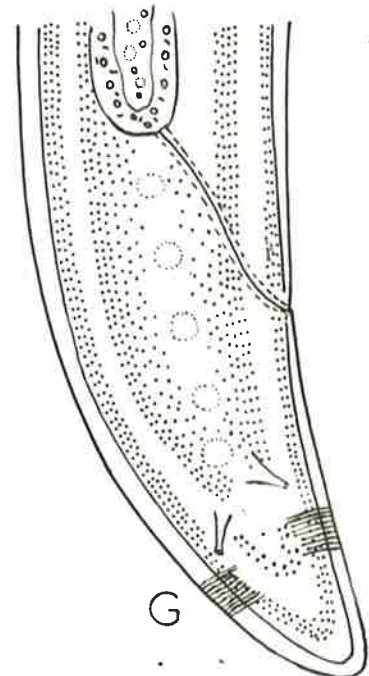
D



E



F



G

GENUS DORYLLIUM Cobb, 1920PREVIOUS WORK

Genus Doryllium was first proposed by Cobb, 1920 for his species D. uniforme, collected from brakish soil on the bank of marine soil on the bank of marine estuary at Los Patos, Long Beach, California. He placed the genus under the family Leptonchidae Thorne, 1935, Super family Dorylaimoidea (De Man, 1876) Thorne, 1934 and order Dorylaimida (De Man, 1876) Pearse, 1936.

Thorne, 1939 added two more species to the genus, D. orthum Thorne, 1939 and D. bryophilum (Imamura, 1931) Thorne, 1939. The latter species however was considered to be species inquirends by Jairajpuri, 1963 in view of slender needle like spear, prodelpic reproductive organs and in having inadequate description.

Izatullaera, 1967 proposed a new genus Didoryllium to accomodate D. bryophilum. The new genus was proposed such species having needle like Tylencholaimoid spear with 3 basal knobs, with only anterior ovary developed and body length over 1mm. Genus Doryllium was left with such species under it, which were less than 1mm. in length, spear of Dorylamoid type with two basal flanges and only posterior ovary developed. Izatullaera also proposed a new sub family, Doryllinae for the two genera, Doryllium and Didoryllium under family Leptonchidae.

Brezeski, 1962 described D. coronatum from Poland.

Jairajpuri and Siddiqi (1963) transferred Tylencholaimellus cornelli (Van der Linde, 1938) Goodey, 1951 to genus Doryllium. Jairajpuri, 1963 proposed a key to four species of Doryllium including his new species D. minor described from soil around roots of Pyrus malus from Srinagar, Kashmir.

Grandison, 1964 described yet another new species D. australe from Auckland and Campbell Islands (New Zealand) and gave a key to 4 species, D. uniforme, D. othum, D. coronatum and his new species D. australe.

Izatullaera, 1967 recorded the species from Kazakhstan in USSR.

Tim, 1967 added another species D. aestuarii to genus Doryllium.

DORYLLIUM KASHMIRENSIS SP. NOV.

(Plate XIX Fig. A-H)

12 females and 3 males of the genus Doryllium were isolated from soil around the roots of Prunus Persica from Duksum, Kashmir. These are considered herein to constitute new species.

MEASUREMENTS

Females (11 Paratypes) L = 0.55-0.67mm; a = 18.3-22.3;
b = 4.4-5.5; c = 34.3-36.2;
v = 36-41%; Spear = 10-11 mic.
Spear extension = 9-10 microns.

Female (Holotype) L = 0.67mm; a = 22.3; b = 5.5;
c = 34.3; v = 36%; Spear = 10 mic.
Spear extension = 10 microns.

Male (Allotype) L = 0.50-0.53mm; a = 17-21;
b = 4-4.9; c = 32.1-34.1;
Spear = 10 mic.; Spear extension
= 10 mic.; Spicule = 30 microns.

DESCRIPTION

'Eel Worm' when killed assumes a slightly ventrally arc like shape. Body tapering at both the ends and ending with a blunt extremities. Body cuticle transversally striated through its length. Lateral hypodermal chord arising as a thin streak at about the middle of the neck and assuming a maximum width of about one fourth of body width at mid body. Lateral body pores serially arranged in neck region, while their arrangement

becoming irregular in the rest of the body. Stoma inverted funnel like extending upto 7 microns from the anterior end. Amphids stirrup shaped, its slit measuring 6 microns across and the sensellar sac located slightly posterior to spear base. Head bluntly rounded set off by deep constriction measuring 9x4 microns in dimension. Labial disc absent. Labial papillae distinct but not projecting beyond the labial contour. Spear measuring 10 microns in length with its lumen measuring about 1 micron; spear extension equal in length to the spear with rounded knobs at its base. Oesophagus with an anterior tubular non-muscular part measuring 78 microns in length, constricted set off distally from the posterior bulbous part which measures 22 x 10 microns in dimension having five gland nuclei. Oesophago-intestinal valve flat. Intestine oligocytus. Pre rectum not found.

Gonads single posterior; ovary reflexed at oviduct measuring 50 microns in length and extending upto 73 microns from the vulva. Vulva depressed transverse slit. Vagina extending upto about half of the vulval body width across. Anterior uterine sac like large measuring about 36 microns in length and is filled up with squill shaped sperms. Rectum measuring about more than one anal body width. Tail dorsally convex conoid with a rounded terminus. Cuticle of the tail considerably thickened and appears to be three layered.

MALE

Body being strongly ventrally curved in the posterior third of body. Body length generally shorter than female with

197

thick cuticle. Body blunt at both the ends. Lip region semi-set-off with distinct constriction. Vas deferens filled with large number of squill shaped sperms. Cuticular striations in tail quite prominent with radial elements. Spicule arcuate measuring 30 microns with lateral guiding piece measuring 22 microns. Supplements reduced, with an adanal pair and only single ventromedian supplement located slightly anterior to spicule head. Tail dorsally curved with a sub cylindrical terminus.

Holotype Female on slide number PN/DOR/1 in authors collection.

Paratypes Females on slide No. PN/DOR/2-3 deposited with the Department of Zoology, University of Kashmir.

MALE (Allotype) On slide No. PN/DOR/4 in authors collection.

HOST Collected from soil around roots of Prunus persica L.

LOCALITY Duksum, Kashmir.

DIAGNOSIS AND RELATIONSHIP

Doryllium kashmirensis n.sp. is distinctive by having body length from 0.55-0.67mm long; a = 18-23, b = 4-5, c = 34-36; v = 36-41; spear = 10-11 microns and spear extension = 9.-10microns. It comes close to D. australe Grandison, 1964 from which it differs in having a distinctly set off lip region from the body (lip region completely amalgamated in D. australe) shorter tail and without the cuticular thickness (C = 27-29 and with extra cuticular thickenings in D. australe)

The only other record of Doryllium from Srinagar, Kashmir is D. minor recorded from soil around the roots of Pyrus malus. The present form of Doryllium also recorded from this region

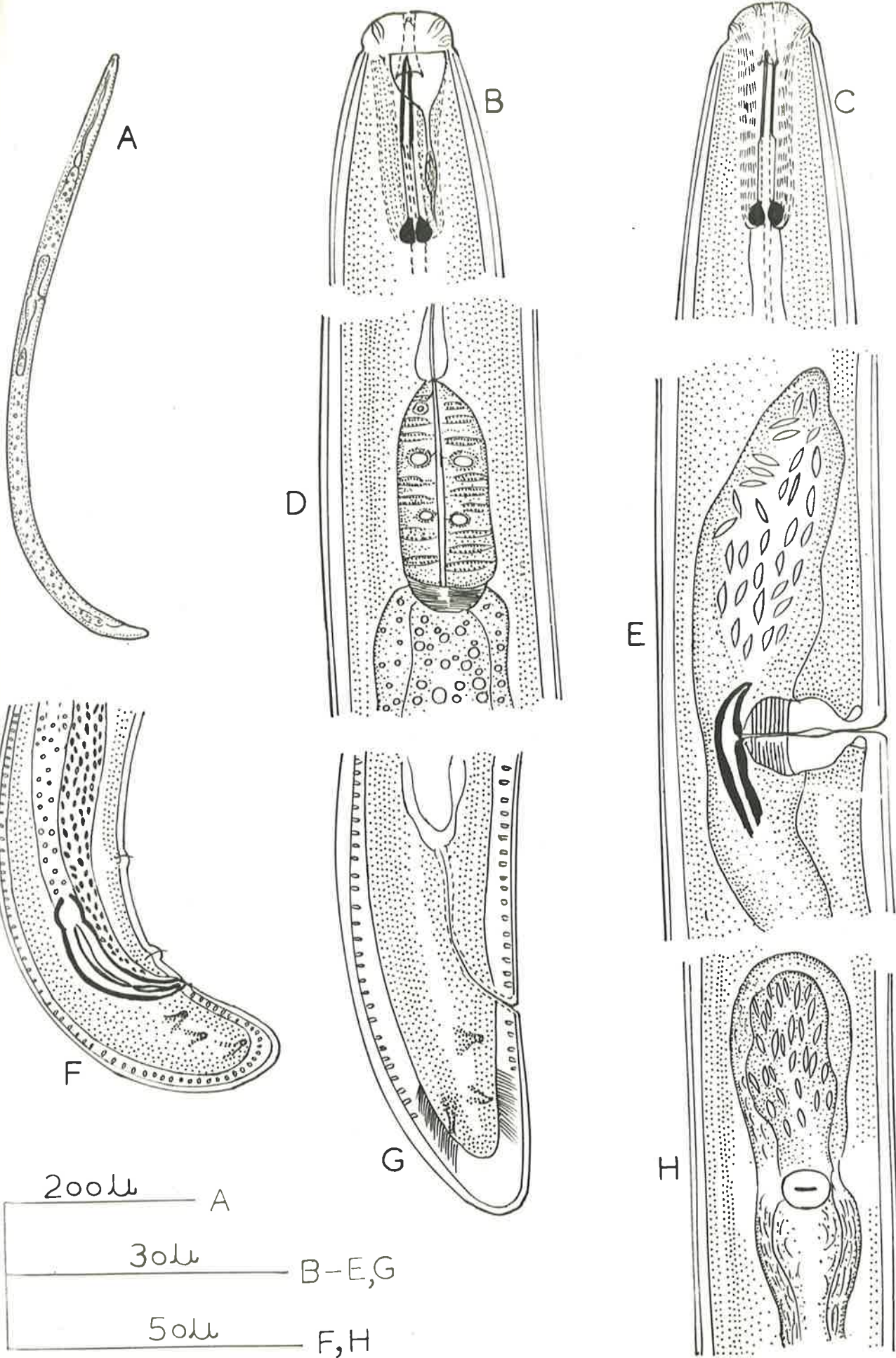
however, differs markedly from this species in having a distinctly set off lip region, in relative length of spear and its extension, shape of cardia and relative body length (In D. minor lips some what rounded, inner amalgamated into a disc like structure surrounded by oral aperture, spear 4-5 microns spear extension 7 -8 microns .Cardia hemispheroid and $L = 0.45-0.50$).

In view of these differences the present form is considered here to constitute a new species for which the name Dorylium kashmirensis is proposed.

PLATE - XIX

DORYLLIUM KASHMIRENSIS SP. NOV.

- Fig. :A : Entire female
B : Anterior end showing amphid
C : Anterior end of female
D : Posterior portion of oesophagus
E : Vulval region showing anterior uterine sac
F : Tail end of male
G : Tail end of female
H. Vulval region of female (Ventral view)



200µ — A
 30µ — B-E, G
 50µ — F, H

FAMILY TYLENCHOLAIMIDAE (Filipjev, 1934) Siddiqi, 1969.

PREVIOUS WORK

The genus Tylencholaimus was described by De Man in 1876 for nematodes resembling Dorylaimus but differing by the nature of spear extension which bear knobs. Filipjev (1934) proposed sub-family Tylencholaiminae for its reception under family Dorylaimidae. Thorne reviewed the group in 1939 and separated out the true Tylencholaimus and simultaneously proposed two new genus Enchodellus and Discomyctus. Chitwood in 1957 united Tylencholaiminae and Longidorinae on the basis of the apparent similarity between the genus Xiphinemella which was placed by Loos in Longidorinae with the genus Tylencholaimus of the Tylencholaiminae. This Tylencholaimus somehow conspicuously differ from related families of Dorylaimoidea in characters like body musculature, the cuticle, the lateral chord and the body pores. The lip region too is quite different and is generally cap like, the inner part often projecting with long inner circle of papillae. In structure of oesophagus this group of nematodes remarkably differ from relative groups by the thin anterior part and a shorter basal part. In most of above mentioned characters the Tylencholaimus only resemble the members of Leptonchidae especially in the sub-family Leptonchinae and Xiphinemellinae. It would therefore, be more proper to remove Tylencholaimus from Dorylaimoidea and place it near Leptonchoides.

Loof & Jairajpuri (1968) reviewed Tylencholaimus and the related genera. The genera Botallium, Xiphinemella, Xenochium and Tylencholaimus all found a close and compact group in regards to structure of shape of lip region, basal part of spear, structure of cuticle and shape of oesophagus. They therefore, suggested that they all should be combined under sub-family Tylencholaiminae (Synonym - Xiphinemellinae Jairajpuri, 1964). In spite of the close relationship between Tylencholaiminae and Leptonchinae they exhibit obvious difference in the nature of spear extension and the character of basal part of oesophagus. They suggested that genus Enchodelus fits better in Dorylaimidae (by the Polymarine musculature) where as Discomyctus be included in Leptonchidae under sub - family Tylencholaiminae.

The sub-family Tylencholaiminae was upgraded to family rank i.e. Tylencholaimidae by Siddiqi (1969) and was considered under super-family Dorylaimoidea. Besides Tylencholaiminae he proposed two new sub-families viz., Vanderliminae and Utanematinae. Under Tylencholaiminae the genera Tylencholaimus De Man, 1876, Discomyctus Thorne, 1939 (Synonym - Oostenbrinkella Jairajpuri, 1965) Xiphinemella Loos, 1949, 1950 (Synonym - Taprobanus Loos 1949 Botallium Heyns 1963) were incorporated. Vanderliminae included Vanderlindia Heyns, 1964 and Metadorylaimus Jairajpuri, 1963, where as in Utanematinae the genera Utanema Thorne, 1939, Chitwoodius Furstenburg and Heyns, 1966 (Chitwoodia Furstenburg and Heyns, 1966) and Xenochium Siddiqi and Khan 1966 were placed.

Ferris (1971) accepted Tylencholaimidae under Dorylaimoidea but only recognised two sub-families i.e. Tylencholaiminae and Utanematinae. The genera Oostenbrinkella and Botalium, were considered valid. Chitwoodius Furstenberg and Heyns, 1966 was transferred to sub-family Pungentinae under family Dorylaimidae. Xenonchium was placed in Tylencholaiminae, and Utanematinae only included Utanema.

Andrassy, 1976 though agreed both with Siddiqi, 1969 & Ferris, 1971 in considering Tylencholaimidae as a distinct family but removed it from super-family Dorylaimidae and placed it under Leptonchoidea. He added one new sub-family under Tylencholaimidae i.e. Mumtazinae to contain the only genus Mumtazium Siddiqi, 1969. Siddiqius (Syn- Utanema Siddiqi, 1969 nec Thorne, 1939) were proposed as a new genus under Vanderlindinae.

FAMILY TYLENCHOLAIMIDAE (Filipjev, 1934) Siddiqi, 1969

DIAGNOSIS. (emended): Meromyarian, Medium sized nematodes, cuticle made up of several layers, the inner one often showing coarse irregular transverse striations. Often loosened from the outer layer in mounted specimens. The lateral chord is broad not distinctly granular. Grandular bodies in lateral chord not developed. Lateral pores very coarse and arranged in one or two rows. The head cap like off set constrictions, papillae prominent. Lips amalgamated. Spear fine, short apparently devoid of any process for attachment with extension, spear extension rod like with knobs or flanges, not divisible into two parts. Oesophagus with anterior tubular part and enlarge part not measuring more than 1/3rd of oesophageal-length. Oesophageal lumen in the basal bulb with thick internal cuticular line, oesophageal gland five. Intestine oligocytous. Ovary single or paired, usually short. Spicules dorylaimid. Supplements few, separated, except in Vanderlindia where they are numerous and lie in pairs.

TYLENCHOLAIMUS ORIENTALIS SP. NOV.

(Plate XX Fig. A-E)

14 females were recovered from soil around roots of Glycine max Linn from Handwara, Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (13 paratypes) L = 0.45-0.49 mm;

a = 24.7-26.9; b = 3-4.1;

c = 36-41; v = 72-76%;

Spear = 7-9 microns;

Spear extension = 7-8 mic.

Female (Holotype)

L = 0.48 mm; a = 26.6;

b = 3; c = 40; v = 75%;

Spear = 7 mic.; Spear-

extension = 7 mic.

DESCRIPTION:

On being killed " eel worm" assumes a ventrally arcuate shape. Body short slender. Body cuticle coarsely striated with distinct radial elements. Lateral hypodermal chord originating in region of spear base and assuming a maximum width of about half of body width at mid body. Lip region almost continuous with slight depression at the adjoining neck measuring 6 x 3 microns in dimension. Stoma weakly sclerotized forming a single spear guiding ring located at 4 microns from anterior end. Amphid stirrup shaped, its apertures measuring 3 microns across i.e. 50% of lip width. Sensillar sac located at 14 microns from

anterior end. Spear slender, measuring 7 microns in length, spear extension simple rod like its length being equal to spear and distally provided with faint thickenings at base. Oesophagus with an anterior tubular part measuring 90 microns in length with the reduced musculature expanding gradually at its base into a cylindrical basal oesophageal bulb, the latter measuring 63 microns in length i.e. 39% of the bulb. Cardia conoid rounded. Intestine with a distinct lumen. Pre-rectum not found. Gonads single anterior, ovary reflexed in the oviduct. Ovocytes mostly arranged in single rows. Vagina sigmoid distinctly cuticularized pushing upto half of body width into the body. Post uterine sac absent. Rectum slightly longer than half of anal body width in length. Tail cylindrical with hemispherical terminus measuring 12 microns in length, being slightly longer than anal body width 2 pairs of caudal pores.

Males: Not found.

Paratypes: Females on slide No. PN/Tyl/11-13 deposited with Department of Zoology, University of Kashmir.

Holotype: Female on Slide No. PN/Tyl/14 in author's collection.

HOST: Collected from soil around roots of Glycine max L.

LOCALITY: Handwara, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

Tylencholaimus orientalis n.sp.is

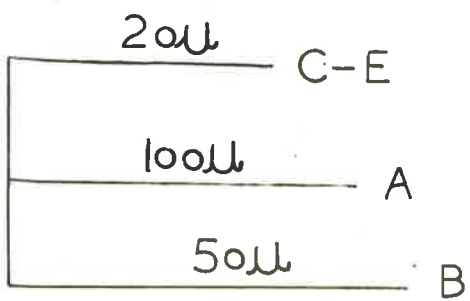
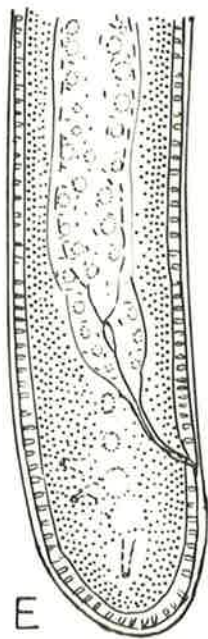
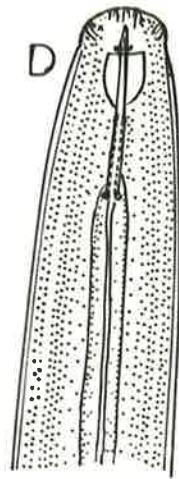
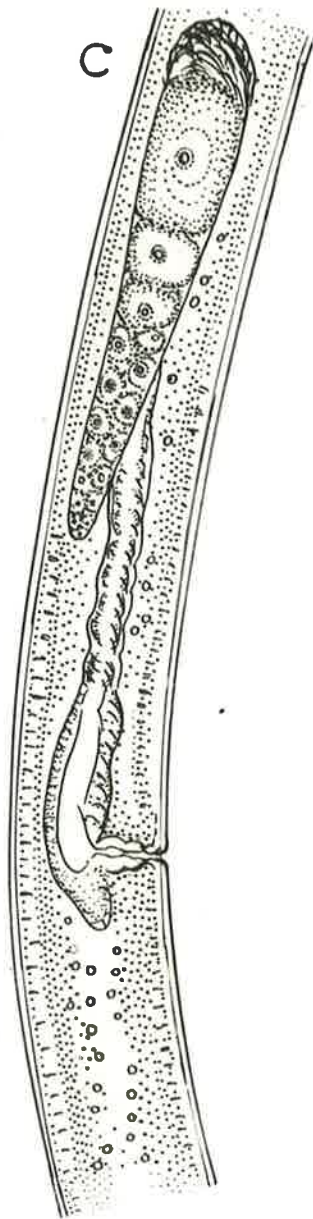
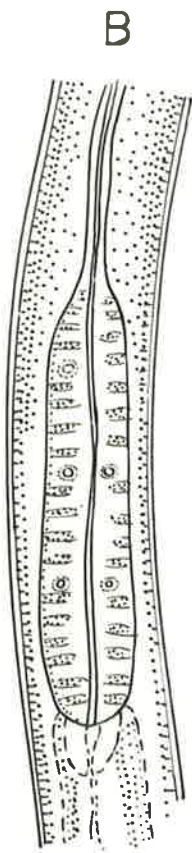
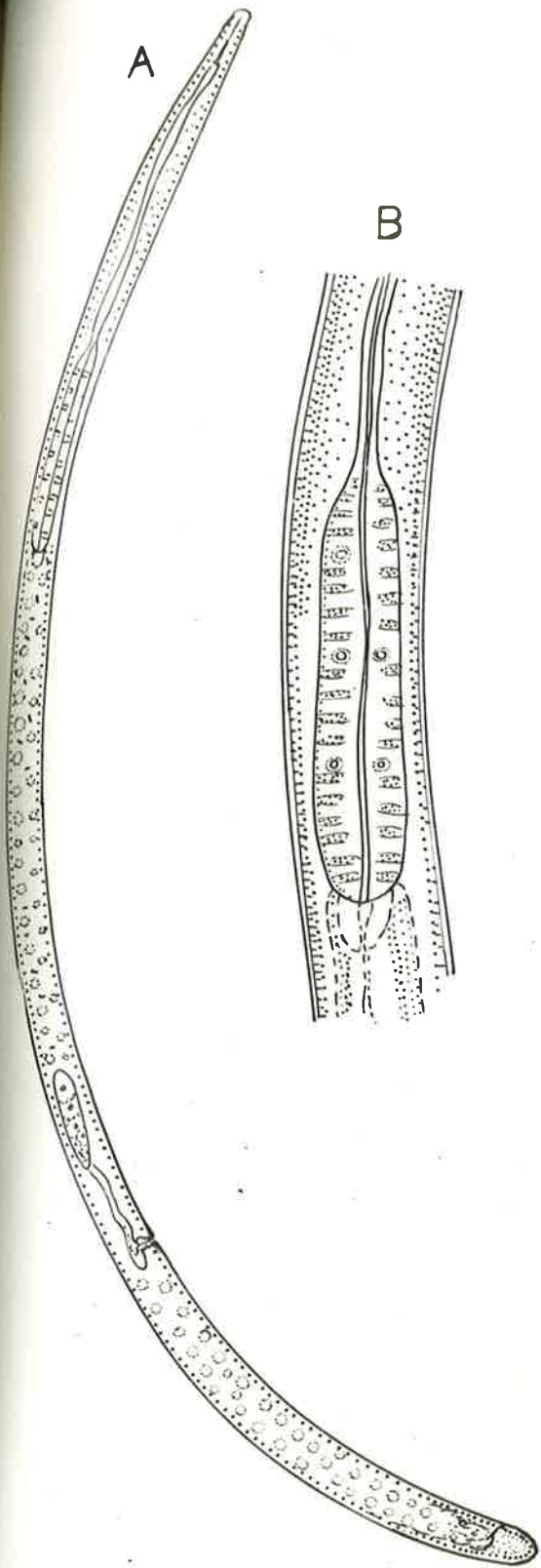
distinctive by having body length from 0.45-0.49 mm; Spear = 7-9 microns; Spear extension \pm 7-8 microns; $v = 72-76\%$; Stirrup shaped amphid; cardia conoid rounded and cylindrical tail with hemispherical terminus. However, it comes close to T. minimus De Man, 1876 and T. pusillus Loof and Jairajpuri, 1968, from the former the new species differs by having slightly set off lip region and smaller body, while from T. pusillus by longer body and spear, shape of lip region and shorter tail and presence of distinct radial striae ($L = 0.34 - 0.40$ mm; $c = 24-28$; lip region deeply set off; spear and extension 5-6 and 4-5 microns respectively and radial striae absent in T. pusillus)

In view of the above differences the present form is considered to constitute a new species for which the name Tylencholaimus orientalis is proposed.

PLATE XX

TYLENCHOLAIMUS ORIENTALIS SP. NOV.

- Fig A : Entire female
B : Posterior end of oesophagus
C : Vulval region showing anterior
Ovary reflexed.
D : Anterior end showing amphid
E : Tail end of female



FAMILY : BELONENCHIDAE Thorne, 1964

DIAGNOSIS (emended) Leptonchiodea. Small sized nematodes. Body cuticle distinctly striated. Radial striae often form fold during fixation. Head continuous. Labial Papillae well developed projecting, lips amalgamated. Oval opening sometimes surrounded by sclerotized discs with additional refractive piece about the oral vestibul from which a funnel shape structure stands back forms the spear guide. Spear accidently slender, axial, like witout aperture. Spear extension rod like without knobs or flanges. Anterior part of oesophagus narrow expanding basely to form oesophageal bulb. Basal bulb Pyriform set off containing five glands nuclei. Cardia conoid muscular extending with intestine. Vulva transverse, bonad single. Pre rectum distinguishable. Tail blunty rounded.

Type Genus Basirotyleptus , Jairajpuri, 1964

GENUS BASIROTYLEPTUS Jairajpuri, 1964

DIAGNOSIS (emended) Belonenchidae. Strong radial striation and fixation folds. Sub cuticle transversally striated lateral chords broad. Lips amalgamated. Head conoid rounded with projecting labial papillae. Spear slender needle like without aperture or lumen. Spear extension simple sclerolized, rod like. Stoma inverted funnel like with single spear guide. Anterior part of oesophagus slender, tabular, non muscular expanding to a pyriform basal bulb. Lumen of basal bulb in two sections becoming distinctly cuticularized in post part of bulb giving appearance of Triquetrous valvular chamber. Vulva transverse. Ovary opisiodelphic and reflexed.

BASIROTYLEPTUS KASHMIRENSIS SP. NOV.

(Plate XXI Fig. A-E)

7 females were recovered from soil around roots of Prunus domestica L. from Kupwara Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (6 paratypes) L = 0.65mm-0.74 mm; a = 26-28;
b = 4.1 -4.8; c = 40.1-40.8;
v = 35-38%; Spear = 12-13 mic.
Spear extension = 10-11 mic.

Female (Holotype) L = 0.65mm; a = 26; b = 4.4;
c = 40.5; v = 38% Spear = 12 mic.
Spear extension = 10 mic.

DESCRIPTION:

"Eel worm" assuming a ventrally arcuate shape on being killed by hot water. Body cuticle transversally striated. Radial elements present. Lateral chords irregular. Amphid stirrup shaped, aperture measuring 4 microns across. Body tapering at both the ends anteriorly from neck base to a set off lip region measuring 6 x 2 microns in dimension, i.e., 1/3rd as wide as body at base of neck. Stoma inverted funnel like forming a single guiding ring located at 9 microns from anterior end. Spear very fine needle like solid measuring 12 microns in length, spear extension straight measuring 10 microns and is slightly flunged at the base. Oesophagus with tubular non muscular part encircled by nerve ring located at 65 microns from anterior

end; basal oesophageal bulb pyriform, set off from anterior tubular part, the former measuring 15 x 8 microns in dimension. Cardia conoid rounded. Intestine oligocytus.

Vulva transverse slit. Vagina extending upto 1/3rd of body width into the body. Gonad single, uterine sac short measuring about 1/2 of the vulval body width in length. Ovary reflexed at the oviduct which is posteriorly situated. Rectum slightly longer than 1 anal body width in length. Tail obtuse and rounded with 2 pairs of caudal pores measuring 12 microns in length i.e., 0.08 of anal body width in length.

MALES: Not found.

Paratypes Females on Slide No: PN/BAS/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype Female on slide No. PN/BAS/3 in author's collection

HOST Collected from soil around roots of Prunus domestica L.

LOCALITY Kupwara, Kashmir.

DIAGNOSIS AND RELATIONSHIP

Basirotylenptus kashmirensis n.sp. is distinctive by having a very fine spear which is needle like and measures 12 microns in length, spear extension flunged at the base, conoid cardia and by the obtuse and rounded shape of tail, with two pairs of caudal pores. However, it comes close to B. pini Siddiqi and Khan, 1965 and B. basiri Jairajpuri 1964

From Basirotyleptus pini the new species differs by the vulva oesophageal distance (about 6 times body width from base of oesophagus) and by the shape of tail, while from B. basiri the present species differs by the shorter anterior uterine sac, shape of amphid and by the length and shape of tail.

In view of the above differences the present form is considered here to constitute a new species for which the name Basirotyleptus kashmirensis is proposed.

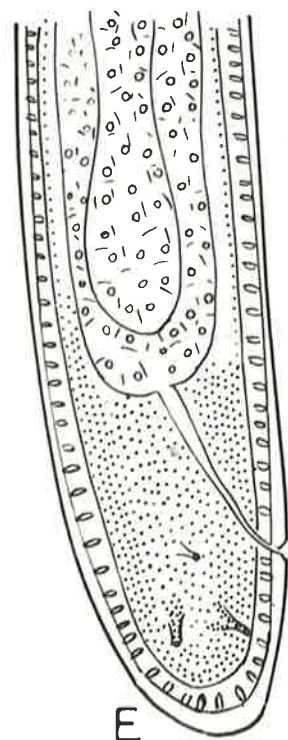
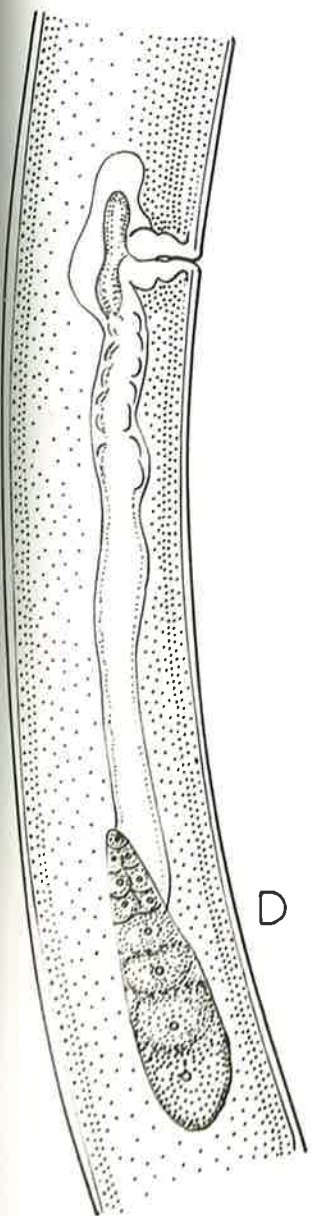
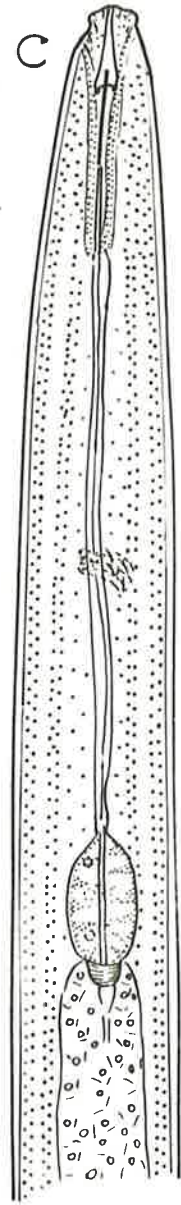
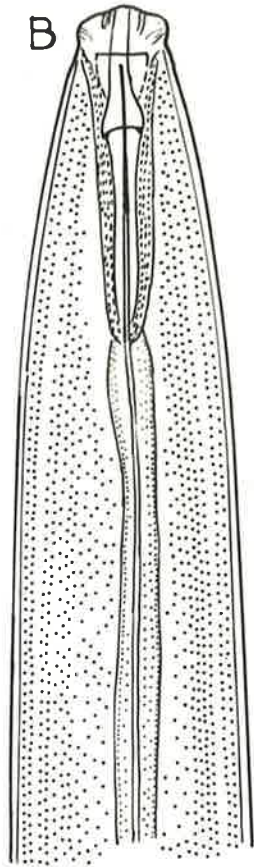
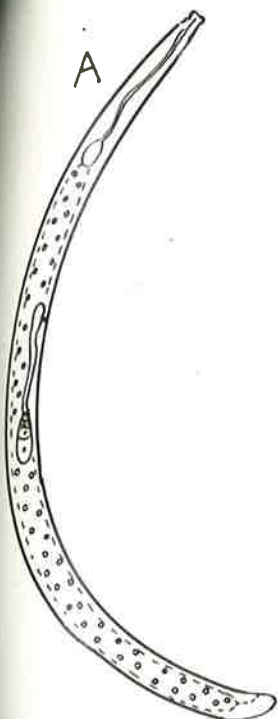
From Basirotyleptus pini the new species differs by the vulva oesophageal distance (about 6 times body width from base of oesophagus) and by the shape of tail, while from B. basiri the present species differs by the shorter anterior uterine sac, shape of amphid and by the length and shape of tail.

In view of the above differences the present form is considered here to constitute a new species for which the name Basirotyleptus kashmirensis is proposed.

PLATE - XXI

BASIROTYLEPTUS KASHMIRENSIS SP. NOV.

- Fig. A : Entire female
B : Anterior end showing amphid
C : Oesophageal region of female
D : Vulval region showing posterior
ovary reflexed.
E : Tail end of female



A	300μ
B, E	20μ
C & D	25μ

FAMILY: LEPTONCHIDAE Thorne, 1935

DIAGNOSIS (emended); Leptonchoidea. Spear extension plain or arched, without knobs or flanges. Oesophagus expended in last fourth or farther back, its anterior portion is very slender. Ovaries generally paired, sometimes pre-delphic with posterior uterine sac. Number of supplemets 0-6. Tail always short, rounded or pointed.

LEPTONCHUS PYRUSEI SP. NOV.

(Plate XXII Fig. A-D)

11 females were recovered from soil around roots of Pyrus communis K. from Naranag (Wangat), Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (10 paratypes) L = 1.2-1.7 mm; a = 33.1 -36.7;
b = 10.5 -11.3; c = 78-87.5;
Spear = 8-9 mic.

Spear extension=16-18; v = 58-59%

Female (Holotype) L = 1.2 mm; a = 33.3; b = 10.5;
c = 78.1; v = 58%; Spear = 8 mic.
Spear extension = 16 mic.

DESCRIPTION:

"Eel worm" when killed assumes slightly ventrally arcuate arc like shape. Body tapering at both the ends anteriorly from the neck base to the head which is about as wide as

body at neck base. Body cuticle transversally striated with scattered radial elements forming longitudinal fixation folds. Lateral hypodermal chord originating in anterior half of neck becomes irregular in width due to longitudinal folds of the cuticle. Stoma with unsclerotized region measuring 7 microns in length whereas the sclerotised region measures 5 microns in length. Guiding ring single. Head set off angular measuring 11x4 microns in dimension. Spear slender measuring 8 microns in length with fine lumen and aperture. Spear extension semicircular measuring about twice the length of spear. Oesophagus with anterior tubular part encircled by nerve ring located at 82 microns from anterior end and is situated at about the middle of its length. Basal oesophageal bulb spatulate set off by constriction from anterior tubular part, the former measuring 35 x 16 microns in dimension. Five gland nuclei are lodged in bulb oesophago-intestinal bulb flat and compressed. Intestine oligocytus filled with granules. Prerectum extending anterior to flexure of anterior ovary. Gonad double opposed symmetrical.

Vulva a depressed transverse slit. Vagina extending to about 1/3 of corresponding body width across. Ovary reflexed at oviduct, oocytes arranged in single row in zone of maturation whereas double in zone of multiplication. Rectum measures 23 microns in length i.e., 1.3 times anal body width in length. Tail short obtusely rounded measuring 10 microns in length i.e., 0.7 times anal body width in length. Two pairs of caudal pores present.

MALES: Not found.

Paratypes: Females on Slide No. PN/LEP/1-3 deposited in the Department of Zoology, University of Kashmir.

Holotype: Female on Slide No. PN/LEP/4 in author's collection.

HOST: Collected from soil around roots of Pyrus communis L.

LOCALITY: Naranag (Wangat) Kashmir.

DIAGNOSIS AND RELATIONSHIP:

Leptonchus pyrusii is distinctive by having body cuticle transversally striated with scattered radial elements forming longitudinal fixation folds, and by the presence of obtusely rounded short tail. However, it comes close to L. scintellans Loof, 1964 and L. baccatus Siddiqi, 1970. From L. scintellanus the present species differs by the shape of lip region, smaller amphidial aperture, basal oesophageal bulb occupying more space of neck and prerectum extending anterior to flexure of interior ovary (lip region set off by deep constriction, amphidial aperture as wide as lip region prerectum joins intestine near the flexure of anterior ovary in L. scintillanus). From L. baccatus the new species differs by having smaller amphidial aperture, less broad basal oesophageal bulb, more anterior extension of prerectum and longer tail. (amphidial aperture extending

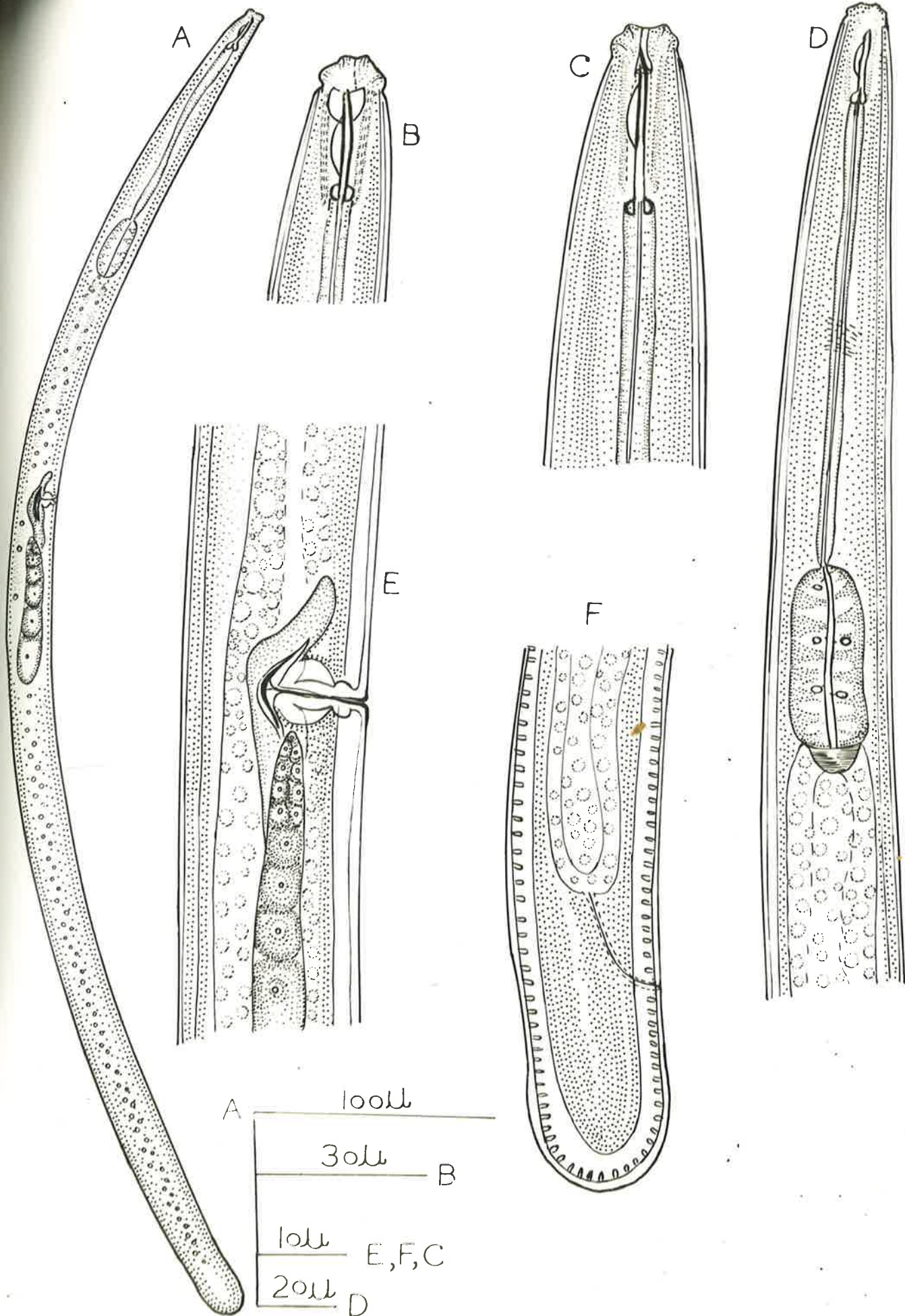
to entire lip width, basal bulb filling the entire neck space, prerectum extending slightly anterior to vulva and $c = 80-109$ in L. baccatus)

In view of the above differences the present form is considered herein to constitute a new species for which the name Leptonchus pyrusii is proposed.

PLATE - XVIII

TYLENCHOLAIMELIUS BRASSICUS SP. NOV.

- Fig. A : Entire female
B : Anterior end of female showing amphid
C : Neck region of female
D : Oesophageal region of female
E : Vulval region showing posterior gonad reflexed at oviduct
F : Tail end of female

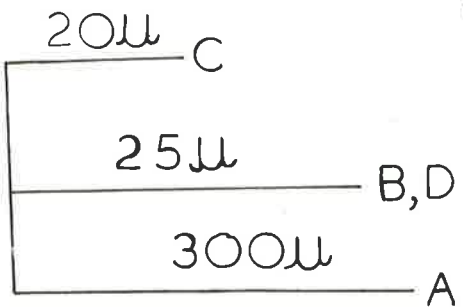
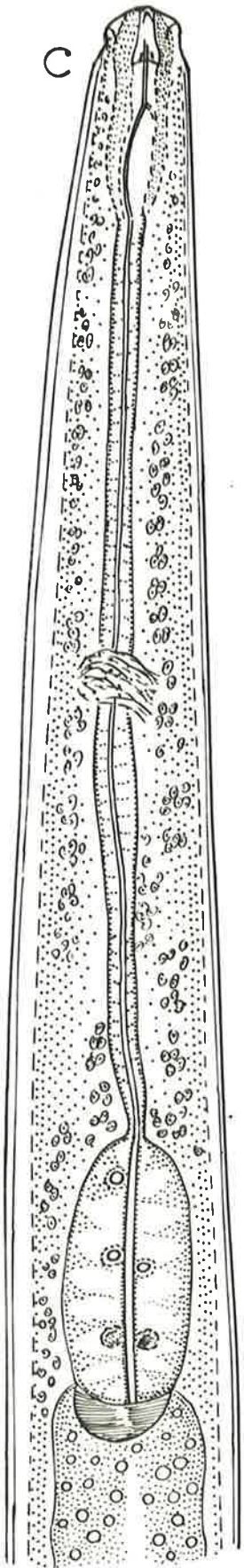
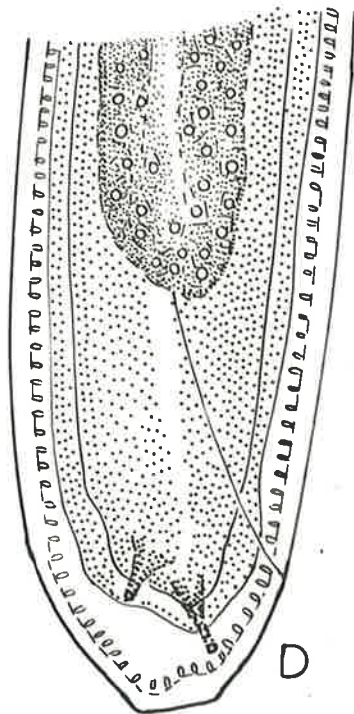
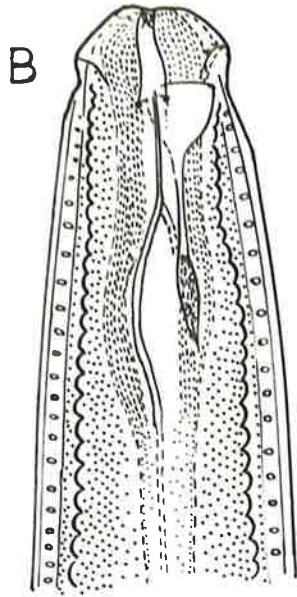
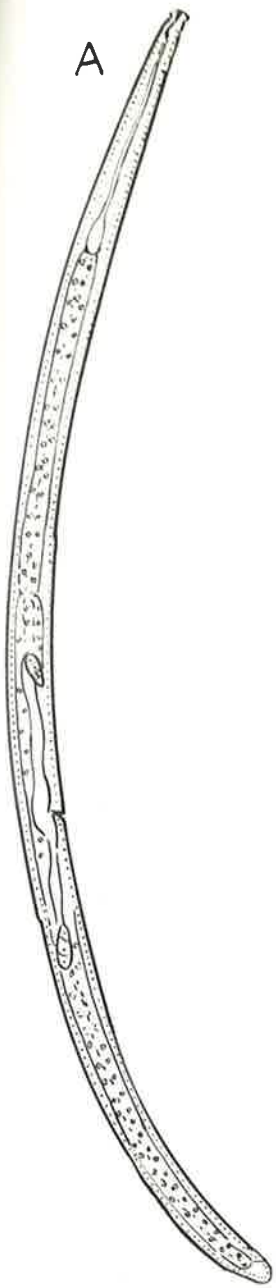


A ————— 100μ
 B ————— 30μ
 E, F, C ————— 10μ
 D ————— 20μ

PLATE - XXII

LEPTONCHUS PYRUSEI SP. NOV.

- Fig. A : Entire female
B : Anterior ends showing amphid
C : Oesophageal region of female
D : Tail end of female



PREVIOUS WORK:

The genus Axonchium was proposed by Cobb, in 1920 for medium sized dorylaimid nematodes with narrow head, thick body cuticle and a sheath of spiral muscles surrounding the basal part of Oesophagus. Thorne (1939) proposed the genera Belondira, Oxydirus, Swingeria, Nygellus and Dorylaimellus Cobb, 1939. There were all placed in a separate family Belondiridae. Loos, (1949) described the genus Nygolaimellus with a single species, abnormis and placed the genus next to Nygellus in the family Belondiroidea, on this supposition that the oesophagus has a Belondirid like sheath of spiral muscle. Jairajpuri (1964) rightly pointed out that Nygellus and Nygolaimellus though resemble Belondirids in one important character, but by the possession of a tooth they also show affinities with Nygolaimidae (Thorne, 1935) Meyl, 1960. Clark (1961) attached more importance to the Nygolaimid character (presence of tooth) and therefore transferred Nygolaimus and Nygellus to the Nygolaimidae. This was not agreed to by Jairajpuri (1964), who proposed a separate family Nygellidae to receive two genera which displayed a combination of characters of Nygolaimidae and Belondiridae. Heyns (1968) in his monographic nematode families Nygolaimidae and Nygolaimellidae suggested that Nygellus belongs to family Nygolaimidae alongwith Nygolaimus. He pointed out that although the Nygolaimidae species have a sheath around the basal

part of oesophagus but it is not equally well developed in all of them. At least in 3 species of Nygellus, Heyns was unable to observe the sheath. Hence he did not consider the spiral sheath of musculature in this group as a reliable character. On this basis he stressed that Nygellus does not justify a separate placing away from Nygolaimidae and rejected the family.

While studying the nematodes of Puerto Rico Thorne, 1964 emended the diagnosis of Belonidiridae and proposed that the group be recognised by having a straight bodies, spear not longer than lip width, basal part of oesophagus surrounded by thick layer of spiral muscle, a prominent dorsal-oesophageal-gland-nucleus where as other nuclei obscure. Ovaries one or two when one, only anterior uterine branch is rudimentary. He also proposed a new super family Belondiroidea. Yeates (1967) considered the muscular oesophageal sheath of Belonidirids as fixation artifact and regarded Belonidiridae and Nygellidae as synonyms with Dorylaimidae and Nygolaimidae respectively. In some species of Discolaimus and Discolaimium of the formally Dorylaimidae, the oesophageal enlargement is covered with a thick sheath of connective tissue which becomes double layered in Discolaimus bicarticus. Siddiqi (1968) studies in detail the musculature in Belonidirids and emphasized that the sheath in species of Discolaimus and Discolaimium is not muscular hence should not be confused with the spiral muscular sheath of Belonidirids.

Hooper (1961) reported six conspicuous spiral muscles in Swingeria, like wise Siddiqi (1968) found six band of strong muscles around the oesophageal enlargement. In Belondora, Dorylaimellus and Axonchium he reported twelve muscles which are similar to somatic muscles in consistency. Yeats (1967) contention therefore holds no good as far as the character of muscular sheath in Belondirids is concerned.

Thorne (1964) recognised the families Belondiridae, Thorne (1939) (Belondirinae Jairajpuri, 1964, Axonchinae Thorne, 1964) Oxyuridae Thorne, 1964, Roquiidae Thorne, 1964; Dorylaimellidae (Jairajpuri 1964) Thorne, 1964; Mydonomidae Thorne, 1964; Nygellidae Jairajpuri, 1964 (sub-families Nygellinae Jairajpuri 1964, Nygolaimellinae Clark, 1961). Siddiqi rejected family Dorylaimellidae and stated that the structure of oesophagus, buccal armature and the number of muscles around the enlarged part of oesophagus are similar to that found in species of Belondirella. Moreover, the spear extension in Belondira is also similar to Dorylaimellus and is divided into two parts- the basal with flanged swelling. He pointed out that Axonchium has a very different oesophagus not found in other Belondiridae which merit familial rank and so proposed the family Axonchidae and the family Falcihastidae. In all he recognised 8 families and 15 genera under Belondiroidea.

Ferris (1971) in his work on classification of

Dorylaimids recognised 9 families in BelonDIRoidea which are BelonDIRidae, Dorylaimellidae, Axonchidae, Mydonomidae, Roqueidae, Oxydiridae, Swangeriidae, Falciharsidae and Nygellidae.

Andrassy (1976) accepted only 5 families i.e., Dorylaimellidae, Roqueidae, Swangeridae (Falcihastiana~~e~~, Swangerinae) Oxydiridae and BelonDIRidae (BelonDIRinae Axonchinae) embracing 16 genera.

The present author in the schme followed in this work considers 8 families under BelonDIRoidea. The family Nygolaimellidae is shifted to Dorylaimoidea and in this regard the author agrees with Heyns, 1968 and Andrassy, 1976.

During the course of his studies the author came across some BelonDIRid nematodes in which the anterior tubular oesophagus is set off from posterior bulbus part as is characterised in family Axonchidae. However, these forms could not be fitted in any of the nominal genera of the family for which a new genus Fotedaronema has been proposed.

REVISED KEY TO THE FAMILIES OF BELONDIROIDEA

1. Female tail filiform; male blunt rounded.....
..... Roqueidae Thorne, 1964.
Tail of sexes similar.....2
2. Vestibule with sclerotization.....3
Vestibule without sclerotization.....4
3. Sclerotization basket like.....

- Swingeridae (Jairajpuri, 1964) Siddiqi, 1968.
- Small plates about oral opening.....
- Dorylaimollidae (Jairajpuri, 1964)
Thorne, 1964.
- 4. Tails of both sexes blunt rounded.....6.
- Tail of both sexes filiform.....5
- 5. Lip region assymetrical.....Falcihastidae Siddiqi, 1968
- Lip region not assymetrical.....
- Oxydiridae (Jairajpuri, 1964)
Thorne, 1964.
- 6. Body arcuate, spear extension divergant.....
- Mydonomidae Thorne, 1964.
- Body striaght spear extensions parallel.....7
- 7. Anterior portion of oesophagus set off by constrictions
- Axonchidae, (Thorne, 1964); Siddiqi, 1968
- Anterior portion of oesophagus not set off by
- constriction..... Belondiridae (Thorne, 1939) Thorne, 1964.

SUPER FAMILY: BELONDIROIDEA Thorne, 1964

DIAGNOSIS (emended): Medium sized nematodes. Head generally narrow. Cuticle smooth, rarely striated. Amphidial aperture large sometimes lip region is assymetrical. Vestibulum without sclerotization or with small platelets or basket like structure. Spear axial fine. Striaht arcuate; spear extension parallel or divergent. Oesophagus expanded behind the middle, surrounded by muscular sheath consists of 6-12 muscles. Ovaries one or two. Rails of both sexes similar or disimilar, varying from filiform to bluntly rounded.

Type family: Belondirdae (Thorne, 1939) Thorne, 1964.

FAMILY: AXONCHIDAE (Thorne, 1964) Siddiqi, 1968.

DIAGNOSIS: (emended). Belendiroidea. Moderately long nematodes ranging from (1-5 mm) in length. Lateral chords are narrow. Labial frame work is semisclerotized or unsclerotized, with or without mamiform cephalic papillae. Head, disc like and set off by deep constriction as in Fotedaronema. The spear is symetrical or assymetrical, rather spindle shaped, axial, and with wide lumen. Anterior part of oesophagus narrow near cephalic end and widens posterirly with distinct radial musculature and lumen. In Axonchoides there is a non-muscular anterior portion oesophagus which is off set by a constriction or short Isthmus from posterior enlarged part, enveloped by about 12 bands of spiral muscles. Dorsal oesophageal gland is large, with prominent nucleus near begining of oesophageal enlargement. Oesophago-intestinal-valve usually elongate-

conoid. Complex cardia with distinct cells present in Fotedaronema. Spicule with internal stiffening piece, guiding piece of spicule present. Supplemets are few to numerous, supplemets not rising above body contour in Axonchoides.

REVISED KEY TO THE GENERA OF AKONCHIDAE

- 1. Cardia complex with three distinct cells.....
..... Fotedaronema N.Gen.
- 2. Cardia not complex without three cells.....2
- 2. Labial frame work semi sclerotized, cephalic papillae mamiform..... Axonchoides Thorne, 1967
- Labial frame work not sclerotized, cephalic papillae not mamiform3
- 3. Slender anterior part of oesophagus forms a pyriform expansion at its posterior end, female tail clavate..
..... Anchobelondira Commans & Nair, 1971
- Slender anterior part oesophagus does not form a pyriform expansion at its posterior end, female tail not clavate..
..... Axoncium Cobb, 1920.

FOTEDARONEMA GEN. NOV.

DIAGNOSIS: Axonchinae. Body long and slender taking a strong ventral curvature, cuticle thin transversally striated. Head set off by deep constriction, disc like. Spear short and thin measuring about one head width, lumen and spear aperture fine. Basal extension of spear symmetrical rod like. Amphid stirrup shaped. Anterior part of oesophagus, thin and non-muscular, no swelling at base of spear extension. Posterior part of oesophagus bulbous, set off by deep constriction from the anterior tubular part. Cardia complex with three distinct cells (like the members of Nygolaimidae). A loose spiral sheath of muscles surround the basal bulbous part of the oesophagus. Intestine polycytus. Gonads amphidelphic symmetrical. Rectum about 1 anal body width in length. Tail dorsally convex conoid with a sub-acute terminus.

Type and Only species : Fotedaronema Kashmirensis n.sp.

FOTEDARONEMA KASHMIRENSIS GEN. ET SP. NOV.

(Plate XXIII Fig. A-H)

9 females were recovered from soil around the roots of Pyrus communis L. from Sonamarg, Kashmir. A new genus Fotedaronema is proposed for their accommodation.

MEASUREMENTS:

Female (8 paratypes) L = 0.77-0.90 mm; a = 38.5-49.5; b = 4.7 - 5.7; c = 28.9-29.9; c' = 2.1- 3.1;
v = 46-49 %; Spear = 7-8 mic.

Female (Holotype) L = 0.90 mm; a = 49.5; b = 4.7; c = 29.1; C' = 2.8; v = 47%; Spear = 7 mic.
Spear extension = 5 microns.

DESCRIPTION:

The "Eel worm" when killed assumes an open 'c' shape. The arcuature of the body is more in the posterior third. Body slender cylindrical tapering at both the ends anteriorly from neck base to a set off head measuring about half the body width at base. Body cuticle thick interrupted by fine transverse striations. Lateral hypodermal chord arising a thin streak in region of anterior tubular part of oesophagus which assumes a maximum width of 1/3rd of body at mid body. Lateral hypodermal glands well developed numbering about 25 posterior to vulva. Lip region set off by deep constriction which is cap like and measures 8 x 4 microns in dimension . Labial papillae projecting beyond the labial contour. Stoma with cuticularized inverted funnel like. Guiding ring single anteriorly located. Spear symmetrical short 7 microns in length, its lumen 1 microns broad with a small aperture measuring about 1/6th of spear length. Spear extension small rod like measuring 5 microns in length, being slightly shorter than

spear. Anterior tubular part of oesophagus swollen in form of spindle behind base of extension. Oesophagus composed of an anterior tubular part and basal bulbous part the former measuring 100 microns in length and is non-muscular and cylindrical. Nerve ring located at about 60 microns from anterior end. Basal oesophageal bulb muscular cylindrical set off from anterior tubular part by a sudden deep constriction; there is a small Isthmus like region which is the modified distal part of the tubular oesophageal region. Small cuticularized plates are present at the junction between 2 parts of oesophagus. Basal oesophageal bulb measure 75 microns in length x 11 microns wide (70-75 x 11-13 in paratypes) and is surrounded by a sheath. Five oesophageal gland nuclei viz. unpaired dorsal and two pairs of sub-ventral gland nuclei are lodged in the bulb along with their openings. Cardia complexed with distinct cells. Gonad didelphic opposed symmetrical, ovaries reflexed at oviduct.

Vulva a transverse slit. Vagina at right angles to body axis, extending to about 1/3 rd of body width across. Rectum about one anal body width in length. Pre-rectum not very much differentiated measuring about 2 rectal length from anus. Tail strongly dorsally curved measuring about 3 anal-body-width in length ending with a sub acute rounded terminus.

MALES: Not found.

Female (Paratypes) on Slide No: PN/ FOT/1-2 deposited
with the Department of Zoology,
University of Kashmir.

Holotype (Female) On slide No. PN/FOT/3 in authors
collection.

HOST: Collected from soil around roots of
Pyrus communis L.

LOCALITY: Sonamarg, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

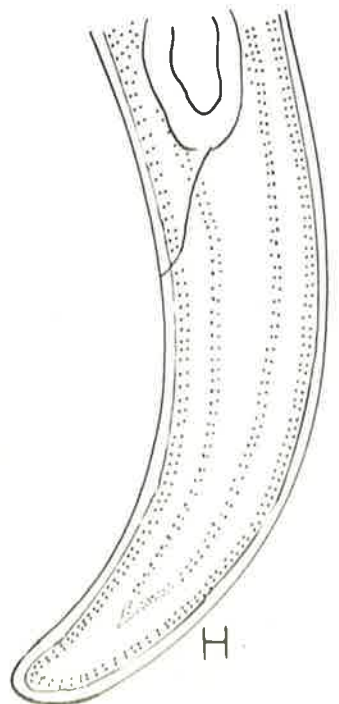
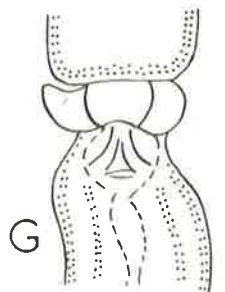
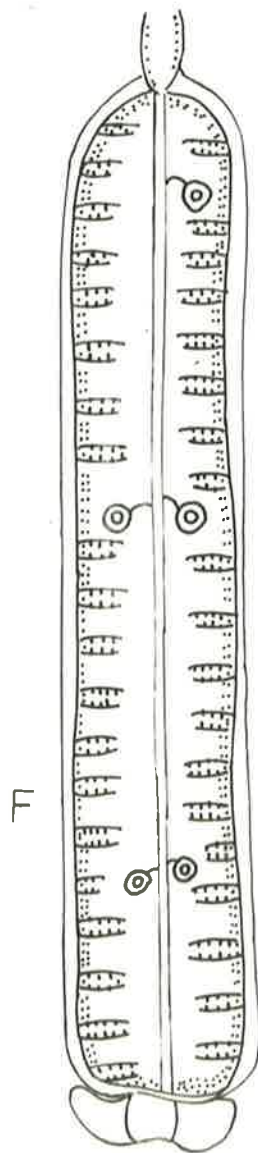
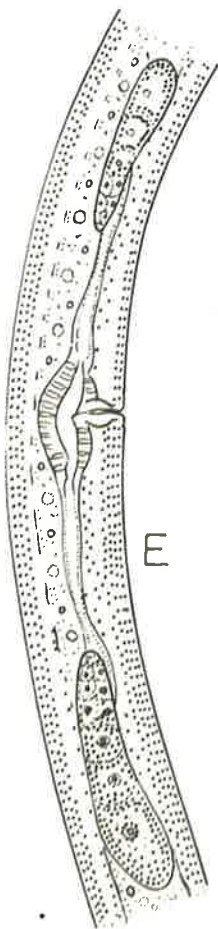
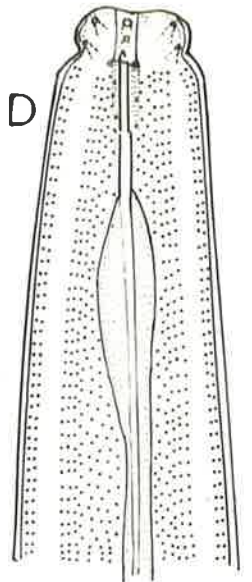
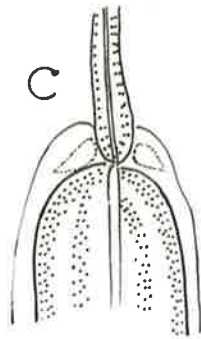
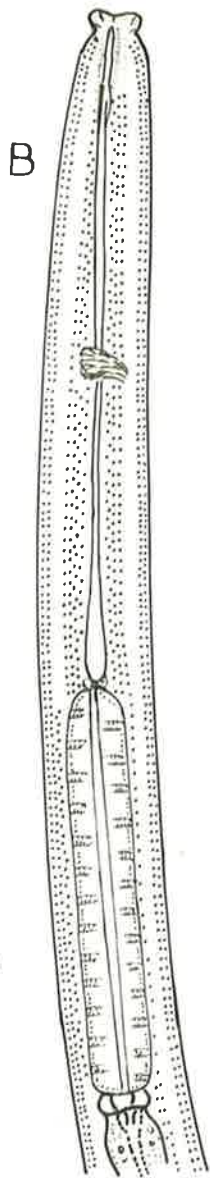
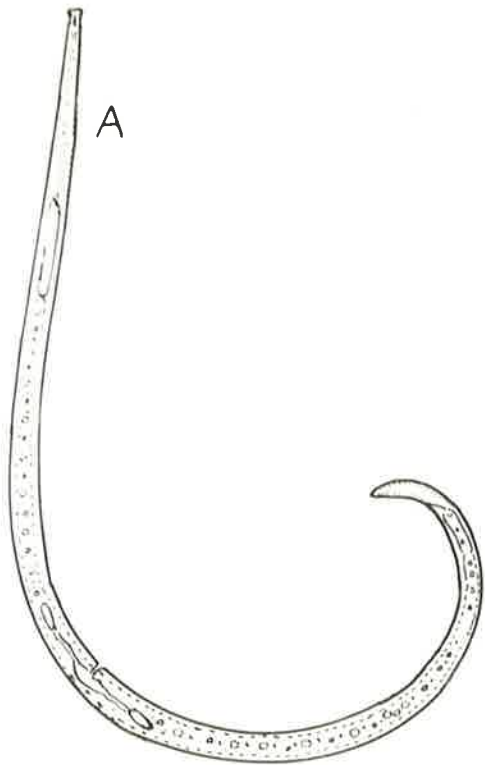
Fotedaronema kashmirensis Gen. et sp. nov is
distinctive by having a disc like set off head by deep
constriction, presence of small Isthmus like region, complex
nature of cardia with three distinct cells and by the shape
of tail, ending into sub-acute rounded terminus. However,
it comes close to Belondirella Thorne, 1964, Yungqueus Thorne
1964, Durinema Jairajpuri, 1960, Bullanema sauer 1968 and
Axonchoides Thorne, 1967, but differs from all the said genera
by having a constriction between the anterior and posterior
portion of oesophagus. It also comes to close to Axonchium
Cobb, 1920 and Anchobelondira Nair and Coomans, 1971. From
Axonchium the n.gen. differs by the presence of Isthmus like
region between the two parts of oesophagus and by having
two female gonads, while from Anchobelondira by the shape of
lip region which is disc like set off by deep constriction,
the presence of Isthmus like region between two parts of
oesophagus and shape of female tail.

In view of the above differences the present form is placed in a new genus for which the name Fotedaronema is proposed.

PLATE - XXIII

FOTEDARONEMA KASHMIRENSIS SP. NOV.

- Fig. A : Entire female
B : Oesophageal region of female
C : Female part of neck region showing junction between the two parts of oesophagus
D : Anterior end of female
E : Vulval region of female showing didelphic gonad, relexed at oviduct
F : Basal oesophageal bulb
G : Complex nature of cardia with distinct cells
H : Tail end of female



10μ	C,D,F,G,H
30μ	B,E
200μ	A

PREVIOUS WORK

Micoletzky, 1922 proposed Longidorus as a sub - generic name for Dorylaimus elongatus. The sub genus was however elevated to the rank of genus by Thorne & Swange in 1936 and was incorporated in the sub-family Longidorinae Thorne, 1935 with 3 other genera i.e. Xiphonema, Longidorella and Xiphinemella. Chitwood did not accept this classification and therefore synonymized sub-family Longidorinae with Tylencholaiminae. Clark (1961) and Goodey (1963) both agreed with Chitwood in this regard. This was however rejected by Meyl, in 1961 and who went even one step further and elevated Longidorinae to family rank i.e. Longidoridae. Thorne, 1964 supported Meyl, 1961 and accepted Longidoridae as a valid family. Siddiqi, 1969 proposed a revised classification of Dorylaimoidea under which he recognized fifteen families, Longidoridae was again considered as a valid family. When assessed objectively the family Longidoridae becomes clearly distinguishable from all the families of the super - family Dorylaimoidea by the possession of long and slender body elongated attenuated spear with fine lumen and aperture by well developed spear extension, the anterior tubular part of oesophagus much coiled with weak musculature and is distinctly set off from the posterior bulbous part which is consistently smaller in size as compared to the other families. There is no doubt that members of

Longidoroidea do show some relationship both with Tylencholaimidae and Nordiidae. Majority of the nematodes included in family Tylencholaimidae possess acicular spear with fine aperture but in no way this can be counted as a character depicting definite relationship with Longidoridae but this resemblance could be better explained as Phenomena of convergence. On the other hand Nordiidae is characterized by a comparatively longer spear in relation to body length which may have been possibly acquired by the elongation of typical Dorylaimid type of spear which must have resulted in the proportionate reduction of the lumen and the aperture during evolution of the group. This phenomena of false resemblance between the two groups (Nordiidae V/S Longidoridae) becomes further magnified if the comparison between the two is taken into account in light of the recent work of Loof & Coomans (1972).

Loof & Coomans (1972) studied in detail the structure of oesophagus especially the gland nuclei of Longidoridae. They gave a clear cut verdict that in the oesophageal structure especially the number and the distribution of oesophageal-gland-nuclei in all the three genera i.e. Longidorus, Paralongidorus and Xiphinema the Longidoridae occupies a distinct and unique place. They also simultaneously indicated that when Longidorella Thorne, 1932 is reviewed in the above perspective (number and location of gland nuclei) it is found to be a true representative of a typical Dorylaimid type. Hence there appears no doubt now in considering Longidorus, Paralongidorus and Xiphinema as

a compact and distinct group in no way less in rank as compared to the other super-families of Dorylaimina.

The main diagnostic characters on the basis of which they can be separated out are (1) by having only three of gland nuclei (2) long and slender body (even holding the record of largest plant parasitic nematode) (3) Attenuated odontostylet (4) Basal expanded part of oesophagus not measuring more than 1/4th of oesophageal length and being generally set off from the anterior part (5) being vectors of soil born viruses and in successfully transmitting and in the manifestation of Pathological symptoms to plants.

Thus it is concluded that Ahmad and Khan were fully justified, though not very methodical in their approach, in upgrading Longidoridae to super family rank. However, the author is in full confirmity with their decision and Longidoroidea is being considered as one of the super families of Dorylaimina.

The sub-family Xiphiniminae as proposed by Dalmase (1969) for accomodating the only genus Xiphinema Cobb, 1913. Loof & Coomans (1972) accepted the sub-family It therefore, looks justified when Khan & Ahmad, 1975 raised Xiphiniminae to family rank i.e. Xiphinimidae which has been done probably to make it equal in rank with the other family Longidoridae. The taxon looks more sound in the light of the advance contributions of Loof & Coomans (1972) and Rogen et al 1967 on the morphology of

this group. Members of the Longidoridae and Xiphinemidae not only in the arrangement of gland nuclei, size of dorsal gland nucleus and location of the openings of these glands but also in the structure of the spear particularly the junction of spear with its extension and nature of guiding ring as shown by recent electron microscopic studies. The super family Longidoroidea therefore, is considered to include two families viz. Longidoridae (Thorne, 1935) Meyl, 1961 and Xiphinimidae (Dalmaso, 1969) Khan & Ahmed, 1975.

SUPER FAMILY: LONGIDOROIDEA (Meyl, 1961) Khan & Ahmad, 1975

DIAGNOSIS : Dorylaimina. Body slender, size reaching maximum of 18 mm. Lip region continuous or set off by constriction. Amphid large; pouch, funnel or stirrup shaped with pore or slit like aperture. Spear axial, long and attenuated with fine lumen; spear extension rod like, with or without distinctly developed flanges; junction between spear and spear extension simple or complex. Spear guiding ring prominent, single or double. Oesophagus with an anterior non muscular convoluted tubular part, set off from the expanded muscular part about one fourth of total oesophageal length. The basal part of oesophagus with five gland orifices, nuclei of second sub ventral pair of glands having disappeared. Vulva transverse slit, gonads single or double. Male tail with an adanal pair and a series of ventro-sub-median supplements. Lateral guiding piece present. Tails of both sexes from long filiform to short rounded.

Type family: Longidoridae (Thorne, 1935) Meyl, 1961.

FAMILY: LONGIDORIDAE (Thorne, 1935) Meyl, 1961

DIAGNOSIS (emended): Longidoridae: Head continuous set off by constrictions; amphid pouch, funnel or stirrup shaped with pore or slit like aperture. Guiding ring single, junction between spear and spear extension simple. The distance between dorsal gland orifice and dorsal oesophageal gland nucleus longer. The dorsal gland nuclei oblong and smaller than is: sub-ventral pair of gland nuclei. Tail short, maximum upto 3 anal-body-widths long.

LONGIDORUS EKRAMI SP. NOV.

(Plate XXIV Fig. A-E)

7 females were recovered from the soil around roots of Prunus persica L. from Sopore, Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (6 paratype) L = 4.1-4.5 mm; a = 120-125;

b = 9-10.5; c = 92-95; v=44-

46% Spear = 95-100 mic.;

Spear extension 50-55 mic.

Female (Holotype) L = 4.1 mm; a = 120; b = 10.5

c = 92; v = 45%; Spear= 95 mic.

Spear extension = 50 mic.

DESCRIPTION:

When relaxed in hot water "Eel worms" assumes a strong ventral arcuature especially in the posterior 3rd body, so much so that often body shape assumes the form of single or double spiral. Body long and slender, tapering anteriorly from base of neck to a continuous rounded head, which is about 1/3rd of body width at base of oesophagus where as posteriorly to a cylindrical and elongated tail. Lateral body pore present throughout the length of body, leading into hypodermal pouches, which are arranged serially in the neck region while becoming irregular in the rest of body. Dorsal and ventral pores not seen. Lateral hypodermal chord arising as a thin streak in region of spear extension and continues to entire body length assuming a maximum width of 1/3rd of body. Spear 95 microns. Body cuticle thick

made up of 3 layers becoming quite distinct in region of head and tail. Faint transverse striation interrupting the body cuticle throughout. Lip region continuous rounded measuring 12 mic. x 5 mic. in dimension. Amphid bilobed slightly assymmetrically. Amphidial aperture minute. Sclerotization of stoma weak, guiding ring located at about 30 microns from anterior end i.e. 2.5 times lip width from anterior end. Oesophagus with a long cylindrical slender, non muscular tubular part expanding posteriorly to a set off basal oesophageal bulb, the latter lodging the dorsal and the first pair of sub ventral gland nuclei and the openings of dorsal and sub ventral glands (the posterior sub-ventral gland nuclei absent). Nerve ring located at 175 microns from anterior end. Cardia conoid rounded. Oesophago-intestinal-junction well marked.

Vulva a transverse slit. Vagina inclined extending to half the body width across. Uterus with a thick muscular distal part. Gonads didelphic opposed reflexed, Oocytes mostly arranged in single rows except in the zone of multiplication. Rectum shorter than 1- anal-body width in length. Tail elongate cylindrical, slightly, dorsally curved measuring about 45 microns in length i.e. 1.7 anal-body-widths long ending with a rounded terminus. Two pairs of caudal pores present.

MALES: Not found.

Paratypes (Females) on Slide No. PN/LON/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype (Female) On Slide No. PN/LON/3 in authors' collection.

HOST: Collected from soil around roots of Prunus persica L.

LOCALITY: Sopre, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

Longidorus ekrami n.sp. is distinctive by having a long and slender body, spear measuring 95- 100 microns with its extension equal to about half of the spear length, presence of conoid rounded cardia and by having an elongate cylindrical tail with two pairs of caudal pores. However, the new species comes close to Longidorus mirus Khan et al, 1971 and Longidorus nirulai Siddiqi, 1962. From L. mirus it differs by having longer and slender body, long spear and extension shape of the vagina and longer rectum. (L = 3-3.6 mm; a = 70-90; spear = 75-85; spear extension = 40-50, vagina at right angles to body axis and rectum 1/2 of anal-body-width in length. in L. mirus). From L. nirulai the present species can easily be differentiated by shorter spear and extension, length and shape of female tail and the absence of males (Spear = 100-160 microns, spear extension = 62-68 microns; c = 54-66; tail subconoid, sub digitate and males present in L. nirulai).

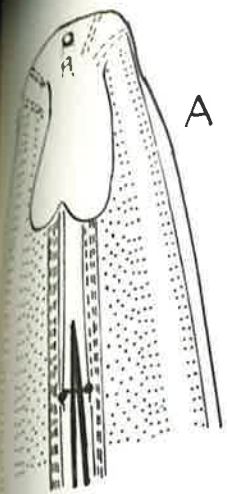
In view of the above differences the present form is considered here to constitute a new species for which the name Longidorus ekrami is proposed.

peak

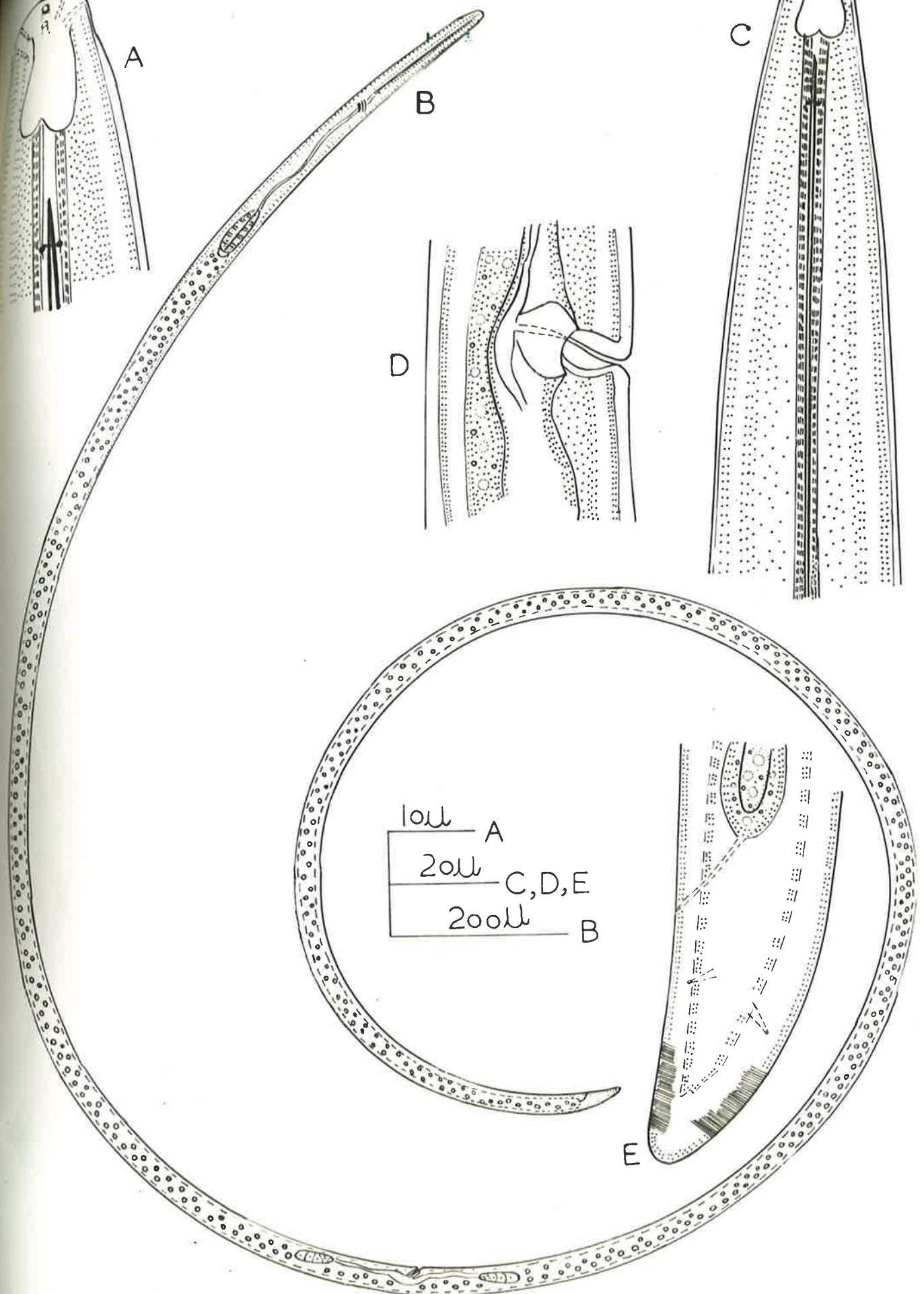
PLATE - XXIV

LONGIDORUS EKRAMI SP. NOV.

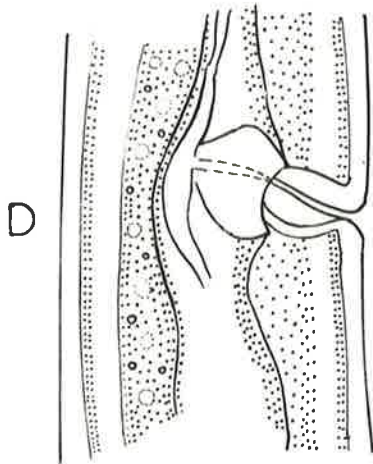
- Fig. A : Anterior end of female showing
amphid
- B : Entire female
- C : Anterior end of female showing
amphid
- D : Vulval region of female
- E : Tail end of female



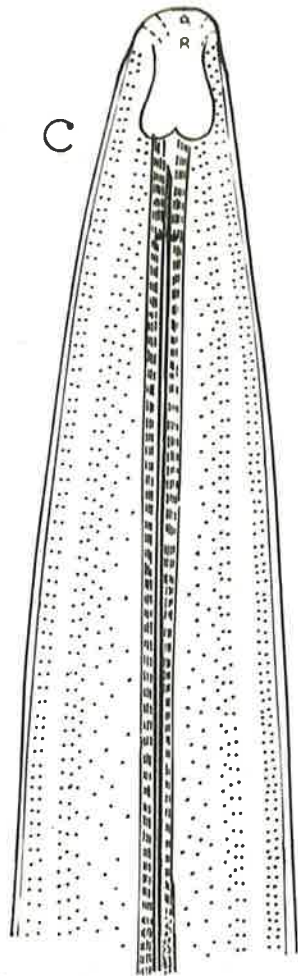
A



B

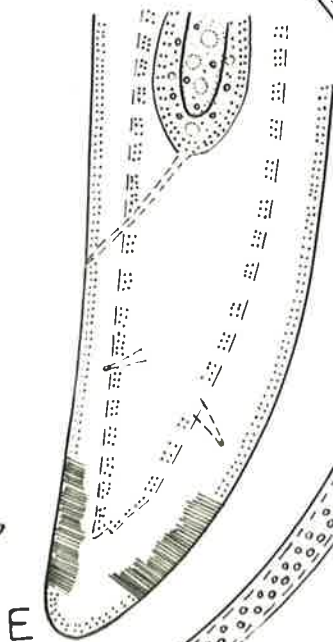


D



C

100μ	A
200μ	C, D, E
2000μ	B



E

FAMILY: XIPHINEMATIDAE

DIAGNOSIS (emended) Longidoroidea. Long and slender nematodes. Body generally over 1.5 mm in length. Lip region continuous or off set. Head sometimes expanded. Amphids stirrup shaped with large slit like apertures. Stoma with one fixed guiding ring and an additional flexible guiding ring. Spear long and attenuated with diverging processes at its base for the attachment of spear extension, the latter expanding at the base forming flange like structure which are divergent. Basal oesophageal bulb having dorsal oesophageal gland nucleus located almost at the level from where oesophagus starts expanding, the dorsal oesophageal gland orifice very close to the nucleus. The first pair of sub-ventral gland nuclei located in anterior half of oesophageal bulb and are always smaller in size than the dorsal oesophageal gland nuclei. Gonads paired or single. Uteri with or without -Z- organ. In the monodelphic forms either vulva is very anterior or very posterior. Tail varying from short hemispherical to elongate filiform.

XIPHINEMA FOTEDARI SP. NOV.

(Plate XXV Fig. A-F)

7 females of the nematode genus Xiphinema were recovered around the roots of Pyrus malus L. from Ganderbal, Kashmir. They are considered here in to constitute new species.

MEASUREMENTS:

Female (6 paratypes) L = 1.7-1.9 mm; a = 29-32; b = 5.3-7;
c = 34-37; v = 54-55%; Spear = 105-107;
Spear extension = 64-66 mic.

Female (Holotype) L = 1.9 mm; a = 31.5; b = 6.8; c = 36;
v = 55 %; Spear = 107; Spear extension =
66 microns.

DESCRIPTION:

"Eel work" when killed assumes a close 'c' shape. Body cylindrical comparatively short and robust than other species of the genus; tapering regularly from the neck base to a continuous rounded head which is less than 1/4th of the body at the base of the spear extension. Body cuticle made up of three layers, thick especially in the region of head and tail. The sub-cuticle conspicuously transversely striated throughout the body length. Lateral body pores arranged serially in the neck region where as their arrangement becoming irregular in the rest of the body. Dorsal and ventral body pores not seen. Lateral hypodermal chord arising in the region of the spear extension and assuming a maximum width of 1/4th of body at mid body region. Head continuous narrowed anteriorly measuring 11 microns across.

Amphid funnel shaped with short aperture measuring about 5 microns across i.e. occupying 45% of the head width. Length of guiding sheath about 11 microns distance from its posterior margin to head end is 78 microns. Odontostylet attenuated and measures 107 microns. Spear extension 66 microns in length terminating basally into well developed flanges. Nerve ring located at 196 microns from the anterior end. Oesophagus consisting of a anterior tubular non muscular convoluted part, expanding suddenly at its base into a basal oesophageal bulb, the latter measuring 68 microns in length and attaining a maximum width of 16 microns lodging the oesophageal gland nuclei. Dorsal oesophageal gland nucleus larger and is located at about 7 microns behind the bulbous expansion, where as its opening lies 3 microns anterior to the nucleus. The first pair of sub-ventral nucleus (left) located at 30 microns behind the expansion where as the right lies at 28 microns behind the expansion. Their openings located close to the respective nuclei. The opening of the 2nd pair of gland nuclei lie at about 75 % of the length of basal bulb. The paired gland nuclei have disappeared. Oesophago-intestinal-junction well marked with a flat rounded cardia.

Vulva transverse slit located at 55% of the body. Vagina at right angles to the body axis, uteri of uniform diameter throughout. The middle part muscular with 2-organ present. Gonads two, symmetrical, opposed, ovaries reflexed at the oviduct. Rectum measuring about 2/3rd of anal-body-diameter in length. Tail strongly dorsally convex conoid, with a short digitate portion and smoothly rounded tip.

Tail measuring 35 microns in length, i.e. 1.4 times anal-body-width having 2 pairs of caudal papillae.

MALES: Not found

Paratypes (Female) on Slide No. PN/XIP/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype (Female) on slide No. PN/XIP/3 in author's collection.

HOST: Collected from soil around roots of Pyrus malus L.

LOCALITY: Ganderbal, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

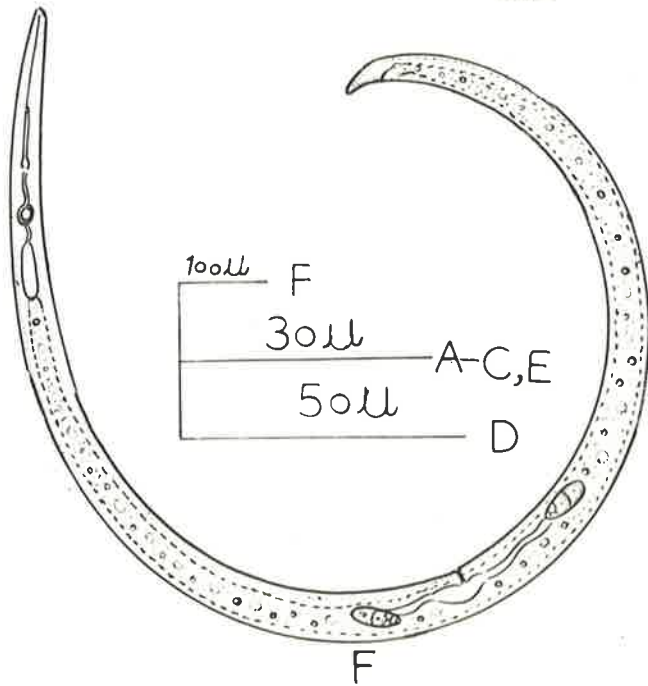
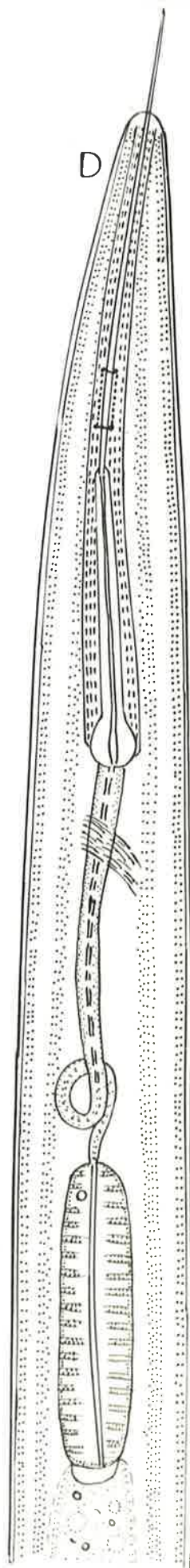
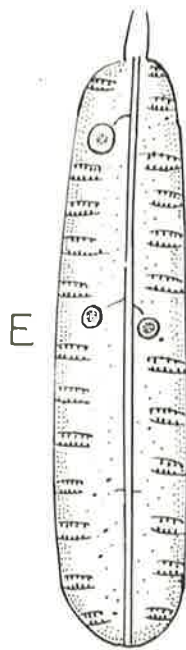
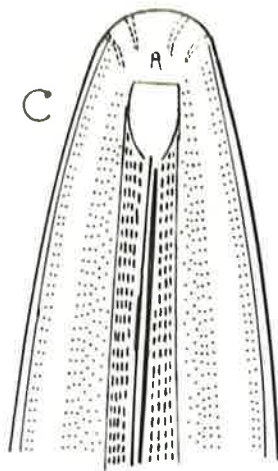
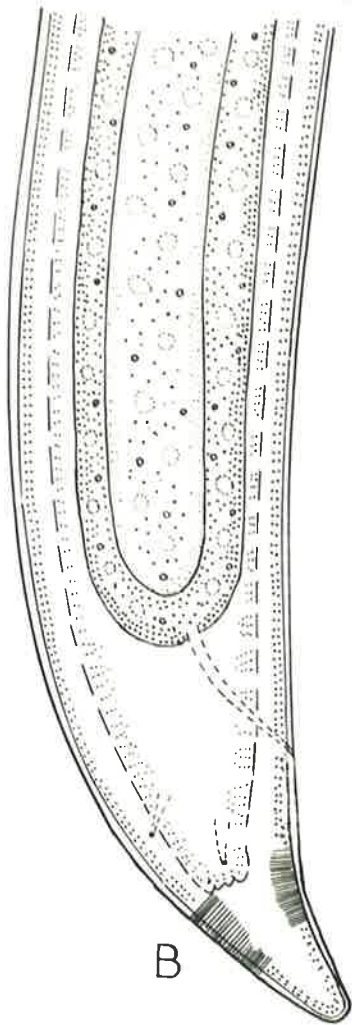
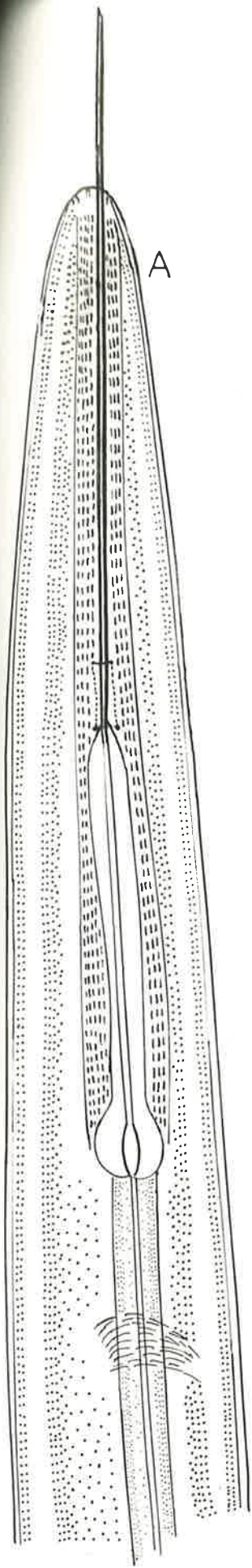
Xiphinema fotedari n.sp. is distinctive by having a small body, narrow, rounded continuous head, short amphidial aperture, spear 173 microns long, vulva located at 55%, tail 1.4 anal-body-width long and tail strongly dorsally curved with a short digitate terminus. However, it comes close to X. ebriense Luc 1958 from which it differs by a continuous head, position of vulva and longer and differently shaped tail.

In view of the above differences the present form is considered herein to constitute a new species for which the name Xiphinema fotedari is proposed.

PLATE - XXV

XIPHINEMA FOTEDARI SP. NOV.

- Fig. A : Neck region of female
B : Tail end of female
C : Anterior end of female showing
amphid
D : Oesophageal region of female
E : Basal bulb of oesophagus
F : Entire female



100μ	F
30μ	A-C, E
50μ	D

XIPHINEMA KASHMIRENSIS SP. NOV.

(Plate XXVI Fig. A, E)

9 females were recovered from soil around roots of Pyrus communis L. from Bandipora, Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (8 paratypes) L = 2.1-2.5 mm; a = 53-55; b = 6.7-7.1; c = 60-63; v = 50-55 %; spear = 90 mic. Spear extension = 60-62 microns.

Female (Holotype) L = 2.3 mm; a = 54; b = 6.9 ; c = 60; v = 50% ; Spear = 90 microns; Spear extension = 62 microns.

DESCRIPTION:

"Eel worm" when killed assumes a strongly ventrally arcuate closed 'c' shape. Body cuticle thick made up of 3 layers, more distinct in the region of head and tail. Lateral hypodermal chords arising as a thin streak in the anterior part of neck region, assuming a maximum width of 1/4th of body at middle region. Lateral body pores arranged serially in the neck region whereas the arrangement becomes very irregular in the rest of the body. Dorsal and ventral body pores not observed. Body tapering at both the ends, anteriorly from neck base to a rounded continuous head, which is about 1/3rd of body width at the neck base. Head with slight depression measures 12 x 3 microns in dimension. Amphid stirrup shaped; amphidial aperture broad slit like measuring

8 microns across i.e., occupying 66% of lip width. Odontostylet measuring 90 microns in length, distally formed at the junction with the spear extension, the latter measuring 62 microns in length and bears strongly developed flanges at base. Oesophagus with an anterior tubular non-muscular part having a small micro like structure in its left sub-ventral structure located at about 13 microns posterior to extension base and measures about 1 micron in length. Basal oesophageal bulb 80 microns long and 22 microns wide. Dorsal oesophageal gland located at about 6 microns behind the region where the oesophageal bulb expands, its opening located 1 micron anterior to dorsal gland nucleus. The first sub-ventral gland nuclei being distally smaller than dorsal gland nucleus. The opening of 2nd pair of sub-ventral gland nuclei (disappeared) is located at 55 microns from proximal end of the oesophageal bulb i.e., 70 % of the basal bulb. Nerve ring located at 177 microns from anterior end. Cardia conoid rounded. Vulva transverse slit. Vagina at right angles to body axis. Uteri with weakly developed -z-organ. Gonads paired symmetrical, opposed, reflexed at the oviduct. Tail dorsally convex conoid measuring a little over one anal-body-width in length with ~~ab~~ bluntly rounded terminus. Two pairs of caudal pores observed. Rectum about half anal-body-width in length with a short post anal blind sac.

MALES: Not found

Paratype (Females) on slide No. PN/XIP/4-5 deposited with
the Department of Zoology, Kashmir University.

Holotype (Female) on Slide No. PN/XIP/6 in authors collection.

HOST: Collected from soil around the roots of
Pyrus communis L.

LOCALITY: Bandipora, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

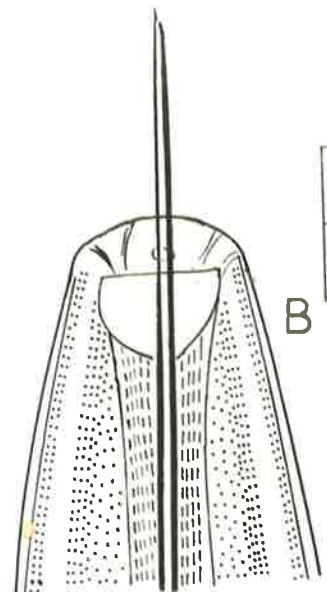
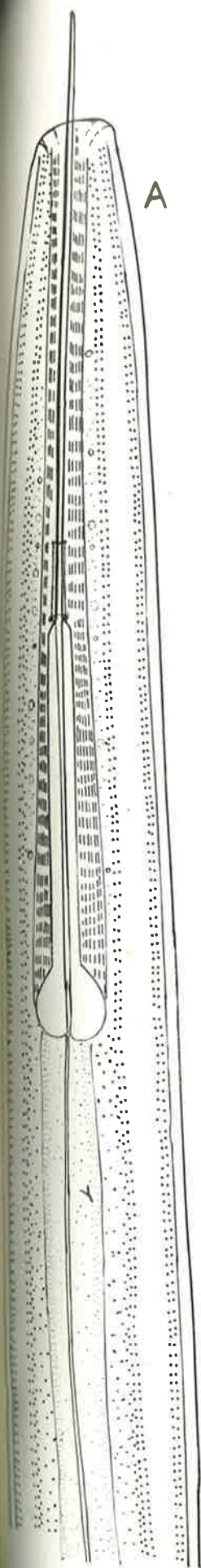
Xiphinema kashmirensis n.sp. is distinctive by having a conoid rounded cardia, short convex conoid tail with a bluntly rounded terminus and by the presence of -Z- organ in the uterus. However, it comes close to X.pini Heyns, 1965 from which it differs by shorter body, value of a and c and by the size of spear and its extension. (L= 3.22 mm; a = 66; c = 117, Spear = 110 microns and spear extension = 84 microns in X.pini)

In view of the above differences the present form is considered hereto constitute a new species for which the name Xiphinema kashmirensis is proposed.

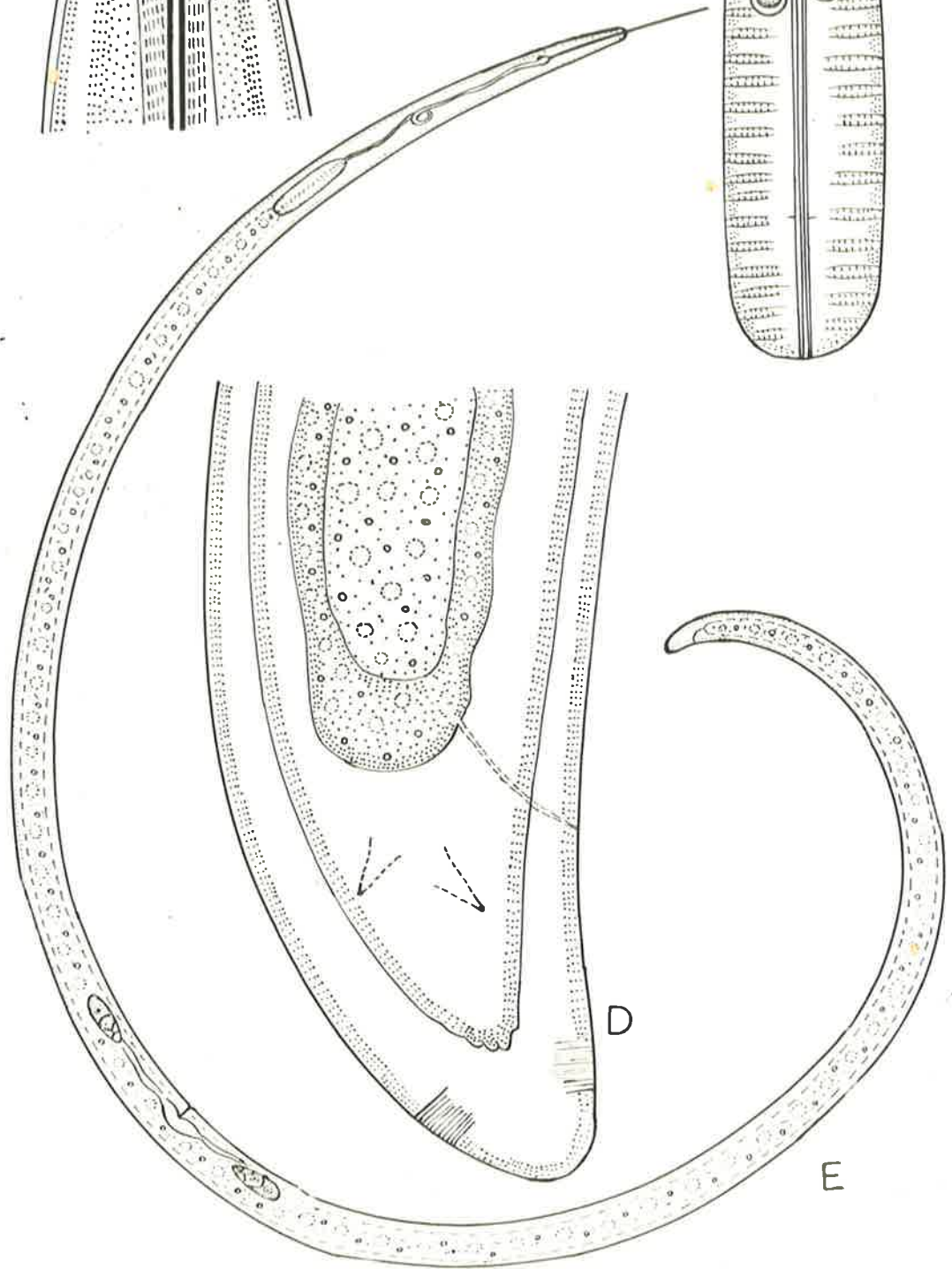
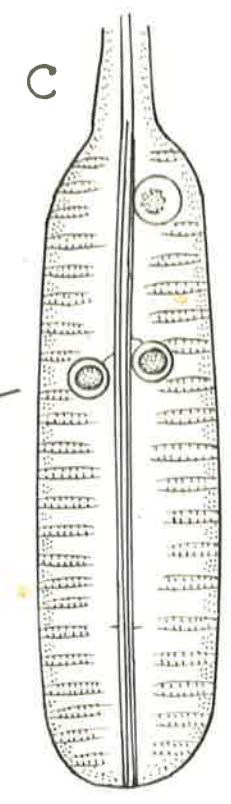
PLATE- XXVI

XIPHINEMA KASHMIRENSIS SP.NOV.

- Fig. A : Neck region of female
B : Anterior end of female showing
amphid
C : Basal bulb of oesophagus
D : Tail end of female
E : Entire female



1000	B, D
3000	A, C
2000	E



PART II

REVISED SCHEME OF CLASSIFICATION
UPTO GENERA FOR SUB-ORDER DORYLAIMINA

Sub order

Super families

Dorylaimina (Micoletzky, 1922) Clark, 1961

Actinolaimoidea Thorne, 1967

Belondiroidoidea Thorne, 1964

Dorylaimoidea (De Man, 1876) Thorne, 1934

Encholaimoidea Golden & Murphy, 1967

Leptonchoidea (Thorne, 1935) Ferris, 1971

Longidoroidea (Meyl, 1961) Ahmed & Khan, 1975

Nygolaimoidea Thorne, 1935.

SUPER FAMILY ACTINOLAIMOIDEA Thorne, 1967

Family

Sub family

Genera

1. Actinolaimidae
(Thorne, 1939) Meyl, 1961

a) Actinolaiminae Thorne, 1939

Actinolaimus Cobb, 1913

b) Neoactinolaiminae Thorne, 1967

Egtitus Thorne, 1967

Hexactinolaimus Yeates, 1973

Mactinolaimus Andrassy, 1970

Metactinolaimus Meyl, 1957

Neoactinolaimus Thorne, 1967

Afractinolaimus Andrassy, 1970

Paractinolaimus Meyl, 1957

Westindicus Thorne, 1967

a) Brittonematinæ
Thorne, 1967

Brittonema Thorne, 1967

Pratinocephalus Andrassy, 1973

b) Actinocinae Andrassy, 1968

Actinca Andrassy, 1964

Actinolaimoides Meyl, 1957

Brasilaimus Lordello & Zamith, 1957

Stomachoglossa Andrassy, 1968

2. Brittonematidae
Thorne, 1967

SUPER FAMILY ACTINOLAIMOIDEA Thorne, 1967

Family

Sub family

Genera

3. Carcharolaimidae
Thorne, 1967

a) Carcharolaiminae
Thorne, 1967

Antholaimus Cobb, 1913

Carcharoides Thorne, 1967

Carcharolaimus Thorne, 1939

Caryboca Lordello, 1967

Caribenema Thorne, 1967

b) Caribenematinae
Thorne, 1967

4. Mylodiscidae
Thorne, 1967

Mylodiscoides Lordello, 1963

Mylodiscus Thorne, 1967

5. Trachypleurosidae
Thorne, 1967

Trachactinolaimus Andrassy, 1963

Trachyplenosum Andrassy, 1959

SUPER FAMILY BELONDIROIDEA Thorne, 1964

1. Axonchidae (Thorne, 1964)
Siddiqi, 1968

Axonchinae Thorne, 1964

Axonchium Cobb, 1920

Axonchoides Thorne, 1967

Fotedaronema N. Gen.

Anchobelondria Nair & Coomans, 1971

SUPER FAMILY BELONDIROIDEA Thorne, 1964

Family	Sub family	Genera
2. Belondiridae (Thorne, 1939) Thorne, 1964	Belondirinae Jairajpuri, 1964	<u>Belaxellus</u> Thorne, 1974 <u>Belondira</u> Thorne, 1939 <u>Belondirella</u> Thorne, 1964 <u>Belondirium</u> Andrassy, 1976 <u>Yunqueus</u> Thorne, 1964 <u>Dorylaimelus</u> Cobb, 1913 <u>Mitoxonchium</u> Yeates, 1973 <u>Oxydirus</u> Thorne, 1939 <u>Mydonomus</u> <u>Roquenus</u> Thorne, 1964 <u>Quesiella</u> Jairajpuri, 1966 <u>Swangeria</u> Thorne, 1939 <u>Falcihasta</u> Clark, 1964
3. Dorylaimellidae (Jairajpuri, 1964) Thorne, 1964	Dorylaimellinae Jairajpuri, 1964	
4. Oxydiridae (Jairajpuri, 1964) Thorne, 1964	Oxydirinae Thorne, 1964	
5. Mydonomidae Thorne, 1964		
6. Roqueidae Thorne, 1964	Roqueinae Thorne, 1964	
7. Swangeriidae (Jairajpuri, 1964) Siddiqi, 1968. Jairajpuri, 1964	Swangeriinae Jairajpuri, 1964	
8. Falcihastidae Siddiqi, 1968	Falcihastinae, Siddiqi, 1968	

.....
SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934
.....

Family

Sub family

Genera

1. Aporcelaimidae Heyns, 1965

Aporcelaiminae Heyns, 1965

Aporcelaimellus Heyns, 1965

Aporcelaimium Loof & Coomans, 1970

Aprocelaimus Thorne & Swanger, 1936

Akrotonus Thorne, 1974

Makatinus Heyns, 1965

Thonus Thorne, 1974

Chrysonema Thorne, 1929

chrysonemoides Siddiqi, 1969

Crateronema Siddiqi, 1969

Dorylaiminae (De Man, 1876)

Filipjev, 1918

3. Dorylaimidae De Man, 1876

Dorylaimus Dujardin, 1845

Ischiodorylaimus Andrassy, 1969

Paradhorylaimus Andrassy, 1969

Labronema Thorne, 1939

Witholdinema Brezeski, 1960

Drepanodurus Altherr, 1954

Meylonema, Andrassy, 1960.

2. Crateronematidae
Siddiqi, 1969

Crateronematinae

SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934

Family

Sub family

Genera

Discolaiminae
(Siddiqi, 1969) Ferris, 1971

Discolaimus Cobb, 1913

Discolaimium Thorne, 1939

Discolaimoides Heyus, 1963

Laimydorinae
Andrassy, 1969

Idiodorylaimus Andrassy, 1969

Laimydor Siddiqi, 1969

Afrodorylaiminae
Andrassy, 1969

Afrodorylaimus Andrassy, 1964

Lordellonematinae

Lordellonema Andrassy, 1969

Poronemella Siddiqi, 1969

Cephalodorylaiminae
Jairajpuri, 1967

Cephalodorylaimus Jairajpuri, 1967

Ottolaimus Kivjanova, 1951

Mesodorylaiminae
Andrassy, 1969

Calodorylaimus Andrassy, 1969

Drepandorylaimus Jairajpuri, 1966

Mesodorylaimus Andrassy, 1959

Minidorylaimus Andrassy, 1972

Vanderlidiinae Siddiqi, 1969 Vanderlindia Heyns, 1964

Torumanawa Yeates, 1967

Family

Sub family

Genera

4. Kochinematidae n. family

5. Nordiidae Jairajpuri & Siddiqi, 1964

Nordiinae
Jairajpuri & A.H.Siddiqi,
1964

Takamangai Yeates, 1967

Kochinema Heyns, 1963

Enchodorella Khan, 1964

Longidorella Thorne, 1939

Thornedia Hussain & A.M.Khan, 1965

Enchodelium Andrassy, 1963

Enchodelus Thorne, 1939

Heterodorus Altherri, 1952

Pungentus Thorne, & Swanger, 1936

Rhysocolpus Andrassy in Zullini, 1970

Nygolaimellus Loss, 1949

Nygolaimium (Thorne, 1930) Heyns, 1968

Scapidens Heyns, 1965

Sectonema Thorne, 1930

Amphidorylaimus Andrassy, 1960

Prodorylaimium Andrassy, 1969

Prodorylaimus Andrassy, 1959

6. Nygolaimellidae
(Clark, 1961) Heyns, 1968

Nygolaimellinae
Clark, 1961

Sectonematinae
(Siddiqi, 1969)

Amphidorylaiminae

Prodorylaiminae

7. Prodorylaimidae
Andrassy, 1969

SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934

Family ----- Sub family ----- Genera -----

- 8. Qudsianematidae
Jairajpuri, 1965
Qudsianematinae
Jairajpuri, 1965
Crassolabium Yeates, 1967
Ecumenicus Thorne, 1974
Endorylaimus Andrassy, 1959
Indorylaimus Mehdi Ali & Prabha, 1974
Parasicagutter N.gen.
Sicagutter Siddiqi, 1971
- 9. Sicagutturiidae
(Ali & Prabha, 1973) n.rank
Parasicagutteriinae
n.sub.fam.
Sicagutteriinae
Ali & Prabha 1973
- 10. Thorniidae
Deconinck, 1965
Thorniinae De Coninck, 1965
Thorneela Andrassy, 1960
Thornia Meyl, 1954
Willinema Bagri & Jairajpuri, 1967
- 11. Thornenematidae
Siddiqi, 1969
Thornenematinae
Siddiqi, 1969
Thornenema Andrassy, 1959

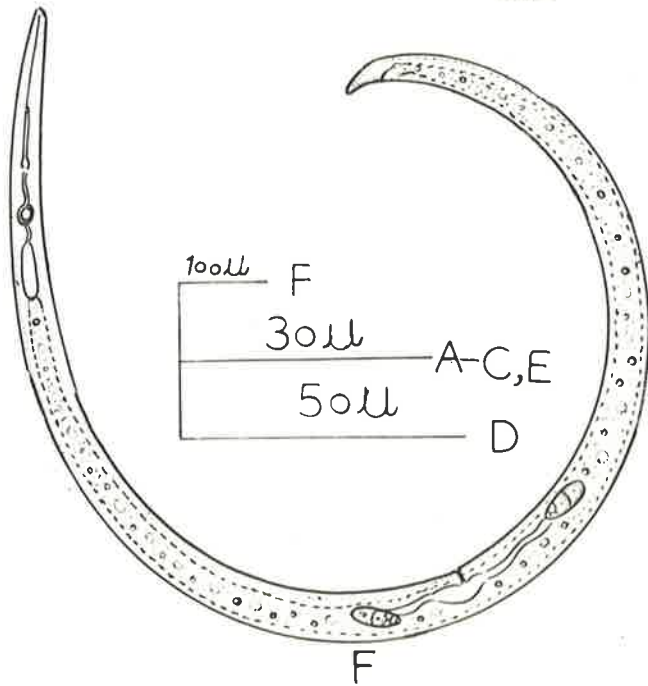
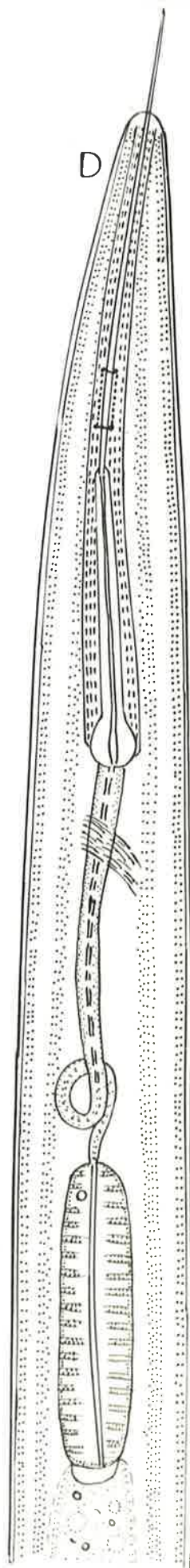
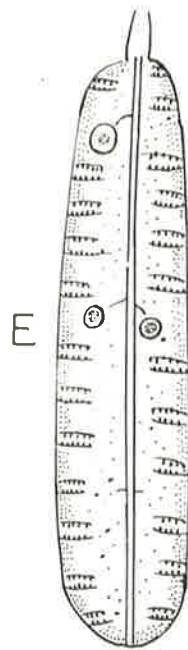
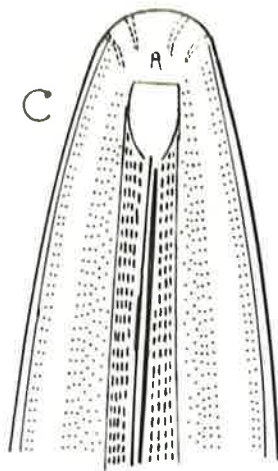
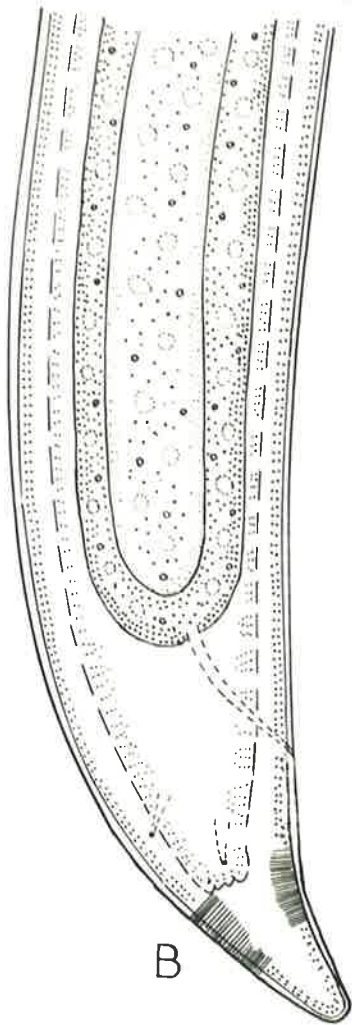
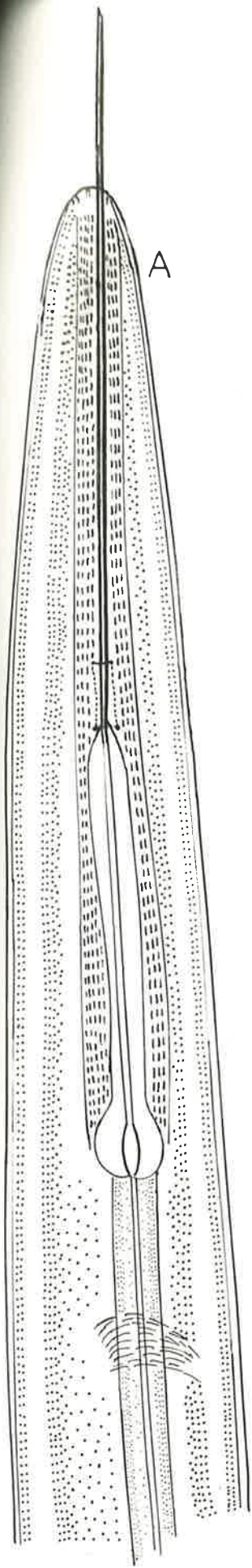
SUPER FAMILY ENCHOLAIMOIDEA Golden & Murphy, 1967

- 1. Encholaimidae
Encholaiminae
Golden & Murphy, 1967
Encholaimus Golden & Murphy, 1967
Helmabia Siddiqi, 1971

PLATE - XXV

XIPHINEMA FOTEDARI SP. NOV.

- Fig. A : Neck region of female
B : Tail end of female
C : Anterior end of female showing
amphid
D : Oesophageal region of female
E : Basal bulb of oesophagus
F : Entire female



100μ	F
30μ	A-C, E
50μ	D

XIPHINEMA KASHMIRENSIS SP. NOV.

(Plate XXVI Fig. A, E)

9 females were recovered from soil around roots of Pyrus communis L. from Bandipora, Kashmir. They are considered herein to constitute new species.

MEASUREMENTS:

Female (8 paratypes) L = 2.1-2.5 mm; a = 53-55; b = 6.7-7.1; c = 60-63; v = 50-55 %; spear = 90 mic. Spear extension = 60-62 microns.

Female (Holotype) L = 2.3 mm; a = 54; b = 6.9 ; c = 60; v = 50% ; Spear = 90 microns; Spear extension = 62 microns.

DESCRIPTION:

"Eel worm" when killed assumes a strongly ventrally arcuate closed 'c' shape. Body cuticle thick made up of 3 layers, more distinct in the region of head and tail. Lateral hypodermal chords arising as a thin streak in the anterior part of neck region, assuming a maximum width of 1/4th of body at middle region. Lateral body pores arranged serially in the neck region whereas the arrangement becomes very irregular in the rest of the body. Dorsal and ventral body pores not observed. Body tapering at both the ends, anteriorly from neck base to a rounded continuous head, which is about 1/3rd of body width at the neck base. Head with slight depression measures 12 x 3 microns in dimension. Amphid stirrup shaped; amphidial aperture broad slit like measuring

8 microns across i.e., occupying 66% of lip width. Odontostylet measuring 90 microns in length, distally formed at the junction with the spear extension, the latter measuring 62 microns in length and bears strongly developed flanges at base. Oesophagus with an anterior tubular non-muscular part having a small micro like structure in its left sub-ventral structure located at about 13 microns posterior to extension base and measures about 1 micron in length. Basal oesophageal bulb 80 microns long and 22 microns wide. Dorsal oesophageal gland located at about 6 microns behind the region where the oesophageal bulb expands, its opening located 1 micron anterior to dorsal gland nucleus. The first sub-ventral gland nuclei being distally smaller than dorsal gland nucleus. The opening of 2nd pair of sub-ventral gland nuclei (disappeared) is located at 55 microns from proximal end of the oesophageal bulb i.e., 70 % of the basal bulb. Nerve ring located at 177 microns from anterior end. Cardia conoid rounded. Vulva transverse slit. Vagina at right angles to body axis. Uteri with weakly developed -z-organ. Gonads paired symmetrical, opposed, reflexed at the oviduct. Tail dorsally convex conoid measuring a little over one anal-body-width in length with ~~ab~~ bluntly rounded terminus. Two pairs of caudal pores observed. Rectum about half anal-body-width in length with a short post anal blind sac.

MALES: Not found

Paratype (Females) on slide No. PN/XIP/4-5 deposited with
the Department of Zoology, Kashmir University.

Holotype (Female) on Slide No. PN/XIP/6 in authors collection.

HOST: Collected from soil around the roots of
Pyrus communis L.

LOCALITY: Bandipora, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

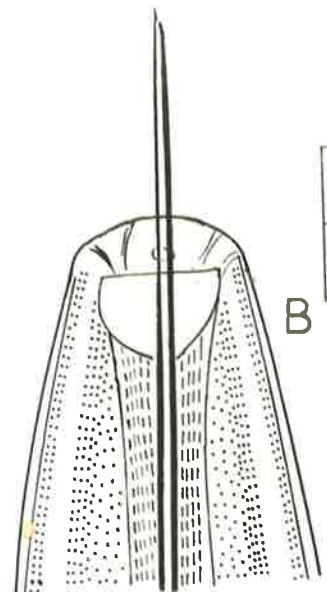
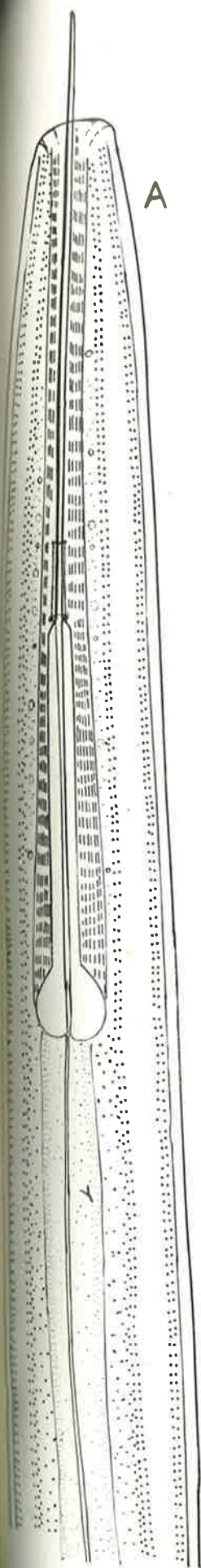
Xiphinema kashmirensis n.sp. is distinctive by having a conoid rounded cardia, short convex conoid tail with a bluntly rounded terminus and by the presence of -Z- organ in the uterus. However, it comes close to X.pini Heyns, 1965 from which it differs by shorter body, value of a and c and by the size of spear and its extension. (L= 3.22 mm; a = 66; c = 117, Spear = 110 microns and spear extension = 84 microns in X.pini)

In view of the above differences the present form is considered hereto constitute a new species for which the name Xiphinema kashmirensis is proposed.

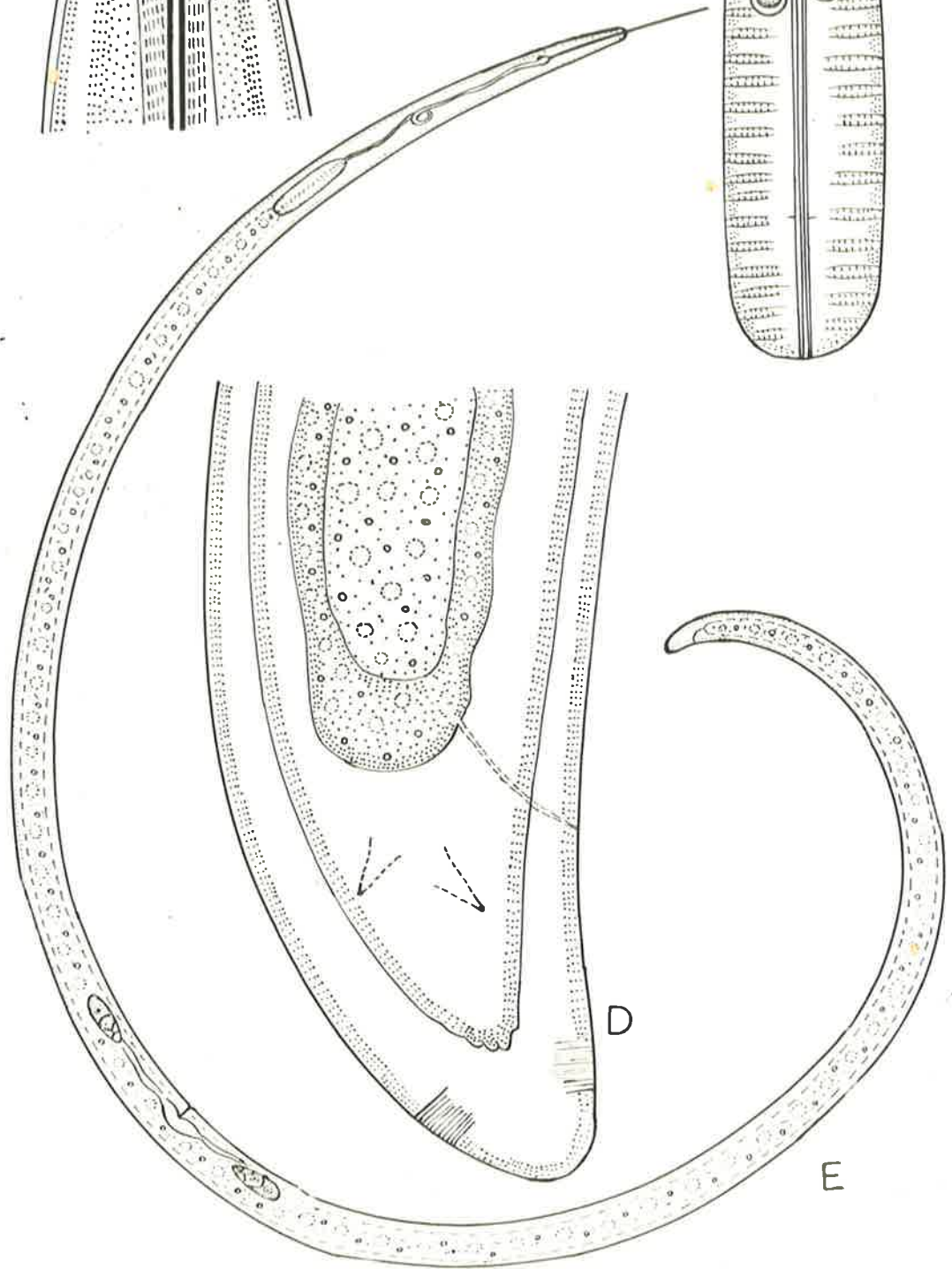
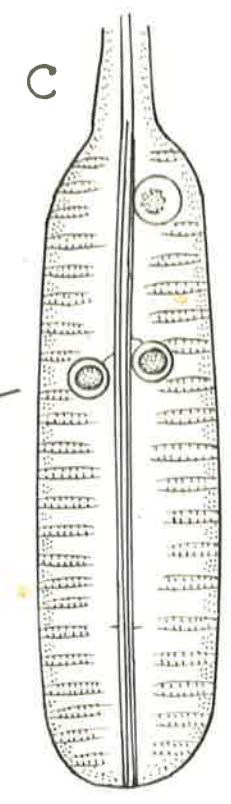
PLATE- XXVI

XIPHINEMA KASHMIRENSIS SP.NOV.

- Fig. A : Neck region of female
B : Anterior end of female showing
amphid
C : Basal bulb of oesophagus
D : Tail end of female
E : Entire female



1000	B, D
3000	A, C
2000	E



PART II

REVISED SCHEME OF CLASSIFICATION
UPTO GENERA FOR SUB-ORDER DORYLAIMINA

Sub order

Super families

Dorylaimina (Micoletzky, 1922) Clark, 1961

Actinolaimoidea Thorne, 1967

Belondiroidoidea Thorne, 1964

Dorylaimoidea (De Man, 1876) Thorne, 1934

Encholaimoidea Golden & Murphy, 1967

Leptonchoidea (Thorne, 1935) Ferris, 1971

Longidoroidoidea (Meyl, 1961) Ahmed & Khan, 1975

Nygolaimoidea Thorne, 1935.

SUPER FAMILY ACTINOLAIMOIDEA Thorne, 1967

Family

Sub family

Genera

1. Actinolaimidae
(Thorne, 1939) Meyl, 1961

a) Actinolaiminae Thorne, 1939

Actinolaimus Cobb, 1913

b) Neoactinolaiminae Thorne, 1967

Egtitus Thorne, 1967

Hexactinolaimus Yeates, 1973

Mactinolaimus Andrassy, 1970

Metactinolaimus Meyl, 1957

Neoactinolaimus Thorne, 1967

Afractinolaimus Andrassy, 1970

Paractinolaimus Meyl, 1957

Westindicus Thorne, 1967

a) Brittonematinæ
Thorne, 1967

Brittonema Thorne, 1967

Pratinocephalus Andrassy, 1973

b) Actinocinae Andrassy, 1968

Actinca Andrassy, 1964

Actinolaimoides Meyl, 1957

Brasilaimus Lordello & Zamith, 1957

Stomachoglossa Andrassy, 1968

2. Brittonematidae
Thorne, 1967

SUPER FAMILY ACTINOLAIMOIDEA Thorne, 1967

Family

Sub family

Genera

3. Carcharolaimidae
Thorne, 1967

a) Carcharolaiminae
Thorne, 1967

Antholaimus Cobb, 1913

Carcharoides Thorne, 1967

Carcharolaimus Thorne, 1939

Caryboca Lordello, 1967

Caribenema Thorne, 1967

b) Caribenematinae
Thorne, 1967

4. Mylodiscidae
Thorne, 1967

Mylodiscoides Lordello, 1963

Mylodiscus Thorne, 1967

5. Trachypleurosidae
Thorne, 1967

Trachactinolaimus Andrassy, 1963

Trachyplenosum Andrassy, 1959

SUPER FAMILY BELONDIROIDEA Thorne, 1964

1. Axonchidae (Thorne, 1964)
Siddiqi, 1968

Axonchinae Thorne, 1964

Axonchium Cobb, 1920

Axonchoides Thorne, 1967

Fotedaronema N. Gen.

Anchobelondria Nair & Coomans, 1971

SUPER FAMILY BELONDIROIDEA Thorne, 1964

Family	Sub family	Genera
2. Belondiridae (Thorne, 1939) Thorne, 1964	Belondirinae Jairajpuri, 1964	<u>Belaxellus</u> Thorne, 1974 <u>Belondira</u> Thorne, 1939 <u>Belondirella</u> Thorne, 1964 <u>Belondirium</u> Andrassy, 1976 <u>Yunqueus</u> Thorne, 1964 <u>Dorylaimelus</u> Cobb, 1913 <u>Mitoxonchium</u> Yeates, 1973 <u>Oxydirus</u> Thorne, 1939 <u>Mydonomous</u> <u>Roquenus</u> Thorne, 1964 <u>Quesiella</u> Jairajpuri, 1966 <u>Swangeria</u> Thorne, 1939 <u>Falcihasta</u> Clark, 1964
3. Dorylaimellidae (Jairajpuri, 1964) Thorne, 1964	Dorylaimellinae Jairajpuri, 1964	
4. Oxydiridae (Jairajpuri, 1964) Thorne, 1964	Oxydirinae Thorne, 1964	
5. Mydonomidae Thorne, 1964		
6. Roqueidae Thorne, 1964	Roqueinae Thorne, 1964	
7. Swangeriidae (Jairajpuri, 1964) Siddiqi, 1968. Jairajpuri, 1964	Swangeriinae Jairajpuri, 1964	
8. Falcihastidae Siddiqi, 1968	Falcihastinae, Siddiqi, 1968	

.....
SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934
.....

Family

Sub family

Genera

1. Aporcelaimidae Heyns, 1965

Aporcelaiminae Heyns, 1965

Aporcelaimellus Heyns, 1965

Aporcelaimium Loof & Coomans, 1970

Aprocelaimus Thorne & Swanger, 1936

Akrotonus Thorne, 1974

Makatinus Heyns, 1965

Thonus Thorne, 1974

Chrysonema Thorne, 1929

chrysonemoides Siddiqi, 1969

Crateronema Siddiqi, 1969

Dorylaiminae (De Man, 1876)

Filipjev, 1918

3. Dorylaimidae De Man, 1876

Dorylaimus Dujardin, 1845

Ischiodorylaimus Andrassy, 1969

Paradhorylaimus Andrassy, 1969

Labronema Thorne, 1939

Witholdinema Brezeski, 1960

Drepanodurus Altherr, 1954

Meylonema, Andrassy, 1960.

2. Crateronematidae
Siddiqi, 1969

Crateronematinae

SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934

Family

Sub family

Genera

Discolaiminae
(Siddiqi, 1969) Ferris, 1971

Discolaimus Cobb, 1913

Discolaimium Thorne, 1939

Discolaimoides Heyus, 1963

Laimydorinae
Andrassy, 1969

Idiodorylaimus Andrassy, 1969

Laimydor Siddiqi, 1969

Afrodorylaiminae
Andrassy, 1969

Afrodorylaimus Andrassy, 1964

Lordellonematinae

Lordellonema Andrassy, 1969

Poronemella Siddiqi, 1969

Cephalodorylaiminae
Jairajpuri, 1967

Cephalodorylaimus Jairajpuri, 1967

Ottolaimus Kivjanova, 1951

Mesodorylaiminae
Andrassy, 1969

Calodorylaimus Andrassy, 1969

Drepandorylaimus Jairajpuri, 1966

Mesodorylaimus Andrassy, 1959

Minidorylaimus Andrassy, 1972

Vanderlidiinae Siddiqi, 1969 Vanderlindia Heyns, 1964

Torumanawa Yeates, 1967

Family	Sub family	Genera
4. Kochinematidae n. family		<u>Takamangai</u> Yeates, 1967
5. Nordiidae Jairajpuri & Siddiqi, 1964	Nordiinae Jairajpuri & A.H.Siddiqi, 1964	<u>Kochinema</u> Heyns, 1963 <u>Enchodorella</u> Khan, 1964 <u>Longidorella</u> Thorne, 1939 <u>Thornedia</u> Hussain & A.M.Khan, 1965 <u>Enchodelium</u> Andrassy, 1963 <u>Enchodelus</u> Thorne, 1939 <u>Heterodoros</u> Altherri, 1952 <u>Pungentus</u> Thorne, & Swanger, 1936 <u>Rhysocolpus</u> Andrassy in Zullini, 1970
6. Nygolaimellidae (Clark, 1961) Heyns, 1968	Nygolaimellinae Clark, 1961	<u>Nygolaimellus</u> Loss, 1949 <u>Nygolaimium</u> (Thorne, 1930) Heyns, 1968
7. Prodorylaimidae Andrassy, 1969	Sectonematinae (Siddiqi, 1969) Amphidorylaiminae Prodorylaiminae	<u>Scapidens</u> Heyns, 1965 <u>Sectonema</u> Thorne, 1930 <u>Amphidorylaimus</u> Andrassy, 1960 <u>Prodorylaimium</u> Andrassy, 1969 <u>Prodorylaimus</u> Andrassy, 1959

SUPER FAMILY DORYLAIMOIDEA (De Man, 1876) Thorne, 1934

Family ----- Sub family ----- Genera -----

8. Qudsianematidae
Jairajpuri, 1965

Qudsianematinae
Jairajpuri, 1965

Crassolabium Yeates, 1967

9-Sicagutturiidae

Ecumenicus Thorne, 1974

(Ali & Prabha, 1973) n. rank

Endorylaimus Andrassy, 1959

Parasicagutteriinae
n. sub. fam.

Indodorylaimus Mehdi Ali & Prabha, 1974

Parasicagutter N. gen.

Sicagutteriinae
Ali & Prabha 1973

Sicagutter Siddiqi, 1971

10. Thorniidae
Deconinck, 1965

Thorniinae De Coninck, 1965

Thorneela Andrassy, 1960

Thornia Meyl, 1954

11. Thornenematidae
Siddiqi, 1969

Thornenematinae
Siddiqi, 1969

Willinema Bagri & Jairajpuri, 1967

Lenonchium Siddiqi, 1965

Thornenema Andrassy, 1959

SUPER FAMILY ENCHOLAIMOIDEA Golden & Murphy, 1967

1. Encholaimidae

Encholaiminae
Golden & Murphy, 1967

Encholaimus Golden & Murphy, 1967

Helmabia Siddiqi, 1971

..... SUPER FAMILY LEPTONCHOIDEA (Thorne, 1935) Ferris, 1971

Family

1. Aulolaimoidae
Jairajpuri, 1964

Sub family

Genera

Aulolaimoides Micoletzky, 1914

Oostenbrinkia Jairajpuri, 1965

Adenolaimus Andrassy, 1973

Basirotyleptus Jairajpuri, 1964

Belonenchus Thorne, 1964

Poncenema Thorne, 1964

Campydora Cobb, 1920

Agmodorus Thorne, 1964

Dorylaimoides Thorne & Swanger, 1936

Mumtazium Siddiqi, 1969

Leptonchus Cobb, 1920

Proleptonchus Lordello, 1955

Leptonchulus Khan

Shamimonema Chawla, Khan & Prassa, 1969

Tyleptus Thorne, 1939

Oxydiroides Altherr, 1972

Doryschota Thorne, 1964

Bertzuckermania Khara, 1970

2. Belonenchidae Thorne, 1964

3. Campydoridae
(Thorne, 1935) Clark, 1961

4. Dorylaimoididae Siddiqi,
1969

5. Leptonchidae
Thorne, 1935

..... SUPER FAMILY LEPTONCHOIDEA (Thorne, 1935) Ferris, 1971

Family

Sub family

Genera

6. Miranematidae Siddiqi, 1969

Miranema Thorne, 1939

7. Tylencholaimellidae

(Jairajpuri, 1964) Siddiqi, 1969

Didoryllium Isatullaeva, 1967

Doryllium Cobb, 1920

Dorella Jairajpuri, 1964

Phellonema Thorne, 1964

Tylencholaimellus M.V.Cobb, 1915

8. Tylencholaimidae

(Filipjev, 1934) Siddiqi, 1969

Botalium Heyns, 1963

Bullaenema Sauer, 1967

Chitwoodius Furstenberg & Heyns, 1966

Discomyctus Thorne, 1939

Oostenbrinkella Jairajpuri, 1965

Tylencholaimus De Man, 1876

Xenochium Siddiqi & Khan, 1964

Xiphinemella Loos, 1950

Utahnema Thorne, 1939

Siddiquis Andrassy, 1976

Utahematinae
Siddiqi, 1969

SUPER FAMILY LONGIDOROIDEA (Meyl, 1961) Ahmad & Khan, 1975

Family

Sub family

Genera

1. Longidoridae
(Thorne, 1935) Meyl, 1961

Longidorinae Thorne, 1935

Longidorus (Micoletzky, 1922) Filipjev, 1933

2. Xiphinematidae

Xiphinematinae
Dalmaso, 1969

Paralongidorus Siddiqi, Hooper & Khan 1963

Xiphinema Cobb, 1913

SUPER FAMILY NYGOLAIMOIDEA Thorne, 1935

1. Aetholaimidae
Jairajpuri, 1965

Aetholaiminae
Jairajpuri, 1965

Aetholaimus Williams, 1962

Mylodiscus Thorne, 1939

2. Nygolaimidae Thorne, 1935

Nygolaiminae Thorne, 1935

Nygolaimus Cobb, 1913

Nygellus Thorne, 1939

SUB ORDER : MONONCHINA Kárajánova & Krall, 1969

PREVIOUS WORK:

Bastian in (1865) proposed genus Mononchus. Cobb (1916, 1917) proposed five sub genera i.e., Mononchus, Prionchulus, Mylonchulus, Iotonchus and Anatonchus. The group afterwards received the attention of workers like Micoletzky (1922), Steiner and Heinly (1922) Thorne, (1927), Cassidy 1931). Chitwood proposed family Monochidae under super family Tripyloidea, of the sub order Enolipna and order Enoplida. De Coninck (1939) and Altherr (1950, 1953) gave generic status to Anatonchus and Iotonchus and Mylonchulus respectively. The genus Sporonchulus was recognised by Pennek (1953). A useful contribution to the study of this group was provided by Andrassy, 1958 who added the genera Brachonchulus, Cobbonchus, Granonchulus, Judonchulus and Miconchus.

The group received considerable attention by workers like Clark, 1960 and 1962. Coomans and Lima (1965) who not only expanded the taxonomy of the group but also proposed the removal of Monochidae from Anoplina and suggested its inclusion in Dorylaimina. The family Bathyodontidae was considered to form a link between Mononchoidea and Dorylaimoidea and the genera Bathyodontus Fielding, 1950 Oionchus Cobb, 1913 and Mirolaimus Andrassy, 1956 were included under it. However, the last one was synonymized to Bathyodontus by S. Jacob & Loof, 1962. The genus Monochulus Cobb, 1918 was shifted and transferred under Batyodontidae

from the family Oncholaimidae of Enoploidea by Jairajpuri and Loof (1966) and Deconinek (1965). The former authors also proposed two new sub-families under Bathydontidae i.e., Bathydontinae and Monochulinae. A mention of Williams, (1958); Andrassy (1959); Clark (1960, 1961, 1963) Mulvey (1961, 1963 and 1967 a) Coetzee (1965, 1966, 1967 a and b; 1968) Buangsuwon and Hensen (1966); Yeates (1967) and Mulvey and Jensen (1967).

Jairajpuri (1969) proposed a new order Mononchida for the reception of Monochid nematodes earlier placed in the super family Mononchoidea under the order Dorylaimida. This proposition of a new order was based on the difference in morphological as well as biological characters from the related order. Jairajpuri emphasized that the characters of stoma and oesophagus in Monochids are so much stable that a parallel is not encountered in any group. He also provided a revised scheme of classification of the order Monochida under which two super families i.e. Bathydontoidea and Mononchoidea were incorporated. Bathydontoidea included bathydontidae and Monochidae and under super family Mononchoidea were included Mononchidae, Mylonchilidae, Cobbonchidae, Atonchidae and Itonchidae, the last three families he proposed as new.

Cooman and Loof (1970) did not agree with Jairajpuri (1969) in raising the mononchs to ordinal rank. They preferred to keep mononchs as a sub order under the Dorylaimida. They also suggested that the five families which were recognised within the monchs can be grouped into

two super families based upon shape of mouth cavity and oesophago-intestinal valve. They further pointed out that difference between Bathydontus and Monochulus-Cionchus are of the same significance as encountered between Nygolaims and Dorylaims or between the two super families of Mononchids. This led them to raise Bathydontidae to sub ordinal rank and the two sub-families proposed by De Connick to super family rank, under their scheme of classifying Dorylaimida which they divided into five sub orders with diagnostic characters.

Andrassy (1976) recognised only one family i.e. Mononchidae with two sub-families Mononchinae and Princhulinae under Mononchoidea. Bathydentina was again reduced to super family rank Bathydontoidea to include Bathydonta and Mononchulidae.

The author agrees with Coomand and Loof (1970) and accepts his scheme of classification.

FAMILY MYLONCHULIDAE Jairajpuri, 1969

GENUS: Mylonchulus (Cobb, 1916) Altherr, 1953

DIAGNOSIS (emended): Mylonchulidae. Cosmopolitan in distribution comparatively smaller in size (1-2 mm) Body assume ventrally accuate posture. Body narrowing only very slightly towards extremities. Body cuticle thick and smooth inner transverse striae striated. Lip region clearly marked off by depression. Six conoid to rounded lips with well developed papillae. Amphid small, obscure. Buccal cavity 2-3 times as

long as wide equal to one lip width. Dorsal tooth massive its apex directed anterior, placed at 75-90 % of the length of Buccal cavity from the base. Sub-ventral walls bear four-eight transverse rows of denticals forming rasp like areas. At base of buccal cavity a small tormina is always present on sub ventral walls. Oesophagus entirely muscular and of uniform width throughout, occupying 25-35% of body length. Dorsal oesophageal gland orifice near middle of oesophagus, 2nd pair of sub-ventral glands near base of oesophagus. 1st pair of sub ventrals between the two. Nerve ring located at about 30% of oesophageal length from anterior end. Oesophago-intestinal-junction typically non tuberculate with a small conoid cardia. Rectum 1 anal-body-width long. Female reproductive organs amphidelphic, monoprodelphic or monoopisthodelphic. Vulva small, transverse. Pre and post vulval papillae are present in some speices. Male with spicule, gubernaculum with lateral guiding piece and ventro sub median supplemets. Tail length varies from 1-3 anal-body-widths. The tail shape hemispherical to obtusely rounded, caudal glands well developed except in few species, where they are either grouped or tandem in their arrangement. Spin~~ner~~et terminal or sub-terminally dorsal or sub-terminally ventral.

MYLONCHULUS SHAMIMI SP. NOV.

(Plate XXVII Fig. A - E)

11 females were recovered from soil around roots of Pyrus communis L. from Sonamarg Kashmir. They are considered herein to constitute a new species.

MEASUREMENTS

Female (10 Paratypes) L = 0.93-0.96^{mm.}; a = 23.1-25.3;

b = 2.7.-2.9; c = 37-39.5;

v = 67-69 %

Female (Holotype) L = 0.95^{mm.}; a = 23.7; b = 2.9;

c = 39.5; v = 67%.

DESCRIPTION

"Eel worm" when killed assumes an almost straight shape in the anterior two third of the body where as in the posterior 3rd ^{region} body getting strong ventral arcuature. Body tapering only slightly anteriorly from the head which is about 2/3rd as wide as body at base of neck. Body cuticle thick smooth getting more thicker in the region of head and tail. Lip region only slightly set off rounded in outline measuring 22 x 6 microns in dimension with labial papillae projecting well beyond the contour. Stoma almost oval with pointed base and measuring 26 x 13 microns in dimension. Dorsal tooth large, anterior edge concave and the posterior edge convex merging into the stoma at about middle of stomal length. Apex of tooth extending to almost anterior half of stoma. Sub ventral

denticles fairly distinct equal in size arranged in six rows. Posterior 3rd of stoma embeddedⁱⁿ anterior portion of oesophagus. Oesophagus narrowing slightly to nerve ring, the latter located at about 118 microns from ant. end. The oesophagus gradually widens towards base behind the nerve ring. Oesophago-intestinal-junction non-tuberculate. Intestine with wide lumen and is provided with numerous refractive granules.

Vulva transverse slit, post equatorial with slightly thickened lips. Vagina with sclerotization stretching across about one fifth of vulval body width. Uteri paired, opposed outstretched, ovaries reflexed up to the vulval region. Egg measuring 90 x 38 microns in dimension. Sperms not observed in the gonad. Rectum sigmoid measuring about 14 microns in length. Gonads amphidelphic. Caudal glands in tandem. Spinneret sub terminal opening on the dorsal side of tail. Tail strongly dorsally curved tapering to a sub acute rounded terminus.

MALES : Not found

Paratypes Females on slide no. PN/MYL/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype Female on slide no. PN/MYL/3 in authors collection.

HOST Collected from soil around roots of

Pyrus communis L .

LOCALITY Sonamarg Kashmir

DIAGNOSIS & RELATIONSHIP

Mylonchulus shamimi n.sp. is distinctive by having lip region continuous with very faint depressions, large dorsal tooth with anterior edge concave while posterior edge convex, vulva with slightly raised lips and by the presence of caudal gland and spinertt on tail. However, it comes close to M.nainitalensis Jairajpuri 1970 and M.agriculturae Coetzee, 1967. From M.nainitalensis the present species differs by longer body and oesophagus and posteriorly located vulva (L = 0.80-0.88; a = 27-30; b = 3.2; v = 63% in M.nanitalensis)

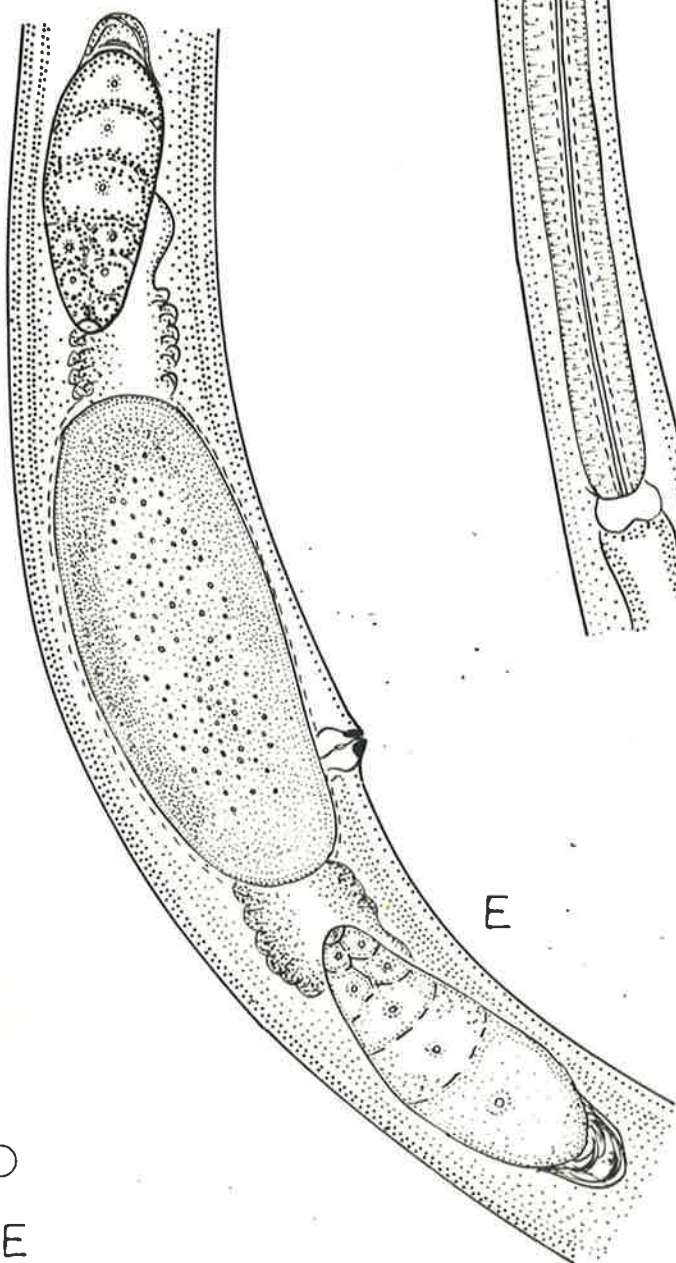
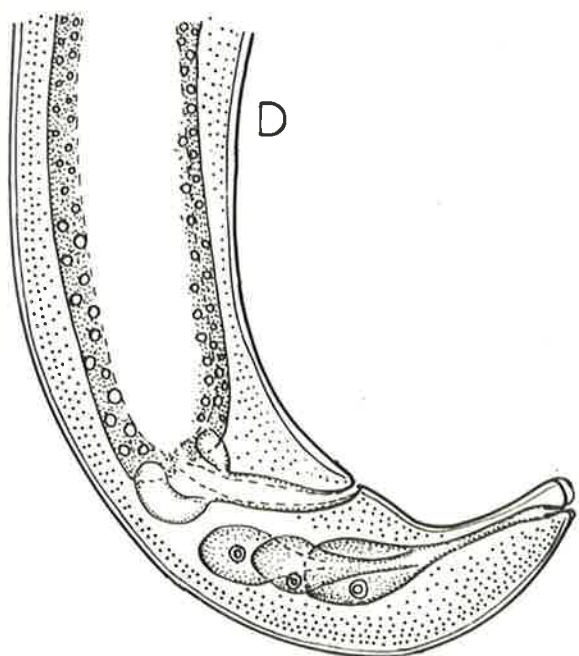
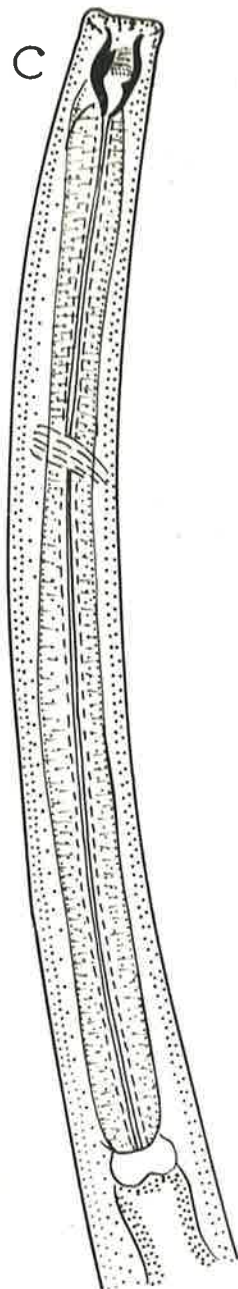
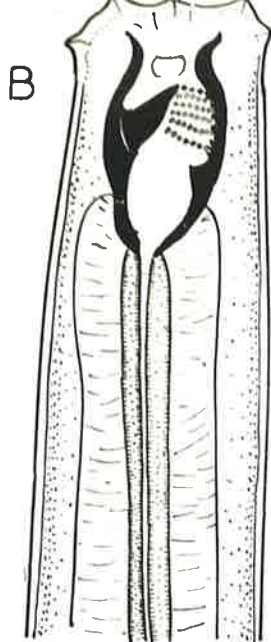
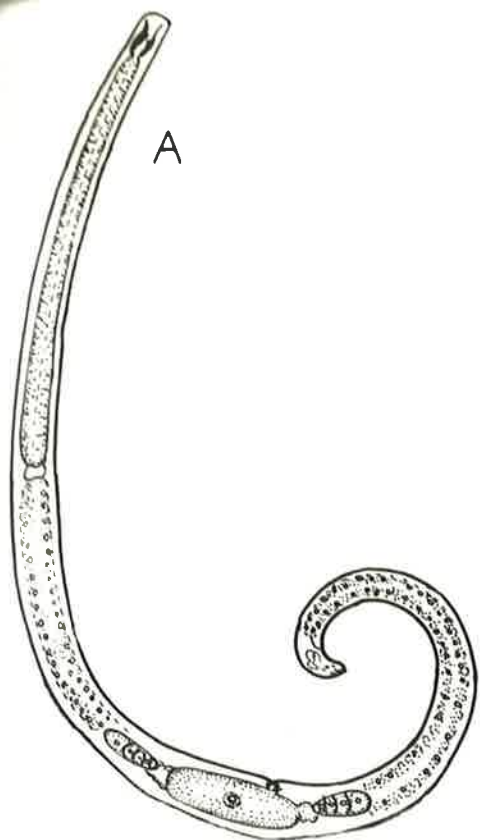
From M.agriculturae it can easily be differentiated by the value of a,b,c, position of vulva and by having comparatively smaller body. (L= 1 mm; a = 28.3; b = 3.5; c = 23.6 and v = 57.4 in M.agriculturae)

In view of the above differences the present species is considered here to constitute a new species for which the name M. shamimi is proposed.

PLATE - XXVII

MYLONCHULUS SHAMIMI SP. NOV.

- Fig. A : Entire female
B : Anterior end of female
C : Oesophageal region of female
D : Tail end of female
E : Vulval region showing
reflexed ovary almost upto
Vulva.



40μ	C
20μ	B, D
40μ	E
200μ	A

GENUS CHRONAGASTER Cobb, 1913

DIAGNOSIS (emended) : Plectinae. Cuticle with transverse striae. Head continuous with body, contour rounded conical in front, with minute papillae and four cephalic setae situated a short distance from the anterior end. Lip region with or without longitudinal striations. Amphids stirrup shaped or spiral, situated close to level of stoma. Mouth cavity in two parts; the anterior funnel like leading to narrow hind part which is about twice the length of former, surrounded by oesophageal tissue. At the junction of hinder part of stoma and oesophagus, a transverse expansion is present. Oesophagus cylindrical but expanding basally to a valveless or valvate bulb and connected to the intestine by a neck (post bulbar elongation). Excretory pore and hemizonid may be present. Vulva equatorial in position; ovary single, prodelphic reflexed caudal glands present or absent. Spicules slender, slightly arcuate and tapering to tips. Gubernaculum may be present. Tail with or without mucro.

Type Species Chronogaster longicollis (Daday, 1899)
Andrassy, 1958

The first report of this genus from India is by Loof & Jairajpuri (1965) when they have described C. andrassyi from Nainital. Nanjapa & Khan described 2 species i.e. C. typica and C. citri from Arispura Jammu. The author came across two species which on study were found to be new. They are being described here under as C. anantnagensis and C. chaetolabius.

REVISED KEY TO SPECIES OF CHRONOGASTER

1. Cuticle with longitudinal and transverse striations dividing the surface outside the lateral field into rectangles or squares2
 1. Cuticle with transverse striations only.....3
2. Longitudinal striae 18, amphid on 4th annule behind smooth lip region, body length about 1.5mm., female tail without mucroC.alata Gerlach, 1954
 1. Longitudinal striae 20-24; amphid on 2nd annule behind smooth lip region, body length about 1 mm, female tail with 3 mucro ...C.magnifica Andrassy, 1957
3. Female tail without mucroC.lissa
 1. Female tail with mucro4.
4. Tail with 4 mucro of equal size
 1.C.longicollis V.Daday, 1889
 1. Tail with 1 mucro, if more than one is distinctly larger than the other5.
5. Mouth cavity funnel shaped, a = about 100.....
 1.C.subtilis Andrassy, 1958
 1. Mouth cavity cylindrical, a = 80 or less6.
6. Body cavity with numerous crystalloids, tail with one mucro7.
 1. Body cavity without crystalloides, lateral glands not conspicuous8.
7. Tail with one, mucroC.typica (De Man, 1921)
 1. Tail with 4 mucroC.anantnagensis sp.nov.
8. Amphid spiral located behind wide part of mouth cavity, tail short (C over 10).....
 1.C.boettgeri Kischke, 1956.

- Amphid not distinctly spiral, located about middle of wide part of mouth cavity, tail longer(C.under 10)...9.
- 9. Tail terminous emarginate terminally
.....C.serrulate Loof, 1973.
- Tail terminus not emarginate terminally10.
- 10. Tail tip with one large mucro surrounded by 3 or minute ones11.
- No minute spines at base of large mucro13.
- 11. Longitudinal striae in lip region present
..... C.andrassyi Loof & Jairajpuri, 1965
- Longitudinal striae on lip absent12.
- 12. Body robust, excretory pore distinctly posterior to nerve ring and v = 54-55%C. chaetolabius sp.nov.
- Body slender, excretory pore in level with nerve ring; v = 49 -53%C. citri Khan & Nanjappa, 1972.
- 13. Tail of moderate length(c =6-8); tail lip with 2 mucros, the dorsal one being the larger one...C. daoi Loof, 1964
- Tail very long(c = 5.2 or less); tail tip with two mucros, the dorsal one being the larger one.....14.
- 14. Body moderately slender(a = 46-47); diameter of lip region 1/4 of maximum body width; length of cephalic setae 4.5 micronsC. brasiliensis Meyl, 1957
- Body very slender(a 67-75) diameter of lip region 1/3rd of maximum body width, length of cephalic setae 9 micronsC. tenuis Loof & Jairajpuri, 1965

CHRONOGASTER ANANTNAGENSIS SP. NOV.

(Plate XXVIII Fig. A - F)

8 females of the nematode genus Chronogaster where recovered from soil around roots of Pyrus malus L. from Anantnag, Kashmir. They are considered herein to constitute a new species.

MEASUREMENTS

7 Females (Paratype) L = 1.1-1.3 mm; a = 41-46;

b = 4.-4.4; c = 7.5-9;

v = 50-52;

Female (Holotype) L = 1.2 mm; a = 41; b = 4;

c = 7.6; v = 52.

DESCRIPTION

"Eel worm" when killed by hot water assumes an open C-shape. Body cylinder tapering at both the ends from the base of neck to a conoid unstriated lip region, which measures 1/3rd of body width at base of oesophageal bulb. Lateral fields not marked. Transverse annulation of the cuticle measuring 2.2 microns at the base of the neck and 2.3 microns apart at mid body. Ist annule below lip region narrower than the succeeding annules. Crystalloids in the body cavity present especially prominent in the neck region. Lip region conoid anteriorly flattende measuring 9 x 5 microns in dimension i.e. 33 % of body width in the neck region. There are no striations in lip region. Amphidial aperture oval slits located at 6 microns below anterior end of body and measures 5 microns across. Cephalic setae four, slender curved forwards measuring

5 microns long i.e. shorter than the head width located in the first annule. Mouth cavity in two parts anterior one measuring 7 microns x 3 microns in dimension, the posterior part is narrow measuring about 26 microns long separated from oesophageal lumen by an extension. Oesophagus a cylindrical tube measuring about 220 microns in length thereafter it expands to an oval bulbous part measuring 20 x 13 microns in dimension, its lumen in two sections, the anterior one serrated bearing about 7 denticles the posterior bulbal prolongation of oesophagus is about 34 microns in length i.e. 1.4 times as long as bulb. Nerve ring located at about 130 microns from anterior end. Excretory pore located at 145 microns from anterior end. Hemizonid not present.

Vulva depressed inconspicuous transverse slit, vagina extending to more than one third of body width into the body. Gonad single anterior, ovary reflexed at the oviduct. Posterior uterine sac present measuring more than half vulval body widths in length. Tail dorsally curved uniformly striated till the tip measures 9 times anal body width in length with obtusely rounded terminus bearing four mucro of which the lateral slightly larger than the others. Caudal gland and spinneret absent.

MALES : Not found

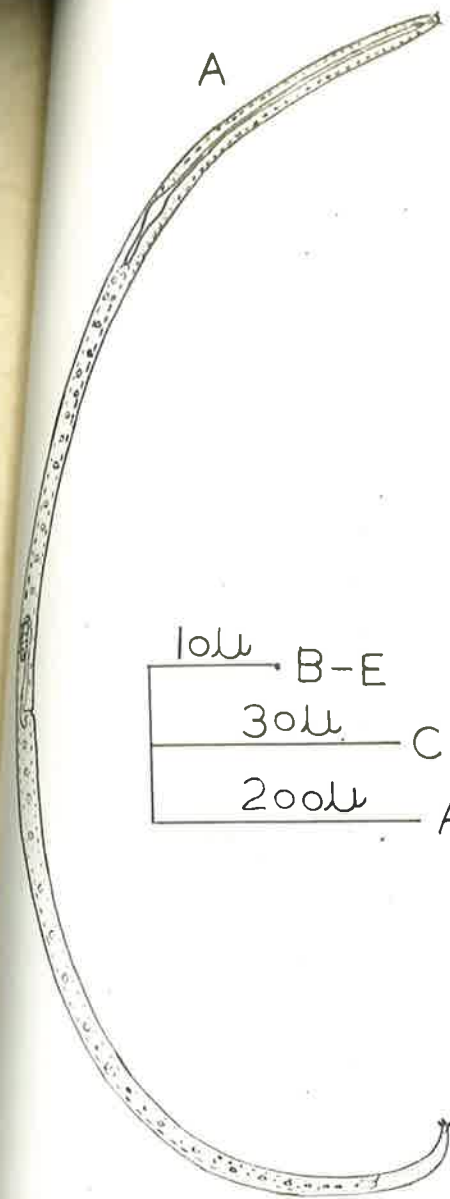
Paratypes Females on slide no. PN/CHR/1-2 deposited with the Department of Zoology, University of Kashmir.

Holotype Female on slide no. PN/CHR/3 in authors collection.

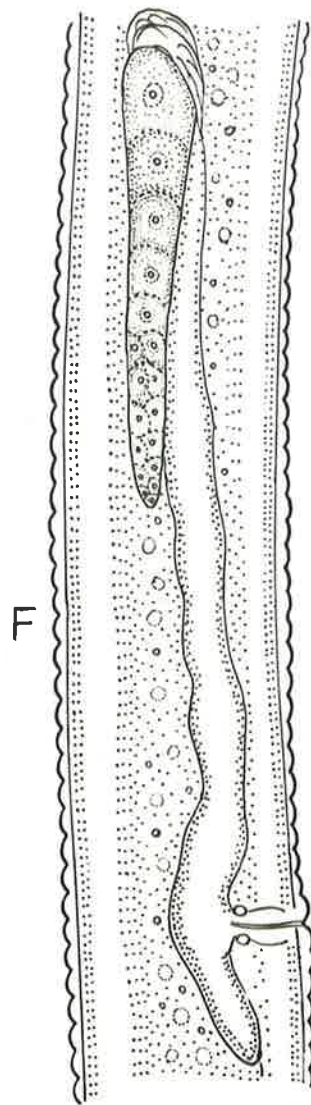
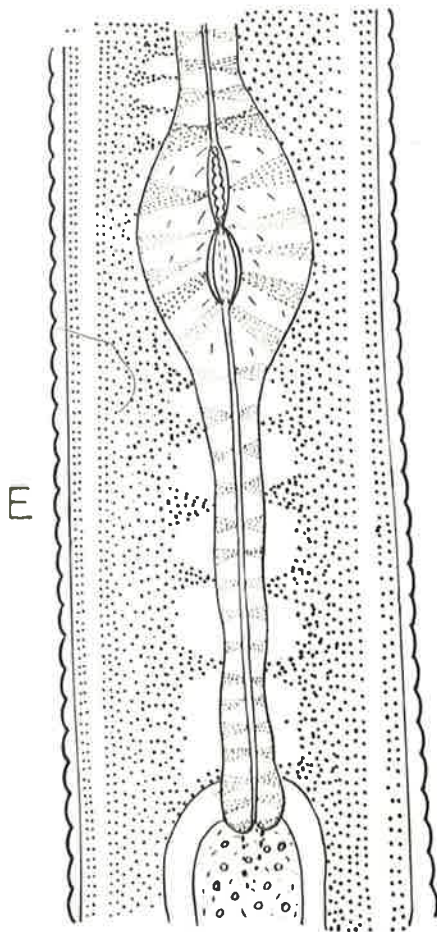
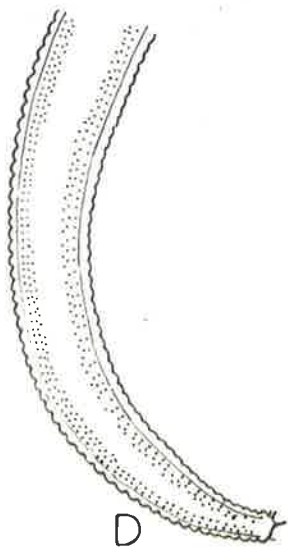
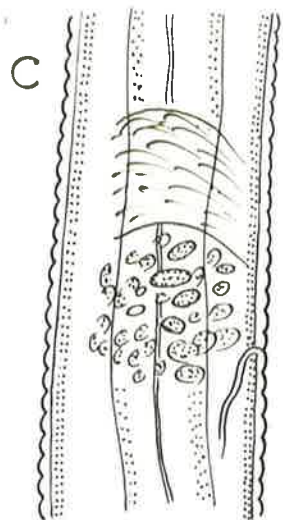
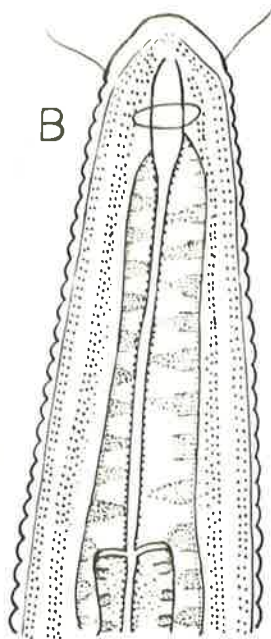
PLATE - XXVII

CHRONOGASTER ANANTNAGENSIS SP.NOV.

- Fig. A : Entire female
B : Anterior end showing amphid
C : Neck region showing crystalloids
D : Posterior part of tail
E : Posterior part of oesophagus
F : Vulval region showing anterior
reflexed ovary.



10μ — B-E
 30μ — C, F
 200μ — A



CHRONOGASTER CHAETOLABIUS SP. NOV.

(Plate XXIX Fig. A - H)

9 females were recovered from soil around roots of Juglans regia L. from Tral, Kashmir. They are considered here to constitute new species.

MEASUREMENT :

Paratypes (8 females) L = 1.1mm; a = 34-36; b = 3-4;

c = 4.8-5.1; v = 54-55%.

Holotype (Female) L = 1.1mm, a = 33; b = 3; c = 4.8

v = 54%

DESCRIPTION

When killed "eel worm" assumes a strongly ventrally arcuate shape especially in the posterior 3rd region of the body. Body tapering at either ends, anteriorly from neck base to a hemispherical continuous head having slightly depressed sides, head being less than 1/3rd of body at base of oesophagus. Lateral field absent. Body cuticle coarsely annulated, the first body annule just below the head measures, one micron apart and is considerably narrower than the succeeding body annules; width in anterior region of neck being about 1.9 microns apart where as at base of neck being 2 microns apart and in ventral region again getting reduced to about 1.8 microns wide. Head dome shaped measuring 9 x 4 microns in dimension, its width being 39% of body width at neck base. There are no transverse and longitudinal striations on the lip. Cephalic setae four measuring 9 microns in length and are slightly larger than the lip width. Amphid with oval curved transverse slits measuring 5 microns across and located at about 4 microns

from anterior end i.e. at the level of the 1st and 2nd body annule. Mouth cavity in two parts, the anterior one sub-cylindrical measuring 9 x 3 microns in dimension, the posterior part narrow measuring about 20 microns long, separated from oesophageal lumen by an expansion. Oesophagus cylindrical tube anteriorly widening in a spindle shape in the region of the narrower part where oesophageal lumen gets expanded; the anterior tubular part measures about 220 microns in length distally getting expanded into an oval bulbous part, the latter measuring 22 x 12 microns in dimension. The post bulbal prolongation of oesophagus is about 24 microns in length i.e. about 1.1 times as long as the bulbous part. Nerve ring located at microns from anterior end. Excretory pore situated about 8 annules posterior to nerve ring. Hemizonid absent. Excretory duct not cuticularized.

Vulva an inconspicuous transverse slit. Vagina extending to one fourth of vulva body width across. Gonad single anterior, ovary reflexed at the oviduct. Posterior vulval sac short. Rectum less than one anal body width in length. Tail strongly ventrally curved. Regularly narrowing to a sub acute striated terminus with a one large macro surrounded by two small spines. Tail measures about fifteen anal-body width in length.

Paratypes Female on Slide No. PN/CHO/5-6 deposited with the Department of Zoology, University of Kashmir.

Holotype Female on slide No. PN/CHO/ 7 in author's collection.

HOST: Collected from soil around the roots of Juglans regia L.

LOCALITY: Tral, Kashmir.

DIAGNOSIS AND RELATIONSHIP:

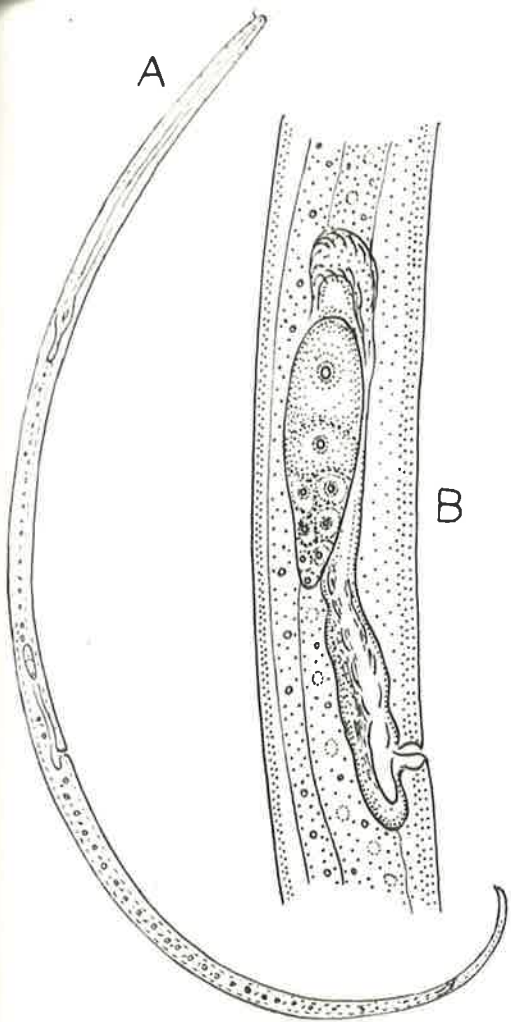
Chronogaster chaetolabius n.sp. is distinct by having hemispherical contineous head which is dome shaped, amphid with oval curved transverse slits and tail stongly ventrally curved regularly narrowing to a suacute striated terminus with one large mucro surrounded by two small spines. However it comes close to C. andrassyi Loof and Jairajpuri, 1968 and C. citri Khan and Nanjappa, 1972. From C. andrassyi it differs by the absence of longitudinal striae in the lip region, absence of hemizonid, posterior uterine branch present and length of tail (anal-body-width ratio). From C. citri to which it comes to quite close can be differentiated by the shape of stoma, position of excretory pore in relation with nerve ring, more robust body ~~longer oesophagus~~ and longer oesophagus posteriorly located (a = 40-47 ; b = 4.5; v = 49-53 in C. citri).

In view of the above differences the present form is considered here to constitute a new speices for which the name C. chaetolabius is proposed.

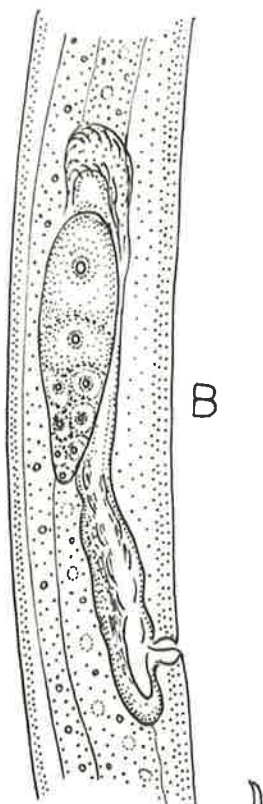
PLATE - XXIX

CHRONOGASTER CHAETOLABIUS SP. NOV.

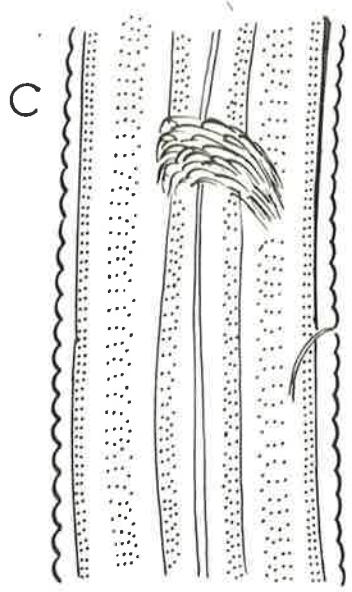
- Fig. A : Entire female
- B : Vulval region showing anterior
reflexed ovary
- C : Neck region of female showing
Nerve ring
- D : Anterior end showing amphid
- E : Vulval region
- F : Posterior part of oesophagus
- G : Tail end of female
- H : Tail terminus with one large
number surrounded by two small region.



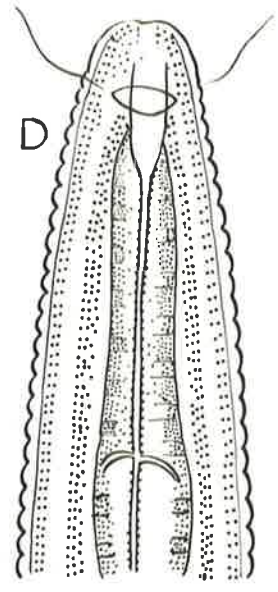
A



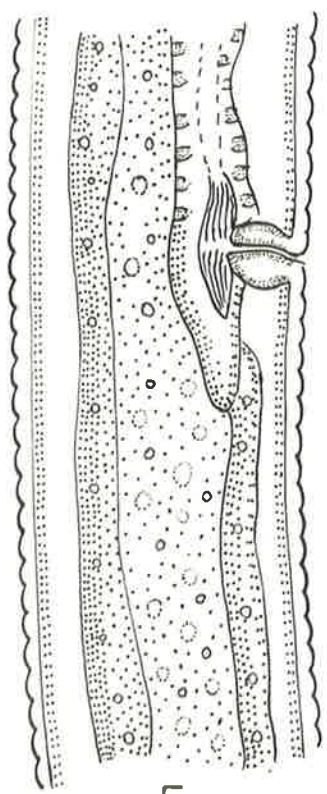
B



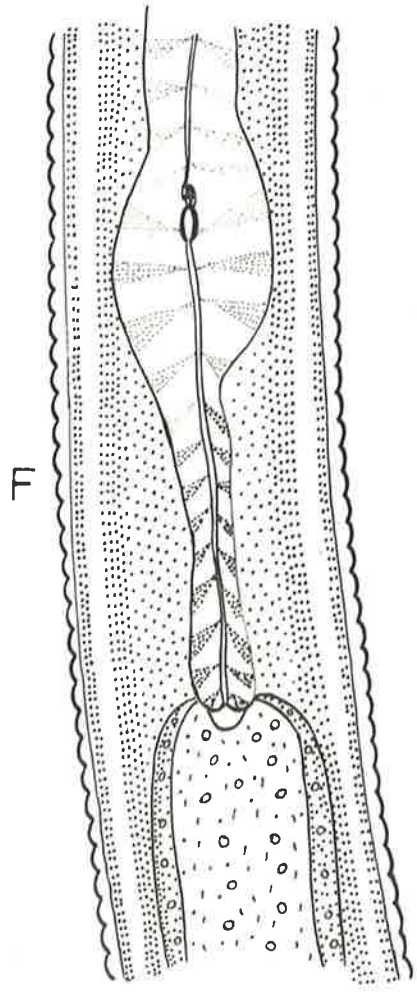
C



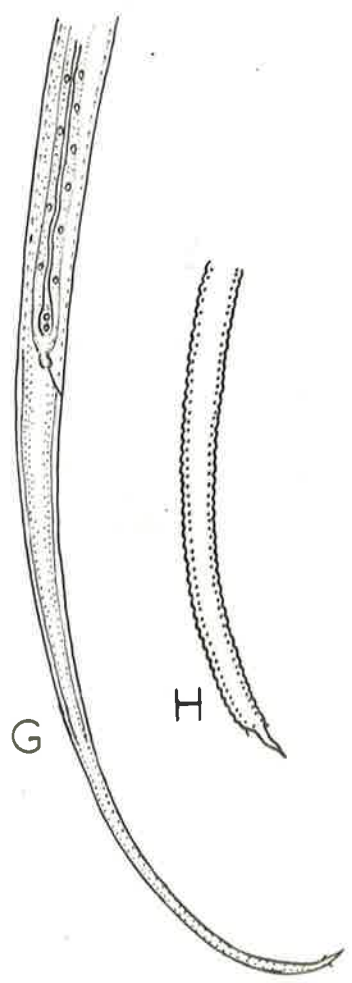
D



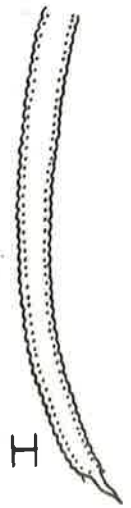
E



F



G



H

C-G	10μ
B	30μ
A	200μ

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D. N. Fotedar and Z. A. Handoo

Post-Graduate Department of Zoology

Kashmir University, Srinagar.

ABSTRACT

Two new species of *Helicotylenchus* Steiner, 1945 are described. *Helicotylenchus kashmirensis* from soil around the roots of Apricot, *Prunus persica* in Srinagar is 0.87-1mm, in length, spear 34-36 microns; lateral fields long and not aerolated, tail longer than anal width, convex, tail annulations not doubling. *Helicotylenchus hazratbalensis* from soil around the roots of Apple, *Pyrus malus* is 0.53-0.65 mm in length, has truncate head with 4-5 annules, anchor-shaped spear knobs, tail dorsally convex, conoid with a ventral projection, striations on tail terminus fine and joining with lateral field.

Genus *Helicotylenchus* was proposed by Steiner (1945) to include nematodes with oesophageal glands overlapping intestine dorsally. Sher (1961) found these glands to be overlapping the intestine ventrally, laterally and dorsally, being conspicuously so ventrally.

Golden (1956) included 3 species in *Helicotylenchus*. Sher (1961) listed 11 species for the genus. Later 17 species were proposed for *Helicotylenchus*. Sher (1966) revised *Helicotylenchus* giving a redescription of 18 known species 20 new species and synonymy of 10 species. He also proposed a key to these species.

10 new species of *Helicotylenchus* proposed by Roman (1965) were apparently not possible for Sher (1966) to be referred to in this revision of the genus. 11 more new species have been proposed to this genus. Out of these *H. apiculus* Roman, 1965 *H. punicae* Swarup & Sethi, 1961 and *H. impar* Prasad et al, 1965 are regarded as synonyms of *H. erythrinae* (Zimmermann, 1904) Golden 1956, *H. dihystra* (Cobb, 1893) Sher, 1961 and *H. retusus* Siddiqi and Brown, 1964 respectively.

Contrary to earlier view, Sher (1966) did not consider *Helicotylenchus* to be closely related to the genera *Hoplolaimus*, Daday, 1905 *Aorolaimus*, Sher, 1963 *Scutellonema* Andrassy, 1958 *Peltamigratus* Sher, 1963 and *Rotylenchus* Filipjev, 1936 because of the said disposition of oesophageal gland. *Rotylenchoides* whitehead, 1958 was regarded by Sher as most closely related to *Helicotylenchus*, differing only in having a non-functional posterior ovary. Accordingly he transferred *H. neoformis* Siddiqi & Hussain, 1964 to *Rotylenchoides*. He also removed *H. steueri* (Stefanski, 1966) Sher, 1961 and *H. intermedius* (Luc, 1960) Siddiqi & Hussain 1964 from *Helicotylenchus* and transferred them to the genera *Rotylenchus* and *Rotylenchoides* respectively.

Siddiqi (1970) assigned *Helicotylenchus* to the sub-family *Rotylenchoidinae*. In 1970, he redefined this sub-family to contain such genera having one or two ovaries. Siddiqi (1972) described 9 (nine) new species under *Helicotylenchus* and proposed key to 70 species of the genus. He also proposed to transfer *Tylenchorhynchus africanus* var. *annobonensis* Gadea, 1960 to *Helicotylenchus* and elevate it to the rank of a species. Accordingly it is named as *H. annobonensis* (Gadea, 1960) Siddiqi, 1972. To Siddiqi's list are added here 4 species of *Helicotylenchus* described by Fotedar and Mahajan (1973, 1974) and present two new species from Kashmir.

4 species of *Helicotylenchus* described by Fotedar and Mahajan, *H. graminophilus* is from soil in grass fields of Duksum, Kashmir and Delhousie, Himachal Pradesh, *H. haki* from soil around roots of local cultivar (Hak) of *Brassica oleracea* in Srinagar, Kashmir, *H. jammuensis* from soil around the roots of apricot, *Prunus persica* in Jammn and *H. steineri* from soil around roots of maize, *Zea mays* in Srinagar, Kashmir, when compared to the present two news, described from soil around roots of apple and Apricot in Kashmir, are found to be different, as discussed here in.

The specimens of the present collection of *Helicotylenchus* were relaxed and killed in hot water, fixed in 4 % formaldehyde and mounted in dehydrated Glycerine. All the drawings were taken from mounted specimens.

***Helicotylenchus kashmirensis* sp. nov.**

(FIG. (A,C & G))

Measurements :

7 Female (paratype) L = 0.84 to 1.0 mm ; a = 30-36 ; b = 4.8-5.2 ;
C = 33-38 ; V = 55-62% ; Spear = 34-36- microns
Female (Holotype) L = 0.8 mm ; a = 36 ; b = 4.8 ; C = 35 ; V = 55%

Spear = 35 microns.

Description :

When killed by gentle heat body assumed single spiral. Body cylindrical tapering anteriorly to rounded head while posteriorly to a cylindrical tail. Body cuticle transversely striated, striations 1.3 microns, apart at mid body interrupted by lateral field, latter marked by four incisures. Cephalic frame work strongly

developed, hexaradiate, its outer margins extending to about 3 body annules posteriorly. Spear 35 microns long with conus 18 microns long, spear knobs indented anteriorly. Vestibulum forming a spear guiding tube extending upto 12 mic from anterior end. Excretory pore located at 120 mic. from anterior end. Hemizonid not observed. Nerve ring located at 100 mic, from anterior end. Spermatheca oval, set off and empty. Rectum about 1/2 anal body width in length. Tail slightly longer than anal body width, convex, cylindrical bearing distinctly striated striae numbering 15 (14-18 in paratype) on ventral side. Phasmids located 10 annules anterior to anus.

Males : Not found

Type Habitat & Locality : Collected from soil around the roots of apricot *Prunus Persica* Srinagar, Kashmir.

Type Material : Holotype & Paratype deposited with the Department of Zoology, University of Kashmir on Slid No: PN/8, A, B & C

Diagnosis & Relationship :

The present form comes close to *H. jammuensis* Fotedar & Majajan, 1974, *H. variacaudatus* Yuen, 1964 and *H. vulgaris* Yuen, 1964. From *H. jammuensis* the present form differs in having rounded shape of the lip region, in the position of excretory pore, absence of Hemizonid, and in the shape of the tail with greater number of tail annules. From *H. variacandatus* it can be further differentiated in having longer body, longer spear, position of phasmid and differently shaped tail. From *H. vulgaris* it further differs in the absence of aeration in the lateral field, a longer and differently shaped tail and tail annulations not doubling.

In view of the above differences the present form is considered here in to constitute a new species for which the name *Helicotylenchus kashmirensis* is proposed.

***Helicotylenchus hazratbalensis* sp. nov.**

(FIG. B, D, E & F)

Measurements :

Females (5 paratypes): L = 0.52-0.65 mm; a = 20.-25; b = 4-5; C=40-50; V = 59-61%; Spear = 22-24 microns; 0 = 31=43

Females (Holotype): L = 0.62mm; a = 21; b = 4-5; C = 41; V = 60% 0 = 38; Spear = 23 microns.

Description :

Ventrally arcuate assuming single loose spiral when killed. Each striae about 1.2 mic. apart at mid body. Lateral field with four incisures not

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aerolated. Head truncate, bearing 4 distinct annules (4—5 in paratypes). Head frame-work heavily sclerotized, its outer margins extending upto 2 annules posteriorly. Spear measuring 23 microns in length, conus 12 microns long. Spear knobs anchor-shaped. Excretory pore located 120 mic. from anterior end. Hemizonid 2 annules anterior to excretory pore. Nerve ring located at 11 mic from anterior end. Ovaries with oocytes mostly in single row. Spermatheca off set, without sperms. Phasmids located at anal latitude (1—3 annules posterior to anns in paratypes). Tail dorsally convex, conoid with a ventral projection, measuring 1.2 (1.1—1.3 in paratype) anal-body-diameters in length, bearing 12 annules on ventral side. Striations on tail terminus fine and coalescing with the lateral field (fig. E).

Males: not found

Type Habitat and Locality: From soil around the roots of apple *Pyrus malus* at Hazratbal Srinagar, Kashmir.

Type Material: Holotype and Paratype deposited with the Department of Zoology, University of Kashmir, on Slide No. PN/6, D & E.

Diagnosis and Relationship:

The present form comes close *H. steineri* Fotedar and Mahajan 1974 and *H. labiatus* Roman, 1965 but differs from the former by the shorter body, truncate shape of lip region, anchor shaped spear knobs, position of Hemizonid, shape of the tail and by the fine striations on tail coalescing with the lateral field. From *H. labiatus* Roman, 1965 the present form differs in the nature of lateral field in tail region, shape of the tail and position of Phasmids.

In view of the above differences the present form is considered here in to constitute a new species for which the name *H. hazratbalensis* is proposed.

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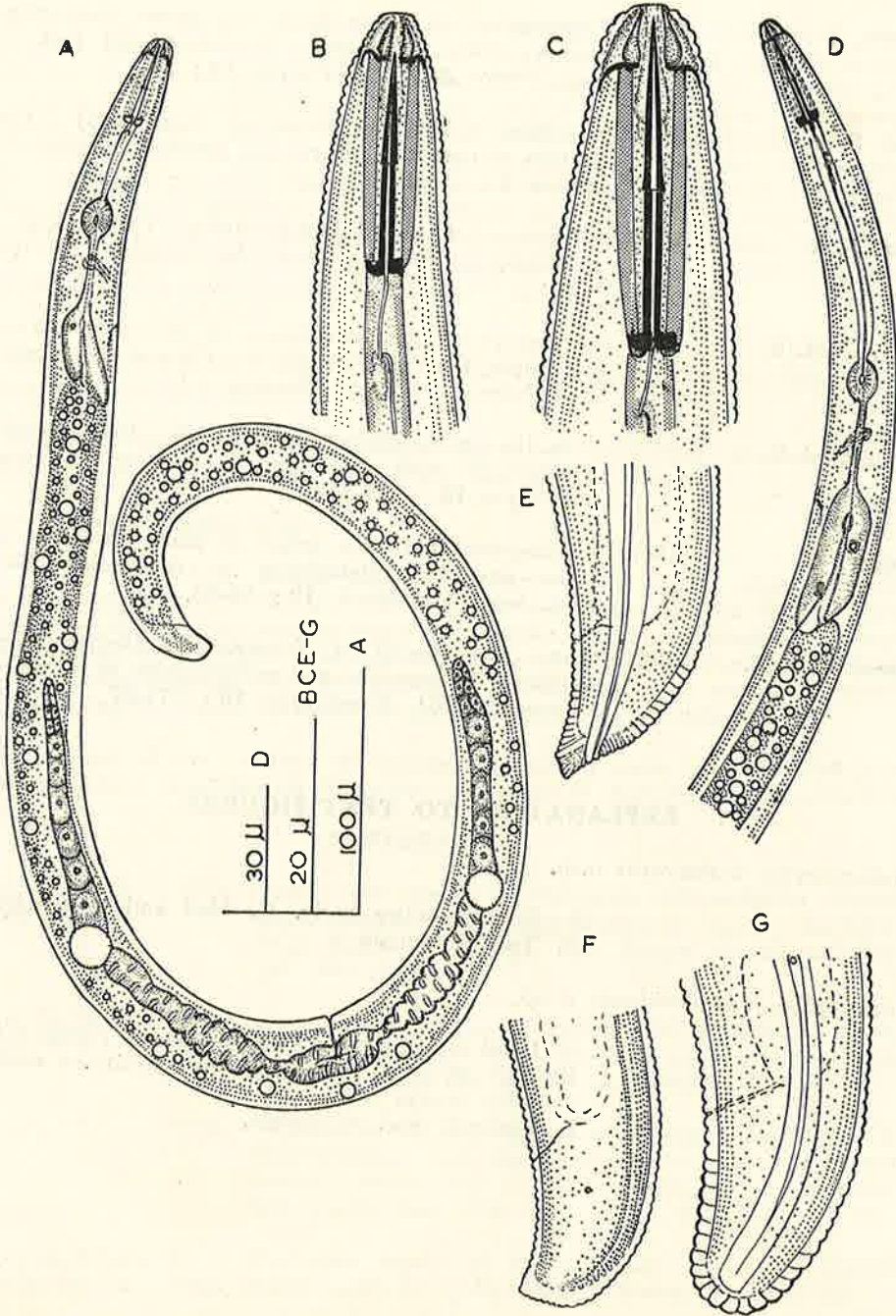
EXPLANATION TO TEXT FIGURES

Helicotylenchus kashmirensis n.sp.

- A. Female, entire body. C. Head and of female
G. Tail of female.

Helicotylenchus hazratbalensis n sp.

- B. Head end of female, D. Oesophageal region of female
E. Tail of female showing fine striations coalescing with lateral field.
F. Posterior end of female.



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