

# A Study on the Plant Parasitic Nematodes (Nematoda: Tylenchida) in Korea\*

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## Abstract

A study on plant parasitic nematodes from 125 host plants at 32 districts in Kyung-Pook, Kyung-Nam and Jae-Ju province in Korea yielded 9 families, 28 genus, 42 different species, eight of which are described new for Korea. Some are noticed on the morphological characteristics:

*Criconemoides morgensis* (Höfmänner & Menzel, 1914) Taylor, 1936.

*Crossonema* (*Crossonema*) *menzeli* (Stefanski, 1924) Mehta & Raski, 1971.

*Macroposthonia ferniae* (Luc, 1959) De Grisse & Loof, 1965.

*Macroposthonia rustica* (Micoletzky, 1915) De Grisse & Loof, 1965.

*Neolobocriconema aberrane* (Jairajpuri & Siddiqi, 1964) Mehta & Raski, 1971..

*Nothocriconema demani* (Micoletzky, 1925) De Grisse & Loof, 1965.

*Rotylenchus pini* Mamiya, 1968.

*Xenocriconemella macrodora* (Taylor, 1936) De Grisse & Loof, 1965.

## Introduction

Several years ago, the author studied on the plant parasitic nematodes in Korea. A part of the results in Kyung-Pook province were reported (1963, 1968, 1971, 1972)<sup>2,3,4,32)</sup>. After that continued with studies of further material in Kyung-Pook, Kyung-Nam and Jae-Ju province.

From these studies, the results obtained can be reported synthetically. Some nematodes are not identified and excepted because of insufficient materials or lack of knowledge on the particular group in this paper.

## Methods

The soil samples were newly collected from 53 plants at 9 districts in Kyung-Pook province, 38 plants at 11 districts in Kyung-Nam province and 13 plants at 3 districts in Jae-Ju province. Soil were fixed hot (70°C) fixative FG 4 : 1 and afterwards, nematodes were extracted from the soil by using the centrifugal

floatation technique (Jenkins, 1964)<sup>10)</sup>; the nematodes were then processed to glycerine by Seinhorst's method (1959, 1962)<sup>19,20)</sup> slightly modified by De Grisse and the nematodes were mounted by using the paraffin ring method (De Maeseneer & D' Herde, 1963)<sup>10)</sup>. The glycerin gelatine method was for the cross sections and the cotton blue lactophenol method (Taylor, Dorpkin and Martin, 1955)<sup>23)</sup> was used for the perineal pattern of Meloidogyne.

## Resluts

The species found are arranged alphabetically within the family.

The families themselves are also alphabetically listed.

1. Family: Aphelenchidae (Fuchs, 1937) Steiner, 1949

Genus: *Aphelenchus* Bastian, 1865

*Aphelenchus avenae* Bastian, 1865

*Aphelenchus avenae* Bastian, 1865

Same as original description.

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2. Family: Aphelenchoididae (Skarbilovich, 1947)

Paramonov, 1953

Genus: *Aphelenchoides* Fischer, 1894

*Aphelenchoides ritzemabosi* (Schwartz, 1911) Steiner  
& Buhner, 1932

Same as original description.

3. Family: Atylenchidae Skarbilovich, 1959

(Syn. Tylenchidae Filipjev)

Genus: *Eutylenchus* Cobb, 1913

*Eutylenchus africanus* Sher, Corbett & Colbran, 1966

(Fig. 1. D.E)

One male in excellent condition was found. In all respects it conforms to the original description and measurements, except that the stylet is slightly smaller ( $18.5\mu$  against 20 to  $23\mu$ ). *E. orientalis* Husain & Khan, 1968. does not differ substantially from *E. africanus* and is synonymized with that species; Husain & Khan (1968)<sup>16)</sup> mentioned a difference in the relative position of the excretory pore (66~67% in *E. africanus* and 76~82% in *E. orientalis*) but our male shows it at 73%; they also mentioned a difference in tail length for the females (15.5 times anal body width

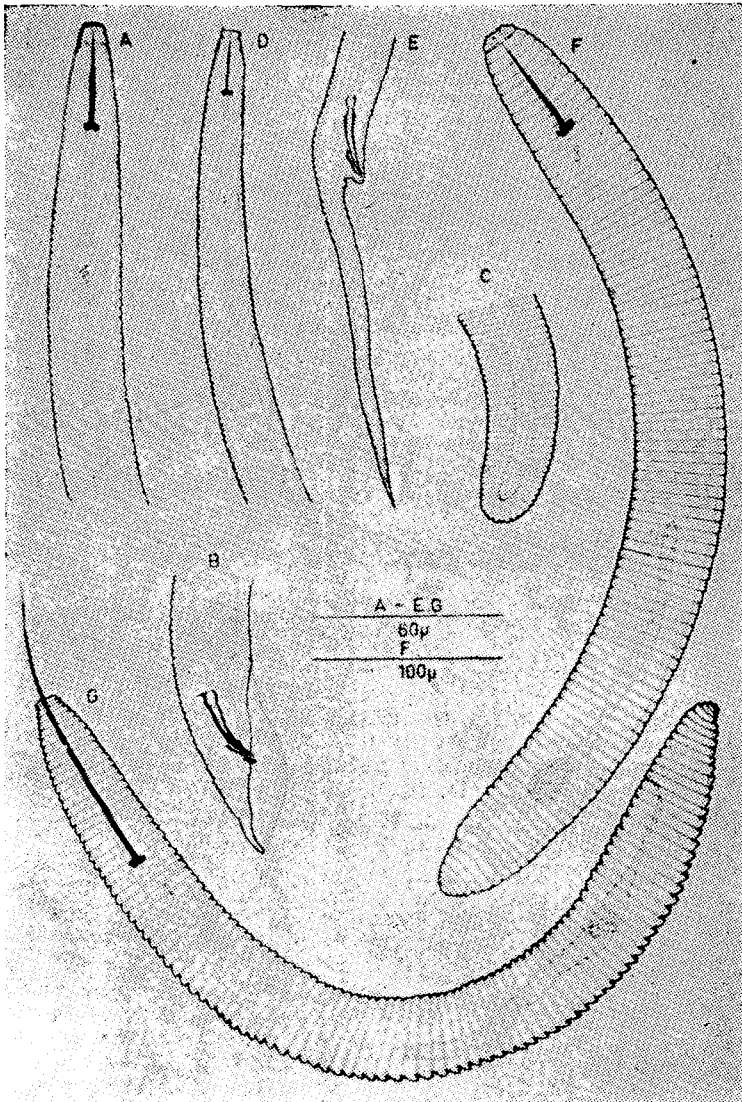


Fig. 1. A-C: *Rotylenchus pini*: A: Head; B: Tail of male; C: Tail of female; D-E: *Eutylenchus africanus*: D: Head; E: Tail of male; F: *Hemicriconemoides intermedius*; G: *Xenocriconemella macrodora*;

in *E. africanus* and 11.5 times in *E. orientalis*) but this is apparently only a difference between the holotypes as the measurements for the paratypes (both L and C) correspond completely; as a last difference they mentioned the relative length of the posterior uterine sac (1.5 against 1.25 times the vulva body width) but again this difference occurs only in the holotypes.

4. Family: Criconematidae (Taylor, 1936) Thorne, 1949

Genus: *Criconemoides* Taylor, 1936

*Criconemoides informis* (Micoletzky, 1922) Taylor, 1936

The populations resemble the original description and the redescription (Loof, 1965) very closely; the tail is more convex than usually (regularly conoid) which is mentioned by Loof & De Grisse (1969).

*Criconemoides morgensis* (Höfmänner & Menzel, 1914) Taylor, 1936

Same as original description.

Genus: *Crossonema* Metha & Raski, 1971

*Crossonema (Crossonema) menzeli* (Stefanski, 1924) Metha & Raski, 1971

(Fig. 2 A-H)

Similar to the original description. In cross-section, there are 6 lips on each subdorsal, subventral lips with a cephalic papillae and lateral lips with amphidial aperture (this is not visible at the surface but some microns lower canals visible). The first head annule apparently always irregularly indented lobe that shows 3 rather regular plications inwards.

Genus: *Macroposthonia* de Man, 1880

*Macroposthonia curvata* (Raski, 1952) De Grisse & Loof, 1965

Same as original description.

*Macroposthonia ferniae* (Luc, 1959) De Grisse & Loof, 1965

Same as original description.

*Macroposthonia rustica* (Micoletzky, 1915) De Grisse & Loof, 1965

Same as original description.

*Macroposthonia xenoplax* (Raski, 1952) De Grisse & Loof, 1965

Same as original description.

Genus: *Neolobocriconema* Metha & Raski, 1971

*Neolobocriconema aberrans* (Jairajpuri & Siddiqi, 19

63) Mehta & Raski, 1971

Same as original description.

*Neolobocriconema serratum* (Khan & Siddiqi, 1963) Metha & Raski, 1971

Same to the original description except for the body which is slightly short; they come nearest to the redescription of Golden & Friedman (1964).

Genus: *Nothocriconema* De Grisse & Loof, 1965

*Nothocriconema demani* (Micoletzky, 1925) De Grisse & Loof, 1965

Same as original description.

Genus: *Xenocriconemella* De Grisse & Loof, 1965

*Xenocriconemella macrodora* (Taylor, 1936) De Grisse & Loof, 1965

(Fig. 1. G)

Same as original description.

Genus: *Hemicriconemoides* Chitwood & Birchfield, 1957

*Hemicriconemoides intermedius* Dasgupta, Raski & Van Gundy, 1969

(Fig. 1. F)

It was originally determined as *H. pseudobrachyurum* De Grisse, 1964. but the presence of a vulvar sheath formed of three annules made it conform with *H. intermedius*, in all respects it conforms to the original description and measurements, except that the stylet is slightly longer (56  $\mu$  against 47 to 52  $\mu$ ).

*Hemicriconemoides varionodus* Choi & Geraert, 1972 (Fig. 3)

Described as a new species (1972).

5. Family: Hemicycliophoridae (Skarbilovich, 1959) Geraert, 1966

Genus: *Hemicycliophora* De Man, 1921

*Hemicycliophora koreana* Choi & Geraert, 1971

(Fig. 4)

Described as a new species (1971)

6. Family: Heteroderidae (Filipjev, 1934) Skarbilovich, 1947

Genus: *Heterodera* A. Schmidt, 1871

*Heterodera glycines* Ichinohe, 1952

Same as original description.

Genus: *Meloidogyne* Goeldi, 1887

*Meloidogyne arenaria* (Neal, 1889) Chitwood, 1949.

Of this species females and males were found. The characteristic oval pattern with the long axis parallel

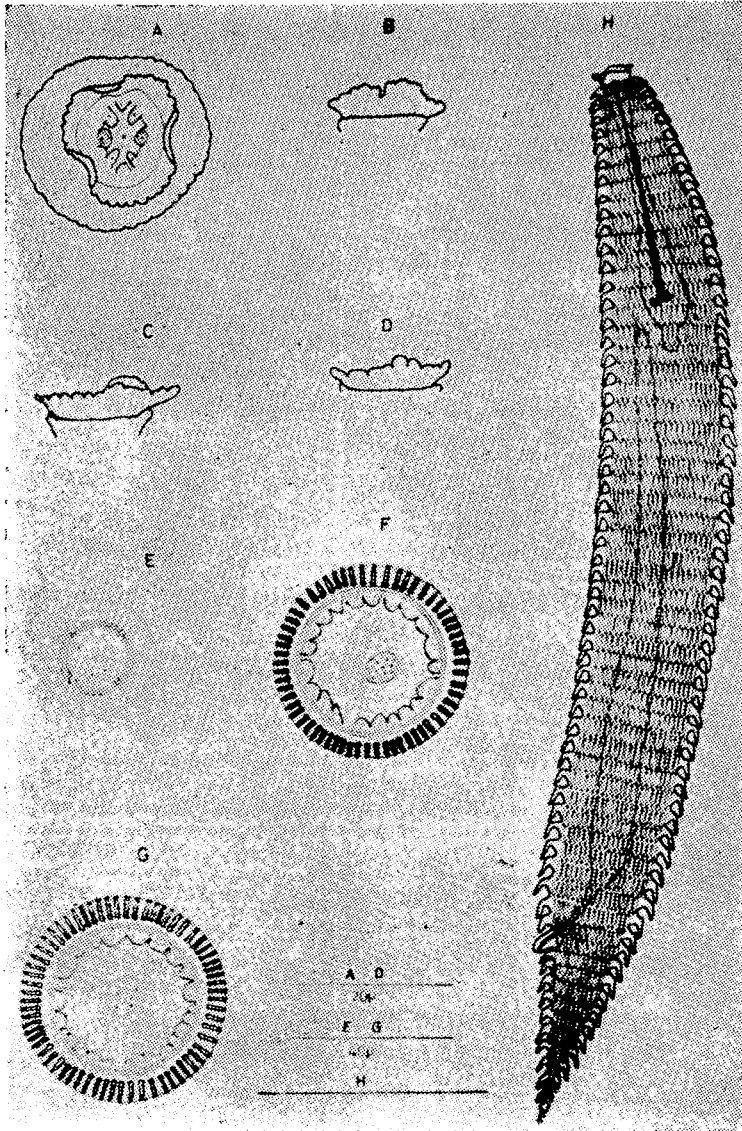


Fig. 2: *Crossonema (Crossonema) menzeli* A-D: first annulation; E: Cross-section of lipregion; F,G: Cross-section middle of body; H: general view.

to the vulva was present in several females.

7. Family: Hoplolaimidae (Filipjev, 1934) Wiesser, 1953

Genus: *Helicotylenchus* Steiner, 1945

*Helicotylenchus dihystra* (Cobb, 1893) Shar, 1961

The characteristics entirely corresponding with the redescription of Shar (1966.)

*Helicotylenchus pseudorobustus* (Steiner, 1914) Golden, 1956

Some characteristics: Stylet length between 26 and 27  $\mu$ , knobs slightly indented anteriorly; opening of a

dorsal oesophageal gland about half the spear length posterior to the stylet knobs. At the end of the lateral field the inner lines fuse. Phasmid five to eleven annules anterior to the anus level.

Genus: *Hirschmannia* Luc & Goodey, 1962

*Hirschmanniella imamuri* Sher, 1968

(Fig. 5. E)

Measurements: ♀♀ (n=9). L=2.41–2.95mm; V=49–52%; Stylet=28–30  $\mu$ ;

d. oes. gl. orifice=4–5  $\mu$  posterior to stylet knobs;

♂♂ (n=8). L=2.01–2.54mm; Stylet=28–29  $\mu$ ;

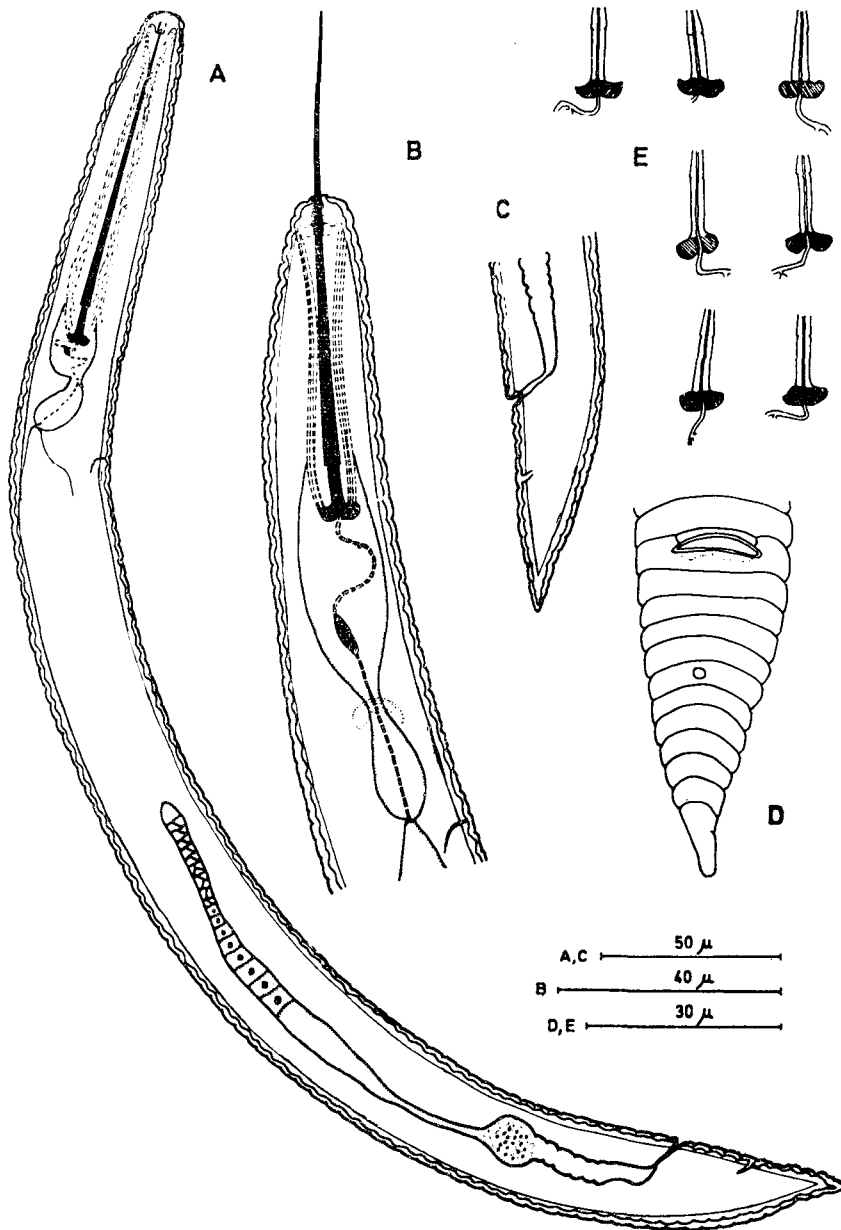


Fig. 3: *Hemicriconemoides varionodus*: A: General view; B: Anterior region; C: Tail, lateral view; D: Tail, ventral view; E: Variation of the stylet knobs.

spicules=38-45  $\mu$ ; Gubernaculum=10-13  $\mu$ ;

They correspond entirely with the original description. In Fig. 6. a ventral view of the males tail is given showing the well-developed titillae.

Genus: *Pratylenchus* Micoletzky, 1922

*Pratylenchus minyus* Sher & Allen, 1953

Same as original description.

*Pratylenchus thornii* Sher & Allen, 1953

Same as original description.

*Pratylenchus vulnus* Allen & Jensen, 1951

Same as original description.

Genus: *Rotylenchus* Filipjev, 1936

*Rotylenchus orientalis* Siddiqi & Husain, 1964

(Fig. 6)

Measurements: ♀♀; (n=19). L=570-690  $\mu$ ; a=27-29; b=5.8-7.0; c=37-52; c'=0.8-1.3; V=67-73;

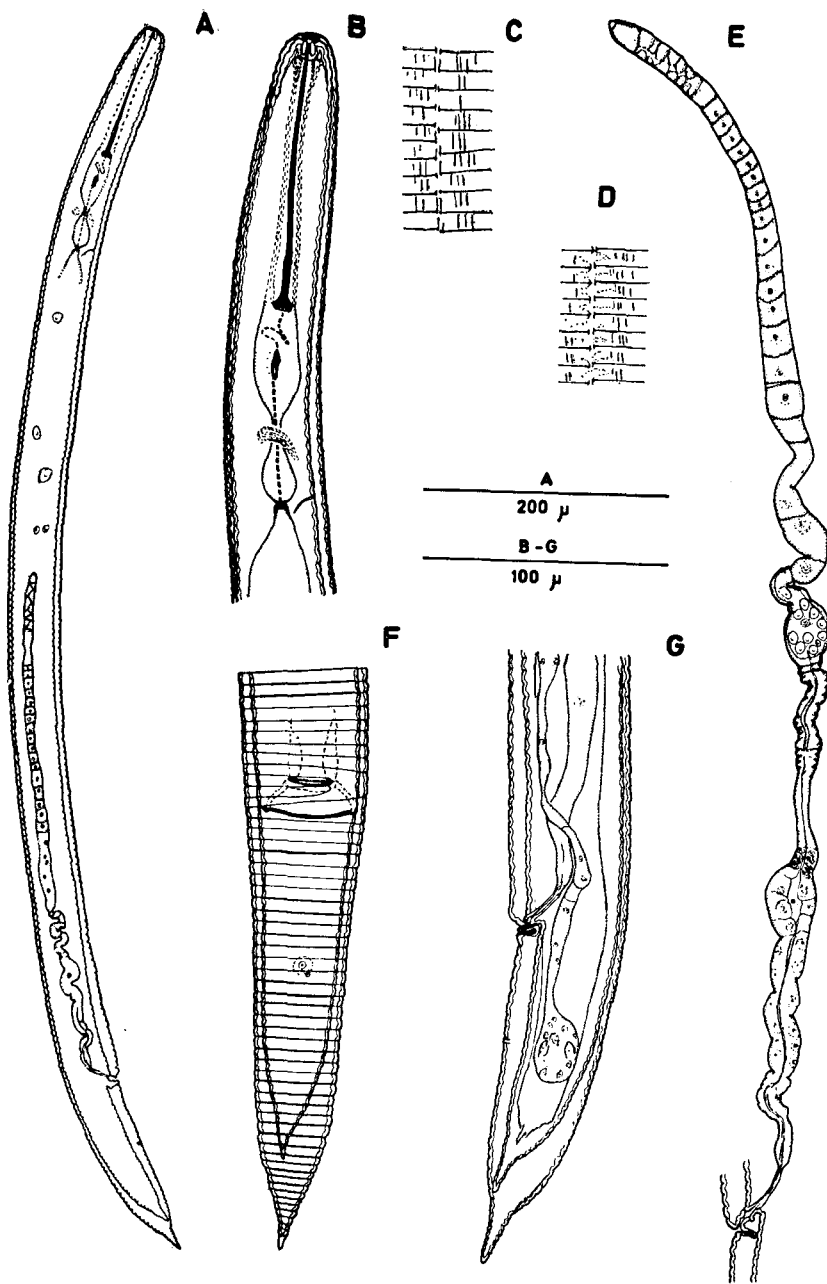


Fig. 4: *Hemiclycliophora koreana*: A: General view; B: Oesophageal region; C & D: Variations in lateral field structure; E: Female gonad; F: Posterior end in ventral view; G: Posterior end in lateral view.

Spear=23-26  $\mu$ ; m=43-47; o=50-61.

Females: Body spirally coiled, posterior end more curved than anterior end. Lip-region hemispherical with four indistinct annules, the third being slightly larger. Spear knobs with flattened anterior surfaces, sometimes slightly indented. Dorsal oesophageal gland opening

between 12 and 15  $\mu$  posterior to the stylet knobs.

The oesophageal gland lob lies dorsally and laterally, never ventrally. Length of posterior gonad 50-60% of anterior gonad, this difference in length is essentially caused by the lesser development of the ovary. Spermatheca empty, sometimes not very conspicuous. Tail

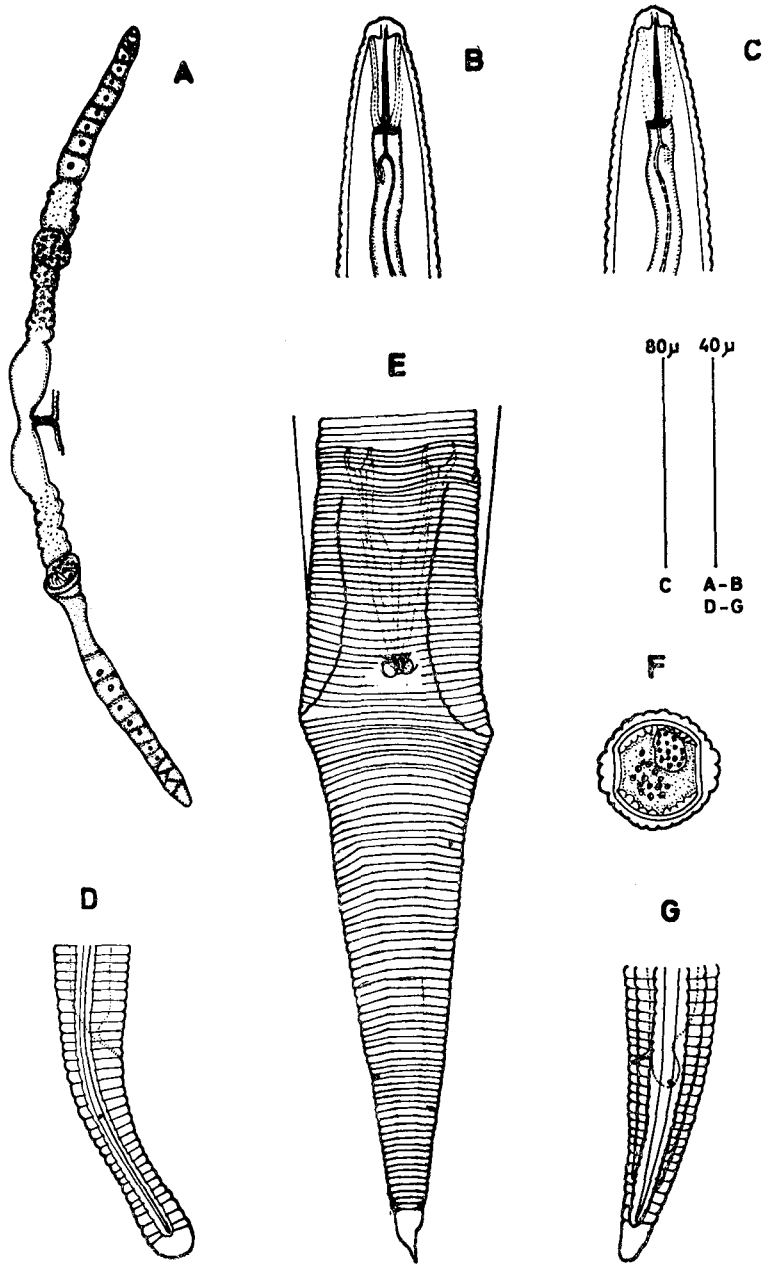


Fig. 5: A-D: *Tylenchorhynchus nudus* ♀♀: A: Gonad; B-C: Variation in head structure; D: Tail; E: *Hirschmanniella imamuri* ♂: Ventral view of Tail; F-G: *Tylenchorhynchus clayton* F: Cross-section at spermatheca level, G: Tail.

11 to 18 $\mu$  long, dorsally convex with irregular hemispherical terminus, 7 to 14 annules on the ventral side, 10 to 17 annules from anus to middle of tail end. Phasmids at anal level, between three annules anterior and three annules posterior. The four lateral lines remain separate; the annulation on the ventral half of

the tail tip is rather irregular.

Male: Unknown.

*Rotylenchus pini* Mamiya, 1968

(Fig. 1. A-C)

Measurements: ♀♀ (n=15). L=955(860-1050);

a=37(31-43); b=7.8(7.0-8.6); c=44(36-53); V=55

(51-59)%;  $o=20(18-23)$ ; Stylet= $27\ \mu$ ; ♂♂ ( $n=15$ ).  
 $L=825(770-930)$ ;  $a=35(30-41)$ ;  $b=6.1(5.5-7.7)$ ;  
 $c=31(28-34)$ ;  $T=37(32-43)\%$ ; Stylet= $26.5(26-27)\ \mu$ ;  
 Spicule= $25(23-27)$ ; Gubernaculum= $10.3(9.6-11)\ \mu$ .

Similar to the original description but some differences were noted; head more or less truncated (not broadly hemispherical); with 7 to 8 annules; sometimes slightly

offset by a fine constriction, lateral lips excavated. Stylet knobs obviously flattened and the epiptygma is well developed.

Genus: *Scutellonema* Andrassy, 1958

*Scutellonema unum* Sher, 1963

The ten females measured showed a length between 660 and 890  $\mu$ , and a spear length between 27 and

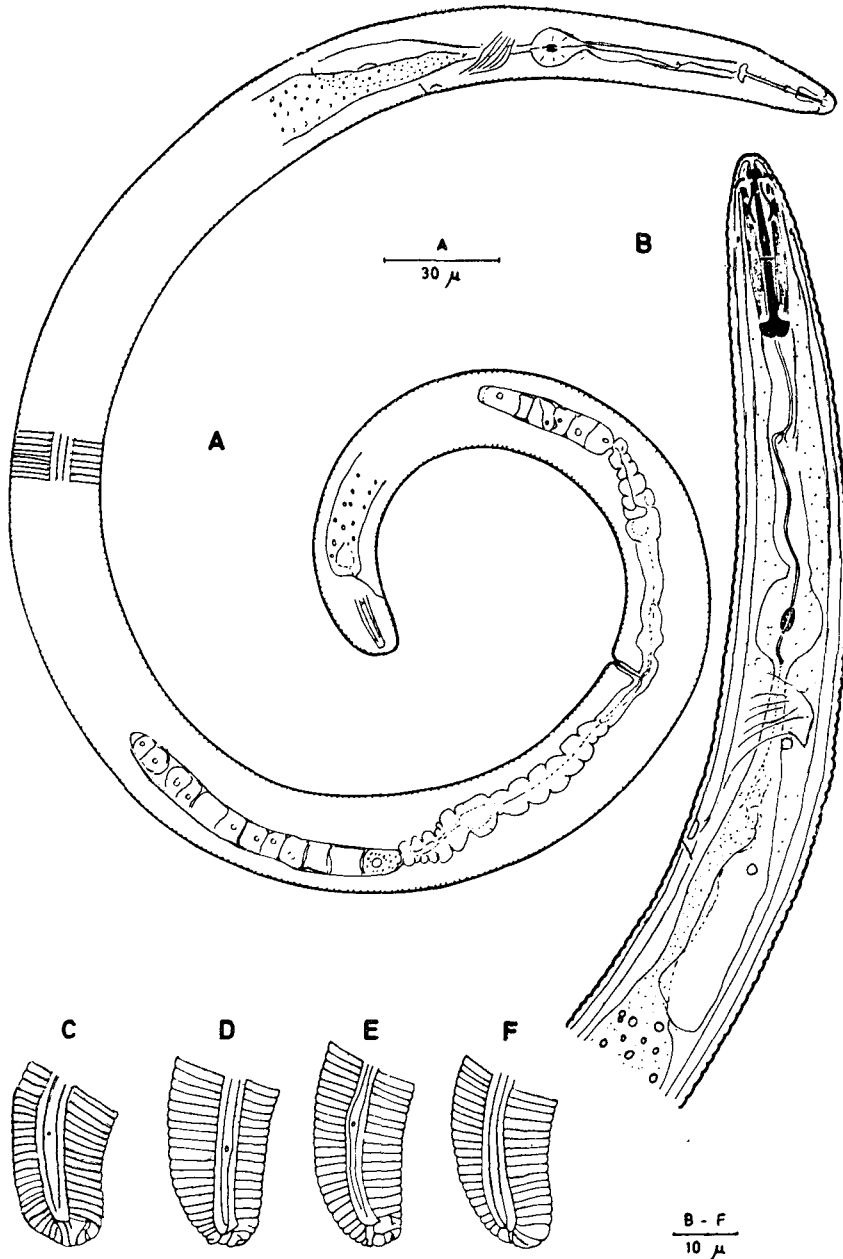


Fig. 6: *Rotylenchus orientalis*: ♀♀ A: General view; B: Anterior region; C-F: Variation of the tail.



33  $\mu$ . In face view sixteen longitudinal striations were discernible on the basal annule of the head. The excretory pore was located at the level of the oesophago-intestinal junction. The tail was, however, longer than in the original description, eleven to fourteen annules against six to eleven. The phasmids were slightly posterior to the anus level and measured five microns in diameter.

8. Family: Tylenchidae Filipjev, 1934

Genus: *Aglenchus* (Andrassy, 1954) Meyl, 1961

*Aglenchus costatus* (de Man, 1921) Meyl, 1961

Same as original description.

Genus: *Anguina* Scopoli, 1777

*Anguina tritici* (Steinbuch, 1799) Chitwood, 1935

Same as original description.

*Anguina moxae* Yokoo & Choi, 1968

Described as a new species (1968).

Genus: *Basiria* Siddiqi, 1959

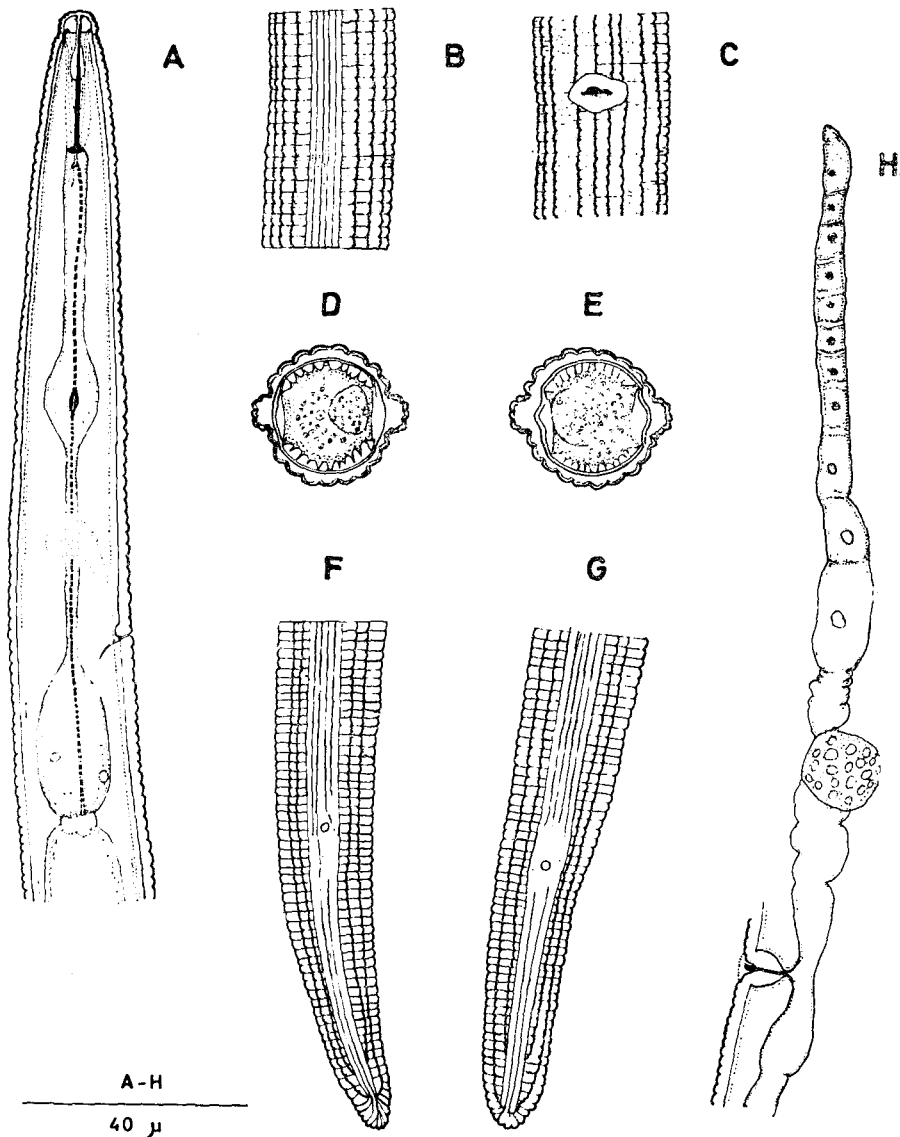


Fig. 7: *Merlinius koreanus* ♀♀ : A: Oesophageal region; B-C: Cuticular structure at mid-body in lateral view (B) and ventral view at vulval level (C); D-E: Cross sections through spermatheca of two females; F-G: Variation in tail-structure; H: Anterior part of gonad.

*Basiria graminophila* Siddiqi, 1959

In females and males the stylet was eleven micrometer long and the dorsal oesophageal gland was between six and nine micrometer behind the spear knobs. The tail was somewhat finer than usual.

Genus: *Ditylenchus* Filipje, 1963

*Ditylenchus dipsaci* (Kuhn, 1857) Filipjev, 1936

Same as original description.

Genus: *Merlinius* Siddiqi, 1970

*Merlinius koreanus* Choi & Geraert, 1971

(Fig. 7, 8)

Described as a new species (1971).

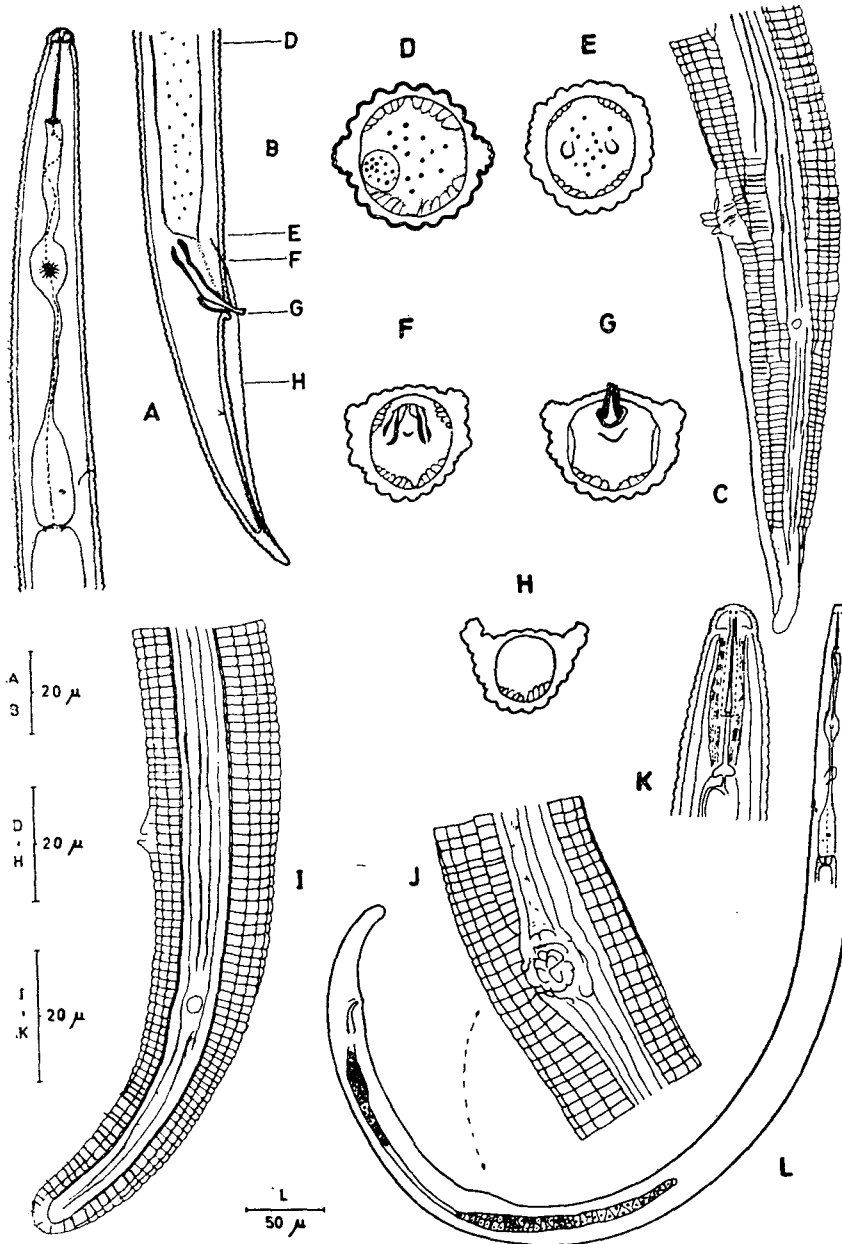


Fig. 8: *Merlinius koreanus*: ♂♂ : A: Anterior region; B: Tail; C: Surface view of tail, the right ala only of the bursa is developed; D-H: Sections at different levels shown in B; I-L: Male with abnormal tail; I: Tail, surface view; J: Abnormality of the lateral field; K: Head region; L: General view.

*Merlinius nothus* (Allen, 1955) Siddiqi, 1970

Fifteen females and eight males were studied belonging to *M. nothus* (Allen, 1955) Siddiqi, 1970; Body length for females between 560 and 770 $\mu$  and for males between 620 and 720 $\mu$ , stylet in both cases between 15 and 18 $\mu$ . Vulva with double epiptygma and lateral membranes.

Genus: *Pseudhalenchus* Tarjan, 1958

*Pseudhalenchus anchilisosomus* Tarjan, 1958

Same as original description.

*Pseudhalenchus minutus* Tarjan, 1958

It has a length of 1.3mm, stylet of 17 $\mu$  and the opening of the dorsal oesophageal gland seven micrometer posterior to the stylet-end. The inner incisures of the lateral field were very difficult to see.

Genus; *Psilenchus* De Man, 1921

*Psilenchus hilarulus* de Man, 1921

Measurements: ♀=1; L=1.3mm; a=40; b=8; c=8.2; stylet=17 $\mu$ ; V=47%; T/ABW=6.5.

Cuticle finely annulated, 1 $\mu$  wide near middle of body. Lateral fields plain (incisures difficult to find out), Deirids prominent at the level of the excretory pore. Spear elongate, slender 17 $\mu$  long, without basal knobs. opening of dorsal oesophageal gland about half of spear length behind spear base. Excretory pore located at the level of base of isthmus. Hemizonid 4 annules length, one annule anterior excretory pore. Phasmids situated on about two anal body-width behind anus. Vagina with thick walls, two ovary outstretched. Tail elongate, regularly tapering to a large swollen tip.

Genus; *Tetylenchus* Filipjev, 1936

*Tetylenchus joctus* Thorne, 1949

The females were found with L between 525 and 640 $\mu$  and a stylet between twelve and thirteen micrometer. These measurements are somewhat shorter than the original ones. On the other hand the tail shape and the striation on the tail are similar to the specimens described by Ferris & Ferris, (1967)<sup>10</sup>. The tail length lies between 3.2 and 4.5 times the anal body diameter; the phasmids are slightly anterior to the

middle of the tail. The vulva shows a double epiptygma and lateral membranes. Other characteristics are nearly the same as in the original description.

Genus: *Tylenchorhynchus* Cobb, 1913

*Tylenchorhynchus claytoni* Steiner, 1937

(Fig. 5. F,G)

A population of *T. claytoni* Steiner, 1937. was found consisting of eleven females and ten males, with a body length between 530 and 650 $\mu$  in both cases and a stylet-length of 21~23 $\mu$  (Steiner gave 20 $\mu$  and Allen, 1955 18 to 20.5 $\mu$ ). The post-anal intestinal sac measures about one-fourth to one-third of the tail-length (Allen, 1955 mentions about one-half); the phasmids are closely behind the anus-level between 10 and 25% of the tail-length (see Fig. 5, G). Apart from the lateral field there are 24 longitudinal striations on the middle on the body (see Fig. 5. F).

*Tylenchorhynchus nudus* Allen, 1955

(Fig 5. A-D)

A population consisting of 14 females and seven males was found which identified as *T. nudus* Allen, 1955. Body length was between 625 and 780 $\mu$  for the females and 600 to 730 $\mu$  for the males, with a stylet length of 19-22 $\mu$ . However, some differences were noted in this population as pointed out below: The head annulation is not very clear, the cent of the lip region is somewhat protruded (Fig. 5. B,C) and only in some specimens were the usual two annules discernible. The tail is more clavate than in the original description and the lateral field continues with four lines almost to the tail-tip (Fig. 5. D). The female gonads show a rounded spermatheca, filled with sperm (Fig. 5. A). On the whole this population comes close to the *T. nudus* described from Dacca (Pakistan) by R.W. Timm (1963).

9. Family: Tylenchulidae (Skarbilovich, 1947) Kirjanova, 1955

Genus: *Tylenchulus* Cobb, 1913

*Tylenchulus semipenetrans* Cobb, 1913

Same as original description.

Table 1. Source and host soil samples collected in the Kyung-pook, Kyung-Nam and Jae-Ju province in Korea.

No.	Province	Locality	Host Plant
1	Kyung-pook	Chil-kok District	Pepper ( <i>Capsicum annuum</i> L.)
2		id.	Rice ( <i>Oryza sativa</i> L.)

3	Chung-Song District	Bean ( <i>Glycine max</i> Merr.)
4	id.	Pepper ( <i>Capsicum annuum</i> L.)
5	id.	Sesame ( <i>Sesamum indicum</i> L.)
6	id.	Tobacco ( <i>Nicotiana tabacum</i> L.)
7	Dal-Sung District	Pepper ( <i>Capsicum annuum</i> L.)
8	id.	Moxa ( <i>Artemisia asiatica</i> Nakai)
9	id.	Millet ( <i>Setaria italica</i> Beauv)
10	id.	Garlic ( <i>Allium sativum</i> L.)
11	Kyung-San district	Apple ( <i>Malus pumila</i> Mill)
12	id.	Garlic ( <i>Allium sativum</i> L.)
13	Sang-Ju district	Rice ( <i>Oryza sativa</i> L.)
14	id.	Apple ( <i>Malus pumila</i> Mill)
15	id.	Persimmon ( <i>Diospyros kaki</i> L.)
16	id.	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
17	id.	Mulberry ( <i>Morus alba</i> L.)
18	Taegu city	Apple ( <i>Malus pumila</i> Mill)
19	id.	Begonia ( <i>Begonia semperflorens</i> Link)
20	id.	Lily ( <i>Lilium longiflorum</i> Thunb.)
21	id.	Persimmon ( <i>Diospyros kaki</i> L.)
22	id.	Rice ( <i>Oryza sativa</i> L.)
23	id.	Garlic ( <i>Allium sativum</i> L.)
24	id.	Pepper ( <i>Capsicum annuum</i> L.)
25	id.	Mulberry ( <i>Morus alba</i> L.)
26	id.	Chrysanthemum ( <i>Chrysanthemum morifolium</i> Ram.)
27	id.	Wheat ( <i>Triticum aestivum</i> Linne)
28	UI-Sung district	Apple ( <i>Malus pumila</i> Mill)
29	id.	Garlic ( <i>Allium sativum</i> L.)
30	id.	Persimmon ( <i>Diospyros kaki</i> L.)
31	id.	Rice ( <i>Oryza sativa</i> L.)
32	id.	Pepper ( <i>Capsicum annuum</i> L.)
33	id.	( <i>Macrocarpium officinale</i> Nakoi)
34	Young-Chun district	Apple ( <i>Malus pumila</i> Mill)
35	id.	Rice ( <i>Oryza sativa</i> Linne)
36	Young-Yang district	Bean ( <i>Glycine max</i> Merr)
37	id.	Millet ( <i>Setaria italica</i> Beauv)
38	id.	Pepper ( <i>Capsicum annuum</i> L.)
39	id.	Tobacco ( <i>Nicotiana tabacum</i> L.)
40	Young-Ju district	Ginseng ( <i>Panax schinseng</i> Nees.)
41	id.	Rice ( <i>Oryza sativa</i> L.)
42	Kim-Chun city	Ginkgo ( <i>Ginkgo biloba</i> L.)
43	id.	Persimmon ( <i>Diospyros kaki</i> L.)
44	id.	Apricot ( <i>Prunus armeniaca</i> L.)
45	id.	Maple ( <i>Acer palmatum</i> Thunb.)
46	id.	Cherry ( <i>Prunus pauciflora</i> Bunge)
47	id.	( <i>Viburnum pubinerve</i> Blune)
48	id.	Wheat ( <i>Triticum aestivum</i> L.)
49	Young-il district	Rice ( <i>Oryza sativa</i> L.)
50	id.	Barley ( <i>Hordeum hexastichon</i> L.)
51	Po-Hang city	Barley ( <i>Hordeum hexastichon</i> L.)
52	id.	Pine tree ( <i>Pinus densiflora</i> Seib & Zucc.)

53		id.	Bean ( <i>Glycine max</i> Merr)
54		Young-Duk district	Willow ( <i>Salix koreensis</i> Ander)
55		id.	Apricot ( <i>Prunus ameriaca</i> L.)
56		id.	Walnut ( <i>Juglans sinensis</i> Dode)
57		id.	Rice ( <i>Oryza sativa</i> L.)
58		id.	Potato ( <i>Solanum tuberosum</i> L.)
59		Chung-do district	Persimmon ( <i>Diospyros kaki</i> L.)
60		id.	Ginkgo ( <i>Ginkgo biloba</i> L.)
61		id.	Chestnut ( <i>Castanea crenata</i> Sieb & Zucc)
62		id.	Treepeony ( <i>Paeonia suffruticosa</i> Andr)
63		An-Dong city	Chestnut ( <i>Castanea crenata</i> Sieb & Zucc)
64		id.	Ginseng ( <i>Panax schinseng</i> Nees.)
65		Yae-Chun district	Apple ( <i>Malus pumila</i> Mill)
66		id.	Mulberry ( <i>Morus alba</i> L.)
67		id.	Barley ( <i>Hordeum hexastichon</i> L.)
68		id.	Persimmon ( <i>Diospyros kaki</i> L.)
69		id.	Rice ( <i>Oryza sativa</i> L.)
70		id.	Alder ( <i>Alnus japonica</i> Steud)
71		UI-Nung island	Corn ( <i>Zea mays</i> L.)
72		id.	Pepper ( <i>Capsicum annuum</i> L.)
73		id.	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
74		id.	Camellia ( <i>Lindera obtusiloba</i> Blune.)
75	Kyung-Nam	Bu-San city	Strawberry ( <i>Rubus idaeus</i> L.)
76		id.	Barley ( <i>Hordeum hexastichon</i> L.)
77		id.	Hibiscus ( <i>Hibiscus syriacus</i> L.)
78		Kea-Chang district	Apple ( <i>Malus pumila</i> Mill)
79		id.	Chestnut ( <i>Castanea crenata</i> Sieb. et Zucc.)
80		id.	Persimmon ( <i>Diospyros kaki</i> L.)
81		id.	( <i>Populus alba</i> L.)
82		id.	Rice ( <i>Oryza sativa</i> L.)
83		Ma-San city	Chrysanthemum ( <i>Chrysanthemum morifolium</i> Ram.)
84		id.	( <i>Wistaria japonica</i> Sieb. & Zucc)
85		id.	( <i>Firmiana platanifolia</i> Schot. et Endl.)
86		id.	Wheat ( <i>Triticum aestivum</i> L.)
87		UL-San district	Bean ( <i>Phaseolus lunatus</i> L.)
88		id.	Pear ( <i>Pyrus serotina</i> Rehder)
89		id.	Sesam ( <i>Sesamum indicum</i> L.)
90		Chang-Nyng district	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
91		id.	Persimmon ( <i>Diospyros kaki</i> L.)
92		Jin-Ju city	Bamboo ( <i>Sinoarundinaria reticulata</i> Ohwl.)
93		id.	Chestnut ( <i>Castanea crenata</i> Sieb. et Zucc.)
94		id.	( <i>Robinia pseudo-acacia</i> L.)
95		id.	( <i>Firmiana platanifolia</i> Schot. et Endl.)
96		id.	( <i>Tsuga sieboldii</i> Carr)
97		Sam-Chun Po city	Bean ( <i>Glycine max</i> Merr.)
98		id.	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
99		id.	Sweet potato ( <i>Ipomoea batatas</i> var. <i>edulis</i> Kuntz.)
100		id.	Cabbage ( <i>Brassica oleracea</i> L.)
101		id.	Rice ( <i>Oryza sativa</i> L.)
102		Sa-Chun district	Bean ( <i>Glycine max</i> Merr)

103		id.	Onion ( <i>Allium fistulosum</i> L.)
104		id.	Cabbage ( <i>Bassica olerace</i> L.)
105		Kei Jae island	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
106		id.	Corn ( <i>Zea mays</i> L.)
107		id.	( <i>Abies holophylla</i> Max)
108		Hap-Chun district	Bean ( <i>Glycine max</i> Merr)
109		id.	Sesam ( <i>Sesamum indicum</i> L.)
110		id.	( <i>Abies holophylla</i> Max)
111		Kim-hae district	Pear ( <i>Pyrus serotina</i> Regder var. culta.)
112		id.	Onion ( <i>Allium fistulosam</i> L.)
113	Jae-Ju	Nam Jae ju district	Citrus ( <i>Citrus sinensis</i> Obseck.)
114		id.	Mulberry ( <i>Morus alba</i> L.)
115		id.	Maple ( <i>Accr palmatum</i> Thunb.)
116		id.	( <i>Nerium odorum</i> Soland)
117		id.	( <i>Zelkova serrata</i> Makino)
118		id.	( <i>Sambucus pendula</i> Blume)
119		id.	( <i>Quercus mongolica</i> Fisch)
120		Jae-Ju city	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)
121		id.	Bean ( <i>Glycine max</i> Merr)
122		id.	( <i>Lagerstroemia indica</i> L.)
123		Pook Jae ju distrect	Hibiscus ( <i>Hibiscus syriacus</i> L.)
124		id.	Sweet potato ( <i>Ipomoea batatas</i> var. <i>edulis</i> Kuntz.)
125		id.	Pine tree ( <i>Pinus densiflora</i> Sieb. & Zucc.)

Table. 2: List of species found in the Kyung pook, Kyung-Nam and Jae-Ju provinces.

Name	Sample number
<i>Aglenchus costatus</i> (de Man, 1921) Meyl, 1961	20, 21, 36.
<i>Anguina mozae</i> Yokoo & Choi, 1968	8.
<i>Anguina tritici</i> (Setinbuch, 1799) Chitwood, 1935	27, 48, 86.
<i>Aphelenchoides ritzemavosi</i> (Schwartz, 1911) Steiner & Buhner, 1932	26, 83.
<i>Aphelenchus avenae</i> Bastine, 1965	3, 5, 9, 15, 21, 36, 51, 57, 66, 67.
<i>Basiria graminophila</i> Siddiqi, 1959	29, 36.
<i>Criconeimoides informis</i> (Micoletzky, 1922) Taylor, 1936	3, 5, 9, 11, 14, 21, 30, 32, 33, 50, 73, 74, 97.
<i>Criconeimoides morgenses</i> (Hofmanner & Menzel, 1914) Taylor, 1936	42, 47, 60.
<i>Crossonema</i> ( <i>Crossonema</i> ) <i>menzeli</i> (Stefanski, 1924)Metha & Raski, 1971	117.
<i>Ditylenchus dipsaci</i> (Kuhn, 1857) Phillipjev, 1936	10, 12, 23, 29, 40, 64, 112.
<i>Eutylenchus africanus</i> Sher, Corbett & Colbran, 1966	18.
<i>Helicotylenchus dihystra</i> (Cobb, 1893) Sher, 1961	7, 9, 20, 23, 24, 45, 67, 72, 79, 80, 118, 120.
<i>Helicotylenchus pseudorobustus</i> (Steiner, 1914) Golden, 1956	21, 30, 58, 70, 81, 90, 114, 115, 112, 125.
<i>Hemicriconeimoides intermedius</i> Dasgupta, Raski and Van Gundy, 1969	13, 62, 84.
<i>Hemicriconeimoides varionodus</i> Choi & Geraert, 1972	16.
<i>Hemicycliophora koreana</i> Choi & Geraert, 1971	11, 56.
<i>Heterodera glycines</i> Ichinohe, 1952	3, 36, 53, 63, 77, 97, 108.
<i>Hirschmanniella imamuri</i> Sher, 1968	2, 10, 12, 13-22, 29, 31, 40, 49, 69, 75, 101, 103.
<i>Macroposthonia curvata</i> (Raski, 1952) De Grisse & Loof, 1965	3, 55,
<i>Macroposthonia ferniae</i> (Luc, 1959) Do Grisse & Loof, 1965	11.
<i>Macroposthonia rustica</i> (Micoletzky, 1915) De Grisse & Loof, 1965)	44.
<i>Macroposthonia xenoplax</i> (Raski, 1952) De Grisse & Loof, 1965	11, 44, 111.
<i>Moloidogyne arenaria</i> (Neal, 1889) Chitwood, 1949	19, 40, 123.

<i>Merlinius koreanus</i> Choi & Geraert, 1971	28, 34, 78.
<i>Merlinius nothus</i> (Allen, 1955) Siddiqi, 1970	37, 38, 39, 91.
<i>Neolobocriconema aberrane</i> (Jairajpuri & Siddiqi, 1964) Mehta & Raski, 1971.	25.
<i>Neolobocriconema serratum</i> (khan & Siddiqi, 1963) Mehta & Raski, 1971	5, 36, 105, 106, 115.
<i>Nothocriconema demani</i> (Micoletzky, 1925) De Grisse & Loof, 1965	92, 106, 108.
<i>Pratylenchus minyus</i> Sher & Allen, 1953	9, 37, 38, 39, 52, 57, 89.
<i>Pratylenchus thornei</i> Sher & Allen, 1953	21, 28, 36, 43, 46, 65, 76.
<i>Pratylenchus vulnus</i> Allen & Jensen, 1951	11, 18, 22, 54, 63.
<i>Pseudhalenchus anchilispomus</i> Tarjan, 1958	6, 36.
<i>Pseudhalenchus minutus</i> Tarjan, 1958	20, 36.
<i>Psilenchus hilarulus</i> de Man, 1921	20, 25, 34.
<i>Rotylenchus orientalis</i> Siddiqi & Husain, 1964	16, 98, 105.
<i>Rotylenchus pini</i> Mamiya, 1968	93, 94, 95, 107, 116.
<i>Scutellonema unum</i> Shar, 1963	3, 4, 5, 6, 17, 18, 21, 53, 88, 116.
<i>Tetylenchus joctus</i> Thorme, 1949	1.
<i>Tylenchorhynchus claytoni</i> Steiner, 1939	9, 11, 34, 45, 76, 81, 85, 93.
<i>Tylenchorhynchus nudus</i> Allen, 1955	5, 18, 21, 28, 30, 33, 37, 43, 48, 59, 99, 102.
<i>Tylenchulus semipenetrans</i> Cobb 1913	113.
<i>Xenocriconemella macrodora</i> (Taylor, 1936) De Grisse & Loof, 1965	61.

## 적 요

우리나라 慶尙北道·慶尙南道·濟州道の 32個郡에서 125種의 農作物에서 植物寄生性 線蟲을 調査한 結果 9科 28屬 42種을 발견하였다. 그중에 다음 8種은 우리나라 미기록 種이여 이미 발표된 種에 대해서는 특이함만한 形態의인 특징 만을 언급하였다.

- Criconemoides morgensis* (Hofmanner & Menzel, 1914).  
*Crossonema* (*Crossonema*) *menzeli* (stefanski, 1924) Metha & Raski, 1971.  
*Macroposthonia ferniae* (Luc, 1959) De Grisse & Loof, 1965.  
*Macroposthonia rustica* (Micoletzky, 1915) De Grisse & Loof, 1965.  
*Neolobocriconema aberrane* (Jairajpuri & Siddiqi, 1964) Mehta & Raski, 1971.  
*Nothocriconema demani* (Micoletzky, 1925) De Grisse & Loof, 1965.  
*Rotylenchus pini* Mamiya, 1968.  
*Xenocriconemella macrodora* (Taylor, 1936) De Grisse & Loof, 1965.

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