

## The Nematode Genus *Xiphinema* (Dorylaimida : Longidoridae) From Korea

Young-Bae Lee,\* Sang-Chan Han\*

韓國產 *Xiphinema* 屬線虫 (Dorylaimida : Longidoridae)의 分類

李 英 培\* · 韓 相 贊\*

### Abstract

Four species of the genus *Xiphinema* have been identified, three of which are new to Korea. *X. radicola* which is distributed geographically from the north (Suweon) to the south (Jeju) of the country is found from soil around roots of apple and elm tree. *X. bakeri* is a confirmed species to the specimens collected from mulberry grove at Suweon. *X. pini* was collected from soil around roots of broad leaf lilac and maple trees at Mt. Kyeryongsan.

Some notes of Korean populations of *X. americanum* are given.

### Introduction

Of plant parasitic nematodes, dorylaim group has considerable economic importance as plant root feeders and as vectors of plant virus diseases (Taylor, 1972).

Plant parasitic dorylaim nematodes consists of the genera *Xiphinema*, *Longidorus*, *Paralongidorus*, *Trichodorus* and *Paratrichodorus*. From these genera, *Xiphinema*, *Longidorus* and *Paralongidorus* combine to consist the family Longidoridae of the superfamily Dorylaimoidea and the rests the family Trichodoridae of the superfamily Trichodoroidea of the order Doylaimida.

The genus *Xiphinema* includes more than 82 described species in 8 subgenera (Cohn & Sher, 1972).

So far, only one species, *Xiphinema americanum*

has been recorded in Korea from some green house ornamental plants by Choi (1963).

The authors have indentified three additional species.

The authors express their sincere gratitude to Mr. J.S. Park, the Head of Entomology Department, I.A.S. for his endless helpfull advice and to Dr. S.A. Sher of University of California, Riverside for his thorough checking the specimens during his staying at the authors' laboratory.

### Materials and Methods

Collected soil samples were washed and nematode specimens were obtained by modified Baermann's funnel, sieving and decanting or centrifugation technique.

Obtained nematodes killed by hot formalin were

\* 농림기술연구소 식물연구실

\* Nematology lab., I.A.S., ORD., Suweon, Korea.

preserved in 5% formalin and processed through the Baker's method to mount in pure glycerine.

Glycerine mounted permanent slide specimens were used for identification of species, based on female specimens.

First step of species identification was to check the overall appearance of nematodes and then the main biometrical characters were measured, using camera lucida to figure out the de Man's formulation.

## Results

### *Xiphinema radicolica* Goodey, 1936

Female (10 specimens)

L=2.34 (2.19–2.43) mm

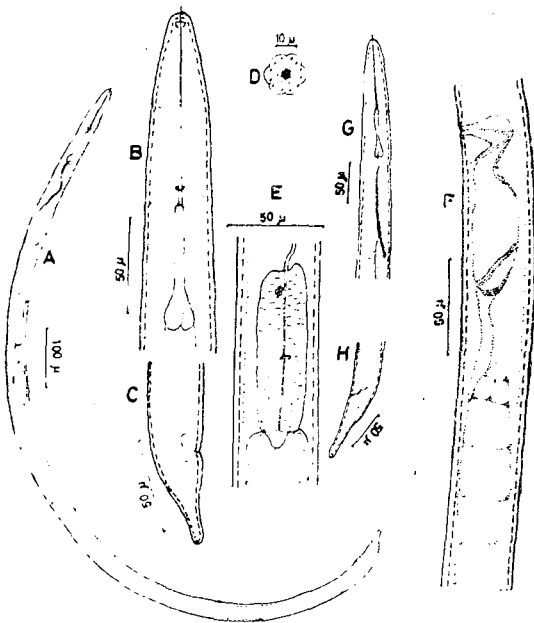
a=49.2 (43.1–56.5)

b=6.1 (5.7–7.8)

c=40.9 (33.9–53.6)

v=26.7 (24.7–27.1) %

Stylet=181 (169.5–189)  $\mu$



**Fig. 1.** *X. radicolica*; A; General body shape of female, B; Anterior portion of female, C; Posterior portion of female, D; End-on view of female, E; Posterior portion of esophagus, F; Female reproductive system, G & H; Anterior and posterior portion of larva.

Overall appearance of the collected specimens corresponds well with the references describing or re-

describing the species (Goodey, 1936; McLeod & Khair, 1971; Cohn & Sher, 1972) with the stylet length of the present specimens being slightly longer than that given by Esser (1973).

The body is open C shaped as shown in Fig. 1—A when killed by hot formalin. Body is tapering toward anterior end and abruptly narrowed near the anal region, making peg-like feature. But the "peg" is not so prominent as in *X. brasiliense* Lordello, 1951 and *X. anstraliae* McLeod & Khair, 1971 which are closest species to the present collection.

Only the basal ring of the guiding apparatus is seen in the hot formalin killed and glycerine mounted specimens.

Flanges are well developed. Esophago-intestinal valve or cardia conoid.

Female gonad monodelphic as shown in Fig. 1—F, consisting of ovary, reflexed oviduct, uterus without "Z" organ. Vulva transverse at 24.7–27.1 % of the total body length.

Male not found.

A large population of this species has been found in an apple orchard at Geumgok-ni near Suweon. This species has also been found in apple orchards at Jinwee near Pyeongtaik, Daegu and Euseong; around root of elm tree and silverberry (*Elaeagnus crispa*) at Seongpan-ak, Mt. Halasan, Jeju.

### *Xiphinema bakeri* Williams, 1961

Females (6 specimens)

L=3.36 (3.05–3.82) mm

a=68.9 (58.8–78.3)

b=11.3 (9.2–14.6)

c=81.0 (71.3–85.3)

v=35.2 (31.8–37.1) %

Stylet=159.5 (129–171)  $\mu$

There is a good agreement between the measurements of these specimens and the descriptions of Williams. (1961) exception of body length, which is shorter in the present specimens.

The body is open C shaped, curved more in the posterior half of the body.

Stylet large with well developed basal flanges of its extension. Anterior portion of the stylet or odonto-

stylet is slightly curved at the position of the guiding sheath as shown in Fig. 2—C in its retracted condition. Guiding sheath is clearly seen in the formalin preserved and glycerine mounted specimens.

Cardia is not distinct.

Female reproductive system didelphic, more or less symmetrical with reflexed oviducts. Vulva transverse with well developed muscles, uterus without "Z" organ. Tail dorsally convex-conoid, forming peg-like feature.

Male not found.

Only found in a mulberry grove of the Sericultural Experiment Station in Suweon.

### *Xiphinema pini* Heyns, 1965

Female (7 specimens)

L=3.34 (3.18—3.58) mm

a=71.3 (63.6—83.5)

b=8.1 (7.1—10.0)

c=108.9 (104.2—122.2)

v=53 (51—55.3) %

Stylet=178.6 (168—188)  $\mu$

Male (1 specimen)

L=3.68, a=53.4, b=10.5, c=122.7

Stylet=190  $\mu$ , Spicule=45  $\mu$

Overall feature of the specimens corresponds well with the reference of Heyns (1965) with some variations in body measurements.

Body is open spiral shaped in hot formalin killed specimens, tapering towards both extremities.

Stylet large with well developed flanges.

Guiding sheath is clear in formalin preserved and glycerine mounted specimens. Cardia prominently conoid.

Tails of both sexes are similarly sub-hemispherical as seen in Fig. 2—A and B.

Female gonad didelphic with faint but positive "Z" organ.

Vulva transverse and 51—55.3 % of the body in its position.

Spicules of the male typical.

Found from soil samples around the root of broad leaf lilac (*Syringa oblata*) and maple tree (*Acer palmatum*) near Donghaksa in Mt. Kyeryongsan, Chung-nam.

### Some notes on *Xiphinema americanum* Cobb, 1913.

A special attention has been paid to this species of the genus *Xiphinema* by virologists as well as by nematologists in Korea since it has been proved as a virus vector of various economically important crops such as cherry rasp leaf virus of cherry, tobacco ringspot virus of soybean, tobacco, grape-vine, etc., and tomato ringspot virus of cherry, grape-vine, peach, tobacco, etc. (Taylor, 1972).

*X. americanum* was first recorded in Korea by Choi (1963) from green house ornamental plants.

The authors found populations from soil around roots of various plants and those specimens are closely

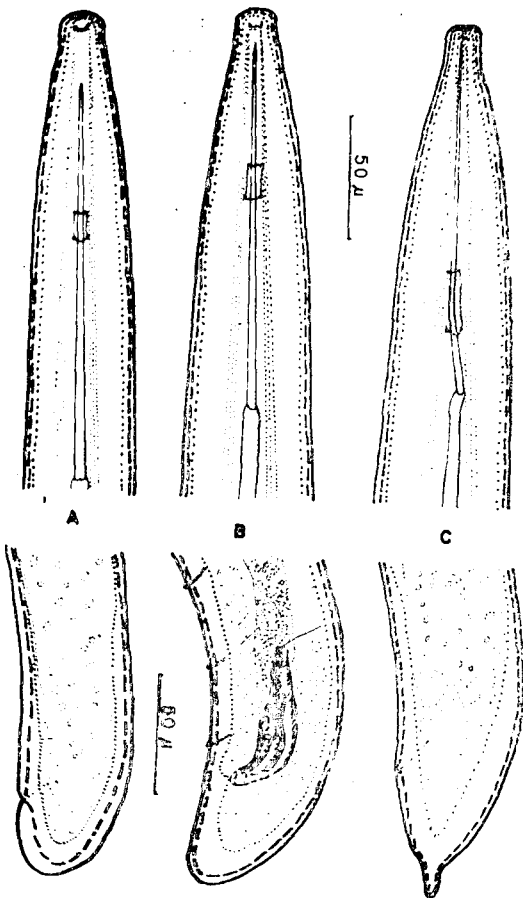
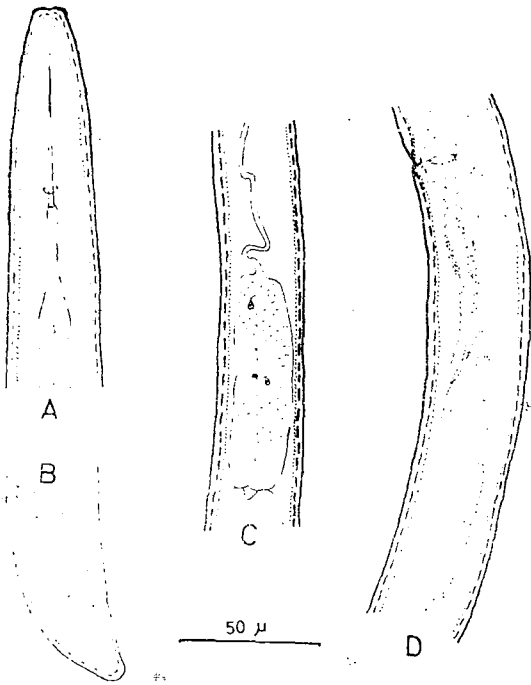


Fig. 2. Anterior and posterior portion of, A; female of *X. bakeri*, B; male of *X. bakeri*, C; female of *X. pini*.



**Fig. 3.** *X. americanum* from peach, A and B; Anterior and posterior portion, respectively, C; Posterior portion of esophagus, D; Female reproductive system.

related to *X. americanum* and *X. mediterraneum*.

These two species, *X. americanum* and *X. mediterraneum* are so confusing each other in its general morphological characters that we would like to consider them as one species, *X. americanum* for the time being.

Measurements of these groups of the genus collected in Korea are given in Table 1.

Fig. 3 shows some important parts of a specimen collected from peach at Jochiweon.

### 摘要

植物 virus 病 媒介體로서 그 重要性이 擡頭되고 있는 *Xiphinema* 屬線虫(Dorylaimida : Longidoridae)을 分類한 結果 우리나라에서는 *X. radicolica*, *X. bakeri*, *X. pini* 와 *X. americanum* 의 4 種이 밝혀졌으며, 이 中에서 *X. radicolica*, *X. bakeri* 및 *X. pini* 의 3 種은 우리나라 未記錄種들이 었다.

*X. radicolica* 는 水原, 平澤의 진위, 慶北의 大邱 및 義城等地的 사과果樹園과 濟州道 漢拿山의 느릅나무와 브리수나무에서 採集되었으며 *X. bakeri* 는 水原 蠶業試驗場의 뽕나무밭에서 그리고 *X. pini* 는 鷄龍山의 東鶴

**Table 1.** Main biometric characters of *X. americanum* from different localities and hosts.

Locality	Host	n	L(mm)	a	b	c	v(%)	Stylet(u)
Jeongnam(Hwaseong)	Soybean	1	1.62	40.5	7.4	73.6	44.4	120.0
Chungju	Lettus	2	1.51	39.9	6.0	43.5	51.0	126.0
Jochiweon	Peach	5	1.23	38.0	6.0	49.0	52.0	139.0
Jeju	Bracken (1)	2	1.53	37.2	9.4	54.6	50.9	104.6
"	" (2)	1	1.47	35.9	6.8	77.4	49.3	115.0
Geumsan	Balloon flower	3	1.20	42.2	6.0	44.2	52.4	125.3
"	Maize	2	1.42	46.3	5.8	67.7	49.1	113.5
Hyangnam (Hwaseong)	Soybean	1	1.11	41.1	5.0	52.9	51.2	106.0
Average		17	1.39	40.1	6.6	57.9	50.0	118.1

*X. americanum* has also been found from pine in Jeju, soybean and *perilla japonica* in Geumsan.

寺附近에 있는 때총나무와 丹楓나무의 뿌리附近土壤에서 發見되었다.

4 種의 *Xiphinema* 屬線虫中에서 *X. americanum* 은 唯一한 우리나라 記錄種으로서 便宜上 여기서는 *X. americanum* 과 *X. mediterraneum* 에 類似한 個體群을 모두 包含시켰다.

### References

- Choi, Y.E. (1963), Studies on the important nematodes in Korea. Korean J. Plant Protection 2: 27-37.
- Cohn, E. & S.A. Sher (1972), A contribution to the taxonomy of the genus *Xiphinema* Cobb, 1913.

- J. Nematology 4 (1) : 36—65.
3. Esser, R.P. (1973), A diagnostic species compendium of the genus *Xiphinema* Cobb. 1913. Proc. Soil and Crop Science Soc., Florida 33 : 88—92.
  4. Goodey, T. (1936), A new dorylaimid nematode, *Xiphinema radicum* n. sp. J. Helminthol. 14 : 69—72.
  5. Heyns, J. (1965), Four new species of the genus *Xiphinema* (Nematoda: Dorylaimoidea) from South Africa. Nematologica 11 : 75—81.
  6. Lamberti, F & G.P. Martelli (1971), Notes on *Xiphinema mediterraneum* (Nematoda : Longidoridae). Nematologica 17 : 75—81.
  7. Loof, A.A.A. & A.M. Yassin (1970), Three new plant parasitic nematodes from Sudan with notes on *Xiphinema basiri* Siddiqi 1959. Nematologica 16 : 537—546.
  8. Lordello, L.G.E. (1951), *Xiphinema brasiliense*, nova especie de Brasil, parasita de *Solcnum tuberosum* L. Bragantia 11 : 87—90.
  9. McLeod, R.W. & G.T. Khair (1971), *Xiphinema australiae* n. sp., its host range, observations on *X. radicum* Goodey; 1936 and *X. monohysterum* Brown, 1968 and a key to monodelphic *Xiphinema* spp. (Nematoda : Longidoridae). Nematologica 17 : 58—68.
  10. Taylor, C.E. (1972), Nematode transmission of plant viruses. Pans 18 (3) : 269—282.
  11. Tarjan, A.C. (1956), Known and suspected plant parasitic nematodes of Rhode Island. II. *Xiphinema americanum* with notes on *Tylencholaimus brevicaudatus* n. comb. Proc. Helminth. Soc. Wash. 23 : 88—91.
  12. Tarjan, A.C. (1964), Two new American dagger nematodes (*Xiphinema* : Dorylaimidae) associated with citrus, with comments on the variability of *X. bakeri* Williams, 1961. Proc. Helminth. Soc. Wash. 31 (1) : 65—75.
  13. Williams, T.D. (1961), *Xiphinema bakeri* n. sp. (Nematoda : Longidoridae) from the Fraser River Valley, British Columbia, Canada. Can. J. Zool. 39 : 307—412.