佐 賀 大 学

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On a new Stubby Root Nematode (*Trichodorus kurumeensis* n. sp.) from Kyushu, Japan

By

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Nematodes belonging to the genus *Trichodorus* which found from Kyushu, Japan amounted to the following 3 species hitherto.

(1) *Trichodorus mirzai* Siddiqi, 1960
(2) *T. cedarus* Yokoo, 1964
(3) *T. longistylus* Yokoo, 1964

In 1965, February, I found a new species of the genus *Trichodorus* from the soils around the roots of the Prunus planted in the Prunus Orchard at the Kyushu Horticultural Experimental Station, Fukuoka Prefecture, Kyushu.

This species is distinguished by comparatively small size (0.5–0.6mm). The male having three ventromedian cervical papillae anterior to the excretory pore, posterior to the base of Onchiostyle, comparatively posterior excretory pore at a level of anterior part of the oesophageal posterior swelling; three ventromedian supplementary papillae, one of which is without the spicular region; striated comparatively small spicula; gubernaculum with a small hook-like enlargement at distal end; and female having the paired asymmetrical gonads; anterior gonad is comparatively shorter (about 84% of the length of posterior gonad), posterior gonad longer with reflexed ovary; and spindle-shaped spermatheca.

Trichodorus kurumeensis Yokoo, 1966 n. sp.

Dimensions:

Female: (n = 10)

L = 0.50 mm (0.35–0.68 mm); a = 14.7 (11.6–18.6); b = 3.8 (2.7–4.7); c = subterminal; e = 5.1 (3.8–6.8); V = 55.8 % (55.1–61.3 %); G_1 = 18.5 % (15.4–21.0 %), G_2 = 22.1 % (18.1–26.4 %); stylet = 5.3μ (47.5–52.5 μ)

Holotype Female; L = 0.52 mm; a = 14.9; b = 4.0; c = subterminal; e = 6.8; stylet = 50.5; V = 52.0%; G_1 = 15.4%; G_2 = 26.0%.

Male; (n = 2)

L = 0.59 mm (0.57–0.61 mm); a = 13.4 (12.6–14.2); b = 4.4 (4.3–4.5); c = subterminal; e = 5.8 (5.5–6.0); T = 52.9% (52.7–53.0%); stylet = 53.4 μ (52.5–54.0μ); Spicula = 46.3 μ (42.5–50.0 μ); gubernaculum = 14.5 μ (13.0–16.0 μ); T = 52.9% (52.7–53.0%)

Allotype Male; L = 0.57mm; a = 12.6; b = 4.5; c = subterminal; e = 6.0; stylet = 54.0 μ; Spicula = 42.5 μ; gubernaculum = 13.0 μ; T = 52.7%

Female:

Body cylindrical, curved slightly ventrally when killed by heat. Tail tip round. Anus subterminal. Lip region desk-like shaped. First annule large and its outside slightly project. Excretory pore at a level of anterior end of posterior oesophageal swelling. Oesophagus composed of two parts; anteriorly a slender tube which folds two times, expanding to posterior elongate conoid swelling. Vulva located at about 56% of total body length, short transverse slit. Cutinized pieces suround valva small, conspicuous. Gonad paired, opposited, asymmetrically. Postrerior gonad long, 4 or 5 times of vulval body width, terminal part of ovary reflexed. Anterior gonad short, outstreched, 2 or 3 times of vulval body width. Spermatheca spindle-shaped. Vagina about 2/5–1/2 of vulval body width, cylindrical. In terminal narrow part of ovary oocytes in one row. In subterminal part oocytes in two row. Caudal pore subterminal.

Male:

Body cylindrical, tapering to the base of onchiostyle as in female. Tail tip round. Cloaca subterminal, posterior part of body hooks ventrally when killed by Heat. Excretory pore situated near posterior part of oesophageal swelling. Three ventromedian cervical papillae located anteriorlly to excretory pore. First papillae situated behind the base of onchiostyle. Third papillae above excretory pore. Second papillae located at a level of mid way of these two papillae. Paired spicula long and ventrally curved, markedly striated by fine transverse striations of annules. Three large supplemental muscular papillae standing anterior to cloaca. Distance between papillae located nearest to cloaca and second papillae is slightly shorter than that between second and third papillae. Gubernaculum about 1/3 length of spicula with a hook-like small enlargement directed downwards near distal end of gubernaculum. Caudal pore subterminal.

Diagnosis and Relationship:

This species is distinguished by the comparatively small size (0.5–0.6mm); the male having three ventromedian cervical papillae, anterior to the excretory pore, posterior to the base of Onchiostyle; comparativelly posterior excretory pore at a level of anterior part of the oesophageal posterior swelling; three ventromedian supplementary papillae, one of which located without the spicular region; striated comparativelly small spicula; gubernaculum with a small hook-liked enlargement at distal end; and female having the paired asymmetrical gonads, anterior gonad is comparativelly shorter (about 84% of the length of posterior gonad), posterior gonad with reflexed ovary at distal end; spindle-shaped Spermatheca.

The known other species of genus *Trichodorus* having males with three ventromedian cervical papillae and three venromedian supplementary papillae, and gubernaculum with a enlargement at distal end are following several species, of which *Trichodorus cedarus* Yokoo, 1964 and *longistylus* Yokoo, 1964 are found from western Japan (Kyushu).

(1) *Trichodorus primitivus* (de Man, 1880) Micoletzky, 1922
(2) *T. pakistanensis* Siddiqi, 1962
(3) *T. cylindricus* Hooper, 1962
(4) *T. viruliferus* Hooper, 1963
(5) *T. cedarus* Yokoo, 1964

(6) *T. longistylus* Yokoo, 1964

The distribution of the ventromedian cervical papillae of this species is closely related to that in *Trichodorus cedarus, T. viruliferus* and *T. longistylus.* But in *T. cedarus* the first two papillae situated within the onchiostyle-region, and in *T. viruliferus* the first one papillae, anterior to the base of onchiostyle.

And in *T. longidtylus* the first papillae situated at a level or behind the base of onchiostyle.

And the distribution of the ventromedian supplementary papillae of this species is closely related to that of *T. cedarus* and *T. longiostylus.* But the distance between the lowest papillae and median papillae is not so narrow as that of *T. longistylus,* and the distance between the first and second papillae is comparativelly longer than that between median and lowest papillae. The paired gonads of female is asymmetrical in this species and the length of the anterior gonad ia about 84% of that of the posterior gonad, the spindle-shaped spermatheca.

Type Host: *Prunus Persica* Batsch. (*Persica vulgaris* Mill.) Peach Type.

Locality: Soils from the Peach-orchard, Kurume, Fukuoka Prefecture, Japan (Kyushu), Kyushu-Horticultural Experimental Station.

Collected: February, 1965.

Bionomics: frequency; Female 23: Male 1.

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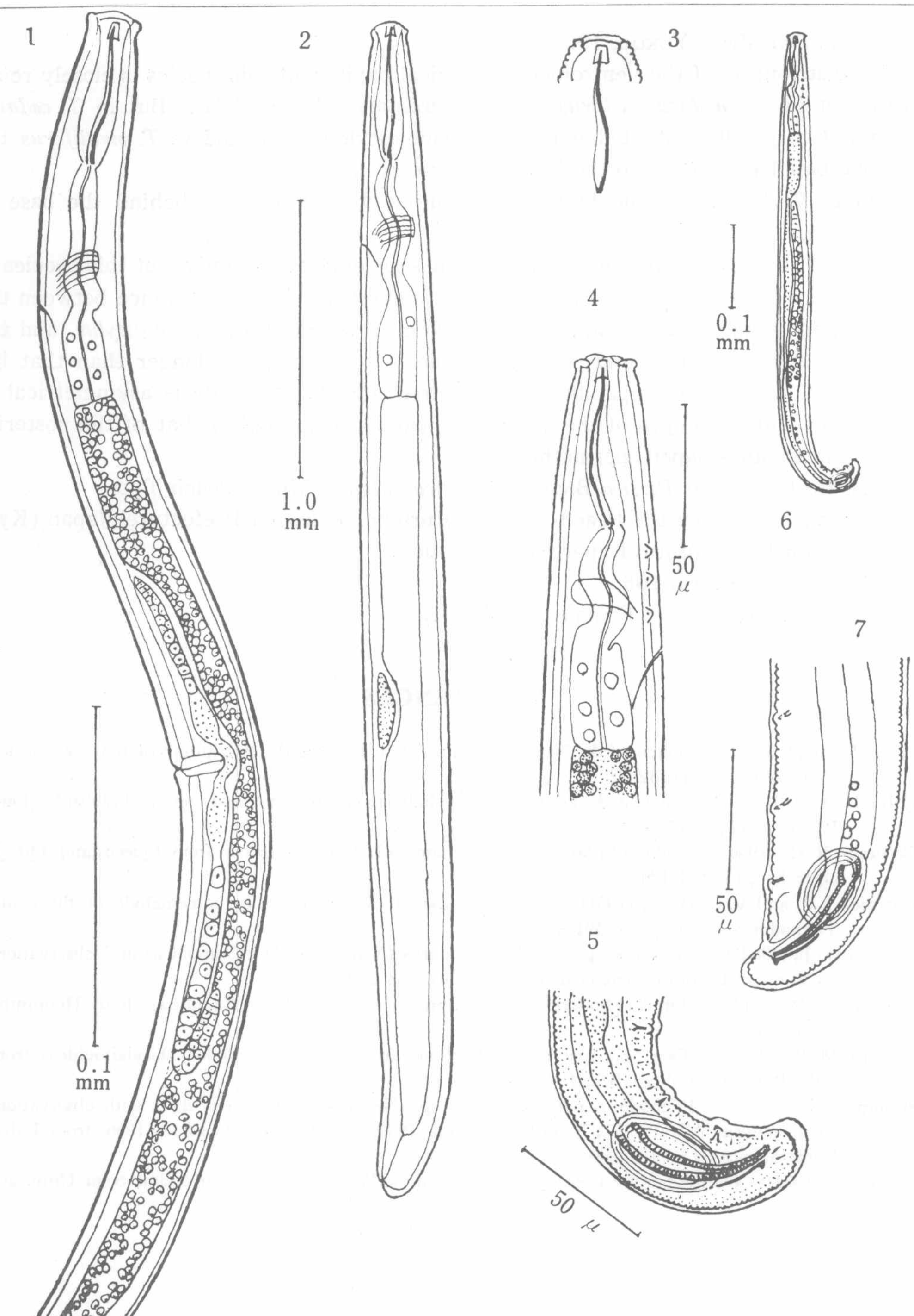

Fig. 1 Trichodorus kurumeensis YOKOO, 1966

1. Female
2. Larva
3. Onchiostyle and Anterior part of Body
4. Male: Anterior part of Body
5. Male: Posterior part fo Body
6. Male
7. Male: Spicula

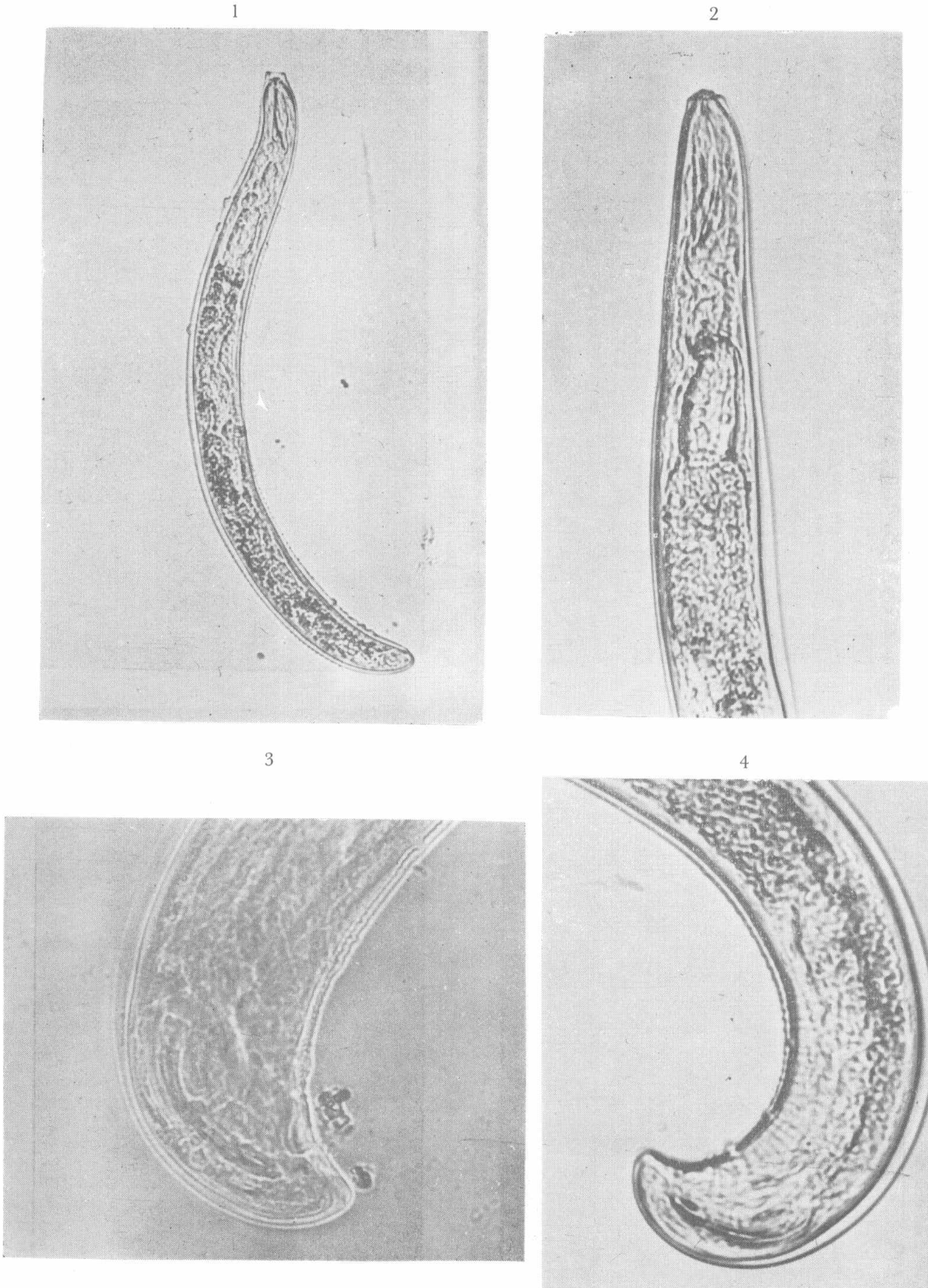

Fig. 2 Trichodorus Kurumeensis YOKOO, 1966

1. Female just before the moultiog
2. Male: anterior part of Body
3. Spicula and Tail of Male
4. Male: posterior part of Body

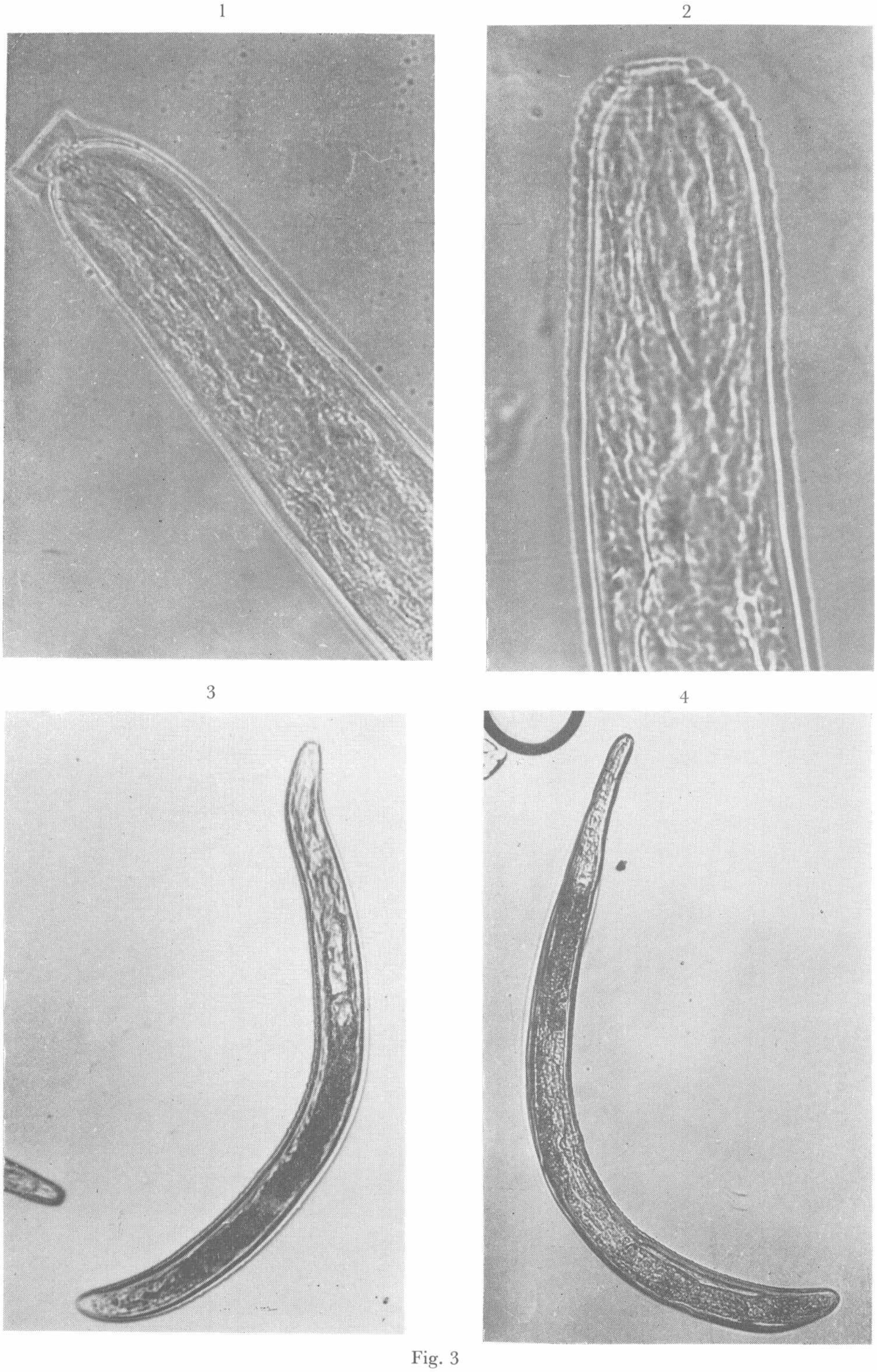

Fig. 3

1. Oesophagus of male in the moulting
2. Larva
3. Oesophagus of Female
4. Female

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On the Nematodes found from the Soils dug round the Roots of Azalea Nurseries for Sale: One Sample of the Porpagation of the more important plant parasitic Nematodes by the Salling of the Nurseries

by

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Introduction

There are many cases by which the more important plant parasitic nematodes were propagated from one place to another places, and the propagation by the salling of the nurseries and the soils dug round the roots of the nurseries for sale is one more important case of the propagation.

The southern district of the Fukuoka prefecture are noted for the famous producing region of the forest and horticultural nurseries in Kyushu, Japan. In Saga-City the marketing of the nurseries of the garden trees and horticultural nurseries are settled two times in a year, that is, in Spring and in Autumn when the festival of the patron deity is held.

The Azalea-nursery is one of the more important nursery for sale in these nursery producing region, and saled as "Kurume Tsutsuji" at the market in Saga-City. (Fig. 1)

But the growth of these Azalea nurseries planted is not so vigorously. Therefore we tried some experiments on the nematode fauna of the soils dug round the roots of these sold Azalea nurseries in Spring and Autumn in 1965–1966. The soils dug round the roots of Azalea nurseries were separated from the nurseries, and the nematodes in these soils were isolated by Baermann's method, and investigated by microscope.

Results

The results obtained in these two experiments were as follows:

I: Autumn–1965

The soils inspected in this experiment were originated from the following 8 breeding places:

	Breeding Places	Nursery-bed Conditions
1.	Kumano, Mii-Gun, Fukuoka Prefecture	Field
2.	Oonohara, Kinryu, Saga-City, Saga Prefecture	Field

3.	Raikoji, Kinryu, Saga-City, Saga Prefecture	Field
4.	Murooka, Yame-City, Fukuoka Prefecture	Field
5.	Ueki, Tanushimaru, Ukiha-Gun, Fukuoka Prefecture	Field
6.	Yoshimoto, Tanushimaru, Ukiha-Gun, Fukuoka Prefecture	Paddy Field
7.	Yoshimoto, Tanushimaru, Ukiha-Gun, Fukuoka Prefecture	Field
8.	Yamamoto, Kurume-City, Fukuoka Prefecture	Field

The nematodes detected from these soils were divided into the three groups:

(1) Plant parasitic nemas

(2) Saprophagous nemas

(3) Predaceous nemas

And each soil treated was 50 gr per one place.

Fig. 1 Azalea-Nursery for Sale

Considering from the abovementioned data (Table 4), the plant parasitic Nematodes amounted to about 55.2% (6.7–96.9%), the saprophagous Nematodes to about 33.6% (2.2–88.5%), and the predaceous Nematodes to about 11.2% (0–80.0%). And the lowest percentage of the plant parasitic Nematodes can be found in the case of the

Table 1 Plant parasitic Namatodes

Breeding places Species of Nemas		1	2	3	4	5	6	7	8
Tylenchus davainii		0	240	0	10	72	0	1	0
Ditylenchus sp.		0	0	0	0	6	0	0	0
Helicotylenchus erthrynae		0	0	0	0	0	1	0	0
Tylenchorhynchus claytoni		0	17	0	29	57	0	1	4
Nothotylenchus sp.		0	0	0	0	0	1	0	0
Telotylenchus sp.		0	0	0	0	2	0	0	0
Pratylenchus penetrans		0	40	0	35	8	0	0	1
Aphelenchus avenae		0	0	0	4	0	0	0	0
Aphelenchoides parietinus		0	259	7	11	27	0	0	1
Meloidogyne incognita acrita		17	0	0	3	0	0	0	0
Criconemoides sp.		0	0	0	0	1	0	0	0
Xiphinema americanum		1	0	0	0	0	0	0	0
Dolichodorus sp.		0	0	0	1	0	0	0	0
Trichodorus sp.		11	89	2	1	51	0	1	0
14 spp.		29	645	9	94	224	2	3	6
	%	42. 5	96. 9	69. 2	83. 9	80. 6	6. 7	11. 5	50. 0

Table 2 Saprophagous Nematodes

Breeding Places Species of Nemas		1	2	3	4	5	6	7	8
Rhabditis sp.		14	2	0	1	10	0	2	0
Cephalobus sp.		20	0	0	1	5	0	0	1
Eucephalobus sp.		0	3	0	1	30	0	1	2
Acrobeloides sp.		1	3	0	1	30	0	1	0
Cervidellus sp.		0	0	0	1	0	0	0	0
Dorylaimus sp.		4	2	3	1	0	0	0	0
Prismatolaimus sp.		0	2	0	5	1	0	15	0
Plectus sp.		0	0	1	0	0	0	2	0
Monhysterella sp.		0	0	0	0	0	1	0	0
Achromadora sp.		0	0	0	0	0	1	0	0
Diplogasterllus sp.		0	0	0	0	0	0	0	2
Alaimus sp.		0	1	0	0	0	0	0	0
Chronogaster sp.		0	2	0	0	0	2	0	0
Cylindrocarpus sp.		0	0	0	0	1	0	0	0
Odontolaimus sp.		0	0	0	0	0	0	0	1
Wilsonema sp.		0	0	0	1	0	0	0	0
16 spp.		39	15	4	18	54	4	23	5
	%	57. 5	2. 2	30. 8	16. 1	19. 4	13. 3	88. 5	41. 7

Table 3 Predaceous Nematodes

Breeding Places / Species of Nemas		1	2	3	4	5	6	7	8
Mononchus sp.		0	2	0	0	0	9	0	0
Miconchus sp.		0	4	0	0	0	0	0	0
Iotonchus sp.		0	0	0	0	0	4	0	1
Prionchus sp.		0	0	0	0	0	10	0	0
Mylonchulus sp.		0	0	0	0	0	1	0	0
5 spp.		0	6	0	0	0	24	0	1
	%	0	0.9	0	0	0	80.0	0	8.3

Table 4 Percentages of Ecological Groups to Total detected Nemas

Breeding Places		1	2	3	4	5	6	7	8	Mean
Nr. of Nemas per 50 gr Soil		68	666	13	112	278	30	26	12	151
Plant parasitic Nemas	%	42.5	96.9	69.2	83.9	80.6	6.7	11.5	50.0	55.2
Saprophagous Nemas		57.5	2.2	30.8	16.1	19.4	13.3	88.5	41.7	33.6
Predaceous Nemas		0	0.9	0	0	0	80.0	0	8.3	11.2

Breeding Place No. 6 at where the nurseries were cultivated at the paddy field soil conditions, amounting to only 6.7% of all detected nematodes. On the other hand, in the soil from No. 6, the highest percentage of the predaceous Nematodes was noted. In soil from No. 7 at where the nurseries were cultivated in the ordinary field soil of the same place as No. 6, the percentage of the saprophagous Nematodes was about 89.0% in contrast to about 12% of the plant parasitic Nematodes and 0% of the predaceous Nematodes. Excepting No. 6 and No. 7 from other places, the percentage of the plant parasitic Nematodes amounted to about 70%, the saprophagous Nematodes to about 28%, and the predaceous Nematodes to about only 2%.

The more important plant parasitic Nematodes detected from the soils dug round the roots of the Azalea-nurseries in Autumn were followings as shown in Table 1–3:

(1) *Tylenchorhynchus claytoni* STEINER, 1937 (Stunt Nematode)

(2) *Pratylenchus penetrans* (COBB, 1917) CHITWOOD & OTEIFA, 1952 (Root lesion Nematode)

(3) *Trichodorus sp.* (probably new species) (Stubby root Nematode)

(4) *Meloidogyne incognita acrita* CHITWOOD, 1949 (Cotton Root Knot Nematode)

(5) *Aphelenchoides parietinus* (BASTIAN, 1865) STEINER, 1932

II: Spring–1966

The soils inspected in this experiment were originated from the following 8 Breeding places:

	Breeding Places	Nursery-bed Conditions
1.	Oonohara, Kinryu, Saga-City, Saga Prefecture	Field
2.	Tanushimaru, Ukiha-Gun, Fukuoka Prefecture	Paddy Field
3.	Tanushimaru, Ukiha-Gun, Fukuoka Prefecture	Field

4. Ueharabaru, Chikugo-City, Fukuoka Prefecture .... Field
5. Jendoji, Mii-Gun, Fukuoka Prefecture .... Field (A)
6. Jendoji, Mii-Gun, Fukuoka Prefecture .... Field (B)
7. Yoshii-Machi, Ukiha-Gun, Fukuoka Prefecture .... Field

Table 5 Plant parasitic Nematodes

Breeding Places / Species of Nemas		1	2	3	4	5	6	7
Tylenchus davainii		6	185	12	32	7	10	6
Tetylenchus sp.		0	0	0	0	1	0	0
Ditylenchus sp.		0	0	0	0	0	2	3
Helicotylenchus erthrynae		3	0	8	0	0	0	0
Tyelnchorhynchus claytoni		30	0	40	4	9	1	6
Pratylenchus penetrans		4	0	0	0	3	0	4
Aphelenchus svenae		6	5	4	1	1	1	2
Aphelenchoides parietinus		33	57	6	0	9	3	1
Hirschmaniella oryzae		0	0	0	0	0	1	0
Trichodorus sp.		8	10	96	1	8	14	0
10 spp.		90	257	166	38	38	32	22
	%	41. 1	70. 0	16. 9	12. 9	39. 6	49. 3	37. 9

Table 6 Saprophagous Nematodes

Breeding Places / Species of Nemas		1	2	3	4	5	6	7
Rhabditis sp.		3	1	16	715	218	5	29
Rhabdolaimus sp.		3	7	0	1	0	0	0
Cephalobus sp.		26	22	6	68	21	2	16
Eucephalobus sp.		9	2	3	0	1	0	3
Acrobeloides sp.		0	0	2	6	0	1	0
Cervidellus sp.		0	0	0	1	0	0	0
Dorylaimus sp.		7	9	1	8	2	1	4
Prismatolaimus sp.		7	43	0	2	0	1	0
Plectus sp.		14	1	3	2	0	2	2
Monhystera sp.		6	2	1	0	2	0	3
Monhysterella sp.		0	0	0	0	2	0	0
Alaimus sp.		3	0	0	1	0	1	0
Chronogaster sp.		0	2	0	0	2	0	0
Diplogaster sp.		0	0	0	0	0	2	0
Wilsonema sp.		1	4	0	0	0	0	0
Thornia sp.		1	0	0	0	0	0	0
Microlaimus sp.		0	0	0	1	0	0	0
Achromadora sp.		0	0	0	1	0	0	0
18 spp.		80	93	32	806	248	15	57
	%	36. 5	25. 4	55. 2	82. 5	84. 7	23. 1	59. 4

Table 7 Predaceous Nematodes

Breeding Places / Species of Nemas		1	2	3	4	5	6	7
Mononchus sp.		17	0	2	1	5	8	1
Mylonchulus sp.		8	2	0	0	1	0	0
Miconchus sp.		1	0	1	1	0	6	0
Anatonchus sp.		0	0	0	0	0	1	0
Brachonchulus sp.		13	15	0	2	1	0	0
Sporonchus sp.		10	0	0	0	0	0	0
Iotonchus sp.		0	0	0	1	0	0	0
Tripyla sp.		0	0	1	0	0	3	0
8 spp.		49	17	4	5	7	18	1
	%	22.4	4.6	6.9	0.6	2.4	27.6	1.0

Table 8 Percentages of Ecological Groups to Total detected Nemas

Breeding Places		1	2	3	4	5	6	7	Mean
Nr. of Nemas per 50 gr Soil		219	367	58	977	293	65	96	296
Plant parasitic Nemas	%	41.1	70.0	37.9	16.9	12.9	49.3	39.6	38.2
Saprophagous Nemas		36.5	25.4	55.2	82.5	84.7	23.1	59.4	52.5
Predaceous Nemas		22.4	4.6	6.9	0.6	2.4	27.6	1.0	9.3

As shown in Table 8, the percentage of the plant parasitic nematodes detected from the soils dug round the roots of the Azalea-nursries amounted to about 38%, that of the saprophagous nematodes to about 52%, and that of the predaceous nematodes to about 10% of all detected nematodes respectively. And the nemic fauna of the soil originated from the nursery planted in the paddy field soil seemed to be different from that in another places, that is, the percentage of the plant parasitic nematodes was very large.

Discussing from the data as shown in Table 5, the more important plant parasitic nematodes detected from the soils dug round the roots of the Azalea-nurseries for sale were the following species:

(1) *Helicotylenchus erthrynae* (Cobb, 1893) Sher, 1961 (Spiral Nematode)
(2) *Tylenchorhynchus claytoni* Steiner, 1937 (Stunt Nematode)
(3) *Pratylenchus penetrans* (Cobb, 1917) Chitwood & Oteifa, 1952 (Root lesion Nematode)
(4) *Aphelenchus avenae* Bastian, 1865
(5) *Aphelenchoides parietinus* (Bastian, 1865) Steiner, 1932
(6) *Trichodorus* sp. (Stubby Root Nematode)

III: Discussion

(1) The plant parasitic Nematodes detected from the soils dug round the roots of the Azalea-nurseries for sale in these experiments were as follows:

As shown in Table 9, 16 species of the plant parasitic Nematodes were detected in these experiments, and considering from their detected number and parasitism

Table 9 Plant parasitic Nematodes

Species of Nematode	In Autumn (1965)	In Spring (1966)
Tylenchus davainii	∘ *	∘ *
Tetylenchus sp.	∘	∘
Ditylenchus sp.	∘	∘
Helicotylenchus erthrynae	∘	∘ ∘
Tylenchorhynchus claytoni	∘ ∘	∘ ∘
Nothotylenchus sp.	∘	–
Telotylenchus sp.	∘	–
Aphelenchus avenae	∘ *	∘ *
Aphelenchoides parietinus	∘ *	∘ *
Pratylenchus penetrans	∘ ∘	∘ ∘
Dolichodorus sp.	∘	–
Trichodorus sp.	∘ ∘	∘ ∘
Criconemoides sp.	∘	–
Xiphinema americanum	∘	–
Meloidogyne incognita acrita	∘	–
Hirschmaniella oryzae	–	∘
Total number of Species	15	10

∘ * . . . detected, in large numbers, but their parasitism seem to be so conspicuous according to the hitherto-reports.
∘ . . . detected, but in small number
∘ ∘ . . . the more important species
– . . . undetected species

to plant, the more important species were the following specics:
(1) *Tylenchorhynchus claytoni* (Stunt Nematode)
(2) *Pratylenchus penetrans* (Root lesion Nematode)
(3) *Trichodorus sp.* (Stubby Root Nematode) (n. sp. ?)

(2) The numbers of the species of the plant parasitic Nematodes were smaller in the soils dug round the roots in Spring for sale than that in Autumn. Considering from the fact that the important season for the reproduction of the soil nematodes is the Summer, this status of the difference in detected number of the nematodes between Autumn and Spring seems to be resonable.

On the other hand, the mean total number of the nematodes detected from the soils was larger in soils of Spring than that of Autumn (296: 151). But the percentage of the plant parasitic Nematodes was generally larger in Autumn than that in Spring reversely as shown in Table 10 (55.2 : 38.2%).

And the difference of the Nemic Fauna between the soil originated from the ordinary field and the soil from the Paddy Field seemed to be noteworthy. In Autumn the percentage of the plant parasitic Nematode was very small in contrast of that of the predaceous Nematode (No. 6 in Table 4). But in Spring this correlation was reversed (No. 2 in Table 8), as shown in Table 10.

(3) The predaceous Nematodes detected from soils in these experiments were as