A Rice Nematode Disease "Senchu Shingare Byo": III. Infection Course of the Present Disease

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https://doi.org/10.5109/22633

出版情報：九州大学大学院農学研究院紀要. 9 (4), pp.287-292, 1950-11. Kyushu University
バージョン：
権利関係：

Journal of the Faculty of Agriculture, Kyūshu University, Vol. 9, No. 4
November 30, 1950

A RICE NEMATODE DISEASE "SENCHÛ SHINGARE BYÔ"[1]

III. Infection Course of the Present Disease[2]

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SOIL INFECTION

It is verified by the preceding experiment (Yoshii, Yamamoto 1950), that the pathogenic nematode of the present disease hibernates mainly within the seed of rice or Italian millet, and sometimes on the straw or seed of some weeds when they are kept in dry state, and that the nematode could scarcely hibernate when these materials were scattered in field. No positive results were obtained from the experiments, carried out from 1944 to 1947, on the infection of the disease through soil. It was found in 1948, however, that 5 culms from ca. 2900 culms of rice were affected by the nematode and showed the white-tip symptom, in newly started rice plots, 5.2×1.8 m. in total size, which were filled with infested soil from the plot in which heavily affected Italian millet had grown in the previous year. It is considered from this fact that the present disease will infect through soil though very rare.

Fukano and Yokoyama (1948) reported that they found the present nematode within the stub of the affected rice-plant after harvest. From the results written above, it is certain that the infection through soil with the affected stub is not important though it may not be negligible.

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[1] Contribution from the Laboratory of Plant Pathology, Kyushu University.

[2] I. Symptom and pathogenic nematode. Jour. Facult. Agr., Kyushu Univ., Vol. **9**, No. 3, 1950. II. Hibernation of *Aphelenchoides oryzae*. Ibid. Vol. **9**, No. 3, 1950.

Infection in Seed Bed

a) Infection of the disease when healthy seed was sown in parallel with that diseased.

Four pots, 30 × 30 cm. in size, filled with disinfected soil were used for the seed bed. In each of three of them, healthy (Variety Aikoku)—and diseased (Variety Asahi) seed grains were sown side by side, bordered by a line, 3 cm. in width. The fourth was used for control and Aikoku was sown. After forty days from sowing, the variety Aikoku were picked up and transplanted in eight pots, 50 cm. in diam., as there were 36 seedlings per pot. At the time before the ear, the numbers of plants having the bleached-tip leaves were counted (Table 1). Data in Table 1 indicate the possibility of infection of the disease in seed bed when healthy seed was sown side by side with that affected.

Table 1. Infection of the disease in seed bed when healthy seed was sown in parallel with that affected.

Sort of seed	Plant with bleached-tips	Total plants examined	Per cent of plants with bleached-tips
Healthy+affected	13	36	36.1
ditto	15	37	40.5
ditto	24	35	68.6
ditto	8	35	22.9
ditto	0	34	0.0
ditto	11	33	33.0
Healthy only (Check)	0	35	0.0
ditto	0	40	0.0

b) Infection of the disease through irrigation water in seed bed.

Healthy (Variety Nôrin No. 18)—and diseased (Variety Asahi) seed were sown separately in 2 pots each, 50 cm. in diam. 100 cc. of irrigation water of each of two diseased pots was poured into each of two healthy pots every day since seven days past from sowing. After forty days from the beginning the seedlings of Nôrin No. 18 were picked up and transplanted in 2 plots, 90 × 60 cm. in size, as there were 60 seedlings per plot. For control, healthy seedlings (Nôrin No. 18) were planted separately.

The results summarized in Table 2 indicate the possibility of infection through irrigation water in seed bed though scanty in number of the plants that have the bleached-tip symptom.

Table 2. Infection of the disease in seed bed through irrigation water from the bed in which the diseased seed was sown.

Sort of seed bed	Plants with bleached-tips	Total plants examined	Per cent of plants with bleached-tips
Poured with water from diseased bed	3	60	6.7
ditto	4	62	4.9
Not poured into (Check)	0	100	0.0

c) Infection of the disease in seed bed with husks of the diseased grain.

Healthy seed (Variety Aikoku) was sown in four small pots, 18 cm. in diam., in which disinfected soil was filled. On each of three of the pots, the husks of the grain of the present disease were scattered after the pots were filled with water. On the fourth pot, the check, the boiled husks were scattered. After forty days from sowing, the seedlings from these pots were transplanted in 8 pots, 50 cm. in diam.; thus, in each pot ca. 36 seedlings were planted. The numbers of plants with bleached-tip symptoms were counted at the time before the ear. The data represented in Table 3 show that the present disease will infect

Table 3. Infection of the disease in seed bed when scattered with husks of the diseased grain.

	Plants with bleached-tips	Total plants examined	Per cent of plants with bleached-tips
Scattered with husks of diseased grain	5	31	16.1
ditto	3	29	10.3
ditto	16	30	53.3
ditto	8	30	26.7
ditto	14	36	38.9
ditto	20	47	42.6
Scattered with boiled husks (Check)	0	35	0.0
ditto	0	36	0.0

in seed bed, when scattered with husks of the diseased grain even though the disinfected seed was sown.

Infection After the Transplanting

a) Infection of the disease when healthy seedlings were planted with that affected.

Diseased (Variety Asahi)—and health (Variety Aikoku) seed grains were sown separately on two pots each, 18 cm. in diam., which were filled with disinfected soil. After forty days from sowing, they were picked up and transplanted in two plots each, 90 × 60 cm. in size, forming four rows of ten hills, each consisted of three seedlings, the one healthy and the other two diseased.

Table 4. Infection of the disease when healthy seedling was mixed planted on a hill with that affected.[a]

	Number of hill	—1st row— Healthy seedling	Diseased seedling	—2nd row— Healthy seedling	Diseased seedling	—3rd row— Healthy seedling	Diseased seedling	—4th row— Healthy seedling	Diseased seedling
1st plot	1	+[b]	+	−	−	+	−	−	−
	2	+	+	+	+	−	+	−	−
	3	−	−	−	−	+	+	−	+
	4	−	−	−	−	+	+	−	−
	5	+	−	+	−	−	−	+	+
	6	−	−	−	−	−	−	+	+
	7	−	−	−	−	−	−	+	+
	8	−	−	−	−	+	+	+	+
	9	−	+	−	−	−	−	−	−
	10	−	+	−	+	−	−	−	−
	Total	2	4	2	2	3	4	4	2
2nd plot	1	−	−	−	−	−	−	−	−
	2	−	−	−	−	−	−	−	−
	3	−	−	−	−	−	+	−	−
	4	−	−	−	−	−	−	−	−
	5	−	−	−	−	−	−	−	−
	6	−	−	−	−	+	−	−	−
	7	−	−	−	−	+	−	+	+
	8	−	−	−	−	+	+	−	+
	9	−	−	+	−	−	+	−	−
	10	−	−	−	+	−	+	−	−
	Total	0	0	1	2	3	4	2	2

a) Samples used were the same those of Table 1.
b) + indicates the presence of the bleached-tip symptom.

At the time before the ear, the numbers of plants of each variety having the bleached-tip symptoms were counted. The results thus obtained were given in Table 4, which indicates the distribution of the plants having the bleached-tips. The data in Table 4 show that the infection of the disease occurs when healthy seedling is planted on a hill mixed with that affected.

b) Infection of the disease from the neighbours that affected.

Diseased (Asahi)—and healthy (Nôrin No. 18) seed grains were sown separately on two pots each, 18 cm. in diam., which were filled with disinfected soil. After forty days they were picked up and planted in two plots, 90 × 60 cm. in size, forming alternate parallel rows of healthy and diseased seedlings. The results obtained by counting numbers of plants having bleached-tip symptoms were given in Table 5.

It is obvious from Table 5 that the infection of the disease occurs in rice field from the neighbours.

Table 5. Infection of the disease from the neighbours that affected.[a]

	Sort of seedlings	Plants with bleached-tips	Total plants tested	Per cent of plants with bleached-tips
1st plot	Diseased	6	12	50.0
	Healthy	2	13	15.4
	Diseased	3	11	27.3
	Healthy	1	13	7.7
	Diseased	2	12	16.7
	Healthy	3	13	23.1
	Diseased	4	13	30.8
	Healthy	2	12	16.7
	Diseased	1	12	8.3
	Healthy	3	13	23.1
2nd plot	Diseased	6	12	50.0
	Healthy	1	11	9.1
	Diseased	3	11	27.3
	Healthy	1	12	8.3
	Diseased	2	12	16.7
	Healthy	2	12	16.7
	Diseased	1	11	9.1
	Healthy	0	12	0.0
	Diseased	0	12	0.0
	Healthy	2	12	16.7

a) Samples used were the same those of Table 2.

Summary

The present disease is a seed-borne disease, and the possibility of soil infection is extremely rare.

Infection occurs in seed bed, by mixed sowing with the diseased seed, through irrigation water from the diseased seed bed, and by using husks of the diseased grain.

Infection occurs also after transplanting.

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