

# 台灣水稻菌核性病害之研究

## 1. 水稻疑似紋枯病及紋枯病樣病斑上分離 之幾種菌核病菌

游俊明

STUDIES ON SCLEROTIAL DISEASES OF RICE PLANT IN TAIWAN

I. Several sclerotial fungi isolated from sheath blight like  
and pseudo sheath blight lesions of rice plants.

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### 摘 要

在一般田間所採集之紋枯病樣病斑上，除了可以分離到紋枯病菌外，常可分離到其他幾種菌核病菌，即褐色紋枯病菌 (*Rhizoctonia solani* - cultural type III B)，赤色菌核病菌 (*Rhizoctonia oryzae*)，褐色菌核病菌 (*Sclerotium oryzae - sativae*) 和球狀菌核病菌 (*Sclerotium hydrophilum*) 等。在 368 個紋枯病樣之樣本中，有 274 個樣本可分離到紋枯病菌，約佔 74.2 %。而在 134 個疑似紋枯病之樣本中，只有 13 個樣本可分離到紋枯病菌，約佔 9.7 %，而其餘主要分離到的是赤色菌核病菌，褐色紋枯病菌和褐色菌核病菌。從同一塊田所取得之樣本，常可分離到二種以上之菌核病菌，而從同一稻株上所取得之樣本，亦常可分離到二種或二種以上之菌核病菌。偶而亦可發現紋枯病菌、褐色紋枯病菌和赤色菌核病菌三者可在同一稻株上分離到，因此在田間病徵之判別上亦較困難。本試驗發現赤色菌核病菌，褐色菌核病菌及褐色紋枯病菌三者均可在病斑之組織內形成短桿狀之菌核，前者之菌核為肉紅色，而後二者之菌核均為褐色至深褐色。

( 關鍵字：水稻疑似紋枯病 Pseudo sheath blight disease，紋枯病樣病斑 Sheath blight like lesion，菌核病 Sclerotial diseases )

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## ABSTRACT

Several sclerotial fungi other than sheath blight fungus were frequently isolated from sheath blight like lesions of leaf sheaths that collected from various localities in Taiwan. These sclerotial fungi were as follows: *Rhizoctonia solani*-cultural type III B (brown sheath blight disease), *Rhizoctonia oryzae* (bordered sheath spot disease), *Sclerotium oryzae-sativae* (brown sclerotial disease) and *Sclerotium hydrophilum* (globular sclerotial disease). 273 out of 368 samples of sheath blight like lesions were isolated to be sheath blight disease, taking 74.2 percent of the total samples, while 13 out of 134 samples of pseudo sheath blight lesions were isolated to be sheath blight disease, taking 9.7 percent of the total samples. Two or more sclerotial fungi could be isolated from diseased leaf sheaths that collected from same field or same hill. Brown sheath blight disease, bordered sheath spot disease and brown sclerotial disease were frequently found in the southern part of Taiwan, and occasionally they could be found even in the same hill. Sclerotial bodies of *Rhizoctonia oryzae*, *Rhizoctonia solani*-cultural type III B and *Sclerotium oryzae-sativae* were observed in the tissue of diseased lesions. Sclerotia of *Rhizoctonia oryzae* were in salmon pink, while sclerotia of the other two fungi were in brown to dark brown. (Key words: Pseudo sheath blight disease, Sheath blight like lesions, Sclerotial disease)

## INTRODUCTION

It was reported in Japan that several sclerotial fungi other than sheath blight fungus, *Pellicularia sasaki*, were frequently isolated from sheath blight like lesions of rice plants. These sclerotial fungi were as follows: *Rhizoctonia oryzae* (bordered sheath spot disease), *Rhizoctonia solani* cultural type III B (brown sheath blight disease), *Sclerotium oryzae-sativae* (brown sclerotial disease), *Sclerotium fumigatum* (grey sclerotial disease) and *Sclerotium hydrophilum* (globular sclertial disease). The average isolation rates of sheath blight fungus and other sclerotial fungi from the sheath blight like lesions collected from different areas in Japan were 69.2 - 82.6 and 13.2 - 30.8 percent respectively (4.5.6). Since the symptom of sheath blight disease, bordered sheath spot disease and brown sclerotial disease were very similar to that of sheath blight disease (9.10.11.12.14.15.16), that it is very difficult to distinguish these diseases from sheath blight disease in the rice field.

In Taiwan, it was not until 1982 that brown sheath blight disease was first discovered in the rice field of Taichung area by the author (16). However, the frequency and distribution of brown sheath blight disease and other sclerotial diseases have not yet been studied. Since sheath blight disease is one of the most important diseases of rice in Taiwan (1), that the occurrence and some properties of the sclerotial fungi which caused sheath blight like lesions were described in this report.

## MATERIALS AND METHODS

Rice leaf sheaths with sheath blight like lesions were collected from different areas in Taiwan from 2nd crop of 1982 to 2nd crop of 1983. Sclerotial fungi isolated from the lesions were cultured on PDA media for identification and further studies. Rice plants, Tainung 67, grown in pots in the greenhouse were prepared continuously for inoculation tests. Inoculations were made by placing the straw inocula in the rice hills of maximum tillering stage. The sclerotial diseases were identified based on the isolation and inoculation tests, symptom of the diseases, cultural types and anastomosis groups of the causal fungi. Each lesions of the leaf sheaths, that collected from the rice field of different areas, were examined carefully to make sure whether or not the sclerotial bodies were formed on the leaf sheaths.

## RESULTS

1. Frequency of sclerotial fungi isolated from sheath blight like and pseudo sheath blight lesions that collected from various localities. The results of the studies showed that among 368 samples of sheath blight like lesions 273 were isolated to be sheath blight disease, taking 74.2 percent of the total samples. While in 134 samples of pseudo sheath blight lesions 13 were isolated to be sheath blight disease, taking 9.7 percent of the total samples (Table 1).

Table 1. Frequence of sclerotial fungi isolated from sheath blight like and pseudo sheath blight lesions that collected from various localities.

Sclerotial fungi	No. of isolate	
	From Sheath blight like	From Pseudo sheath blight
<i>Rhizoctonia solani</i> I A	273 (74.2 <sup>a</sup> )	13 ( 9.7)
<i>Rhizoctonia solani</i> III B	3 ( 0.8 )	37 (27.6)
<i>Rhizoctonia oryzae</i>	36 ( 9.8 )	45 (33.6)
<i>Sclerotium oryzae - sativae</i>	50 (13.6 )	42 (31.3)
<i>Sclerotium hydrophilum</i>	33 ( 9.0 )	6 ( 4.5)
Total of samples	368 <sup>b</sup>	134 <sup>b</sup>

a Values in parenthesis are percentage of the total number of sample.

b Two or more sclerotial fungi could be isolated from one sample.

2. Distribution of sclerotial fungi which caused pseudo sheath blight disease. The results of the studies showed that the sclerotial fungi which caused pseudo sheath blight disease were mainly found in the southern part of Taiwan, especially for *Rhizoctonia solani* III B. However, *Rhizoctonia oryzae* and *sclerotium oryzae - sativae* could also be easily found at other localities (Table 2).

Table 2. Distribution of sclerotial fungi which caused pseudo sheath blight disease.

Locality	No. of sample	<i>Rhizoctonia</i>		<i>Sclerotium</i>
		<i>solani</i> III B	<i>oryzae</i>	<i>oryzae - sativae</i>
Kaoshiung area	97	35	27	21
Chianan area	89	2	22	24
Taichung area	116	2	6	2
Hsinchu area	103	0	5	26
Lanyang area	65	0	12	22
Taitung area	21	1	4	2

3. Sclerotial fungi isolated from the diseased leaf sheaths that collected from same field. The results indicated that several sclerotial fungi, including sheath blight fungus, could be isolated from diseased leaf sheaths that collected from the same field. Although as many as 4 sclerotial fungi could be found in one field, however, 2-3 sclerotial fungi in one field was more common (Table 3).

Table 3. Sclerotial fungi isolated from diseased leaf sheaths that collected from same field.

No. of field	<i>Rhizoctonia solani</i> I A	<i>Rhizoctonia solani</i> III B	<i>Rhizoctonia oryzae</i>	<i>Sclerotium oryzae - sativae</i>	<i>Sclerotium hydrophilum</i>
1	+	+		+	+
1	+		+		
2	+	+		+	
2	+		+	+	+
3	+	+			
5	+			+	+
6	+	+	+		
7	+		+	+	
7	+		+		+
19	+			+	

"+" Means fungus isolated

4. Sclerotial fungi isolated from diseased leaf sheaths that collected from the same hill. The results indicated that several sclerotial fungi could be isolated in the same hill. Two sclerotial fungi in one hill was very common, while, in some cases, 3 to 4 sclerotial fungi could be isolated in one hill (Table 4).

Table 4. Sclerotial fungi isolated from diseased leaf sheaths that collected from the same hill.

No. of hill	<i>Rhizoctonia solani</i> I A	<i>Rhizoctonia solani</i> III B	<i>Rhizoctonia oryzae</i>	<i>Sclerotium oryzae - sativae</i>	<i>Sclerotium hydrophilum</i>
1	+		+	+	+
1	+		+	+	
1	+			+	+
1	+	+		+	
2	+				+
3		+	+		
3			+	+	
4	+		+		
4				+	+
18	+			+	

"+" Means fungus isolated.

5. Rate of sclerotia formation in diseased leaf sheaths that collected from the rice field and some characteristics of these sclerotia. Sclerotia of *Rhizoctonia solani* III B, *Rhizoctonia oryzae* and *Sclerotium oryzae - sativae* could be found in the tissue of the diseased leaf sheaths, and the rate of their sclerotia formation were 57.9, 5.8 and 53.7 percent respectively (Table 5, 6). Other characteristics of the sclerotia were listed in Table 6.

Table 5. Rate of sclerotia formation in diseased leaf sheaths that collected from the rice field.

Disease *	No of sample investigated	No. of sample formed sclerotia	Rate of sclerotia formation (%)
Brown sheath blight	38	22	57.9
Brown sclerotial	67	36	53.7
Bordered sheath spot	68	4	5.8

\* 1. Sheath blight disease was not investigated because most of the sclerotia have dropped to soil surface during sampling.

2. Sclerotia of other diseases were not found.

Table 6. Characteristics of sclerotia bodies of some sclerotial diseases.

Disease	Site of sclerotia formed	Color of sclerotia	Size of sclerotia
Brown sheath blight	In the tissue of leaf sheaths	Brown to dark brown	0.4 x 1.8mm
Brown sclerotial	In the tissue of leaf sheaths	Brown to dark brown	0.4 x 1.1mm
Bordered sheath spot	In the tissue of leaf sheaths	Salmon pink	0.5 x 1.2mm

## DISCUSSION

The results of the studies corroborated Nonaka's reports<sup>(5,6)</sup> that several sclerotial fungi other than sheath blight fungus, *Pellicularia sasaki*, could also be isolated from sheath blight like lesions that collected from various localities in Taiwan. The average isolation rates of sheath blight fungus and other sclerotial fungi from sheath blight like lesions were 74.2 and 33.8 percent respectively, while that from pseudo sheath blight lesions were 9.7 and 97.0 percent respectively (Table 1.) The results also agreed with Nonakas' finding<sup>(8)</sup> that several sclerotial fungi could be isolated from sheath blight like lesions that collected from same field or same hill (Table 3, 4). Although the inoculation tests showed that these sclerotial fungi could cause individual diseases, however, in many cases, the symptoms of these diseases were very similar to that of sheath blight disease. Therefore, it is rather difficult to distinguish these sclerotial diseases from sheath blight disease in the rice field, particularly when sheath blight, brown sheath blight and bordered sheath spot diseases occurred in the same hill (Table 4).

Since brown sheath blight disease and bordered sheath spot disease could easily be found in the southern part of Taiwan as shown in Table 2, and brown sheath blight disease was reported to be more tolerant to arsenic compound than sheath blight disease<sup>(3,12)</sup>, while bordered sheath spot disease was reported to be very pathogenic<sup>(2,7)</sup>, therefore the importance of these sclerotial diseases should not be neglected. Tu and Chang also claimed that rice diseases caused by anastomosis groups of *Rhizoctonia solani* other than sheath blight fungus, AG - 1, should be notified<sup>(13)</sup>. More detail studies on the ecology and etiology of these diseases should be carried out before the diseases spread out.

## LITERATURE CITED

1. Annual Report of Plant Protection. 1965-1981. Taiwan Provincial Department of Agriculture and Forestry. (in Chinese)
2. Chen, C. C., C. C. Chien and T. F. Hwang 1961. Studies on the sclerotial diseases of rice plant in Taiwan. I. Relation of fertilization and rice varieties to an outbreak of the sclerotia diseases. Agricultural Research 10 (2): 40 - 47. (in Chinese, Engl. summ.)
3. Nonaka, F. 1964. Study on the sheath blight like pathogen, *Corticium* sp., isolated from rice plant. Ann. Phytopath. Soc. Japan 29: 90 - 91. (in Japanese)

4. Nonaka, F. 1977. Causal fungi for lesion formation of various types on sheath of rice plant. Proc. Assoc. Pl. Prot. Kyushu 23: 15 - 17. (in Japanese)
5. Nonaka, F., K. Tanaka and A. Sakata 1979. On the several sclerotial fungi isolated from the sheath blight like lesions of rice plant in Japan. Proc. Assoc. Pl. Prot. Kyushu 25: 3 - 5. (in Japanese)
6. Nonaka, F., M. Yoshida and K. Tanaka 1980. Several sclerotial fungi isolated from sheath blight like lesions and their properties. Proc. Assoc. Pl. Prot. Kyushu 26: 23 - 26. (in Japanese)
7. Nonaka, F., M. Yoshida., C. M. Yu and K. Tanaka 1982. Pathogenicity of sclerotial fungi of rice plants. Proc. Assoc. Pl. Prot. Kyushu 28: 15 - 18. (in Japanese)
8. Nonaka, F., M. Yoshida., C. M. Yu and K. Tanaka 1982. Seasonal development of sclerotial diseases of rice plants in paddy fields. Proc. Assoc. Pl. Prot. Kyushu 28: 18 - 21. (in Japanese)
9. Oniki, M. 1976. Studies on the outbreak and chemical control of rush stem rot. Bulletin of Fukuoka Agricultural Experiment Station. No 23: 1 - 57.
10. Oniki, M. 1979. Rice diseases caused by *Rhizoctonia* spp. Plant Protection 33(9): 373 -379. (in Japanese)
11. Ou, S. H. 1972. Rice Diseases. Commonw. Mycol. Inst., Kew, Surrey, England, P. 268 -272.
12. Taketani, K. and M. Tamura 1970. The occurrence of sheath blight like lesions of rice plant in Ishikawa Prefecture. Proc. Assoc. Pl. Prot. Hokuriku 18: 13 - 16. (in Japanese)
13. Tu, C. C. and Y. C. Chang 1978. Anastomosis groups of *Rhizoctonia solani* kuhn and their pathogenicity on rice. P. 263 - 285. In Diseases and Insect Pests of Rice: Ecology and Epidemiology. J. C. R. R. (in Chinese, Eng1, summ.)
14. Watanabe, B., M. Oniki, and F. Nonaka 1977. Brown sheath blight of rice. Proc. Assoc. Pl. Prot. Kyuahu 23: 22 - 25 (in Japanese)
15. Yoshida, M. 1982. Studies on sclerotial diseases of rice plants. Master thesis of Plant Pathology Laboratory Saga university, Japan.
16. Yu, C. M. 1983. Brown sheath blight disease of rice - A new disease of rice in Taiwan. Plant Prot. Bull. (Taiwan, R. O. C. ) 25: 53 - 56.