A New Race of *Cercospora soja* in Hokkaido

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The frog-eye spot disease of soybean caused by *Cercospora soja* Hara has long been known in Hokkaido, Japan. However, few studies have been made on this disease until recently because its occurrence has been negligible and caused little damage to soybean. This disease occurred severely on a soybean variety, Suzuhime in Tokachi district in 1990. The formation of frog-eye-like spots on the leaves is characteristic of this disease. The brown spots appear on the stems and pods at a later stage of growth, resulting in the formation of black seeds of low quality. On the other hand, the occurrence of this disease was first reported in the U.S.A., 1924¹⁾. Since then this disease had prevailed in Midwest region till the end of the 1940's. However, it has recently become less severe due to the use of resistant variety. The five races are known to be involved in this disease in the U.S.A.^{1,2,4)} However, little is known about the races of this disease found in Hokkaido and the varietal difference of soybean to this disease.

The identification of race was carried out by the method of Phillips and Boerma²⁾. The pathogens were isolated from a single spore on the infected seeds of Suzuhime grown in the same field in Ashoro, Hokkaido. Five isolates (SCS9001~SCS9004 by Dr. Tani, and H8 by Dr. Kodama) were used for this experiment. Ten soybean varieties (standard varieties for this test in the U.S.A.) were used for this experiment. *C. soja* was cultured on potato-dextrose agar for 3-4 weeks on which sterilized water was poured, followed by rubbing softly the surface to make spore suspension. After filtration through two layers of gauze, the concentration of spores was adjusted to 6×10^4 cells/ml. A soybean plant at the stage of 2-3 compound leaves grown in a greenhouse was sprayed with 2.5 ml of spore suspension. The plants were placed at 25°C for 72 hr under 100% humidity and then transferred to a greenhouse. The reaction of the varieties was examined in terms of the number of spots formed on the leaves 2 weeks after spraying with the spore suspension.

The varieties forming no spots or a small number of tiny brown spots were regarded as resistant, while those forming large spots of 2-3 mm as susceptible (Table 1). Table 2 shows the comparison of the races between the U.S.A. and Japan. Soybean varieties, Lee and Hill were resistant, while the other varieties were susceptible to all five isolates in Hokkaido. Besides, these five isolates were the same in terms of the symptoms on the varieties tested. Accordingly, all the isolates tested were concluded to belong to the same race. Our race did not correspond to any of the races reported in the U.S.A. (Table 2). This suggests that our race is a new one. Therefore, this new race was designated as race H.

The reaction of 70 varieties of practical use to these five isolates was examined. The experimental procedures were the same as mentioned above. Figure 1 shows the reaction of soybean varieties to these

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Table 1. Relative number of spots on soybean varieties and reaction to the isolates in Hokkaido

Soybean variety	Isolate									
	SCS9001		SCS9002		SCS9003		SCS9004		H8	
	a)	b)	a)	b)	a)	b)	a)	b)	a)	b)
Hood	40.0	S	28.8	S	15.2	S	65.2	S	31.6	S
Roanoke	95.7	S	55.0	S	136.6	S	59.0	S	16.6	S
Lee	1.0	R	0.5	R	0.3	R	0.0	R	0.2	R
Hill	0.0	R	0.0	R	0.0	R	0.0	R	0.0	R
Blackhawk	123.3	S	39.2	S	20.6	S	35.2	S	15.8	S
Kanrich	67.7	S	20.7	S	52.8	S	35.0	S	16.0	S
Davis	65.5	S	49.8	S	72.2	S	13.5	S	15.5	S
Bragg	77.5	S	39.0	S	5.0	S	89.3	S	16.7	S
Lincoln	93.3	S	24.0	S	12.2	S	32.2	S	19.4	S
Kent	72.5	S	11.0	S	40.0	S	49.3	S	30.8	S
Suzuhime	25.4	S	7.5	S	8.3	S	20.5	S	9.2	S

a) Average number of spots/plant.

b) Reaction of variety, S : susceptible, R : resistant.

Table 2. Reaction^{a)} of differential soybean varieties to the races of *Cercospora sojina*

Soybean variety	A new race (race H) in Hokkaido	Race in U.S.A. ^{b)}				
		1	2	3	4	5
Hood	S	R	R	R	S	S
Roanoke	S	R	R	R	S	S
Lee	R	R	R	S	S	R
Hill	R	R	R	S	S	R
Blackhawk	S	S	S	S	S	S
Kanrich	S	R	R	R	R	R
Davis	S	R	R	R	R	R
Bragg	S	R	R	R-S	—	S
Lincoln	S	R	S	R	—	R
Kent	S	R	R-S	R	—	R

a) S : susceptible, R : resistant, — : not tested.

b) Reported by Athow *et al.*¹⁾, Ross⁴⁾, and Phillips and Boerma²⁾.

isolates. The number of spots was expressed as the average of those formed by the five isolates, respectively. Great differences in the reaction were found among soybean varieties. Large and fused spots were generally observed on the leaves of the varieties which formed the great number of spots. Hon-iku 65 and Shirosengoku formed innumerable spots but their spots were tiny in size. Therefore these two varieties were regarded as resistant. Suzuhime was the most susceptible among the varieties tested. Koganejiri and PI.84751, parents of Suzuhime⁵⁾, also formed large frog-eye-like spots. Accordingly the present result supports that this disease occurred severely on Suzuhime in 1990. The varieties such as Chashouryu, Yuhime and Kariyutaka which do not form any spots will be of use for breeding of resistant varieties.

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Fig. 1. Average number of spots on soybean varieties to 5 isolates (SCS9001, SCS9002, SCS9003, SCS9004, H8)

Variety

1 Chashouryu	25 Horoizumidaizu	49 Shiratsurunoko
2 Yuhime	26 Karafuto 1	50 Hourai
3 Kariyutaka	27 Oyachi 2	51 Himeyutaka
4 Nagahadaka 1	28 Isuzu	52 Tsurukogane
5 Ishikarishiro 1	29 Kitamusume	53 Asamidori
6 Otofuke-ousode	30 Bansei-hikarikuro	54 Oshima-shirome
7 Okuhara 1	31 Marukotsubu	55 Kitakomachi
8 Miharudaizu	32 Shinsei	56 Wase-tsurunoko
9 Shizunaidaizu	33 Chusei-hikarikuro	57 Toyokomachi
10 Chuseihadaka	34 Suzunari	58 Toyosuzu
11 Tokachihadaka	35 Nagahajiro	59 Tsurunoko (Kariwano)
12 Rankoshi 1	36 Nukanaidaizu	60 Fukunagaha
13 Wasemidori	37 Tenpoku-shirome	61 Suzumaru
14 Shirobana-dairyuhadaka	38 Wasekogane	62 Kitahomare
15 Gokuwase-chisima	39 Yoshioka-tairyu	63 Komamusume
16 Tokachinagaha	40 Toyomusume	64 Shirokotsubu
17 Wasehadaka	41 Rankoshi	65 Yuuzuru
18 Hokkaihadaka	42 Karikachi	66 Koganejiro
19 Tokachishiro	43 Shimoshirazu 1	67 Suzuhime
20 Kitaminagaha	44 Tokachikuro	68 PI.84751
21 Karafuto (Toyohara)	45 Kanro	69 Hon-iku 65
22 Hosoba 1	46 Tenpokuwase	70 Shirosengoku
23 Sakamoto-wase	47 Honkurakake	
24 Kitamishiro	48 Tsurunoko (Odate)	

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和 文 摘 要

白井佳代・堀田治邦・田中文夫・谷井昭夫・美濃羊輔：北海道におけるダイズ斑点病菌, *Cercospora sojina* の新レース

1990年に北海道十勝地方で、ダイズ斑点病が、品種スズヒメに特異的に多発生した。そこで、この罹病スズヒメ種子より5菌株を分離し、レース判別試験を行った。試験は、Phillips & Boerma (1981)の方法に準じた。その結果、5菌株はすべて同一レースであり、これは、米国で報告されている既知の5レースとは異なる新レースであると考えられた。したがって、本レースをレース H と命名した。また、北海道の実用品種において、同様に接種試験を行ったところ、葉の病斑数には品種間差がみられた。スズヒメは本病に対する感受性が最も高い品種のひとつであった。また、ユウヒメ、茶小粒、カリユタカなどは、まったく発病せず、抵抗性品種と考えられた。

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