DEPLOYMENT OF RESISTANT VARIETIES TO BLAST (*Pyricularia grisea*) IN THE MEKONG DELTA

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ABSTRACT

Rice blast isolates were collected from Ben Tre, Tien Giang, Tra Vinh and Minh Hai provinces of Mekong Delta in 1996 which were identified into 4 pathogenic races such as 002.4 (Ben Tre), 106.4 (Tien Giang), 002 (Tra Vinh) and 102.4 (Minh Hai) using Japanese defferential varieties. The highest virulence was recognized in race 106.4, it attacked four differential varieties Aichi Asahi (Pi-a), Ishikari shiroke (Pi-l), Yashiromochi (Pi-ta), and K59 (Pi-t). While race 002 attacked only one differential variety Aichi asahi (Pi-a). These pathogenic races were used to test the resistance of 51 promising rice varieties, which are popular in Mekong Delta. The race 106.4 (Tien Giang) attacked 41.2 % of rice varieties tested. Similarly, races 002.4 (Ben Tre) and 102.4 (Minh Hai) attacked about 35.3 and 33.3 % of rice varieties, respectively, while race 002 (Tra Vinh) attacked only 2 varieties. From the artificial inoculation test, resistance of varieties to specific races can be further deployed for sustainable blast management in Mekong Delta.

Key words: rice, blast, resistance, isolates, fungus

INTRODUCTION

Rice leaf blast disease caused by *Pyricularia grisea* (Rossman et al 1990) is a very serious disease in Mekong Delta (MD) (Noda et al. 1998), especially in dry season. At present, more than 60 % of varieties grown in the delta are susceptible to the disease (Du and Paul Teng 1988). In the last 15 years, rice cultivars of very short duration and high yielding were not stable against blast due to quick adoption of fungus to varieties released. In 1998, an attemp to identify race distribution of blast fungus of 112 monoconidial isolates collected in MD, and 11 pathogenic races had been found (Noda et al. 1998), using 12 Japanese differential rice varieties (Kiyosawa 1984) for differentiating the isolates. It is not a diversity of blast fungus but virulence of races might be considered. To test reaction of promising varieties to some pathogenic races at particular locations where resistant varieties can be deployed against incompatible isolates of blast disease.

MATERIALS AND METHODS

Isolation and identification of the causal fungus

The experiment was conducted in greenhouse condition at Japan International Research Center for Agricultural Science (JIRCAS) of Japan.

A set of 51 promising rice varieties and blast disease samples collected in MD, were used in this experiment. Rice

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leaves infected by leaf blast disease were collected from 4 provinces Ben Tre, Tien Giang Tra Vinh and Minh Hai provinces. Disease leaf samples were used for isolation of the causal pathogen. Through this experiment, monoconidial isolation method was made. For long term preservation, fungal material was grown and kept on dry filter paper in tube.

Inoculation preparation

The fungus was grown on Oatmeal Agar medium at 26^0C for 11 days, Thereafter, aerial mycelia were slightly washed off by gentle rubbing with a water soaked paintbrush. The colonies were exposed under the fluorescent light at 26^0C for 3 days to induce sporulation. The spore suspensions were prepared with sterile distilled water in which Tween 20 surfactant at 0.01 % concentration had been added. The conidial suspensions were filtered through 3 layers of gauze mesh and adjusted to a concentration of 1 - 5 x 10^5 spores/ml. These suspensions were used as inoculums.

Inoculation

The rice seedlings were prepared in seedling box in an isolation greenhouse. Inoculation was performed at 20 days after sowing, by the spraying of 30 ml of spore suspension of blast fungus. Thereafter, the inoculated plants were immediately placed in a dew chamber at 26^0C for 24 hours, and then transferred into greenhouse. Disease assessment was taken at 7 days after inoculation based on the reaction of the differential cultivars and promising rice varieties.

RESULTS AND DISCUSSION

Gene symbols of resistance of differentials and its reaction to isolates were presented in Table 1. Reactions of differential varieties to the isolates of *Pyricularia grisea* from four Provinces in Mekong Delta were identified as 4 pathogenic races. Race 002.4, 106.4, 002 and 102.4 were collected from Ben Tre, Tien Giang, Tra Vinh and Minh Hai respectively. The race 002.4 could attack two differential varieties Aichi Ashahi (*Pi-a)* and K59 (*Pi-t)*. Race 106.4 collected from Tien Giang was the highest virulence and four differential varieties were susceptible to this race. another high virulent race 102.4 was collected from Minh Hai province. This race attacked three differential varieties such as Aichi Ashahi (*Pi-a)*, Yashiromochi (*Pi-ta),* and K59 (*Pi-t).* While, race 002 collected from Tra Vinh attacked only one differential variety Aichi Ashahi (*Pi-a)* (Table 1).

Table 1. Reaction of differential varieties to the blast fungus collected from four different province of Mekong Delta,Vietnam

No.	Designation	Resistant gene	Source of blast isolates			
			Ben Tre	Tien Giang	Tra Vinh	Minh Hai
1	Shin 2	*Pi-R^s*	HR*	HR	R	HR
2	Aichi asahi	*Pi-a*	S	MS	MS	S
3	Ishikari Shiroke	*Pi-l*	HR	MS	R	HR
4	Kusabue	*Pi-R*	HR	HR	HR	R
5	Tsuyuake	*Pi-R^m*	HR	HR	HR	HR
6	FukunishiRi	*Pi-z*	HR	HR	R	HR
7	Yashiromochi	*Pi-ta*	HR	S	R	S
8	PiNo 4	*Pi-ta^2*	HR	HR	R	HR
9	Toride 1	*Pi-z^t*	HR	HR	R	R
10	K 60	*Pi-R^p*	HR	HR	HR	HR
11	Bl 1	*Pi-b*	HR	HR	R	HR
12	K 59	*Pi-t*	MS	S	HR	MS
Isolate Code			00 2.4	106.4	00 2	102.4

** HR = High resistance*
R = Resistance
MR = Moderate resistance
MS = Moderate susceptible
S = Susceptible

Four particular races, which were generally found in four different provinces were used to test the reaction of promising rice varieties grown in MD. Results indicated that 16 varieties accounting for 32.2% of tested varieties were ranked from moderate resistance to high resistance to all four races.

Fourteen varieties were found to be resistant to three races. There were only three varieties, which were susceptible to three races, and none was susceptible to all four races (Table 2). The reactions of promising rice varieties to the races were presented in Table 3. Race 106.4 could attack to 41 % of tested varieties, while race 002 could only attack two varieties (3.9 %). 33.3 to 35.3 % of rice tested varieties, were noticed to be susceptible to races 102.4 and 002.4.

Table 2. The reaction of promising rice varieties blast to races (*Pyricularia grisea)*

No.	Designation	Pathogenic race			
		00 2.4	**106.4**	**00 2**	**102.4**
1	OMCS 94	HR	HR	HR	HR
2	OM 1570	HR	HR	HR	HR
3	OM 1742-26	HR	HR	HR	HR
4	IR 64	HR	HR	R	HR
5	OM 1490	HR	HR	R	HR
6	OM 1647-8	HR	MR	HR	HR
7	OM 1643	MR	HR	HR	HR
8	OM 1960	MR	HR	HR	HR
9	OM 1726	MR	HR	HR	HR
10	OM 1305	MR	HR	HR	HR
11	MTL 149	R	HR	R	HR
12	OM 1633	HR	MR	HR	MR
13	MTL 152	MR	MR	HR	HR
14	MTL 147	HR	MR	R	MR
15	OMCS 97	MR	MR	HR	MR
16	IR 70140	MR	MR	R	MR
17	OM 1881	MS	MR	MR	R
18	OMCS 96	S	HR	HR	HR
19	OMCS 95-3	S	HR	HR	HR
20	OM 1882	S	HR	HR	HR
21	AS 1007	MS	HR	HR	HR
22	IR 62030	MS	HR	HR	HR
23	ML 62	HR	MS	HR	MR
24	MTL 150	HR	MR	HR	MS
25	MTL 151	MR	HR	HR	MS
26	OM 1033	S	HR	R	HR
27	OM 1890-1	S	HR	HR	HR
28	OM 1630	HR	S	HR	MR
29	VSD 95-20	S	HR	HR	R
30	IR 2014	S	MR	R	HR
31	IR 65623	HR	MS	HR	MS
32	OM 1308	MS	HR	MS	HR
33	IR 50404	HR	MS	R	MS
34	OM 1576	MR	MS	HR	MS
35	OMCS 97-25	S	MS	MR	MR
36	DS 96	MR	MR	MS	HR
37	OM1723-62	S	MS	HR	MR

Table 2. (continued)

No.	Designation	Pathogenic race			
		00 2.4	**106.4**	**00 2**	**102.4**
38	OM 1995	MS	MS	R	MR
39	OM 1271	MR	S	R	MS
40	OM 997-6	HR	S	HR	S
41	OM 1269	HR	S	HR	S
42	KSB 288	MR	MS	HR	S
43	DS 20	MS	S	R	R
44	ML 65	MR	MS	HR	MS
45	IR 65596	HR	S	R	MS
46	IR 62126	HR	S	HR	MS
47	IR 2065	HR	S	HR	S
48	IR 62032	HR	S	R	S
49	OM 1493	MS	MS	R	S
50	OM 2008	MS	MS	R	MS
51	OM 1890-2	S	MS	R	MS

Table 3. Reaction of promising rice varieties to different pathogenic races at different locations

Isolate	Ben Tre 002.4	Tien Giang 106.4	Tra Vinh 002	Minh Hai 102.4
No. of resistant varieties tested	33	30	49	34
Percentage of resistant genotype (%)	64.7	58.8	96.1	66.7
No. of susceptible Varieties tested	18	21	2	17
Percentage of susceptible genotype (%)	35.3	41.2	3.9	33.3

CONCLUSIONS

Before making a decision to release a new variety, blast screening with races isolated from different cultivated areas should be recommended, to help determine the incompatible reaction in host parasite interaction. These promising varieties were found resistance to specific races of particular

location then can be further deployed against blast disease in that area. This is one of most economical ways for sustainable blast disease management.

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TÓM TẮT

Bố trí giống kháng bệnh cháy lá ở đồng bằng sông Cửu Long

Các mẫu nấm bệnh cháy lá thu thập từ 4 tỉnh Bến Tre, Tiền Giang, Trà Vinh và Minh Hải ở ĐBSCL có phản ứng khác nhau với bộ giống chuẩn nòi của Nhật Bản. Các mẫu bệnh được xác định là các nòi 002.4 (Bến Tre), 106.4 (Tiền Giang), 002 (Trà Vinh) và 102.4 (Minh Hải). Nòi 106.4 có độc tính cao nhất có thể tấn công được 4 giống chuẩn nòi gồm Aichi Asahi (*Pi-a)*, Ishikari shiroke (*Pi-l)*, Yashiromochi (*Pi-ta*), và K59 (*Pi-t*). Trong khi nòi 002 chỉ nhiễm bệnh trên giống chuẩn kháng Aichi asahi. Các nòi nấm bệnh thu thập dùng cho lây bệnh 51 giống lúa triển vọng đang trồng phổ biến ở ĐBSCL. Nòi nấm 106.4 (Tiền Giang) tấn công lây nhiễm trên 41,2 % số giống trắc nghiệm. Tương tự hai nòi 002.4 (Bến Tre) và 102.4 (Minh Hải) gây bệnh trên 35,3 % và 33,3 % số giống trắc nghiệm.Trong khi đó chỉ có 2 giống lúa có phản ứng nhiễm bệnh vớo nòi 002 (Trà Vinh) chiếm khoảng 3,9 % số giống trắc nghiệm. Phương pháp lây bệnh nhân tạo để tìm giống kháng với những nòi riêng biệt cho từng vùng có thể giúp cho công tác bố trí giống kháng bệnh có hiệu quả lâu dài cho ĐBSCL.