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RICE (*ORYZA SATIVA*) GENOTYPES WITH MULTIPLE PEST RESISTANCE

D.J. Pophaly, Amol Gupta and G.R. Sahu

Department of Entomology, Indira Gandhi Agricultural University, Raipur 492 012 (Madhya Pradesh)

Seven new rice breeding lines out of 58 were found resistant/moderately resistant to major pests viz., *Nilaparvata lugens, Orseolia oryzae* and *Xanthomonas campestris*. Among these lines, R710-3-37-1-1-1 is resistant to all these three major pests and also possesses desirable grain and plant characters. **Ruchi**, a popular variety of this area is used as one of the donors in all seven crosses. Variety IET 6286 showed moderate resistance to Bacterial leaf blight disease (BLB) and brown planthopper (BPH) insect, is resistant to rice gall midge also. This genetic multiple pest resistant material is of great value in formulating the IPM programme for this region.

Key words : Rice, breeding lines, multiple pest resistance, grain characters

Rice crop is very rich in harbouring various insect pests. In formulating the IPM programme for this area, priority always be paid to such a variety which is resistant to Brown planthoppers (*Nilaparvata lugens* Stal), Gall midge (*Orseolia oryzae* WM.) and Bacterial leaf blight disease (*Xanthomonas campestris* pv. *oryzae*). At present it is very difficult to select a variety resistant to these three pests. Variety selected for gall midge resistance often suffers from Brown planthopper attack. Chemical control measures offered against these pests are loosing ground for many reasons. Moreover, emergence of insect biotypes limits the use of resistant varieties employed against single pest. After few years of cultivation, there is likelihood of break down of resistance in these varieties. To overcome this situation, improved new varieties with greater genetic diversity must be introduced in agro-ecosystem. Recently gall midge biotype 5 is identified in Mancompu at Kerala, India (Nair and Ambika, 1994). Similarly Raipur BPH population is more virulent than Pattambi and IRRI, Philippines (Pophaly and Rana, 1994).

MATERIALS AND METHODS

Experiment was conducted during monsoon season (rainy season) of 1993 to 1995 in field conditions for evaluating new breeding lines against gall midge (*Orseolia oryzae* wood mason) and Bacterial leaf blight (*Xanthomonas campestris*

pv. oryzae) disease. Whereas in glasshouse conditions, these lines were tested against BPH insect *Nilaparvata lugens* (Stal), by adopting the technique described by Kalode *et al.* (1975), Pathak and Heinirichs (1982) and Naito (1964).

In field, 30 day old seedlings of test lines were transplanted in two rows of 2 m length at spacing of 15 × 20 cm with TN1, susceptible and ptb-33, resistant check. At maximum tillering stage, all plants were inoculated with *Xanthomonas compestris* pv. oryzae by clip inoculation methods of Kauffman *et al.* (1973). Recommended agronomic practices were followed to raise the crop. Observations on gall midge were recorded from all hills at 50 days after transplanting when gall midge incidence was at peak. Likewise, BLB inoculated plants were observed for disease symptoms at maximum disease pressure and average plant damage score is presented in Table 1. At harvest, the grains were collected for resowing in next rainy season. Grain and plant characters were also recorded.

RESULTS AND DISCUSSION

In a plea to fight with major insect pests viz., Brown planthopper, Gall midge and Bacterial leaf blight, a single variety generally does not meet all the requirements, both resistance to major pests and desirable agronomic characters. But in the present studies, efforts were diverted to hunt for such varieties which could attain all these requirements.

Out of 58 breeding lines, seven lines of F_8 generation were found promising with respect to pest resistance and agronomic characters. Except IET 6286, pure line, all 7 breeding lines were derived from popular variety **Ruchi** which is resistant to Gall midge and moderately resistant to Bacterial leaf blight disease, and is being widely cultivated in this region and developed basically at Raipur. Variety IR 64 is resistant to Raipur BPH insect population (Pophaly *et al.*, 1994). RM_1 (Raipur mutant) variety used as a donor, is resistant to Bacterial leaf blight disease but susceptible to Gall midge population. IR 19661-23-3-2 and IR 27325-111-2-1 donors are gall midge susceptible but resistant to BLB disease which were used as a BLB resistant donors.

All the 7 breeding lines are resistant to Raipur Gall midge population. For Brown planthopper, two varieties viz. R712-1-65-1-1 and R710-37-1-1-1 are resistant. BPH insect feeding on these two varieties was very less (15 and 26 mm^2/ 24 h) in comparison to TN1 susceptible check variety (160 mm^2/24 h) and other breeding lines; indicating presence of feeding deterrent or antifeedant chemicals. Consequently, these lines also exhibited the highest probing marks (35 and 33/seedling) as compared to other test lines and TN1 susceptible check (18/seedlings). This speculates the presence of inbuilt genetic resistance to BPH insect in these lines. Insect tried often and often to suck the sap from

Table 1. Reaction of rice breeding lines against BPH, Gallmidge and BLB

S. No.	Breeding lines	Parentage	BPH				Gallmige (1993-95)4		BLB (1993-95)		Test wt. (gm) 1000 seed	Duration (days)	Hull colour	Kernal colour	Grain dimension	Plant type	Plant colour
			Plant[1] damage score	Rating	Av.[2] feed. mm2/ in 24 hours	Av. [3] Probing marks/ seedling	score	rating	score	rating							
1.	R 712-1-65-1-1	Ruchi × IR19661-23-3-2	1.0	R	15.0	35.0	0	R	3	MR	33	125	Light golden	white	LS	SD	green
2.	R 710-3-37-1-1-1	Ruchi × IR 27325-111-2-1	2.58	R	26.0	33.0	0	R	1	R	31	125	Light golden	White	LS	SD	Green
3.	IET 6286	-	3.20	MR	-	30.0	0	R	3	MR	23	155	Deep golden furrows	White	LS	T	Green
4.	R 746-2-34-1-2-1	IR 64 × Ruchi	3.31	MR	-	20.0	0	R	1	R	24	125	Straw	White	LS	SD	Green
5.	R 714-2-9-3-2-2	RM1 × Ruchi	3.87	MR	99.0	22.0	0	R	I	R	28	125	Straw	White	LS	SD	Purple
6.	R 714-1-19-1-5-1	RM1 × Ruchi	3.94	MR	-	24.0	0	R	1	R	27	125	Straw	White	LS	SD	Purple
7.	R 720-1-91-2-1-1	Ruchi × RM1	4.15	MR	-	17.0	0	R	1	R	26	130	Straw	White	LS	SD	Purple

(Cont. on next page)

S. No.	Breeding lines	Parentage	BPH				Gallmige (1993-95)4		BLB (1993-95)		Test wt. (gm) 1000 seed	Duration (days)	Hull colour	Kernal colour	Grain dimension	Plant type	Plant colour
			Plant[1] damage score	Rating	Av.[2] feed. mm2/ in 24 hours	Av. [3] Probing marks/ seedling	score	rating	score	rating							
8.	R 714-3-103 -1-3-2	RM1 × Ruchi	4.30	MR	57.0	25.0	0	R	1	R	31	128	Light golden	White	LS	ST	Purple ring in green plant
9.	TN1 (S. check)	-	9.0	S	160.0	18.0	9	S	9	S	23	120	Straw	White	MS	D	Green
10.	PTB-33 (R. check for BPH & BLB)	-	1.08	R	10.0	42.0	9	S	1	R	18	185	Straw	White	LS	T	Green

R = Resistant, MR = Moderately resistant, S = Susceptible, 1 = Data based on 4-7 replication, 2 = Data based on 16-22, 3 = Average based on 5-6 seedlings, 4 = Data based on 120 plants, LS = Long slender, MS = Medium slender, SD = Semi dwarf, T = Tall, D = Dwarf

these lines, but could not meet the proper nutritional requirements, thereby making more probing marks.

The only variety R710-2-1-1 is resistant to gall midge, Bacterial leaf blight disease and BPH and possesses all desirable agronomic characters. It's kernal colour is white, grains are long slender and plant type is semidwarf, moreover, hull colour is light golden and matures in 125 days. Thousand seed weight is 31 g.

Five breeding lines serial No. 4, 5, 6, 7 and 8 are moderately resistant to BPH but resistant to gallmidge and IET-6286 is moderately resistant to BLB.

These breeding lines are under yield trials and awaiting nomenclature.

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