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PAVITHRA (MO 13) AND PANCHAMI (MO 14): TWO GALL MIDGE RESISTANT VARIETIES OF RICE

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Abstract: Hybridization programme was started in 1985 at the Rice Research Station, Moncompu using locally accepted varieties like MO 4, MO 6, MO 7 and gall midge (GM) resistant varieties such as MO 5, Surekha, Pothana etc. using pedigree-breeding method to evolve varieties with resistance to GM Biotype 5. Up to six generation, selection was practised based on GM resistance, yield and general performance. Two cultures, KAU M59–29–2–1–2 (IET 13983) from the cross Surekha / MO 5 and KAU M61-6-1-1-2 (1ET 14260) from the cross Pothana / MO 5 performed well in yield trials over the check varieties and were released as Pavithra (MO 13) and Panchami (MO 14) respectively in 1998 for use in GM endemic areas.

Key words: Gall-midge resistance, high yielding, Pavithra and Panchami, rice.

INTRODUCTION

Gall midge *(Orseolia oryzae)* has assumed the status of a major pest of rice. This insect attacks rice from seedling stage to panicle initiation and causes severe crop losses. Depending on the level of incidence, the loss varies from 20-100%. The maggot of gall midge (GM) being an internal feeder is very difficult to be controlled by chemical sprays. The cheapest, easy and most successful plant protection measure against this pest is the use of resistant varieties. At present there are no resistant varieties to gall midge (GM) Biotype 5, which was recently reported from Kerala. Keeping in mind the severity of damage that can be caused by this pest and lack of control measures against the incidence, breeding work was initiated at the Rice Research Station, Moncompu in 1985 to evolve high yielding GM resistant varieties suitable for cultivation in GM endemic areas.

MATERIALS AND METHODS

The material consisted of locally accepted high yielding varieties viz. MO 4, MO 6, MO 7 and GM resistant varieties i.e., MO 5, Surekha, Pothana etc.

After hybridization between the above varieties selection was practised up to F6 generation based on GM resistance, yield and general performance. Initial evaluation trials (IET) were conducted with 34 cultures and two check varieties Jyothi and Mahaveera in Rabi 1989. Preliminary yield trial (PYT) was conducted with 15 promising cultures for three seasons during kharif 89, rabi 90 and kharif 90 along with 3 check varieties. Seven selected cultures were carried forward to comparative yield trial (CYT) for four seasons (rabi 91, kharif 91, kharif 92 and rabi 93). Based on the yield, pest and disease tolerance especially resistance to GM, three cultures viz., M59-29-2-1-2 (GM1), M61-6-1-1-1 (GM8) and M61-6-1-1-2 (GM9) were advanced to multi locational trials (MLT). M59-29-2-1-2 (GM1) was included in initial variety trial - irrigated mid early (IVT–IME) of the AICRIP during kharif 1994 and was advanced to AVT-IME during 1995. MLT was conducted in three locations during rabi 1996 and in five locations during kharif 1996 in cultivators' fields along with Jyothi as check variety. Farm trials were conducted with GM1 and GM9 in five locations at Alappuzha in rabi 1998.. The scoring of cultures against pests and diseases was done based on the Standard Evaluation System for rice, IRRI, 1996.

RESULTS AND DISCUSSION

The yield data of IET, PYT and CYT are presented in Table 1. The cultures viz., M59-29-2-1-2 (GM1), M61-6-1-1-1 (GM8) and M61-6-1-1-2 (GM9) out-yielded all other cultures. Based on the yield as well as pest and disease tolerance especially to GM, these three cultures were carried forward to MLT, the yield data of which are presented in Table 2 and 3. In the multilocational trials also, these three cultures out-yielded the check variety Jyothi. In the farm trials in cultivator's fields, the red kernelled cultures GM1 and GM9 showed superior performance compared to the check Jyothi (Table 4). In the national testing of entries under the AICRIP, GM1 recorded a grain yield of 4892 kg ha^{-1} and ranked 6th in over all mean yield (Table 4) and was superior to check varieties Rama and Vikas (DRR, 1995). The reaction of GM1, GM8 and GM9 to gall midge Biotype 5 during Punja

Table 1. Yield data of IET, PYT and CYT (kg ha^{-1})

Culture/variety	Parentage	Grain yield		
		IET*	PYT**	CYT***
KAU M59-29-2-1-2 (GM 1)	Surekha/MO 5	5000	5292	4169
KAU M61-5-2-2-1 (GM 7)	Pothana/MO 5	5000	4583	3297
KAU M61-6-1-1-1 (GM 8)	do	5000	4167	3881
KAU M61-6-1-1-2 (GM 9)	do	6667	5208	4459
KAU M61-4-2-2-1 (GM 10)	do	6222	4792	3181
KAU M61-4-2-2-2 (GM 11)	do	5222	5000	3175
KAU M65-1-2-1-1 (GM 15)	Kakathiya / MO 6	5000	5417	3581
Jyothi	-	4189	4525	2766
Mahaveera	-	5078	3333	3225
MO 5	-	-	-	3675
CD (0.05)		872	917	961

*IET (1 season rabi '89) with 34 cultures and two check varieties.; **PYT (pooled over three seasons kharif. 89, rabi 90, and kharif 90) with 15 cultures and 3 check varieties. ***CYT (pooled over four seasons rabi 91, kharif. 91, kharif 92 and rabi 91) with 7 cultures and 3 check varieties.

Table 2. Yield data of multilocational trial, rabi 96 (kg ha^{-1})

Culture/variety	Parentage	Locations			
		Choolabhagam	Kumarakom	Edathua	Pooled over 3 locations
KAU M59-29-2-1-2	Surekha / MO 5	6534	6364	6594	6497
KAU M61-6-1-1-1	Pothana / MO 5	6028	5910	6125	6021
KAU M61-6-1-1-2	do	5389	5463	5313	5388
Jyothi	-	5038	4504	4919	4953
CD (0.05)		510	503	222	405

Table 3. Yield data of multilocational trial, kharif 1996, (kg ha^{-1})

Culture/variety	Parentage	Locations					
		Ponga	Nedumudy	Ramankary	Venmony	Thayankary	Pooled over 5 locations
KAU M59-29-2-1-1	Surekha / MO 5	6145	5445	7065	6125	4880	5932
KAU M61-6-1-1-1	Pothana / MO 5	5775	5105	6630	6055	4880	5693
KAU M61-6-1-1-2	Do	5490	4640	6040	5350	3975	5099
Jyothi	-	4910	4190	5600	3875	3935	4502
CD (0.05)		645	481	627	812	388	572

1996-97 in cultivator's fields at Edathua and Thayankary are given in Table 5. The GM incidence percentage was very low for the advanced cultures compared to Jyothi and Mattatriveni.

Table 4. Yield data of farm trials, rabi 1998 and AVT–IME kharif 1995 (kg ha^{-1})

Culture/ Variety	Alappuzha Dt. Mean of 5 locations	DRR, Pooled over 24 locations (33 entries)
KAUM 59-29-2-1-2	6100	4892
KAUM 61-6-1-1-2	5950	-
Jyothi	3125	-
Ratna	-	4145
Vikas	-	3993

The score of cultures against pests and diseases at the Rice Research Station, Moncompu along with plant characters are given in Table 6. In all the yield trials, the two cultures, GM1 and GM 9 consistently out-yielded the local checks. They also showed tolerance to BPH, sheath blight and sheath rot. They are medium duration (115-120 days), dwarf and resistant to GM Biotype 5. Considering the high yield potential and tolerance to pests and diseases especially to GM Biotype 5 and the necessity of GM tolerant varieties for GM endemic areas like Kuttanad, the cultures were released as Pavithra (MO 13) and Panchami (MO 14) in 1998 by the State Seed Subcommitte.

Table 5. Gall midge incidence during puncha 96-97

Culture / variety	Parentage	Duration, days	Incidence%
KAU M59-29-2-1-2 (GM 1)	Surekha / MO 5	115-120	3.8
KAU M61-6-1-1-1 (GM 8)	Pothana / MO 5	115-120	0.68
KAU M61-6-1-1-2 (GM 9)	do	115-120	4.60
Mattatriveni	-	110-115	50.0-60.0
Jyothi	-	110-115	80.0-90.0

Table 6. Mean expression of plant characters and pest and disease tolerance

Culture./ variety	Pl. ht. (cm)	Flowering duration (days)	No. of pt./hill	Kernel colour	Pest			Disease (0-9)	
					SB (% WEH)	GM (% SS)	BPH (0-9)	Sheath blight	Sheath rot.
KAU M59-29-2-1-2	95.0	90	9.6	Red	2.2	0.6	2.5	1.6	1.6
KAU M61-6-1-1-1	95.0	90	10.0	White	3.1	2.3	2.5	1.0	2.4
KAU M61-6-1-1-2	95.0	90	11.1	Red	1.7	2.9	3.0	0.4	1.4
TN 1	–	–	-----	—	20.0	50	9.0	7.5	8.0
Jyothi	84.0	85	12.0	—	3.6	25	3.5	3.0	3.8

SB = Stem borer; WEH = White ear head; GM = Gall midge; BPH = Brown plant hopper

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