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Variety or line	Score[a]	Rating[b]
IR2035-117-3	1	R
IR31805-20-1-3-3	3	MR
IR32843-92-2-2-3	1	R
IR32876-54-2-2-2	1	R
IR33059-26-2-2	3	MR
IR33380-60-1-2-2	3	MR
IR33383-23-3-3-3	3	MR
IR34686-179-1-2-1	1	R
IR35293-125-3-2-3	5	MS
IR35366-28-3-1-2-2	1	R
TNI	7	S
IR35366-40-3-3-2-2	7	S
IR35366-62-1-2-2-3	1	R
IR35546-17-3-1-3	5	MS
IR39334-31-2-2-2	5	MS
IR39357-45-3-2-3	9	HS
IR43342-10-1-1-3-3	1	R
IR43491-140-1-2-3	1	R
IR43524-55-1-3-2	1	R
IR43526-523-1-1-1	1	R
TNI	7	S
IR60	7	S
IR65	7	S
Khaira Basant (Acc. 611691)	7	S
Khao Kad Bow (Acc. 64384)	1	R
Ramic Hudi (Acc. 64045)	1	R
RP1057-184-5-3-2	1	R
RP1442-2-2-3-5-1	7	S
RP1579-1864-70-33-54	7	R
RP1579-28-54	1	R
IR1552	5	MS
RP1579-52	5	MS
RP2068-16-9-5	1	R
RP2068-18-3-5	3	MR
RP2068-18-4-5	3	MR
RP2068-18-4-7	1	R
RP2068-32-2-3	1	R
RP2068-32-6-1	1	R
RP2084-2-3-1	3	MR
Suweon 339	5	MS
Tainung Sen Glutinous	5	MS
UPRH151 (Acc. 6160)	9	HS
UPRH193 (Acc. 61637)	9	HS
YSSI (Acc. 663931)	1	R
ZHEL I (Acc. 74587)	3	MR
3000	1	R
9101 (Acc. 74588)	5	MS
IR6	7	S
KS282	7	S

[a]0 = no visible damage, 1 = partial yellowing of first leaf, 3 = first and 2d leaf partially yellow, 5 = pronounced yellowing and some stunting, 7 = wilting and severe stunting, and 9 = all test plants died. [b]HR = highly resistant, R = resistant, MR = moderately resistant, MS = moderately susceptible, S = susceptible, and HS = highly susceptible.

Evaluation of brown planthopper (BPH)-resistant rice varieties for resistance to Angoumois grain moth (AGM)

Wu Jung Tsung and Zhang Liangyou, South China Agricultural University, Guangzhou, China

AGM *Sitotroga cerealella* Oliver causes severe damage to stored rice in China. We evaluated rice varieties with resistance to BPH *Nilaparvata lugens* Stål for their resistance to AGM.

AGM were reared on wheat seeds in the laboratory. The moisture content of rice seeds was adjusted to 13%. Five seeds, which served as one replication, were infested with 100 AGM eggs. The

Resistance of rice varieties to AGM and BPH.

Variety	AGM				BPH	
	Emerging adults (%)	Susceptibility index	Grain weight loss (%)	Damage[a] scale	Damage[b] scale	Reaction
ASD7	9.8	6.21	3.7	R	1.0	R
CR94-13	7.8	5.55	1.8	R	1.7	R
IR13240-108-2-2-3	8.3	5.65	3.5	R	1.0	R
IR19256-88-1	8.5	5.88	1.5	R	1.0	R
IR46	9.5	6.52	1.9	R	1.0	R
IR58	3.3	3.06	0.1	R	0.3	R
IR60	3.0	3.57	0.1	R	0.3	R
Kau 1727	3.0	2.32	2.6	R	1.0	R
Ping You Zhan	9.0	6.12	3.1	R	5.0	MR
San Ye Zhan	9.8	5.49	1.9	R	1.7	R
Suweon 294	4.2	3.66	2.5	R	1.0	R
Tie Liu Ai	4.0	4.10	3.0	R	4.2	MR
Balamawee	12.8	7.01	7.3	MR	1.0	R
Bao Xuan 2	11.0	8.25	2.5	MR	3.7	MR
BG 367-4	18.0	7.82	6.9	MR	0.5	R
C1321-9	14.0	8.06	3.9	MR	1.7	R
C1322-28	11.3	7.40	4.8	MR	1.7	R
C701045	14.5	8.46	4.4	MR	1.0	R
Gao Mei Zhan	19.5	8.64	6.1	MR	1.7	R
Hong Yuan	19.7	8.48	9.6	MR	1.0	R
IR4432-52-6-4	10.5	6.78	7.1	MR	1.7	R
IR13427-40-2-3-3	12.5	6.22	5.3	MR	1.0	R
IR26	15.5	7.52	6.4	MR	1.7	R
IR36	13.3	7.29	7.9	MR	3.0	R
Mudgo	17.0	8.71	6.6	MR	1.0	R
Pratap	13.8	6.99	2.7	MR	1.0	R
Yue Nan Xiang Mi	14.3	8.35	4.4	MR	2.3	R
7105	22.5	8.61	13.4	S	1.0	R
82-44-4	22.0	11.52	6.1	S	2.3	R
Duo Long	35.5	9.59	9.0	S	3.0	R
Hu Jing Kang	40.0	10.10	15.5	S	3.0	R
IR21141-24-2	30.7	11.13	6.5	S	1.0	R
Jar 80047	23.8	8.24	8.8	S	3.0	R
Qi Gui Zao 25	23.0	11.83	7.5	S	3.0	R
RNR 3070	21.3	9.55	4.8	S	1.0	R
San Gui Zhan 1	40.0	10.31	12.3	S	2.3	R
San Huang Zhan 2	38.0	10.93	10.6	S	3.0	R
Shan Ke 2	37.0	10.48	12.9	S	3.7	MR
Tai Nuo Xuan (C712068)	25.0	7.14	10.7	S	1.0	R
Triveni	23.5	9.23	6.8	S	2.3	R
Xin Hui Zhan 1	43.5	13.73	8.9	S	1.0	R
Xin Hui Zhan 2	24.0	10.36	4.9	S	1.0	R
Xin Jin Zhan 1	24.1	12.35	5.7	S	5.0	MR
Xin Jin Zhan 2	24.5	10.83	5.0	S	1.0	R

[a]R = resistant. MR = moderately resistant. [b]Based on a plant damage rating of 1-9 where 0-3.5 = R, 3.6-5 = MR.

samples were stored at 20 °C and 75% relative humidity after infestation. The experiment was laid out in a split-plot design with four replications.

Resistance was evaluated on three parameters: emerging adults, susceptibility index (SI), and weight loss. The emerging adults were removed each day and counted. Seed weight loss was calculated by weighing seed before and after the experiment.

SI was based on the formula

$$SI = \frac{\text{natural log number of emerging adults}}{\text{average development period}} \times 100$$

Susceptibility was scored as % emerging adults where resistant (R) = <10%, moderately resistant (MR) = 10-20%, and susceptible = >20%.

Twelve of 44 BPH-resistant rice varieties tested were rated R and 15 were MR to AGM (see table). The new variety Hong Yuan, which is a cross of the good agronomic variety Hong Zhan and resistant donor Suweon 294, is R to BPH and MR to AGM. Hong Yuan yielded an average 6 t/ha, indicating that the resistance was heritable and easily recombined with other agronomic traits. ■

Stress tolerance—excess water

Plant elongation at three seedling ages in some rice varieties

J. L. Dwivedi, D. Senadhira, and D. HilleRisLambers, IRRI

Experiments using three seedling ages (2, 3, and 4 wk with 9, 21, and 21 entries, respectively) were laid out in a completely randomized design with three replications to assess variation in plant elongation ability induced by flooding. The objective was to select the most appropriate seedling age for use in work on the genetics of elongation ability.

Seedlings were submerged for 7 d in 100 cm of water in a glasshouse tank. Plant height was recorded before and after flooding, and the difference was used to calculate plant elongation.

Seedlings in each age group survived. Entries differed significantly in plant elongation. Percent increase in elongation after flooding was highest in the 2-wk seedlings (see table), perhaps because older seedlings were taller than younger ones and needed comparatively less elongation to survive at the 100-cm flooding depth. Leaf sheaths and blades contributed considerably to plant elongation (data not presented).

To compare the relevance of results, we used previous knowledge that IR11141-6-1-4 and IR11288-B-B-69-1 are elongating modern varieties (MVs), whereas IR36, IR42, BKNFR76106-16-0-1, and FR13A are nonelongating MVs. Better selection of elongating MVs and nonelongating MVs was obtained from the 4-wk treatment. The difference in average elongation between these groups was greater at 4 wk (6.3 cm) than at 3 wk (3.0 cm) (see table). ■

Plant elongation at 3 seedling ages following 7 d of submergence.

Variety	Plant elongation (cm) at			Elongation score in previous test
	2 wk	3 wk	4 wk	
Elongating types				
Saingar	-	37	13	1
Barogar	-	37	20	1
LMN111	-	42	21	1
Jalmagna	24	27	36	1
NDGR407	25	-	-	1
Chakia 59	-	34	16	3
IR40905-11-3-1-5-3-3	-	25	16	3
NC492	-	28	20	3
Baisbish	26	23	21	3
NDGR150	22	22	7	5
FRG15	-	24	9	5
Madhukar	-	20	10	5
NDGR207	15	21	12	5
Elongating MVs				
IR11141-6-1-4	17	16	12	5
IR28273-R-R-R-39-28	-	17	18	5
IR11288-B-B-69-1	13	12	11	5
Nonelongating MVs				
Ghoghari	-	18	10	7
Shayma	-	15	9	7
IR42 (susceptible check)	14	9	8	9
FR13A	-	13	5	9
BKNFR76106-16-0-1	-	8	5	9
IR36	11	9	7	9
Mean increase (%)	46.9	37.9	18.7	
CV (%)	9.2	17.6	25.0	

Optimum water depth for testing fast elongating deepwater rice (DWR) varieties

J. L. Dwivedi, D. Senadhira, and D. HilleRisLambers, IRRI

We conducted an experiment to determine the optimum water depth for testing the ability for fast elongation in

Table 1. Analysis of variance for percent elongation in 12 varieties at 5 water depths and control.

SV	DF	MS[a]
Replications	2	32.0 ns
Water depth (d)	5	3013.1**
Error (a)	10	18.6
Varieties (v)	11	1861.0**
Depth × variety (d × v)	55	113.9**
Error (b)	132	17.8

CV (a) = 18.0%, CV (b) = 17.6%

[a]** = significant at 1% level, ns = not significant.