

BPH resistance was evaluated using the standard seedbox screening test and scored with the *Standard evaluation system for rice*. Each year (1993-96),

plants were infested with a fresh BPH population collected at CLRRRI and reared in a screenhouse for one to three generations on TN1.

The resistance score of varieties containing the *O. officinalis* gene varied from 2.3 (resistant) to 5.6 (moderately resistant) (see table). We did not find a trend of decreasing resistance over time. However, hopperburn was observed in some farmers' fields planted to these varieties, probably as a result of insecticide overuse.

In all 3 yr of testing, varieties with the *O. officinalis* gene were significantly more resistant to BPH than the test varieties with two other dominant genes, *Bph5* and *Bph9*. This suggests that the *O. officinalis* gene is distinct from these genes, although minor genes in the *O. officinalis*-derived varieties could be enhancing their resistance. Interestingly, varieties containing the genes *bph4*, *Bph5*, *Bph7*, *bph8*, and *Bph9* scored susceptible or only moderately resistant to BPH in 2 or 3 of the test years, even though varieties containing these genes are not known to have been grown in the Mekong Delta. ■

Brown planthopper resistance of selected varieties. Cuu Long Delta Rice Research Institute, Vietnam. 1993-96.

Variety	BPH resistance gene	SSST damage scores ^a		
		1993	1994	1996
TN1	None	9.0 a	9.0 a	9.0 a
Mudgo	<i>Bph1</i>	3.7 def	5.0 c	5.7 cd
ASD7	<i>bph2</i>	5.0 dc	7.7 ab	7.7 ab
Rathu Heenati	<i>Bph3</i>	1.0 hi	2.3 d	3.7 ef
Babawee	<i>bph4</i>	5.0 dc	6.3 bc	4.3 de
ARC10550	<i>Bph5</i>	7.7 ab	9.0 a	9.0 a
Swarnalata	<i>bph6</i>	1.7 gh	3.0 d	5.7 cd
T12	<i>Bph7</i>	-	-	7.0 bc
ChinSaba	<i>bph8</i>	4.3 de	7.7 ab	7.7 ab
Pokkali	<i>Bph9</i>	6.3 bc	7.7 ab	7.7 ab
IR64	<i>Bph1</i> plus Minor gene(s)	4.3 de	5.0 c	5.7 cd
Ptb33	<i>bph2</i> , <i>Bph3</i>	0.0 i	0.0 e	0.0 g
MTL 103 (IR54751-2-34-10-6-2)	<i>O. officinalis</i>	2.3 fgh	3.0 d	2.3 f
MTL 110 (IR54742-23-19-16-10-3)	<i>O. officinalis</i>	3.0 efg	5.0 c	5.7 cd
MTL 114 (IR54751-2-44-15-2-2)	<i>O. officinalis</i>	3.7 def	5.7 c	3.7 ef

^aScores are the means of three replicates. Means within a column followed by the same letter are not significantly different ($P>0.05$, LSD test).

Erra Mallelu, Kavya, and Orugallu: fine-grained, gall midge (biotype 1)-resistant rice varieties

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Rice gall midge (biotype 1) is a serious pest when rice is planted late because of delayed rains and late filling of tanks, or planted in the tailend areas of canals in the Telangana zone of Andhra Pradesh, India. Rice varieties Erra Mallelu (1991), Kavya (1991), and Orugallu (1993) were released to control gall midge in this area.

Erra Mallelu (UGL 20471) is a short-duration rice variety (see table) that outperformed popular Tellahamsa,

Characters of fine-grained gall midge (biotype 1)-resistant rice varieties.

Character	Cultivars		
	Erra Mallelu	Kavya	Orugallu
Parentage	Sabarmati/W12708	WGL 27120/// WGL 17672/ Mahsuri//Surekha	OBS677/IR2070-423-2-5
Duration (d)	120	135	140
Suitable season	Wet, winter, summer	Wet, winter (under irrigation)	Wet (up to 30 Jun)
Height (cm)	80-85	90-95	85
Panicle-bearing tillers hill ⁻¹ (no.)	10-12	10-12	15-16
Photoperiod sensitivity	Insensitive	Insensitive	Insensitive
Response to fertilizer	Responsive	Responsive	Responsive
Anthocyanin pigmentation	Absent	Absent	Absent
Plant type	Semicompact	Compact	Compact and erect
Panicle length (cm)	22.2	24.5	21.7
Grains panicle ⁻¹ (no.)	125	220	180
Glume color	Light brown	Straw	Straw
1,000-grain weight (g)	21.0	20.5	24.5
Head rice recovery (%)	70	73	68
Grain type	Long slender	Medium slender	Long slender
L-B ratio of grain (mm)	4.37	3.86	3.74
L-B ratio of kernel (mm)	3.61	2.78	3.00
Abdominal white	Absent	Absent	Absent
Yield potential (t ha ⁻¹)	6.0-6.5	6.5-7.0	7.0
Resistance to pests	Resistant to gall midge biotype 1	Resistant to gall midge biotype 1	Resistant to gall midge biotype 1 and tolerant of bacterial leaf blight

which was susceptible to gall midge and other pests, in station trials (1981-82) and minikit trials (1988-91) at different sites in Telangana zone.

Erra Mallelu had no or negligible incidence of galls compared with checks Jaya and TN1 in trials at numerous locations. The variety is now grown on 50,000 ha in the zone.

Kavya (WGL48684) is a medium-duration variety (see table) that is similar in grain type but 10 d earlier than the locally popular Samba Mahsuri, which is susceptible to gall midge and other pests. Kavya showed no or negligible incidence of galls in many trials at several locations from 1987 to 1989. Its yield performance in multi-

location and national trials from 1987 to 1989 was promising. Kavya is grown on 40,000 ha.

Orugallu (WGL47970) is a long-duration, high-yielding (4.7 t ha⁻¹) rice variety (see table). It performs well in slightly saline soils and was resistant to gall midge in the 1987-89 trials. It is grown on 20,000 ha. ■

Stress tolerance—other stresses

Flowering behavior of rainfed lowland rice varieties during dry season in West Bengal, India

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We studied the flowering behavior of five popular rainfed lowland rice cultivars (CN540, CNM539, Mahsuri, Pankaj, and IR42) compared with that of two photoperiod-insensitive boro checks (Jaya and IR26).

Seeds were sown on three dates during 1992-93 and 1993-94 dry seasons. Rice is traditionally sown in June-July and harvested in November-December in West Bengal. Daylength peaks in July (13 h 11 min) (Table 1).

Low temperature from November to January limits seedling growth, which extends crop duration. Early-to medium-duration photoperiod-

Table 1. Mean daylength and minimum and maximum temperature of each month. Rice Research Station, Chinsurah, India.

Month	Day length		Minimum temperature (°C)	Maximum temperature (°C)
	H	Min		
January	10	43	10.2	25.6
February	11	14	13.2	28.7
March	11	51	18.5	33.7
April	12	22	22.9	36.8
May	13	06	25.0	36.4
June	13	24	25.5	33.9
July	13	11	25.7	31.7
August	12	50	25.7	31.3
September	12	11	25.5	31.5
October	11	31	22.9	31.0
November	10	55	16.0	28.8
December	10	36	10.0	25.6

insensitive modern boro varieties are popular in this season. We studied the performance of longer duration rainfed lowland rice varieties under these conditions, which had not been done to date.

Seeds were sown on 23 Nov, 12 Dec, and 28 Jan and transplanted on 10 Jan, 8 Feb, and 3 Mar, respectively, for two

consecutive dry seasons (1992-93 and 1993-94), with three replications for each sowing.

The data were recorded for initial flowering (first panicle in the plot), 50% flowering (half of the panicle in the plot), 100% flowering (every panicle in the plot), and grain yield (t ha⁻¹) pooled over 2 yr (Table 2).

Table 2. Flowering behavior and grain yield of different lowland rice varieties under different sowing dates in West Bengal, India. 1992-94^a.

Variety	Sowing date									Grain yield (t ha ⁻¹)		
	23 Nov Days to flowering			12 Dec Days to flowering			28 Jan Days to flowering					
	Initial	50%	100%	Initial	50%	100%	Initial	50%	100%	23 Nov	12 Dec	28 Jan
Pankaj	140	144	147	130	136	140	145	152	162	5.3	4.4	3.8
IR42	135	140	144	120	125	129	105	108	110	5.4	4.8	4.2
CN540	147	160	167	130	155	169	150	162	175	4.7	3.0	2.5
CNM539	139	143	145	—	—	—	—	—	—	4.8		
Mahsuri	147	154	158	135	139	143	137	145	152	4.5	3.7	3.3
Jaya	135	140	145	123	127	131	102	105	108	5.6	5.1	4.4
IR36	127	130	135	116	122	127	94	98	103	5.3	5.0	4.2
CD (variety × sowing date) at 0.05 level	8	4	4	8	4	4	8	4	4	0.6	0.6	0.6

^aData pooled over 1992-93 and 1993-94.