

cultivars with the *Glh 2* gene (see table). ASD7 and Tilockkachari were highly resistant to all GLH colonies, indicating no cross virulence of the colonies to those two varieties. Population growth on

Godalki was similar to that on susceptible TN1 for all colonies. ASD8 was highly resistant to all colonies. The Moddai Karuppan colonies were more virulent on IR29 than the other colonies. The

study indicated that none of the colonies selected on the various resistant cultivars were more suitable than the TN1 colony as a source of insects to begin a selection program on ASD7 or ASD8. □

Reaction to *Marasmia patnalis* Bradley of varieties resistant to *Cnaphalocrocis medinalis* Guené

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Leaffolders *C. medinalis* and *M. patnalis* are almost identical in external appearance and have recently caused similar damage in rice fields in Laguna, Philippines. We evaluated 30 rice varieties previously identified as highly susceptible or moderately resistant to *C. medinalis* for their reaction to *M. patnalis*.

First-instar larvae at 2 larvae/tiller were caged on 36-d-old rice plants kept in the greenhouse. Each accession was replicated six times and treatments were in a split-plot design with the leaffolder species as the main plot and rice varieties subplots. The 1980 *Standard evaluation system for rice* was used to score damage.

Damage from the two species was not significantly different at the 5% level. Damage ratings were correlated ($P > 0.05$). Varietal differences within a leaffolder species occurred (see table). Susceptible TN1, commonly used to screen varieties for *C. medinalis* resistance also can be used as a susceptible check for *M. patnalis*. Ptb 33, ASD5, TKM6, IR4707-106-3-2, Darukasail, and GEB24 are possible donors for resistance to the two leaffolder species. □

Reactions of rice varieties to *C. medinalis* and *M. patnalis*, IRRI, 1984.

Variety	Accession no.	Origin	Leaf damage ^a					
			<i>C. medinalis</i>		<i>M. patnalis</i>			
			Damage rating (%)	Scale	Damage rating (%)	Scale		
TN1	105	Taiwan	27.3	d	—	25.5	f	—
ARC6650	12308	India	22.0	cd	9	22.4	ef	9
IR36	1187	Philippines	21.0	cd	9	22.3	ef	9
Shete	46671	India	21.1	cd	9	20.1	def	9
ARC5752	12119	India	20.6	cd	9	19.1	cdef	9
ARC10560	20992	India	19.8	cd	7	19.8	def	9
ARC10550	12507	India	19.7	cd	7	19.0	cdef	7
BKN-BR1008-21	—	Thailand	22.0	cd	9	15.1	bcdef	7
Khao-rad	48069	Thailand	17.4	abc	7	19.2	cdef	7
Balam	49020	Bangladesh	16.0	abc	7	19.6	def	9
Calixto	47166	Philippines	21.8	cd	9	13.6	bcdef	7
Khao-Ma Khaek	47852	Thailand	18.1	abc	7	17.0	cde	7
IR5685-26-1	39433	Philippines	19.0	bcd	7	15.5	bcdef	7
Gorsa	49088	Bangladesh	16.3	abc	7	17.8	cde	7
Karpur Kanti	46048	India	15.6	abc	7	17.9	cde	7
Bora	49157	Bangladesh	16.3	abc	7	15.2	bcdef	7
Biron	49154	Bangladesh	17.7	abc	7	13.5	bcdef	7
Yakadayan	36408	Sri Lanka	17.1	abc	7	13.3	bcdef	7
Muthumanikam	15327	Sri Lanka	18.1	abc	7	12.3	abcd	5
Vashaipoo Samba	—	India	14.8	abc	7	13.8	bcdef	7
CO 7	6041	India	12.9	abc	5	15.2	bcdef	7
ASD7	6303	India	16.5	abc	7	11.6	abcd	5
Kataribhog	46076	India	14.3	abc	7	12.9	abcde	7
W 1263	11657	India	15.9	abc	7	10.7	abcd	5
Ptb 33	19325	India	12.9	abc	5	13.3	bcdef	7
ASD5	5812	India	13.4	abc	5	11.6	abc	5
TKM6	237	India	13.3	abc	5	10.1	abc	5
IR4707-106-3-2	47459	Philippines	9.6	a	5	13.4	bcdef	7
Darukasail	45493	India	14.9	abc	7	7.9	a	5
GEB24	5909	India	9.7	ab	5	8.7	ab	5
Mean			17.2			15.6		

^aAv of 6 replications. Separation of means in a column by Duncan's multiple range test at the 5% level.

Testing for field resistance in rice under induced brown planthopper (BPH) outbreaks

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From several years of research at CRRI, we have developed a reliable field method for inducing BPH hopperburn. This is helping us to identify promising field-resistant rices. The following steps ensure

heavy BPH incidence.

- Two erect wind-breaker walls made of glass fiber-based bitumen felt or local bamboo mat (0.75 m high around test entries and 1.5 m high, around tall, long-duration varieties) are installed. They withstand high winds and keep the experimental area undisturbed by wind (Fig. 1).
- Three to five cm of standing water is maintained in treated plots.
- A lush rice canopy is maintained by

applying up to 25 kg N/ha in convenient splits until 60 d after planting (DAP).

- Insect colonies are established by confining BPH for 24 h in cylindrical 50- × 15-cm fine wire mesh cages (Fig. 1).
- Progressive BPH colonization is provided between 10 and 60 DAP to reach 1 adult BPH/hill.
- Rice is transplanted at 10- × 10-cm spacing in two 1.5-m-long rows per



1. Field layout showing wind break double wall and colonization of adult BPH on plants in cylindrical cages. Cuttack, India.

2. BPH hopperburn in field planted test entries. Cuttack, India.

test entry with 2 rows of susceptible Jaya or TN1 on each side. Surface foliar sprays of 0.02% methyl parathion are applied weekly between 10 and 60 DAP to kill natural enemies. At transplanting, seedlings are dipped in the same solution.

Hopperburn appeared in patches by 80 DAP and by 95 DAP reached 100% in the susceptible check (Fig. 2). Monitoring data of insect buildup at weekly intervals showed that by 75 DAP 6 BPH adults, 75 BPH nymphs, and 1 mirid bug were present on each hill. Between 90 and 100 DAP, BPH adults and nymphs exceeded 500/hill. Beyond 80 DAP, hopperburn spread so fast that insect populations became irrelevant. BPH populations emigrated from the plots by 100 DAP.

In 1983, 10 known resistant cultures, IR36, and susceptible Ratna were evaluated. Based on percent hopperburned hills (see table), CR401-7, CR233-10, CR157-1900, and CR157-380-303 were on par and were outstandingly superior to IR36 in field resistance.

In 1984, CR333-6-1 was outstanding among 50 entries, followed by CR316-639, CR319-644, CR233-10, CR157-212, CR157-300, and CR157-1900, which were on par with the resistant check CR57-MR1523.

Because percent hopperburned hills in a test entry was recorded only when check entries were 100% hopperburned, single-replication testing appeared acceptable, which saves valuable resources. □

Relative performance of some rice cultivars under induced field outbreak of BPH, CRRI, 1983 dry season.^a

Cultivar	Cross combination	Mean hopperburned hills ^a	
		%	Angles
CR407-6-2	CR94-1512-6/Ratna	92 d	76.85
CR407-19	CR94-1512-6/Ratna	100 de	90.00
CR157-392-212	Vijaya/PTB10	68 ab	56.06
CR157-1900	Vijaya/PTB10	54 ab	47.32
CR157-380-303	Vijaya/PTB10	57 ab	49.25
CR404-56	CR94-1512-6/Pusa-2-21	95 de	82.79
CR233-10	Pelita/CR94-MR.1550	48 a	44.07
CR57-11-2	IR8/PTB21	59 ab	50.76
CR401-7	Vijaya/CR94-1512-6	45 a	42.40
CR190-103	CR129-118/CR57-49-2	61 ab	51.75
IR36		87 bc	71.98
Ratna (susceptible check)		100 de	90.00
	CD (0.05)		16.08
	CD (0.01)		21.86

^aMean of 3 replications. Separation of mean (angles) in a column by Duncan's multiple range test at the 5% level.

Evaluation of promising rice varieties for thrips resistance

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Thrips *Stenchaetothrips biformis* (Bagnall) is a major rice pest along the lower Changjiang River in China. Seedlings of the second rice crop often are damaged in Jun-Jul. We developed the following scale for evaluating thrips resistance.

Rating	Damage
1	No rolling of terminal of leaf; a few silvery spots on leaf surfaces.

- 3 Rolling of leaf terminals; light silvery of leaf tips.
- 5 Rolling of leaf terminals; yellow-reddish and scorched leaf tips.
- 7 Rolling of entire length of all leaves with pronounced rigidity.
- 9 All plants dead.

Seventy-five thrips-resistant rice varieties from IRRI were evaluated at Wu-Jiang district in Jiangsu Province. The varieties were sown on 10 and 15 Jun 1984. About 100 seeds of each entry were sown in moist soils in a 0.5-m-long row at 0.250 m row spacing. One week later, fields were flooded to a proper level.

Twenty-five-day-old seedlings of the test varieties were evaluated using the

scale. Of 75 entries, 6 scored 1; 3, 3; 59, 5; and 7, 7 (see table). The six most resistant entries were from Sri Lanka. □

Thrips resistance rating of rice varieties, Jianguo, China.

Reaction rating	Variety name ^a
1	Dahanala (15663), Dahanala 682 (50729), Kalubalawee (7717 & 15184), Kalu Heenati (15745 & 31431).
3	Kaluheenati (7750), Madael (15234), Wannu Dahanala (11726).
5	ADT22 (5901), ASD4 (5814), ASD7 (6303), Balamawe (15276), BJ1 (256, 3711, & 45195), BW78 (26915), Chandina (36420), CO 23 (6042), CO 27 (26843), Dahanala (15202 & 15650), Demala Kotan (40787), Gangala (7733, 15207, & 15259), Gona-baru (7809), H105 (158), Heenati (8964), Herath Banda (15304, 15362, 15378, 15632, 15748, 31412, & 31431), Jeeraga Samba (49732), Kalubalawee (7702), Kaluheenati (11996), Kalu Heenati (15568, 31432, 31433, 31434, 31435, 36267, & 36268), Kaohsiung Sen Yu 185 (38892), Madael (7722, 7727, 11701, & 15426), MRC 505 (39519), Perunel (15473), Ptb 33 (19325), Sinna Sivappu (15444), Sudu Hondarawala (15541), Suduru Samba (11671, 15237, 15272, & 36390), Sudurvi 305 (3475), Thunmar hamara (15226), TKM 2 (6034), TKM 6 (237, 6216, 35185), TNR 1 (9913), Utri Rajapan (16684).
7	Kuribit Puti (26882), Nira (1749, & 6309), Suduru Samba (14354), Sugadas (or Godavari Samba 50163), TKM6 (28571), Wulan Rua (19194).
9	-----

^aIRRI accession no. are in parentheses.

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Genetic Evaluation and Utilization COLD TOLERANCE

VL Dhan 16: a medium-maturing, cold-tolerant rice for irrigated conditions

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We evaluated many advanced breeding lines to identify a suitable cold-tolerant variety for irrigated valleys at 900 m to 1,500 m altitudes. Some selections from IR1846 (J. P. 5/Y. R. L. I) were promising. One selection performed well in regional and national trials. It was released by the State Varietal Release Committee in 1984 as VL Dhan 16.

VL Dhan 16 is medium tall, compact, and stiff-strawed with medium tillering and light green leaves. Panicles are long and compact with good spikelet fertility and threshability. The husk and apiculus are straw-colored. Grains are medium-

Grain yield of VL Dhan 16 in multilocal trials, Uttar Pradesh, India.

Variety	Grain yield (t/ha)				
	1980 (2)	1981 (4)	1982 (4)	1983 (4)	Mean
VL Dhan 16	4.3	5.4	4.5	4.2	4.6
VL 8	4.3	3.7	3.2	2.8	3.5
VLK 39	3.6	3.9	3.4	2.5	3.4
Thapachini	3.5	3.8	3.8	2.8	3.5

^aNumbers in parentheses indicate test locations.

sized with red kernels, nonglutinous endosperm, and good cooking quality. VL Dhan 16 has good blast and stem borer resistance and is cold tolerant.

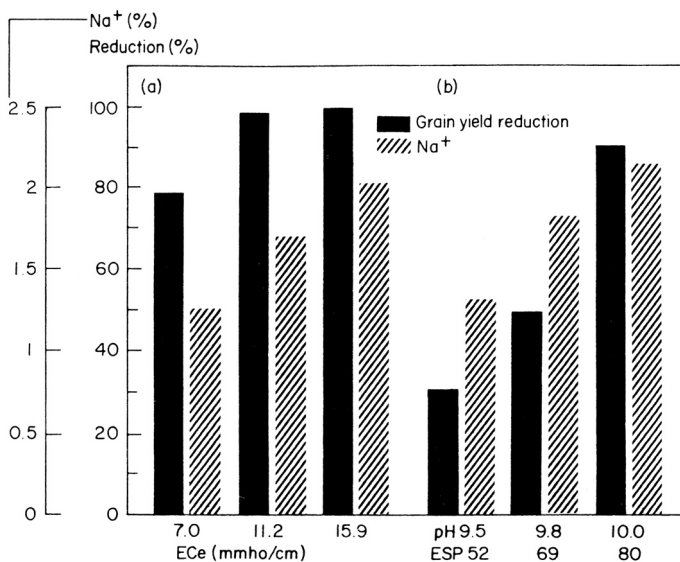
In 14 multilocal yield trials during 4 yr, VL Dhan 16 was compared with VL-8 (improved medium-maturity check), VLK 39 (improved early check), and Thapachini (a local check) (see table). □

Genetic Evaluation and Utilization ADVERSE SOILS TOLERANCE

Salinity and sodicity tolerance in rice

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In a study of salinity and sodicity tolerance in rice, 40-d-old M1-48 seedlings were transplanted in pots in soils with EC 2.8, 7.0, 11.2, or 15.9 dS/m and pH 8.2, 9.5, 9.8, or 10.0. Exchangeable sodium



1. Effect of salinity (a) and sodicity (b) on percent reduction of grain yield and Na⁺ content of mature shoots of M1-48.