

the late season and yields 6.8 t/ha, 8.42% more than widely grown Nonghu 6 and with better grain quality (Table 2).

Chengte 232 also is being used to generate indica/japonica rice hybrids. The F₁ of Chengte 232 (japonica)/26 Zezhao (indica) yielded 11.3 t/ha. □

Table 2. Some agronomic characteristics of Chengte 232. Hangzhou, China.

Variety	Duration (d)	Plant ht (cm)	Panicles (no./m ²)	Grains (no./panicle)	Panicle length (cm)	1000-grain wt (g)	Yield (t/ha)
Chengte 232	139	88.2	418.29	83.1	16.2	24.0	6.8
Nonghu 6	144	97.7	454.27	73.3	15.1	23.2	6.3

Insect resistance

Influence of male sterile and normal cytoplasm on expression of resistance to thrips

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Reactions to rice thrips *Stenchaetothrips biformis* among cytoplasmic male sterile and their maintainer lines seem to differ under field conditions at TNAU. We evaluated nine sets with male sterile and normal (fertile) cytoplasm for resistance in Jun 1988.

Seeds of each line were sown in 1-m-long rows, with 5 replications. Resistant check Ptb 33 and susceptible check TN1 were sown at random.

Reaction of cytoplasmic male sterile and restorer lines to thrips. Tamil Nadu, India.

Line	Damage rating ^a
V20A	1 a
V20B	1 a
Erjiunan A	9 b
Erjiunan B	9 b
IR46829A	9 b
IR46829B	1 a
IR46830A	1 a
IR46830B	9 b
IR46831A	9 b
IR46831B	1 a
IR48483A	9 b
IR48483B	1 a
MS37A	1 a
MS31B	1 a
Madhu A	9 b
Madhu B	1 a
Pragathi A	9 b
Pragathi B	9 b
Ptb 33 (resistant check)	1 a
TN1 (susceptible check)	9 b

^a Mean of 5 replications. Separation of means by DMRT at the 5% level.

Thrips incidence was severe 20 d after sowing. When all TN1 seedlings were dead, entries were rated for thrips damage on the *Standard evaluation system for rice* 1-9 scale.

Resistance to thrips differed significantly (see table). Male sterile lines IR48483A, IR46829A, IR46831A, and

Madhu A scored susceptible, but their corresponding maintainer lines scored resistant, indicating cytoplasmic-based expression of susceptibility to thrips. Male sterile lines V20A, IR46830A, MS37A, and Mangala A have high resistance to thrips that could be utilized in developing resistant hybrids. □

Genes conditioning resistance to brown planthopper (BPH)

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Although rice varieties with seven monogenic genes for resistance to BPH *Nilaparvata lugens* (Stål) have been identified at IRRI, little is known about their reactions to other BPH populations. We evaluated varieties with *Bph 1*, *bph 2*, *Bph 3*, *bph 4*, *bph 5*, and *Bph 6* genes and a variety with *bph 2* + *Bph 3* genes for resistance and for fecundity, hatchability, growth, development of nymphs and increase in BPH population in Tamil Nadu, India.

IR747-B2-6 (*Bph 1*), Mudgo (*Bph 1*), ASD7 (*bph 2*), Ptb 18 (*bph 2*), Rathu Heenati (*Bph 3*), Babawee (*bph 4*), ARC10550 (*bph 5*), Swarnalata (*Bph 6*), Ptb 33 (*bph 2* + *Bph 3*), and TN1 (no resistance gene) were sown in 40-cm rows in 60- × 45- × 10-cm wooden trays. At 7 d after sowing, seedlings were thinned to 15/row and infested with 8 2d-instar nymphs/seedling. Trays were covered with fine fiberglass mesh cages. Treatments were replicated five times. When susceptible TN1 was dead, varieties were graded for damage.

To determine fecundity and hatchability, three pairs of newly

emerged brachypterous males and females were caged on 30-d-old potted plants of test varieties. Five replications were arranged in a randomized complete block design (RCBD) in a water-filled iron tray. Nymphs emerging represented the number of viable eggs produced by the females. After nymph emergence, leaf sheaths were dissected under a 20× binocular microscope and unhatched eggs counted.

To determine growth and development, 10 1st-instar nymphs were caged on 30-d-old potted plants of each test variety, with 5 replications in a RCBD. Growth was measured by the number of nymphs that became adults and the time taken. Insect growth index was calculated as the percentage of nymphs developing into adults to the mean developmental period in days.

To determine population increase, 30-d-old potted plants of each variety were infested with 4 pairs of newly emerged brachypterous males and females per pot, with 5 replications in a RCBD. Nymphs and adults were counted 20 d after infestation.

Rathu Heenati, Babawee, ARC105504 Swarnalata, and Ptb 33 rated resistant in seedbox screening (see table). Mudgo and Ptb 18 were moderately resistant. IR747-B2-6 and ASD7 were susceptible.

Fecundity and egg hatchability were significantly higher on susceptible TN1 and IR747-B2-6 and ASD7 than on

Damage to rice varieties infected with BPH in a free-choice test, and BPH fecundity, egg hatchability, nymph growth and development, and Population increase on 10 rice varieties with different genes for resistance.^a Tamil Nadu, India.

Variety	Resistance gene	Damage rating	Fecundity (no. eggs/female)	Hatchability ^b (%)	Nymphs becoming ^c	Development (d) adults	Growth index (%)	Population increase (no./cage)
IR747-B2-6	<i>Bph 1</i>	9.0 a	525 c	93 e	94 d	12.7 a	1.4 d	512 c
Mudgo	<i>Bph 1</i>	5.4 b	290 b	62 d	62 c	13.4 b	4.6 c	270 b
ASD7	<i>bph 2</i>	9.0 a	537 c	94 e	94 d	12.7 a	7.4 d	515 c
Ptb 18	<i>bph 2</i>	5.8 b	298 b	63 d	64 c	13.3 b	4.8 c	275 b
Rathu Heenati	<i>Bph 3</i>	1.0 c	122 a	46 bc	44 ab	14.9 c	2.9 ab	99 a
Babawee	<i>bph 4</i>	1.0 c	123 a	46 bc	40 ab	14.7 c	2.7 ab	106 a
ARC10550	<i>bph 5</i>	1.4 c	121 a	48 c	46 b	14.8 c	3.1 b	100 a
Swarnalata	<i>Bph 6</i>	1.0 c	116 a	44 ab	42 ab	14.9 c	2.8 ab	103 a
Ptb 33	<i>bph 2 + Bph 3</i>	1.0 c	118 a	41 a	38 a	15.1 d	2.5 a	101 a
TN1	(no resistance gene)	9.0 a	535 c	93 e	96 d	12.6 a	7.6 d	515 c

^aAv of 5 replications. Separation of means in a column by DMRT at the 5% level. ^bThree newly emerged males and females were caged on 30-d-old plants. ^cTen newly emerged 1st-instar nymphs caged on 30-d-old plants.

Rathu Heenati, Babawee, ARC10550, Swarnalata, and Ptb 33. Significantly more nymphs became adults on susceptible TN1, IR747-B2-6, and ASD7. Nymph development was delayed and growth indices were lower on moderately resistant and resistant varieties. The population increase was 2-

4 times higher on TN1, IR747-B2-6, and ASD7 than on Rathu Heenati, Babawee, ARC10550, Swarnalata, and Ptb 33.

Evidently, *Bph 1* and *bph 2* genes do not confer resistance against the BPH population in Tamil Nadu. Minor genes

probably contribute to a moderate level of resistance in monogenic varieties Mudgo (*Bph 1*) and Ptb 18 (*bph 2*). Varieties with *Bph 3*, *bph 4*, *bph 5*, *Bph 6*, and *bph 2 + Bph 3* genes had high levels of resistance to the BPH population in Tamil Nadu. □

Mass-rearing of rice hispa *Dicladispa armigera* Olivier and testing of BR varieties for resistance

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We developed a simple technique to rear rice hispa in the greenhouse. The mass-reared insects were used to test resistance of 15 BRRI rice varieties.

Hispa beetles were collected from ricefields, sorted by sex, and released on potted 30-d-old BR3 rice plants inside 1.8- × 0.6- × 0.6-m fine-mesh wire cages for oviposition. After 34 d, plants with eggs were transferred to another cage for development of grubs. Grubs developing in the leaves were easily visible. Plants were sprinkled with water intermittently during daytime by means of a fine sprinkler until most grubs approached the pupal stage.

Grubs usually developed in 2 wk and turned brownish at pupation. Plants with pupae were transferred to another

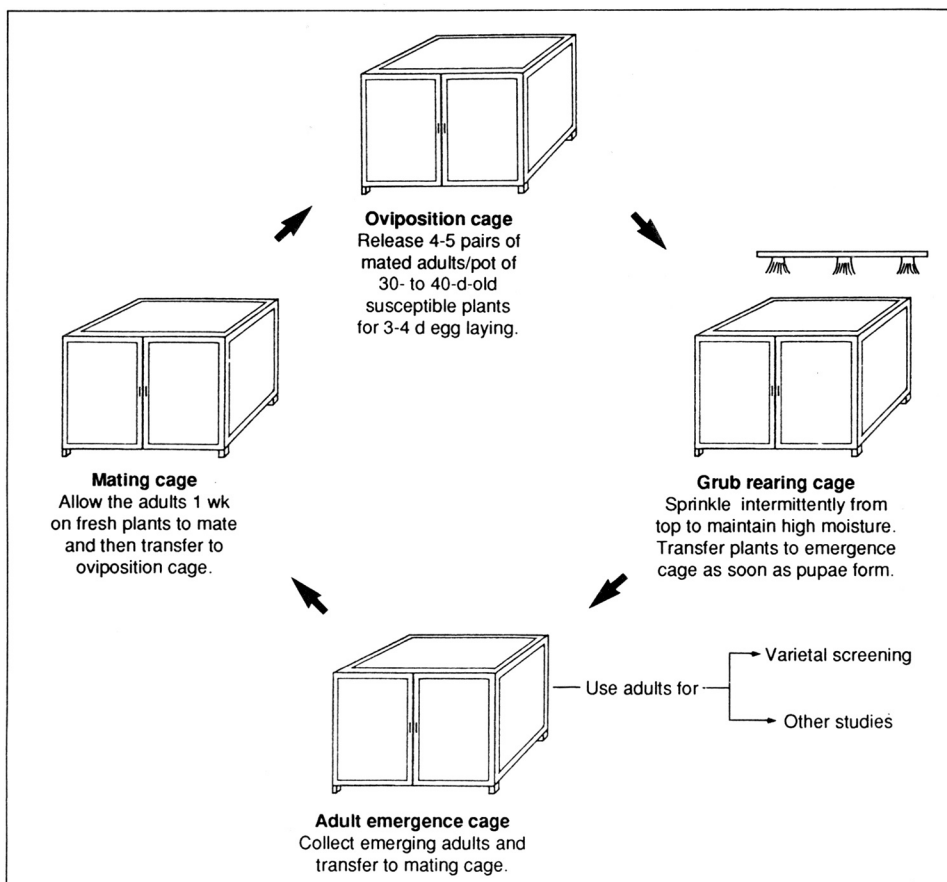


Diagram for mass-rearing of hispa on rice plants. BRRI.