Wide hybridization between rice and most of its wild relatives is now possible. Genes for insect resistance from *O. officinalis* have been successfully incorporated into advanced breeding lines. Therefore, the various sources of resistance reported are potential donors for resistance to the tungro viruses. □

## Performance of a bacterial blight (BB)-resistant rice variety in the endemic pockets of Konkan Region, India

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Karjat 1 (Holamaldiga/lR36) is an early-maturing rice with high resistance to BB at both the vegetative phase and flowering stage. The variety, released by KKV, is specifically for the BB-endemic areas of Konkan Region (west coast).

The variety and susceptible checks EK70 (local) and Karjat 184 were tested during the five kharif (monsoon) seasons of 1985-86 to 1989-90, in farmers' fields. We recorded BB incidence three times using the *Standard evaluation system for rice* (SES) 0-9 scale.

At vegetative phase, Karjat 1 was free of BB as foliar and kresek infections during all years studied (see table). Average incidence of BB at flowering and grain filling ranged from 0.12 to 1.24, with a maximum of 0.4 at flowering stage and 1.5 at grain filling. Average incidence of BB was 3.90-6.72 on Karjat 184 and 3.92-7.22 on EK70.

Karjat 184 had an average kresek infection of 3.54 and EK70, 3.64.

The study indicates that farmers can adopt Karjat 1 for cultivation in BB-endemic areas of Konkan Region. □

**Performance of Karjat 1, Karjat 184, and EK70 in BB endemic areas in Konkan Region, India, 1985-86 to 1989-90.**

| Year | Locations (no.) | Av BB incidence[a] | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Vegetative[b] | | | | | | | | | | | | |
| | | Karjat 184 | | EK70 | | BB at flowering | | | BB at grain filling | | | Av grain yield (t/ha) | | |
| | | BB | Kresek | BB | Kresek | Karjat I | Karjat 184 | EK70 | Karjat 1 | Karjat 184 | EK70 | Karjat I | Karjat 184 | EK70 |
| 1985-86 | 5 | 0.0 | 0.1 | 1.4 | 2.4 | 0.4 | 2.4 | 6.2 | 1.0 | 4.6 | 7.2 | 4.2 | 3.9 | 2.8 |
| 1986-87 | 5 | 7.7 | 7.0 | 5.0 | 4.4 | 0.1 | 6.2 | 5.2 | 1.2 | 6.5 | 5.4 | 3.6 | 1.6 | 2.6 |
| 1987-88 | 4 | 5.0 | 2.4 | 5.0 | 3.0 | 0.1 | 7.2 | 7.0 | 1.5 | 9.0 | 8.0 | 4.1 | 2.8 | 2.8 |
| 1988-89 | 2 | 2.4 | 2.0 | 3.2 | 2.4 | 0.0 | 4.6 | 4.9 | 1.0 | 6.2 | 6.5 | 3.7 | 3.0 | 2.9 |
| 1989-90 | 6 | 4.4 | 6.2 | 5.0 | 6.0 | 0.0 | 5.6 | 5.6 | 1.5 | 7.3 | 9.0 | 3.2 | 2.0 | 1.8 |
| Av | | 3.00 | 3.54 | 3.92 | 3.64 | 0.12 | 5.16 | 5.78 | 1.24 | 6.72 | 7.22 | 3.8 | 2.7 | 2.6 |

[a] 1976 SES scale for BB: 0 = no BB incidcnce. 9 = 5 100% area of upper 3 leaves showing necrotic symptoms. SES scale for kresek: 0 = no incidence. 9 = 91-100% hills affected. [b] Karjat I had no BB at vegetative phase.

# Pest resistance—insects

## Insecticide-induced resurgence of brown planthopper (BPH) on IR62

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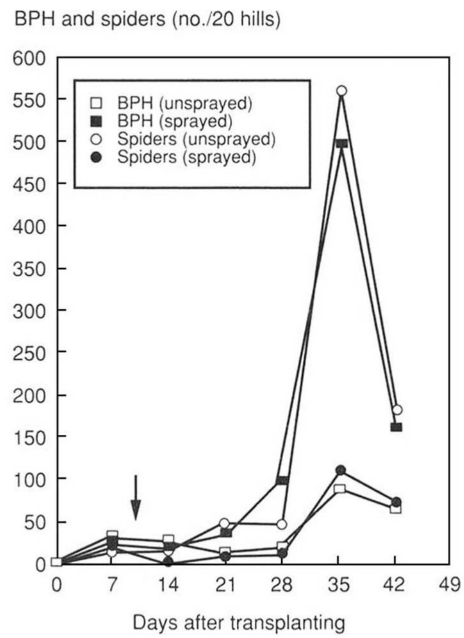
Many farmers in Koronadal, Philippines, apply sprays of synthetic pyrethroids to their rice as early as 1-2 wk after transplanting (WT) regardless of numbers of insect pests or beneficial arthropods. These sprays are perceived as "insurance"-even when varieties have insect resistance. Resurgence of BPH populations on susceptible varieties due to the destruction of natural enemies is well documented. Little information is available, however, on the impact of these chemical sprays on BPH and natural enemy populations on resistant rice varieties.

We established a trial in a farmer's field in Caloocan, Koronadal, during the 1986 wet season (Jul-Sep) to demonstrate the effects of broad-spectrum chemical applications on BPH and spiders (major BPH predators) on resistant variety IR62. An area of 800 $m^2$ was planted and divided into two equal parts. One part was sprayed at 10 days after transplanting (DT) with a synthetic pyrethroid




Total number of BPH and spiders sampled by D-vac. Caloocan, South Cotabato, Philippines, 1986 wet season.

(decamethrin) at 8 g active ingredient/ha as a foliar application using a knapsack sprayer; the other part was untreated.

Weekly for 6 wk, 10 hills from each plot were randomly sampled for BPH and spiders using a D-Vac suction sampler. Insects and spiders were identified, counted, and their numbers plotted to show population trends. Rice yields were taken from each plot.

The BPH population in the sprayed plot resurged to about 500 insects/20 hills; that in the unsprayed plot remained below 100/20 hills (see figure). In contrast, the number of spiders remained low in sprayed plots but reached a peak of more than 550/20 samples in the unsprayed fields.

Rice grain yields were significantly lower in the treated plot (137 kg) than in the untreated one (159 kg). The larger BPH number clearly reduced yields in the sprayed plot, thus negating the possible expression of insect resistance in IK62.

Any effects of a resistant rice variety may be masked by unnecessary insecticide sprays that induce BPH populations. Early insecticide spraying kills spiders and causes BPH numbers to multiply unchecked. This increase of BPH puts the varietal resistance of IR62 at risk because it induces local BPH populations to more quickly adapt to resistant varieties than they would without the chemical treatment. □

## Genetic sources of resistance to whitebacked planthopper in scented quality rices

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Aromatic (Basmati) rices command a premium price in international markets. They have superfine grains, pleasant aroma, and kernel elongation with soft texture upon cooking. All of' the traditional Basmati types are tall, susceptible to many insects and diseases, and low yielding. It has been difficult to transfer the key quality characteristics of Basmati rices into productive dwarfs that have pest and disease resistance.

We screened 400 scented quality rices to identify Basmati types with resistance to whitebacked planthopper (WBPH) *Sogatella furcifera* (Horvath), a major pest in Basmati-growing areas in India, brown planthopper (BPH) *Nilaparvata lugens* (Stål), and gall midge (GM) *Orseolia oryzae* (Wood Mason) under artificial infestations in a glasshouse. Some important quality traits, such as aroma, kernel length (KL), length-to-breadth ratio, anti kernel length after cooking (KLAC), were also studied.

None of the Basmati types were resistant to either BPH or GM, but some showed varied reaction to WBPH. HBC5 was the only variety found resistant to WBPH (see table). HBC5 has extra-long slender grains, KL of 7.42 mm, strong scent, and a high KLAC of 13 mm. Basmati Kota, with moderate resistance to WBPH, has extra-long grains and showed the highest KLAC of 15.0 mm. Basmati 397 and HBC98 also had moderate WBPH resistance and good KLAC. These varieties can be readily utilized in breeding programs to develop high-yielding dwarf Basmati rices. □

**Key quality attributes of scented quality rices and reaction to WHPH. DKR, Hyderabad, India, l990 wet season.**

| Variety | Nature of resistance[a] | Score[b] | Kernel length[b] (mm) | Length: breadth | Kernel length after cooling (mm) | Grain type | Aroma[d] |
|---|---|---|---|---|---|---|---|
| HBC5 | R | 2.7 | 7.42 | 4.21 | 13.0 | LS | SS |
| Dehradun Basmati | MR | 5.1 | 6.07 | 3.13 | 10.0 | LS | SS |
| Basmati 397 | MU | 4.4 | 6.67 | 3.83 | 13.7 | LS | SS |
| Basmati 405 | MR | 3.6 | 6.79 | 3.53 | 10.8 | LS | SS |
| HBC85 | MU | 3.2 | 7.65 | 3.98 | 12.2 | LS | SS |
| HBC98 | MU | 3.6 | 6.63 | 3.83 | 13.7 | LS | SS |
| Basmati Kota | MU | 3.5 | 7.54 | 3.95 | 15.0 | LS | SS |
| Lua Nheden | MR | 4.4 | 5.74 | 2.94 | 8.5 | LB | MS |
| Basmati 370 | S | 9.0 | 6.63 | 3.45 | 12.5 | LS | SS |
| Mean | | | 6.19 | 3.65 | 12.16 | | |
| CV (%) | | | 11.9 | 18.3 | 20.0 | | |

[a] R = resistant, MR =moderately resistant. S = susceptible. [b] Scored by the by Standard evaluation system for rice scale of 0-9,1988. [c] LS = long slender, LB = long bold. [d] MS = mild scent, SS = strong scent.

## Screening Basmati rites for stem borer resistance

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We evaluated Basmati rices comprising 19 scented dwarf, 6 scented tall, and 10 new entries or lines for resistance to stem borer *Scirpophaga incertulas* (Lepidoptera: Pyralidae) in the field during 1990. Each entry was planted in 20-m$^2$ plots at 20- × 15-cm spacing with three replications. Total and affected panicles from 10 random hills in each plot were counted at flowering stage to calculate damage.

Infestation (whiteheads) ranged from 6.3 to 51 % in the scented dwarfs (see

**Resistance of Basmati entries to stem borer.**

| Entry, culture | Whiteheads(%) |
|---|---|
| *Scented dwarf* | |
| HKR86 411 | 51.0 |
| BBC19 (check) | 48.8 |
| Bas 370 (check) | 48.5 |
| HKR403 | 47.0 |
| HKR239 | 46.5 |
| HKR86-40 | 45.9 |
| HKR240 | 45.5 |
| HKR242 | 38.9 |
| HKR416 | 37.7 |
| HKR86-404 | 37.7 |
| HKR401 | 32.8 |
| IET120-11 | 31.3 |
| HKR236 | 29.3 |
| HKR410 | 27.8 |
| HKR238 | 18.0 |
| Pusa Basmati 1 | 16.2 |
| HKR228 | 10.9 |
| Kasturi | 8.1 |
| HKR243 | 6.3 |

*continuation on next page...*