Efficacy of fungicides and application methods for controlling blast (Bl)

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B1 disease caused by *Pyricularia oryzae* Cav. is endemic to the northeastern hill region of India, where it causes significant yield losses to upland and lowland rice. Chemical control by conventional fungicide sprays and dusts is difficult because of high rainfall and many rainy days during wet season. We tested other fungicide application methods such as seed treatment and seedling root-dip.

In 1982 wet season, we set up a fungicide trial with eight treatments and three replications in a randomized block design at Barapani farm, Shillong. Pusa 33 was transplanted in 3.5 × 2-m plots at 15- × 10-cm spacing and fertilized with 60-60-40 kg NPK/ha. Combinations of carbendazim, benomyl, IBP, and isoprothiolane were applied as seed treatment, root dip, and spray. Seed treatments were carbendazim and benomyl at 1 g ai/kg seeds; root dips were IBP .08% ai and isoprothiolane 0.04% ai; and sprays were carbendazim 0.05% and benomyl 0.05% ai, applied at 300-800 g ai of the fungicides in 600 to 800 litres water/ha.

Efficacy of fungicides and application methods for controlling B1 disease at Barapani, Shillow, India, 1982.

Fungicide,[a] application method	Dose (ai)	Efficacy (%)	
		Leaf B1	Neck B1
Carbendazim 50 WP (seed treatment)	1 g/kg seeds	40	34
Carbendazim 50 WP (seed treatment and sprays at PI and heading)	1 g/kg seeds + 0.5 g/litre	30	18
Benomyl 50 WP (seed treatment)	1 g/kg seeds	30	37
Benomyl 50 WP (seed treatment and sprays at PI and heading)	1 g/kg seeds + 0.5 g/litre	30	16
IBP 40 EC (12 h root-dip and sprays at PI and heading)	0.8 ml/litre	40	20
Isoprothiolane 40 EC (12 h root-dip and sprays at PI and heading)	0.4 ml/litre	20	6
Isoprothiolane 40 EC (sprays at tillering, PI, and heading)	0.4 ml/litre	20	8
0 (control)	–	70	32
CD (5%)	–	–	20

[a] WP = wettable powder, EC = emulsifiable concentrate, PI = panicle initiation.

Data in the table show that seedling root-dip in isoprothiolane 40 EC for 12 h before transplanting, followed by one spray at panicle initiation and one at heading, can significantly reduce B1 incidence. A schedule of 3 sprays (20 d after transplanting, panicle initiation, and heading) of isoprothiolane was equally effective. IBP 40 EC root-dip followed by one spraying at panicle initiation and one at heading, and carbendazim and benomyl either as seed treatment alone of as seed treatment plus spraying at panicle initiation and heading reduced foliar B1 but not neck B1. ☐

Effect of K on bacterial blight (BB) development

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To test the effect of K on BB development, we fertilized a soil sample containing 100 ppm K with 200 ppm N and 66 ppm P. One-third of the total N from urea was topdressed 7 d before panicle initiation. Five potash treatments (see table) in six pot replications were compared for effect on BB development and some other yield components. Three BB-susceptible IR8 seedlings were transplanted in each plot and inoculated with *Xanthomonas campestris* pv. *oryzae* strain BXO9 at maximum tillering and at flag leaf stage by clipping.

Relation between different doses of K and response of BB-inoculated IR8 plants in t. aman season, 1983, Joydebpur, Bang1adesh.[a]

Treatment	Average lesion length (cm)		Average no. of		Average yield (g/pot)
	1st inoculation at maximum tillering	2d inoculation at flag leaf stage	fertile tillers	filled grains	
100 ppm K	30 a (7)	13 a (5)	81 a	71 b	34 a
183 ppm K	22 b (5)	8 b (5)	78 a	76 a	37 a
266 ppm K	20 bc (5)	6 b (5)	74 a	80 a	40 a
349 ppm K	19 bc (5)	6 b (5)	76 a	81 a	40 a
432 ppm K	16 c (5)	5 b (5)	78 a	79 a	43 a
CV%	12.6	34.0	13.6	7.4	12.4

[a] Data are averages of six replications. Figures followed by the same letter are not significantly different at P0.05 level. Values in parentheses are scores based on the *Standard evaluation system for rice* scale of 0-9.

Comparison of plants grown on treated soil and on soil with 100 ppm K showed that average lesion lengths both at maximum tillering and flag leaf stage were significantly lower on plants in potash-treated soil than on those grown in soil containing less K, indicating that plants grown in soil with 183 ppm or more K are more BB resistant. Percentage of filled grains was significantly lower in plants grown in soil containing less K than in those with added potash. Although yield was not significantly different between treatments, plants grown in the soil with 349 ppm added K yielded nearly 16% higher than those grown with 100 ppm K. ☐

Optimum age of rice for brown spot (BS) control by fungicide spray

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BS, caused by *Cochliobolus miyabeanus* (Ito and Kuribay) Dickson, is a major rice disease in Tamil Nadu. In North Arcot District, foliar application of various fungicides often does not control the disease.

We sought to determine optimum plant age for fungicide application to control BS in the field. Five treatments were in a randomized block design with four replications (see table). Disease intensity was scored as 0 = no disease, 1 = less than 1% of leaf area affected, 2 = 1-3% affected, 3 = 4-5%, 4 = 6-l0%, 5 = 11-15%, 6 = 16-25%, 7 = 26-50%, 8 = 51-76%, and 9 = 76-100%.

Trials from Aug 1981 to Jan 1982 with Ponni and ADT35 showed that spraying edifenphos at 500 ml/ha at 50 and 65 d after transplanting (DT) effectively reduced disease intensity and significantly increased yield. From Nov 1981 to May 1982, spraying Vaigai and Bhavani 25, 40, and 55 DT also was effective. Spraying TKM9 and ADT31 from Apr to Aug 1982 did not produce significantly different yields although all treatments significantly reduced disease intensity (see table). ☐

BS intensity and mean yield, Tamil Nadu, India.

Age (DT) at spraying	Aug 1981-Jan 1982				Nov 1981-May 1982				Apr-Aug 1982			
	Ponni		ADT35		Vaigai		Bhavani		TKM9		ADT3 1	
	Intensity (mean)	Mean yield (t/ha)	Intensity (mean)	Mean yield (t/ha)	Intensity (mean)	Mean yield (t/ha)	Intensity (mean)	Mean yield (t/ha)	Intensity (mean)	Mean yield (t/ha)	Intensity (mean)	Mean yield (t/ha)
20, 35	7.0	4.4	3.0	2.7	5.0	8.0	6.0	6.1	2.0	4.8	2.0	2.5
35, 50	4.0	5.0	2.0	2.7	5.0	8.1	5.0	7.4	2.0	4.8	2.0	2.6
50, 65	2.0	5.7	1.0	3.3	4.0	7.9	5.0	7.1	2.0	4.7	2.0	2.5
25, 40, 55	3.0	5.2	1.0	3.1	3.0	9.5	3.0	7.8	1.0	4.8	2.0	2.5
Control	9.0	4.1	3.0	2.6	8.0	5.7	8.0	4.6	2.0	4.7	3.0	2.5
CD (P = 0.05)	2.6	0.3	9.8	0.1	2.4	0.8	0.5	0.9	0.4	NS	0.5	NS

Pest Control and Management

INSECTS

Entomopathogenic microorganisms of rice planthoppers and leafhoppers in China

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We studied pathogenic microorganisms of rice planthoppers and leafhopper pests in Hunan Province, China. Under optimum temperature and humidity, the pathogens significantly decrease pest populations. The fungal species usually are most abundant in rainy season and at later stages of rice growth. Up to 80% of the hopper population may be infected. At some sites there are high infection levels by entomopathogenic nematode species such as *Amphimermis unka.*

Various species of pathogenic fungi, two nematode species, and one species of bacterium have been identified as infecting hoppers. Several of the fungal species and the bacterium have been isolated on artificial solid media. The nematodes were identified under the microscope.

The following planthoppers and leafhoppers were examined: *Nilaparvata lugens, Sogatella furcifera, Nisia atrovenosa, Laodelphax striatellus, Saccharosydne procerus, Nephotettix cincticeps, Empoasca subrufa, Deltocephalus dorsalis,* and *Macrosteles fascifrons.* The following entomopathogenic fungi were isolated from them: *Entomophthora delphacis, Beauveria bassiana, B. tenella, Metarrhizium anisopliae,* and *Hirsutella saussurei.* Unidentified *Paecilomyces* spp., *Cephanosporium* spp., etc. also have been isolated. Surprisingly, several hoppers were infected with *Nomuraea rileyi,* a common entomopathogen of lepidopteran larvae in the rice ecosystem.