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ASSESSMENT OF SOME NEW FUNGITOXICANTS AGAINST *HELMINTHOSPORIUM ORYZAE* AND BROWN SPOT OF PADDY

By

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Four new fungicides-2-iodobenzoic acid anilide (Benodanil), a 50 : 32 mixture of 2-5, dimethyl-furan-3-carbonic acid anilide and (zinc) manganese ethylene-bis-dithocarbamate (Campogran N), M-tridecyl-2, 6-dimethylmorpholine (Calixin) and 2-(thiocyanomethylathio)-benzothiazole (Busan), were assessed for their fungitoxic activity against *Helminthosporium oryzae* and the disease caused by it, the brown spot of paddy. None of them had very high toxicity towards spore germination but the growth was strikingly inhibited by Calixin (ED_{50}=0.35 ppm). Sporulation and spore size were also reduced. When applied to inoculated seedlings under controlled conditions through seed treatment, soil drench or foliar spray all were effective in reducing the disease intensity to different extents. A spray application of Calixin (0.1%) reduced the disease intensity to negligible proportions. However, it caused pin-head type phytotoxic lesions. Soil drench with Benodanil of seed treatment with Busan considerably reduced the intensity of the disease.

INTRODUCTION

Efforts to control brown spot of paddy caused by *Helminthosprium oryzae* Breda de Haan [*Cochliobolus miyabeanus* (Ito and Kuribayashi) Dreschler ex. Dastur] has been made from time to time and certain degree of success has been claimed (Chattopadhyay & Chakrabarti, 1961; Padmanabhan, 1974; Das Gupta, 1975). The pathogen is known to overwinter in seed (Kuribayashi, 1937) and infected plant parts (Chattopadhyay & Chakrabarti, 1954).

A large number of new systemic and seed protectant fungicides have been recently introduced.

The purpose of this investigation was to assess the effects of some of the newly introduced fungitoxicants on the pathogen and on the incidence of this disease.

MATERIALS AND METHODS

The pathogen was isolated from infected grains of paddy and maintained on potato-dextrose agar medium.

The fungicides tested were three systemics: iodobenzoic acid anilide (Benodanil); a 50 : 32 mixture of 2, 5 dimethylfuran-3-carbonic acid anilide and (zinc) manganese ethylene-bis-dithiocarbamate (Campogran-M); N-tridecy2.6l--dimethyl-morpholine (Calixin) and a contact protectant; 2-(thiocyanomethylthio-) benzothiazole (Busan).

Bioassay of fungicides was done through slide germination (Montgomery & Moore, 1938) and poisoned-food technique. All experiments were suitably replicated and the ED_{50} was determined on a log-probit scale. The growth pattern and degree of sporulation in sub-lethal concentrations were recorded.

Effect of seed treatment with fungicides on seed germination and seedling health was datetmined by treating infected paddy seeds (var. *Kaberi*) with requisite quantity of fungicide in a wrist action shaker and placing 20 seed in triplicates in moist chamber petriplates. Percent germination and root and shoot length were recorded after seven days.

In order to determine the effectiveness of these fungicides on the incidence of brown spot of paddy, rice seed, var. *Dular* were sown in 6 inch earthen pots in a soil-manure mixture (3 : 1) and kept in green house. The number of seedlings were thinned to 20 per pot At 4 leaf stage (10 days) the seedlings were sprayed with 5×10^6 spore/ml suspension of a virulent isolate of *H. oryzae* and

the pots maintained for 24 hr at saturation humidity under plastic chambers. After 24 hr the inoculated seedlings were either sprayed or soil drenched with requisite quantities of fungicide solution. Effect of seed treatment was studied by sowing treated seeds. Effects of spraying Busan and Camogran-M were not included as they have been basically developed as seed protectants. The disease intensity was recorded after 15 days of spray application following the method described earlier (Sen and Kaiser, 1972).

Results And Discussion

In-vitro effect of fungicides on Helminthosporium oryzae : Except Busan, none of the fungicides appeared to have any significant effect on the germination of spores of *H. oryzae*. However, the germ tube growth was inhibited in all cases, the effect being most pronounced with Campogran-M (Table 1), followed by Calixin.

Growth inhibition studies through poisoned-food technique revealed a striking effect of Calixin with an ED_{50} of less than 1. Other fungicides were also effective to different degrees (Table 1).

Table 1. *ED_{50} of four fungicides against* Helminthosporium oryzae

Fungicides	ED_{50} (ppm)		Mean germ tube length (μ)
	Spore germination	Growth inhibition	
Benodanil	400.0	74.64	144.7 (449.5) *
Campogran M	139.3	58.61	69.5 (342.5)
Calixin	235.0	0.85	116.6 (171.13)
Busan	44.4	52.34	90.5 (250.0)

* Figures in parentheses are average germ tube length in the control.

Benodanil and Campogran-M had little effect on the colony characters of the pathogen. With increasing concentration of Calixin the colony became crumby and dimpled. The intensity of sporulation was progressively reduced and became nil at 160 ppm even after 28 days of incubation at 28°C. The size of the conidia were also reduced, being 25-40 at 80 ppm (90-140 μ in control). Busan induced irregular marginal growth with progressive reduction in sporulation.

Effect of fungicides on seed and seedling health: The fungicides did not affect* germination of seed significantly (Table 2) although germination was delayed in all cases. Seedlings emerging from Calixin-treated seed developed poor root

Table 2. *Effect of fungicides on seed germination and root and shoot growth of rice seedlings*

Fungicides	Concentration*	Germination (%)	% reduction in growth	
			root	shoot
Benodanil	3.0 g	63.3	33.4	32.3
Camaogran M	3.0 g	80.0	47.3	24.9
Calixin	2.5 ml	61.7	77.2	55.0
Busan	1.0 ml	68.5	51.4	31.4
Control		73.4		

*) Concentration indicates amount of product used for treating one kg seed lot.

system. Roots were almost devoid of hairs and showed burning of the tips. Seedlings from Benodanil and Compogran treated seed recovered the initial setback in growth but those treated with Calixin did not.

Effect of fungicides on brown spot of paddy : Although all treatments showed significant improvement over uninoculated control, the responses obtained through 3 different methods of fungicide application were different (Table 3). Foliar application of Calixin (0. 1%) brought down the infection value to negligible level. However, a large number of minute phytotoxic spots developed on the leaves. Soil drench and seed treatment with Calixin also reduced disease incidence significantly but the later treatment led to phytotoxicity expressed in the reduction of height of seedings, size of the leaf blades and burning of the leaf tips.

claimed to be a systemic. Translocability of this fungicide needs to be investigated.

The results showed that soil drench with Benodanil or seed treatment with Busan reduced the intensity of the disease considerably.

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