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EVALUATION OF SEED TREATMENT FUNGICIDES FOR THE CONTROL OF THE RICE BLAST DISEASE CAUSED BY *Pyricularia oryzae*

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ABSTRACT

The efficacy of seed treatment fungicides Benomyl (benlate), pyroguilon (Fongorene), marcozeb (Dithane M45), Apron plus (metalazyl, and caboxin) on rice blast was investigated. Field tests indicated that the fungicides had significant effects on rice seed germination. Under laboratory conditions, seeds treated with Apron plus had the highest germination (90.8). This was followed by mancozeb, control, pyroguilon, Benomyl (Dust) and Benomyl (Dip) with 89.8, 88.3, 88 and 87.8% respectively. Similar results were obtained in the nursery. The nursery disease assessments showed that seedlings from pyroguilon had the least disease incidence followed by mancozeb, Benomyl dip, Benomyl dust, Apron plus and control. The blast disease was least severe in pyroguilon treated plots and most severe in the control plots.

INTRODUCTION

The rice blast disease caused by *Pyricularia oryzae* Cav is the major and most devastating disease of rice in Nigeria (Aurion, 1987: Imolehin, 1983) and most rice producing areas of the world.

Blast can affect rice plant at any stage of its development (Nagaraju *et al*, 1988). The leaf blast occurs mostly at the vegetative stage while the most destructive symptom at the ripening and reproductive stage is the neck blast characterised by infection at the base of the panicle. Susceptibility of rice to the disease depends on the rice variety planted, environmental conditions and cultural practices employed (Odyody and Fredericksen, 1984; Nagaraju *et al*, 1988; Ou, 1988).

Since rice varieties differ in their susceptibility, the use of resistant varieties is largely used to control the disease. However, due to rapid production of new physiological

races of *P. oryzae* (Awoderu, 1974; Imolehin, 1987) resistance often breaks down with time. Moreover, inadequate use of fertilizer as practiced by most Nigerian farmers also predisposes rice plants to the blast disease.

Effective fungicides are a source of relief during blast outbreaks (Odyody and Fredericksen, 1984; Singh and Bhatt 1986; Aurion, 1987; Nagaraju *et al*; 1988; Reddy and Satyanarayana, 1988). However, there is a dearth of such chemicals in our rice production systems. The use of potent seed dressing fungicide when found will further relieve the farmers of the hazards and drudgery of fungicidal application. In this trial, some systemic seed dressing fungicides were assessed for the control of the rice blast disease.

MATERIALS AND METHOD

Effect of Seed Treatment on Seed Germination.

One kilogram of rice seeds (FARO 29) were put into a receptacle to which 10g of Apron plus and 10ml of water were added. The contents were thoroughly mixed for about 5 minutes. Similarly 1kg of seeds were separately treated with 4g of Fongorene, 5g of Dithame M45 or 5g of Benlate while another set of 1kg of rice seeds were soaked for 5 minutes in a solution of 5g of Benomyl in 11 litres of water. The control was not treated with any chemical.

The various seed lots was tested for their germinations in the laboratory by placing 50 treated or untreated seeds on moist filter papers in petri dishes.

The treatment were randomly placed using radomised complete block design and each was replicated thrice. Germination counts were taken after five days.

For field germination tests, 1000 each of the treated and untreated seed lots were sown on 1.2m x 5m nursery beds, and each was replicated four times using randomised complete block design. Germination counts were taken 10 days after sowing.

Effect of seed Dressing Fungicide on Rice Blast

To test the effects of various fungicidal seed treatments on the rice blast disease, rice seeds were treated with the various systemic fungicides as described above.

The seeds were sown on well prepared nursery bed that had received an equivalent of 80kg N/ha. After sowing grass straws were used to cover the bed for 7 days to enhance germination and equally protect the seeds against some pests.

The rice seedlings were scored for the incidence and severity of blast after 27 days of sowing and they were transplanted into the permanent field the following day. At tillering and booting stages of growth, the rice plants were also scored for blast susceptibility using International Rice Research Institute (IRRI) 1990 Standard Evaluation System (SES).

RESULTS

Effect of Fungicidal Seed Treatment on Seed Germination

The effects of the fungicidal seed treatments on seed germination under laboratory tests showed that percent seed germinations did not differ significantly among treatments and they ranged from 87.8 to 90.8 (Table 1).

However, the percent seed germinations differed significantly among the various treatments under condition, the highest percent seed germination of 81.3 was also observed under metalaxyl treated seeds while control had the least germination of 65.0% (Table 1)

Effect of Fungicidal Seed Treatment on the Blast Disease

The effect of fungicidal seed treatment on the incidence of the rice blast disease show that blast incidence in the nursery differed significantly and ranged from 2.3 to 7.7, Blast disease severity also followed similar trend but the differences were not significant (Table 2). Blast incidence also differed significantly between the treatments under the field condition.

The least blast score of 1.0 was recorded on pyroguilon treated seeds while the highest incidence score of 3.5 was observed on the control and the Metalazyl treated plots when assessed at the tillering stage of development (Table 3).

The effects of the seed treatments on blast severity showed that blast was least severe on pyroguilon treated plots (Table 3). The rice blast was most severe on the control plants. Blast incidence and severity at the booting stage of the rice development did not differ from those recorded at the tillering stage (Table 3). The blast disease incidence of 1.5 was recorded in the pyroquilon treated plot while the control plot had a score of 4.5. Blast severity score of 1.0 was observed in pyroquilon plots while the rest ranged from 2.0 to 5.5 recorded for the control plots.

Table 1 Effect of seed dressing fungicides on rice seed germination.

Treatments	Field	Laboratory
Apron plus	80.5	90.9
Benomyl/Dip	76.3	87.8
Benomyl/Dust	81.3	88.8
Dithane M45	75.8	89.0
Fongorene	79.5	89.3
Control	65.0	89.8
Mean	76.4	89.3
LSD at 5%	5.44	N.S

Table 2 Effect of seed dressing fungicides on blast infestation in the Nursery bed.

Treatments	Blast Incidence	Severity
Apron plus	7.0	4.3
Benomyl/Dip	4.3	3.0
Benomyl/Dust	5.7	4.3
Dithane M45	5.7	3.0
Fongorene	2.3	1.7
Control	7.7	5.0
Mean	5.5	3.6
LSD at 5%	2.07	N.S

1 = 2%, 3 = 5%, 5 = 25%, 7 = 50%, 9 = above 75%

Table 3 Effect of seed dressing fungicides on blast infestation at tillering and booting stages and paddy yield.

Treatments	Blast Incidence at tillering	Severity	Blast incidence at booting	Severity	Paddy yield (kg/ha)
Apron plus	3.5	2.5	3.0	3.0	1750
Benomyl/Dip	3.0	2.0	3.0	2.5	1685
Benomyl/Dust	2.5	2.0	3.0	2.0	1650
Dithane M45	2.5	2.5	2.5	2.0	1815
Fongorene	1.0	1.0	1.5	1.0	2035
Control	3.5	3.5	4.5	5.5	1750
LSD at 5%	1.27	1.14	1.59	N.S	N.S

1 = 2%, 3 = 5%, 5 = 25%, 7 = 50%, 9 = above 75%

Effect of Fungicidal Seed Treatments on Rice Yield

There were no significant differences in the yields of plots treated with fungicides in this trial (Table 3). However, the highest yield of 2035kg/ha was recorded from fongorene treated plots.

DISCUSSION

Results of the effects of some systemic seed treatment fungicides on the rice blast disease indicated that the tested fungicides had significant effects on the germination of the treated seeds. Metalaxyl greatly enhanced seed germination both under laboratory and field conditions. The differences in germination of rice seeds treated with other fungicides compared to metalaxyl was low and not significant under laboratory condition in contrast to the results obtained under the field conditions. Moreover seed germinations observed under laboratory conditions were generally higher than those observed under the field conditions for all treatments. The significant differences between control and treated plots under field conditions thus suggest that the various fungicides might be playing a major role in suppressing the soil borne pathogens that have depressing effects on seed germination (Fernando *et al,* 1980; Imolehin, 1983). The effectiveness however differed with the potencies of the fungicides used. These findings were also observed in earlier studies recorded (Odyody and Fredericksen, 1984; Nagaraju *et al* 1988). Results on the effect of seed treatment on blast incidence indicated that pyroquílon seed treatment significantly reduced blast incidence both under the nursery and field conditions.

Results of the present studies also showed that the pyroquilon was equally superior to other seed treatments in suppressing blast severity both at the nursery and field conditions. The other treatments did not differ significantly among themselves. Present results thus suggest that pyroquilong had great promise as a seed dressing fungicide in the control of the rice blast disease. This finding supports the reports of earlier workers on the efficacy of pyroquilon on blast (Nagaraju *et al,* 1988; Reddy and Satyanarayana, 1988). Metalaxyl reported to be effective in the control of downry mildew of cereals (Ling and Ou, 1969) was not effective in the control of blast in this study. This finding thus suggests that Metalaxyl used as seed dressing fungicide may not be effective in the control of *Pyricularia oryzae* the pathogen.

Present results thus suggest that pyroquilon has great potentials as a seed dressing fungicide in the control of the rice blast disease and its use by farmers will reduce the damage caused by the disease.

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