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STUDIES ON EFFICACY OF DIFFERENT CHEMICAL TREATMENTS AGAINST BACTERIAL LEAF BLIGHT OF RICE IN BIHAR

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ABSTRACT

Bacterial leaf blight (BLB) of rice caused by *Xanthomonas oryzae* pv. *oryzae* is emerging as serious threat to rice production worldwide, including India & its state of Bihar. Keeping in view enormous losses caused by this disease an attempt has been made to control this disease through chemicals. The present study was aimed to find out the best chemical control of Bacterial Leaf Blight disease of rice. Five chemicals i.e. Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt), Kresoxim methyl (Ergon 44.3 SC), Azoxystrobin 25 SC (Amistar) and Carbendazim 50 WP (Bavistin) were tested for this purpose. While observing the effect of different chemicals on growth of *Xanthomonas oryzae pv. oryzae in vitro* maximum zone of inhibition was recorded in case of Tricyclazole 75 WP (Beam). Among five seed dressing chemicals Tricyclazole 75 WP (Beam) proved to be the most effective seed dressing bactericide in minimizing the disease intensity and maximizing the grain yield. Bactericides were sprayed as foliar sprayer, treatment wise. Seed treatment with Tricyclazole @ 3 g/kg and 3 sprays with Tricyclazole @ 0.06 % (tillering, boot and flowering stages) proved to be the most effective treatment in which the least disease intensity and highest yield was recorded.

Keywords: *Xanthomonas oryzae* pv *oryzae*, Rice (*Oryza sativa*), Bacterial Leaf Blight (BLB)

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INTRODUCTION

Rice (*Oryza sativa* L.) is the most staple and leading cereal crops in the world. Seed-borne bacterial leaf blight (BLB) of rice, caused by *Xanthomonas oryzae* pv. *oryzae* (Ishiyama) (Swings et al., 1990), is the major limiting factor in rice production. In India, the yield loss due to this disease is up to 81.3% (Srivastava, 1967; Sonti, 1998; Gnanamanickam *et al*., 1999; Veena *et al*., 2000). In addition, to direct yield loss in the seed production programmes, this disease also adversely affects the seed quality through seed discoloration. The disease is widespread in Asia, United States, Latin America and Australia. In Bihar, it is increasing its area year by year.

Chemicals prevent rice diseases which can result in severe damage to the crop in terms of both quality and quantity. In order to control BLB spraying of Copper-Oxychloride and Streptomycin solution completely inhibits the growth of bacterium (Tagami and Mizukami, 1962; Hori, 1973). In India streptomycin mixture was tested for disinfection of rice seeds and was found effective (Srivastava, 1972). Bleaching powder containing 30% chlorine (2kg/ha) significantly reduced the BLB lesion in rice (Chand *et al.*, 1979). It has been observed that acetylenic compounds such as dicarbamoylacetylen (*Collocidin)* at low

concentrations completely inhibits *Xanthomonas oryzae* in liquid medium (Okimoto & Misato, 1963). Expecting the effectiveness of chemical molecules for control of BLB, the present study was aimed to find out the best chemical control measures of Bacterial Leaf Blight disease of rice. Five chemicals i.e. Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt), Kresoxim methyl (Ergon 44.3 SC), Azoxystrobin 25 SC (Amistar) and Carbendazim 50 WP (Bavistin) were selected against *Xanthomonas oryzae* pv. *oryzae in vitro* and zones of inhibitions were recorded. On the basis of Zone of inhibition further investigations were done *in situ* to assess effectivity of bactericides and to find out suitable stages of bactericide application for management of BLB disease of rice.

MATERIALS & METHODS

Effect of different chemicals on growth of *Xanthomonas oryzae pv. oryzae in vitro*

Five chemicals i.e. Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt), Kresoxim methyl (Ergon 44.3 SC), Azoxystrobin 25 SC (Amistar) and Carbendazim 50 WP (Bavistin) were tested for this purpose. Six Petri plates were poured with nutrient agar medium. All were inoculated with *Xanthomonas oryzae* pv. *oryzae, after solidifying the media by spreading method. Thereafter, 6mm discs of five chemicals; were placed on different Petri plates in three replications. The plate without any chemical was taken as control. Plates were incubated at 30° C for 24 hours. After that zone of inhibition were observed.*

Effect of seed treatment with different bactericides on the BLB disease of rice

Five seed dressing bactericides viz., Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt), Kresoxim methyl (Ergon 44.3 SC), Azoxystrobin 25 SC (Amistar) and Carbendazim 50 WP (Bavistin) were screened as seed treatment agents, against the pathogen to test their efficacies to control the BLB disease of rice.

The pot experiment was conducted during 2012-13 and 2013-14 rice crop season in the poly house of Agricultural Research Institute, Patna. Pots filled with sterilized soil were sown with treated seeds in three replications. A separate set, having un-treated seeds in three replications was also maintained as control.

Naturally infected seeds of rice variety Nata Mahsuri (MTU 7029/ Swarna) were treated by shaking the seeds in plugged conical flask for 15 minutes with respective concentrations of each chemical separately.

Three rice plants were maintained in each pot. Disease intensity was recorded on 0-9 scale and the yield data was obtained after the harvest of the crop.

Efficacy of different bactericidal treatments against BLB of rice

To test the efficacies of chemicals for controlling the disease, five bactericides viz., Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt), Kresoxim methyl (Ergon 44.3 SC), Azoxystrobin 25 SC (Amistar) and Carbendazim 50 WP (Bavistin) were evaluated against the pathogen through pot experiment conducted during 2012-13 and 2013-14 rice crop seasons in the poly house of Agricultural Research Institute, Patna.

Bactericides were sprayed as foliar sprayer, treatment wise. Care was taken for thorough spraying. Plants were injured by the clip method (Kauffman *et al*., 1973). The pots were heavily irrigated for providing better moisture condition, after the inoculation. The appearance of disease symptoms were observed at weekly intervals. Final disease severity was recorded at grain setting stage of the crop using 0-9 scale and the yield data was obtained after the harvest.

RESULTS AND DISCUSSION

The results of the Table 1 (Fig 1) revealed that the maximum zone of inhibition was recorded in case of Tricyclazole 75 WP (Beam). Propiconazole 25 EC (Tilt) gave the second highest inhibition zone. The result was followed by Kresoxim methyl (Ergon 44.3 SC) & Azoxystrobin 25 SC (Amistar). Carbendazim 50 WP (Bavistin) showed also good result. Zone of inhibition was not observed in Control plate.

Table 1: Effect of different chemicals on growth of *Xanthomonas oryzae pv. oryzae in vitro*

Sl. No.	Chemicals	Concentration % [Dose (gm or ml)/L]	Inhibition Zone
1	**Tricyclazole 75 WP (Beam)**	**0.6 gm**	**+++++**
2	**Propiconazole 25 EC (Tilt)**	1.0 ml	++++
3	**Kresoxim methyl (Ergon 44.3 SC)**	1.0 ml	++++
4	**Azoxystrobin 25 SC (Amistar)**	1.0 ml	++++
5	**Carbendazim 50 WP (Bavistin)**	1.0 gm	+++
6	**Control**	**-**	**-**

*Average of three replications

Note : Activities were classified according to the diameter of the zone of inhibition around the disks.

+ : <10 mm ++ : 10 -15 mm +++ : 15 -20 mm ++++ : 20 -25 mm
+++++ : > 25 mm – : without activity NT : Not tested

Table 2: Effect of seed treatment with different chemicals on the BLB disease of rice *in situ*

Sl.No.	Chemicals	Concentration % [Dose (gm or ml)/L]	*Average disease intensity grade			*Grain yield (g/pot)		
			2012 -13	2013 -14	Mean	2012 -13	2013 -14	Mean
1	**Tricyclazole 75 WP (Beam)**	**0.6 gm**	**1.8**	**1.9**	**1.9**	**70.2**	**65.4**	**67.8**
2	**Propiconazole 25 EC (Tilt)**	1.0 ml	2.2	2.3	2.3	64.1	60.3	62.2
3	**Kresoxim methyl (Ergon 44.3 SC)**	1.0 ml	3.1	2.9	3.0	54.8	55.1	55.0
4	**Azoxystrobin 25 SC (Amistar)**	1.0 ml	3.4	3.0	3.2	53.8	51.0	52.4
5	**Carbendazim 50 WP (Bavistin)**	1.0 gm	4.1	4.2	4.2	49.9	42.6	46.3
6	**Control**	-	5.6	4.9	5.3	20.5	24.9	22.7
	SEm ±		0.17		2.22			
	CD at 5%		0.60		7.68			
	C.V.		7.46%		6.14%			

Average of 3 replications: Three plants per pot

The results of Table 2 (Fig 2) indicated that Tricyclazole 75 WP (Beam) proved to be the most effective seed dressing bactericide in minimizing the disease intensity and maximizing the grain yield. It was significantly superior to the control and other treatments in respect of disease intensity. Next to Tricyclazole 75 WP (Beam), Propiconazole 25 EC (Tilt) was significantly superior to all other seed dressing chemical in minimizing the disease intensity and maximizing the grain yield. Kresoxim methyl (Ergon 44.3 SC) was found to be third effective chemical which was closely followed by the effect of Azoxystrobin 25 SC (Amistar) in minimizing the

disease intensity and maximizing the grain yield. Carbendazim 50 WP (Bavistin) was significantly superior to control in minimizing the disease intensity and maximizing the grain yield.

The results of Table 3 revealed that almost all bactericidal treatments significantly reduced the disease intensity and increased the grain yield. Seed treatment with Tricyclazole @ 3 g/kg and 3 sprays with Tricyclazole @ 0.06 % at tillering + boot + flowering stages proved to be the most effective treatment in which the least disease intensity and highest yield was recorded. The second best treatment was seed treatment with Tricyclazole @ 3 g/kg and sprays with Propiconazole @ 0.1 % at tillering + boot + flowering stages. Seed

Table 3: Efficacy of different chemicals treatments against BLB of rice *in situ*

Sl.No.	Chemicals treatments	*Average disease intensity grade			*Grain yield (gm/plant)		
		2012 -13	2013 -14	Mean	2012 -13	2013 -14	Mean
1	Seed treatment with Tricyclazole @3 g/kg seed (T1)	7.4	8.0	7.7	17.7	18.0	17.9
2	T1 + 1 spray with Tricyclazole @ 0.06 % at tillering (T2)	7.1	7.4	7.3	18.	217.4	17.8
3	T1 + 1 spray with Tricyclazole @ 0.06 % at boot (T3)	5.5	6.2	5.9	19.1	20.0	19.6
4	T1 + 2 sprays with Tricyclazole @ 0.06 % at tillering + boot (T4)	4.9	5.1	5.0	20.4	22.9	21.7
5	T1 + 3 sprays with Tricyclazole @ 0.06 % at tillering + boot + flowering (T5)	**3.4**	**4.2**	**3.8**	**25.7**	**27.9**	**26.8**
6	T1 + 3 sprays with Propiconazole @ 0.1 % at tillering + boot + flowering (T6)	**4.7**	**5.0**	**4.9**	**24.0**	**23.1**	**23.6**
7	T1 + 3 sprays with Kresoxim methyl @ 0.1 % at tillering + boot + flowering (T7)	5.0	5.1	5.1	23.4	22.4	22.9
8	T1 + 3 sprays with Azoxystrobin @ 0.1 % at tillering + boot + flowering (T8)	5.1	5.5	5.3	22.8	19.1	21.0
9	T1 + 3 sprays with Carbendazim @ 0.1 % at tillering + boot + flowering (T9)	6.9	6.5	6.7	19.0	18.1	18.6
10	Control (no seed treatment, no chemical spray) (T10)	8.8	9.0	8.9	8.0	7.6	7.8
	SEm ±			0.23			0.85
	CD at 5%			0.72			2.69
	C.V.			5.34%			6.11%

*Average of three replications: Three plants per pot

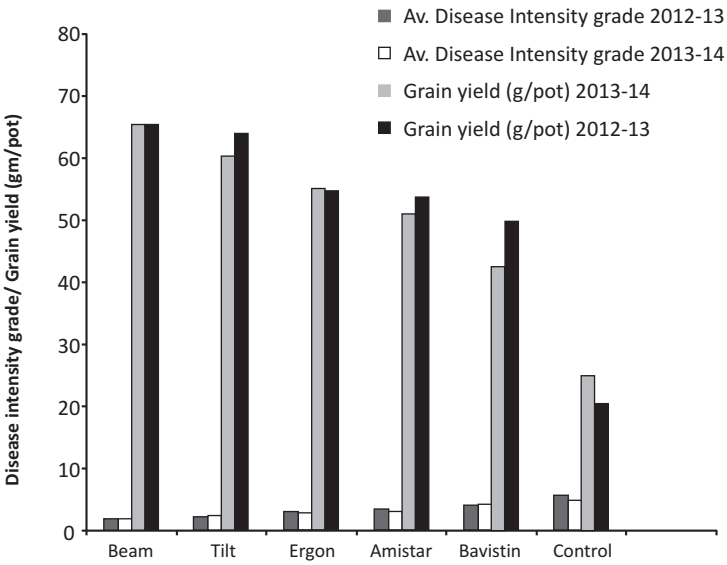

Figure 1 : Effect of seed treatment with different chemicals on the BLB disease of rice *in situ*

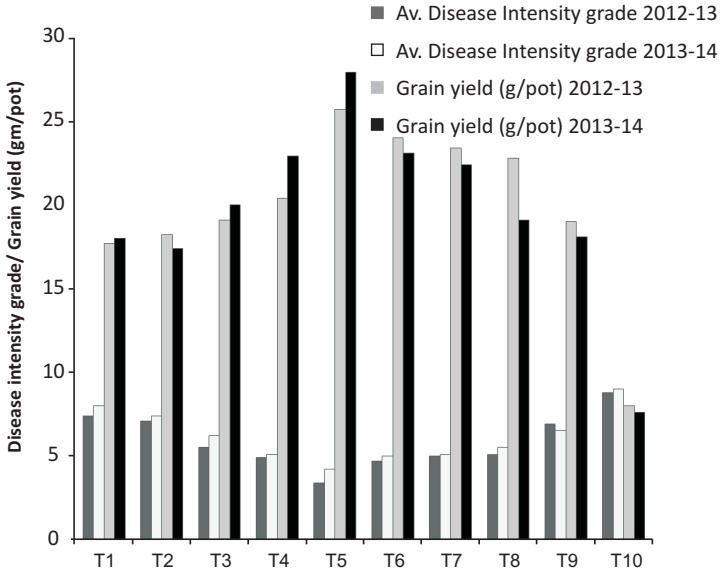

Figure 2. Efficacy of different chemicals treatments against BLB of rice *in situ*

treatment with Tricyclazole @3 g/kg and 3 sprays with Kresoxim methyl @ 0.1 % at tillering + boot + flowering stages ranked third position in reducing the disease intensity and increasing the grain yield. Spraying of Tricyclazole at lesser number was also evaluated with a view to assess its effectivity. Its results were closely followed by seed treatment with Tricyclazole @ 3 g/kg and 3 sprays with Azoxystrobin @ 0.1 % at tillering, boot and flowering stages & followed by seed treatment with Tricyclazole @ 3 g/kg and 3 sprays with Carbendazim @ 0.1 % at tillering, boot and flowering stages. The highest disease intensity & lowest yield were recorded in the control, receiving neither seed treatment nor bactericidal spray.

On the basis of the above mentioned results; seed treatment with Tricyclazole @ 3 g/kg and 3 sprays with Tricyclazole @ 0.06 % at tillering, boot and flowering stages may be recommended for control of the Bacterial leaf blight disease of rice.

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