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Fungicide and insecticide compatibility against Sheath Blight and Stem Borer of paddy

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The readymix formulation RIL-060/F_1 8.5WG containing 3.5% Flubendiamide (effective against stem borer) + 5.0% Hexaconazole (effective against sheath blight) was tested for its efficacy against sheath blight and stem borer of rice as well as for the compatibility in the mixed formulation during *kharif* 2010 and 2011 at AICRIP, Regional Research and Technology Transfer Station, Chiplima, Sambalpur, Odisha. The combination product was found biologically as effective as individual treatments in controlling sheath blight and stem borer and increased the grain yield by 66.4% as compared to 35.3% in Hexaconazole and 46.7 % in Flubendiamide treated plots without any phytotoxic symptom. RIL-060/F_1 8.5WG was equally effective against sheath blight and stem borer confirming the perfect compatibility of the test fungicide and insecticide.

Key words: Rice, fungicide, insecticide, compatibility

INTRODUCTION

Diseases and insect pests co-exist in the rice- ecosystem. In many endemic areas blast, sheath blight, stem borer and leaf folder occur at the same stage of crop growth. So, a combined application of effective fungicide and insecticide will be economical and practical as a tank mix instead of two separate applications under compatible condition. Fungicide and insecticide mixture is now being popularized among the farmers as applying a tank mix of pesticides can save time, labour, energy and equipment cost. The farmers are in a habit of mixing fungicide and insecticide without knowing their compatibility to mitigate simultaneous occurrence of diseases and insect pests of rice which invite a lot of ecological problems like enhanced phytotoxicity, resurgence etc. To retain the same level of effectiveness of both fungicides against diseases and insecticides against insect pests, the fungicide-insecticide combinations should be compatible from bioeffectiveness point of view with regard to diseases and insect pests. Pesticide combinations usually alter plant absorption and translocation as well as metabolism and toxicity at the site of action of one or more of the mixed products. The information on compatibility and efficacy of fungicides and insecticides as a tank mix application in rice is limited (Lakshmanan, 1992; Dodan *et al.*, 1997). In view of this, the present trial has conducted with the combination of effective fungicide along with a effective insecticide to find out their efficacy on sheath blight and stem borer, as well as the compatibility of the test fungicide and insecticide.

MATERIALS AND METHODS

Field experiments were carried out during *kharif* seasons of 2010 and 2011 at All India Coordinated Rice Improvement Project, Regional Research and Technology Transfer Station, Chiplima, Odisha, India. Rice variety 'Jaya' was transplanted in plots of 25 m^2 area with a spacing of 20 cm X 15 cm in Randomized Block Design with 4 treatments and 5 replications. Fertilization and all other agronomic

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practices were followed as per the local recommendations. Natural occurrence of the diseases and insect pests was permitted. Flubendiamide 3.5% + Hexaconazole 5% (RIL – 060/F_1 8.5 WG), a ready mix formulation was used @ 2 g/l and compared with Hexaconazole 5SC (Contaf) @ 2 ml/l, along with an effective insecticide Flubendiamide 20WG (Takumi) @0.35 g/l on sheath blight severity and stem borer incidence. An untreated control without any fungicide or insecticide was also included for comparison. The chemicals were supplied from Directorate of Rice Research, Hyderabad.

First spraying of all the treatments was given 15 days after transplanting and subsequent sprays were given when sheath blight infection and stem borer infestation exceeded economic threshold level. A spray of all the treatments was given at panicle initiation and another spray 10 days later to evaluate the compatibility of fungicide and insecticide against sheath blight and white ear damage by stem borer.

For sheath blight five sampling units of 1 m^2 area was fixed in each plot at random and disease severity was recorded at 10 days interval from the day of its appearance and terminal disease severity at heading stage following the SES scale (IRRI, 1996) for sheath blight.

To assess stem borer damage in vegetative stage, dead hearts and total tillers were recorded at 10 days after each spraying from 20 hills per plot based on stratified random sampling. At heading stage, panicle bearing tillers and white ears were enumerated on 20 hills/plot selected in similar fashion.

The plants were observed regularly for phytotoxicity symptoms, if any. Yield data of all the plots were also recorded. The data were subjected to necessary transformations and analyzed as per RBD procedure (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

The observations on the severity of sheath blight and incidence of stem borer (dead hearts and white ears) were recorded by following standard procedures and presented in Table 1. It was found that, all the treatments differed significantly from each other.

Based on the mean values it is very clear that, Hexaconazole @ 2 ml/l recorded 4.06% disease severity closely followed by the combination product containing Flubendiamide (3.5%) + Hexaconazole (5.0%) @ 2 g/l resulting in 5.7% disease severity compared to 14.29% in Flubendiamide and 17.26% in untreated control. This very clearly revealed that combining Hexaconazole with Flubendiamide in the same formulation i.e, RIL-060/F_1 8.5WG did not inhibit the biological efficacy of Hexaconazole against sheath blight. Sharma and Sood (2008) also found no reduction in the efficacy of Tricyclazole (Sivic 75WP) and Iprobenphos (Kitazin48EC) @ 0.06% and 0.2% respectively against rice blast and Indoxacarb (Indoxacarb 15EC) and Cartap hydrochloride (Caldan 50SP) @ 0.006% and 0.08% respectively against whorl maggot when used as a tank mix combination proving their perfect compatibility with each other for the control of rice pests.

Based on the stem borer damage as dead hearts, the efficacy of Flubendiamide was closely followed by the combination product in reducing dead hearts. This proved that Hexaconazole did not reduce the efficacy of Flubendiamide drastically. Both of these treatments had significantly less dead hearts (1.28% and 1.77% respectively) as compared to untreated (8.65%) and Hexaconazole alone (6.53%). The combination product effectively checked stem borer at heading stage recording 3.38% white ears (WE) and was next to Flubendiamide alone (2.58% WE) in terms of efficacy. There were 12.05% WE in untreated control and 8.03% WE in Hexaconazole treated plots which were inferior to above two treatments. According to Singh *et al.* (2011), the tank mix applications of fungicides (Tricyclazole and Isoprothiolane) with insecticides (Fipronil and Flubendiamide) was found biologically as effective as individual treatments in controlling neck blast, stem borer and leaf folder and increasing grain yield of Tarori Basmati.

Significantly higher grain yield was recorded in case of fungicidal and insecticidal combination (66.4% yield increase over control) than the individual fungicide and insecticide (35.3% & 46.7% yield increase over control respectively). Field studies indicated that combined application of insecticide Imidacloprid (Confidor 200SL) @ 0.25 ml/l and the fungicide Validamycin (Rhizocin 3L) @2.5 ml/l were highly compatible and effective in reducing plant hopper and sheath blight incidence besides contributing to yield increase (Bhanu *et al.*, 2007).

Table 1 : Effect of combined application of fungicide and insecticide against sheath blight and stem borer on rice during *kharif* 2010 and 2011

	Treatment	Dose	Sheath blight severity (%)			Stem borer incidence						Grain yield (Kg/ha)			Per cent yield increase over control
						Dead heart (%)			White ear head (%)						
			2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled	2010	2011	Pooled	
T_1	Flubendiamide 3.5% + Hexaconazole 5% WG (RIL-060/F_1 8.5WG)	2.0 g/l	3.49 (2.0)*	7.90 (2.89)	5.70 (2.49)	1.57 (1.43)	1.95 (1.56)	1.77 (1.50)	3.91 (2.10)	2.84 (1.83)	3.38 (1.97)	2702	4193	3448	66.4
T_2	Hexaconazole 5 SC (Contaf)	2.0 ml/l	2.89 (1.84)	5.22 (2.38)	4.06 (2.13)	5.62 (2.29)	7.43 (2.82)	6.53 (2.65)	7.14 (2.76)	8.92 (3.07)	8.03 (2.92)	2072	3534	2803	35.3
T_3	Flubendiamide 20WG(Takumi)	0.35 g/l	8.75 (3.04)	19.82 (4.50)	14.29 (3.84)	1.16 (1.28)	1.39 (1.37)	1.28 (1.33)	3.06 (1.89)	2.10 (1.61)	2.58 (1.76)	2244	3833	3039	46.7
T_4	Check		10.74 (3.35)	23.78 (4.92)	17.26 (4.21)	7.02 (2.74)	10.27 (3.28)	8.65 (3.02)	11.17 (3.41)	12.92 (3.66)	12.05 (3.54)	1743	2400	2072	-
	SE(m)±		0.04	0.10	0.06	0.1	0.07	0.04	0.07	0.06	0.05	73.9	122.9	67.8	
	CD(0.05)		0.13	0.32	0.19	0.30	0.20	0.13	0.22	0.19	0.15	227.6	378.7	209.0	
	CV (%)		3.69	6.33	4.29	11.37	6.5	4.43	6.17	5.48	4.23	7.54	7.87	5.34	

*Figures in the parenthesis are square root transformed values

As regards to the various phytotoxic symptoms like necrosis, epinasty, hyponasty, chlorosis and top burning; no such symptom was recorded within seven days of each spray of the combination product during both the years, hence, satisfying their compatibility.

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