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Evaluation of new chemical molecules against sheath blight of rice

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Abstract

Sheath blight of rice is one of the major fungal disease causing 25-30% losses in irrigated rice ecosystem. There are no any resistant varieties is available therefore disease management is only by chemical molecules. In view of that eight treatment combinations viz. ICF-110 (Tricyclazole 45%+hexaconazole 10% WG) @1.0g/l, Merger (Tricyclazole 18%+ Mancozeb 62%WP)@ 2.5g/l, Tricyclazole 75% WP @0.6g/l,Hexaconazole 5%EC @ 2.0ml/l, Mancozeb 75%WP @ 2.0g/l, Companian (Mancozeb 63WP+ Carbendazim 12WP) @1.5g/l, Carbendazim 50WP @1.0g/ml and check were evaluated against sheath blight of rice on the susceptible variety Pusa basmati-1 under field condition. Among the new fungicides ICF-110 was found best in checking the disease severity (19.5% & 18.5%) and increased grain yield (61.3% & 57.6% over check) of rice.

Keywords: Sheath blight, rice disease, chemical fungicide

Introduction

Rice is one of the most important food crop for more than 60 % of world's population. The production of rice is affected by various fungal, bacterial, and viral diseases. Among the fungal diseases sheath blight caused by *Rhizoctonia solani* Kuhn is one of the most widely distributed disease of rice. Its occurrence in India was reported by Paracer and Chahal (1963) [2] from Gurudaspur in the Punjab. It appears throughout the all rice growing areas.

The disease appears both on sheath and laminar portion of leaf depending upon the age of the plant, time of infection and severity of disease. It causes yield loss to the extent of 59 to 69 per cent (Venkat Rao *et al.* 1990; Naidu 1992) [5]. The incidence of disease has become rampant with the introduction of semi dwarf, heavy tillering early maturing and high yielding varieties. In the absence of suitable resistance varieties, chemical control is the only alternative to manage the disease since the seriousness of disease warrants chemicals protection. The disease managed mostly by application of systematic fungicides. It is important to explore alternative chemical molecule to avoid build up of resistance in the pathogen. Several new fungicides have been recently developed which are known to possess good control against *Rhizoctonia solani*. The present study was undertaken to evaluate the some chemical molecules in combination against this disease under field condition for better management with low cast of fungicides.

Methods and Materials

The experiment were carried out at Crop Research Station, Masodha during WS 2014 and 2015. The sheath blight infected sample were collected from rice field. The pathogen was isolated and characterized on the basis of its morphological and cultural characteristic, Pathogenicity of the pathogen was confirmed by proving the Koch's postulate (1876). The cultures were maintained on slants containing Potato Dextrose Agar medium. To evaluate the efficacy of new molecules/chemicals against sheath blight, were tested. The chemical molecules viz. ICF-110 (Tricyclazole 45%+hexaconazole 10% WG) @1.0g/l, Merger (Tricyclazole 18%+ Mancozeb 62%WP)@ 2.5g/l, Tricyclazole 75%WP @0.6g/l, Hexaconazole 5%EC @ 2.0ml/l, Mancozeb 75%WP @ 2.0g/l, Companian (Mancozeb 63WP+ Carbendazim 12WP) @1.5g/l, Carbendazim 50WP @1.0g/ml along with check were used against sheath blight of rice under field condition. The experiment was constituted in RBD with four replication adopting net plot size of 5×2m and a spacing of 15×15cm. on susceptible variety Pusa basmati-1. In the experimental plot recommended dose of fertilizer along with 25% additional dose of Nitrogen was given to pre dispose the crop to the sheath blight.

Inoculum and inoculation

The pathogen was multiplied from pure culture on Autoclaved rice culms bits (5-7cm.). Rice plants were inoculated at tillering stage (35-40 DAT) by placing the inoculums between the tillers just above the water lines. The fungicides were sprayed twice at 15 days interval starting from just appearance of disease symptoms under artificial inoculation. Control plot were sprayed with ordinary water. Disease observations were recorded after 15 days last spray by fixing 5 sampling unit of one square metre in each plot. The disease severity and incidence were recorded in percent and increased in yield (kg/h) was calculated by using following formula;

$$\text{Percent increase in Yield} = \frac{\text{Yield in treated} - \text{yield in check plot}}{\text{Yield in untreated plot}} \times 100$$

The degree of severity estimated by on the basis of plant tissue affected by the disease and express as percentage of the total area. This was calculated by the percentage of leaf and sheath area of each tillers in a sampled hills covered by the sheath blight lesions. Percentage of the disease incidence were calculated on 15 plants per sampling units, by counting the number of infected tillers.

Result

From the perusal of table 1 and 2 it revealed that all the fungicides showed effective against sheath blight of rice during both the year WS 2014 and 2015 resulted reduced diseased severity and incidence was recorded. The plots treated with ICF-110 exhibited very less infection 19.5% &

18.5% disease severity and 18.1% & 20.3% incidence respectively and the better grain yield 3325 kg/ha and 3112 kg/ha was recorded during both the consecutive year (2014 & 2015). While severity and incidence of sheath blight had gone to the extent of 73.2%, 74.7% and 46.00%, 46.70% respectively in unsprayed plots. In check plots reduced grain yield recorded (2062 and 1975 kg/ha).

In plot treated with Meger @ 2.5 g/l had also shown good response with 24.1%, 22.4% disease severity and 25.0%, 25.1% disease incidence was recorded. The yield was notice 2850 kg/ha, 2712 kg/ha. However the plot treated with commercially available fungicide Hexaconazole 20.0%, 25.1% disease severity, 18.9%, 25.3% disease incidence along with good grain yield 3250 kg/ha, 2987 kg/ha was recorded. In this treatment 57.6% & 51.2% increased grain yield over untreated check was observed.

Among the treatment combinations (Table 1 and 2) Carbendazim showed good response 25.6%, 28.5% disease severity and 25.4%, 29.2% disease incidence was observed along with 44.5% & 36.7% grain yield advantage over check. The plot treated with fungicide Companion 26.2%, 28.5% disease severity and 32.1%, 29.2% disease incidence along with 32.7%, 36.7% increase grain yield over check was recorded. The plot treated with Mancozeb 30.1%, 36.1% disease severity and 32.1%, 34.3% disease incidence with 2600 kg/ha, 2350 kg/ha grain yield was recorded. In the plot treated with Tricyclazole the disease severity was record 32.1%, 30.0% and incidence 33.9%, 32.2% with 2587 kg/ha, 2462 kg/ha during wet season 2014 and 2015, respectively.

Table 1: Effect of different fungicides on severity and incidence of sheath blight of rice under field condition during WS 2014

Treatments	Disease severity (%)	Disease incidence (%)	Grain Yield (kg/ha)	% increase grain yield
T1-ICF 110 (Tricyclazole 45%) +Tebuconazole 10 WG @1.0g/l	19.5 (26.2)	18.1 (25.1)	3325	61.3
T 2- Meger (Tricyclazole 18%+ Mancozeb 62 % WP)@ 2.5 g/l	24.1 (29.3)	25.0 (29.9)	2850	38.2
T 3-Tricyclazole 75WP @ 0.6 g/l	32.1 (34.5)	33.9 (35.5)	2587	25.5
T 4- Hexaconazole 5 % EC@ 2.0 ml/l	20.0 (26.5)	18.9 (25.7)	3250	57.6
T 5- Mancozeb75 % WP@ 2.0 g/l	30.1 (33.2)	32.1 (34.4)	2600	26.1
T 6- Companion (Mancozeb 63 % WP+ Carbendazim 12% WP) @ 1.5 g/l	26.2 (30.6)	27.5 (31.6)	2737	32.7
T 7- Carbendazim 50% WP@ 1. g/l	25.6 (30.3)	25.4 (30.4)	3000	45.5
T 8- Untreated control	73.2(58.8)	46.0 (43.0)	2062	-
CV %	4.1	5.1	6.4	-
CD at 5%	1.2	1.1	126	-

Table 2: Effect of different fungicides on severity and incidence of sheath blight of rice under field condition during WS 2015

Treatments	Disease severity (%)	Disease incidence (%)	Grain Yield (kg/ha)	% increase grain yield
T1-ICF 110 (Tricyclazole 45%) +Tebuconazole 10 WG @1.0g/l	18.5 (24.4)	20.3 (26.7)	3112	57.6
T 2- Meger (Tricyclazole 18%+ Mancozeb 62 % WP)@ 2.5 g/l	22.4 (28.2)	25.1 (30.0)	2712	37.3
T 3-Tricyclazole 75WP @ 0.6 g/l	30.0 (33.9)	33.2 (35.2)	2462	24.7
T 4- Hexaconazole 5 % EC@ 2.0 ml/l	25.1 (30.1)	25.3 (30.2)	2987	51.2
T 5- Mancozeb75 % WP@ 2.0 g/l	36.1 (37.4)	34.3 (35.8)	2350	19.0
T 6- Companion (Mancozeb 63 % WP+ Carbendazim 12% WP) @ 1.5 g/l	26.4 (30.9)	29.3 (32.7)	2675	35.4
T 7- Carbendazim 50% WP@ 1. g/l	28.5 (32.3)	29.2 (32.9)	2700	36.7
T 8- Untreated control	74.7 (59.9)	46.7 (43.1)	1975	-
CV	6.93	6.73	8.6	-
CD @ 5%	1.7	1.58	163	-

Figure in parenthesis are AT transformed value

Discussion

All these fungicides were found significantly effective in checking the disease severity and incidence over untreated control and increased the grain yield of rice. However, the fungicides ICF-110 treated plot showed best response among the fungicide followed by Hexaconazole and Meger. These

chemicals are systematic in nature as well as suppressed the mycelial growth, sclerotial formation and germination that might be cause of their excellent performance. Devi. *et al.* (1987) [1] and Krishnakant *et al.* (2015) also found the best curative and protective effects of Validamycin, Contaf and Propiconazole against sheath blight of rice. Upmanyu *et al.*

(2002) [3] also reported that spray of Carbendazim were most effective in reducing sheath blight severity and increased the grain yield by the spraying of these fungicides. The minimization of disease severity may be one of the possible reasons for enhancement of grain yield Singh *et al.* (2016) [7] also reported the compatibility of different fungicide with insecticide for the management of sheath blight.

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