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EVALUATION OF FUNGICIDES AGAINST FALSE SMUT OF RICE CAUSED BY *USTILAGINOIDEA VIRENS*

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ABSTRACT

False smut caused by *Ustilaginoidea virens* is becoming a major disease of rice causing yield loss throughout the rice growing countries. In India, the disease has spread widely in recent years. In Kerala state also the trend is same. In the present study three fungicides *viz.,* trifloxistrobin + tebuconazole 75WG (0.04 %), kresoxym methyl 44.3 SC (0.1%) and propiconazole 25 EC (0.1%) were evaluated against false smut in the field for two seasons. Spraying at three different stages of the crop *viz.,* booting, 50 % panicle emergence (PE) and 100 % panicle emergence were tested. Propiconazole 25 EC (0.1 %) recorded lowest disease severity which was significantly less than the control when sprayed at any of the three crop growth stages tested. This was followed by trifloxistrobin + tebuconazole 75WG when sprayed at booting or 50% PE. Significantly higher yields were recorded when propiconazole 25EC was sprayed at booting, 50 % PE or 100 % PE stage and trifloxistrobin + tebuconazole 75 WG when sprayed at booting.

KEYWORDS: False Smut, Fungicides, Rice, *Ustilaginoidea virens*

INTRODUCTION

False smut caused by *Ustilaginoidea virens* is a serious disease of rice worldwide. Earlier this disease was considered to be a minor disease but recently its occurrence has increased. Its occurrence has been reported from many rice growing countries of the world (Rush *et al*., 2020; Atia, 2004, Singh & Pophaly, 2010, Ashizawa *et al*., 2010). In India the occurrence and intensity has increased in recent years (Ladhalakshmi, 2012). The fungus infects the grains direclty converting it into velvety yellow spore balls. This causes the quantitative and qualitative yield loss. The grains and straw gets contaminated with the toxin called ustiloxin produced by the fungus (Koiso *et al.,* 1994) toxic to human beings and animals (Nakamura *et al*., 1994; Luduena *et al*., 1994). The climatic factors favouring the disease are high humidity, low temperature and rainy days at the time of flowering. The application of high doses of nitrogen favours the disease (Mohiddin *et al.,* 2012). Most of the varieties cultivated in Kerala state are susceptible to this disease. Since the disease is a relatively new one systematic screening studies for resistance is lacking in the state. Several workers reported varieties with low disease incidence and varieties that recorded no disease in the field screening trials (Ahonsi *et al.,* 2000 ; Biswas, 2001 ; Singh & Singh, 2005; Mohiddin *et al*., 2012).

The efficacy of several fungicides against false smut has also been reported by various workers from different

parts of the world. Mohiddin *et al.* (2012) reported the efficacy of prochloraz + carbendazim against false smut. Pannu *et al*., (2010) obtained reduction in false smut by spraying of fungicide copperoxychloride 50 WP (0.25%) at booting followed by propiconazole 25 EC (0.1%). The present study was conducted to evaluate three fungicides at three different stages of application against false smut of rice

MATERIALS AND METHODS

Field Evaluation of Fungicides against False Smut of Rice

Experiment was conducted during the years 2012 - 13 and 2013 - 14 in wetland ecosystem at the Regional Agricultural Research Station, Pattambi, Kerala. The experiment was laid out in randomized block design (RBD) with four replications. The plot size was 10 m^2. The rice variety used was Uma. The seedlings were raised in the nursery and 25 days old seedlings were transplanted to the main field.

Treatments	Dose l^{-1}	Time of spray
T_1 - Trifloxystrobin 25% + tebuconazole 50% (75WG)	0.4g	Booting
T_2 - Trifloxystrobin 25% + tebuconazole 50% (75WG)	0.4g	50%PE*
T_3 - Trifloxystrobin 25% + tebuconazole 50% (75WG)	0.4g	100%PE
T_4 - Kresoxim methyl (44.3 SC)	1 ml	Booting
T_5 - Kresoxim methyl (44.3 SC)	1 ml	50 % PE
T_6 - Kresoxim methyl (44.3 SC)	1 ml	100 % PE
T_7 - Propiconazole (25 EC)	1 ml	Booting
T_8 - Propiconazole (25 EC)	1 ml	50 % PE
T_9 - Propiconazole (25 EC)	1 ml	100 % PE
T_{10} - Untreated control		

* PE-Panicle emergence

Spraying

The fungicides were sprayed at different stages as mentioned above.

Observations

Observations on false smut infected spikelets / panicle and number of infected panicles per m^2 were recorded. From that percentage of infected spikelets and infected panicles were calculated. The yield data was recorded at the time of harvest

RESULTS AND DISCUSIONS

There was significant difference among the treatments in false smut disease severity and yield. The pooled analysis of the data for two seasons trials is given in table 1. The infected spikelets were significantly less in propiconazole treated plots compared to the other two fungicides and control. There is no significant difference between the times of spray of the fungicide in spikelet infection percentage. The percentage of infected spikelet even when the fungicides

sprayed at booting (15.23%), 50% flowering (18.97%) and 100 per cent flowering (16.29 %) were significantly less than the control (28.69 %). The percentage of infected spikelets when the fungicide trifloxistrobin + tebuconazole 75WG sprayed at booting (20.68 %) and at 50 per cent panicle emergence (20.88) was significantly less than that of control. But there was no reduction in spikelet infection when the fungicide sprayed at 100 per cent PE. The fungicide kresoxym methyl did not result in any reduction in infected spikelets even when it was sprayed at booting. The percentage of infected panicles was significantly less in all the fungicide treated plots compared to control (Table 1). There was no significant difference between the time of spraying in the percentage of infected panicles. The yield recorded was significantly higher in propiconazole sprayed plots (Table 1). The yield was also significantly higher in trifoxistrbin + tebuconazole 75 WG when sprayed at booting stage. But there was no yield improvement when this fungicide was sprayed at 50 per cent panicle emergence or 100 per cent panicle emergence. There was no increase in yield in kresoxym methyl sprayed plots.

Among the fungicides tested, propiconazole 25 EC recorded lowest severity of false smut. The fungicide when sprayed at booting recorded lowest spikelet infection percentage. There was 46.9 percent reduction when compared to control (Figure 1). When this fungicide was sprayed at 50 per cent panicle emergence or even at 100 per cent panicle emergence, there was significant reduction in percentage of infected spikelets. There was significant increase in yield also by spraying propiconazole 25 EC at booting, 50 per cent PE compared to control.

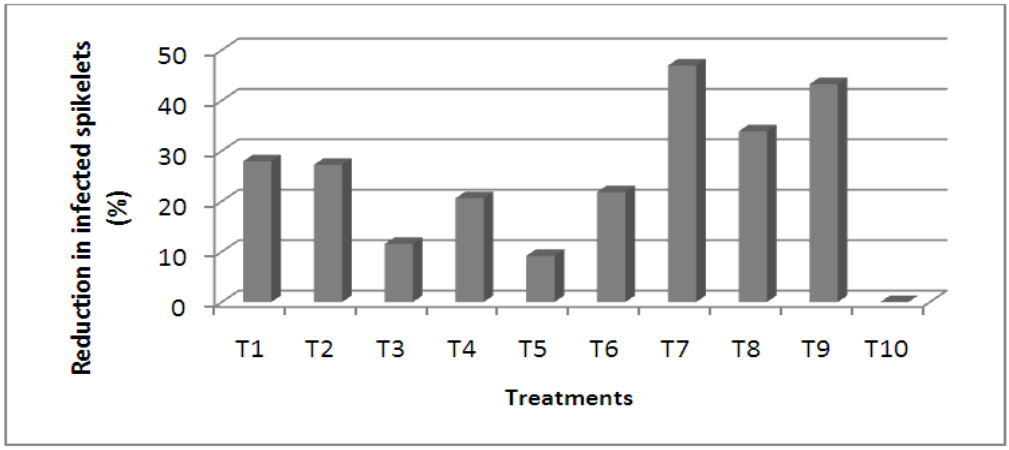

Figure 1: Effect of Fungicides on False Smut Affected Spikelets of Rice

Yan *et al.,* (2014) tested three fungicides *viz.,* 20 % SPY 160 – tebuconazole SC, 15% propiconazole + 15 % difenoconazole EC and 20% validamycin SP and biopesticide product suspension of *Bacillus subtilis* in validamycin. Combination of propiconazole + difenoconazole and formulation of *B subtilis* in validamycin gave satisfactory control of false smut. Barnwal *et al.,* (2010) studied the field efficacy of fungicides against false smut. The disease severity was lowest in fields sprayed twice with propiconazole. This was followed by one spray of hexaconazole followed by propiconazole.

Another fungicide which was effective against false smut in this study was trifloxistrobin + tebuconazole 75WG. When it was sprayed at booting stage there was 27.91 per cent reduction in spikelet infection percentage. The yield was significantly improved (34.32%) when this fungicide was sprayed at booting stage. The fungicide kresoxym methyl 44.3 SC recorded no reduction in disease severity.

The application of fungicide simeconazole (RS – 2 (4 fluorophenyl) – 1 (1 H – 1, 2, 4 – triazol – 1 – yl) – 3 trimethylsilylpropan – 2 – ol) three week before heading was found effective for controlling false smut (Tsuda *et al.*, 2006). Mohiddin *et al.,* (2006) reported the efficacy of prochloraz + carbendazim followed by chlorothalonil against false smut of rice.

In the present study spray of propiconazole 25 EC (1ml l^{-1}) resulted in lowest spikelet infection percentage. There was significant reduction in infected spikelets and infected panicles when sprayed at booting or 50% PE or even when it was sprayed at 100 per cent PE. This was followed by trifloxystrobin + tebuconazole 75 WG. This fungicide when sprayed at booting and panicle emergence stage reduced the infected spikelet number significantly. There was significant improvement in yield by the spray of propiconazole 25 EC at booting, 50% PE and 100% PE and trifloxistrobin + tebuconazole 75 WG at booting stage.

CONCLUSIONS

The fungicide propiconazole 25 EC and trifloxistrobin + tebuconazole 75 WG were effective for the management of false smut of rice. The spraying of propiconazole 25 EC at booting, 50% PE or even at 100 % PE reduced the percentage of spikelet infection as well as the percentage of infected panicles and increased grain yield. The spraying of fungicide trifloxystrobin + tebuconazole 75 WG at booting or 50 % PE reduced the percentage of spikelet infection and panicle infection and spraying at booting stage increased the grain yield. These two fungicide could be used for the management of false smut.

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APPENDICES

Table 1: Effect of Fungicides on False Smut of Rice

Treatment	Infected Spikelet	Infected Panicles	Yield (Kg/Ha)
T_1	20.68 (22.54)	3.32 (9.02)	4281
T_2	20.88 (22.69)	3.53 (9.68)	3371
T_3	25.38 (27.57)	3.89 (10.75)	3778
T_4	22.78 (24.38)	3.86 (10.17)	3262
T_5	26.06 (26.72)	3.67 (10.32)	3459
T_6	22.43 (24.44)	4.20 (11.16)	3520
T_7	15.23 (20.68)	3.82 (10.74)	3684
T_8	18.97 (22.00)	3.09 (9.11)	4040
T_9	16.29 (20.73)	3.25 (9.44)	3643
T_{10}	28.69 (29.27)	5.42 (13.17)	3187
CD (0.05%)	4.93	2.39	412

Values in parenthesis are arscine transformed. Each value is pooled mean of two trials each with four replications.