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Research Article

EFFICACY OF FUNGICIDES AGAINST FALSE SMUT OF RICE CAUSED BY USTILAGINOIDEA VIRENS

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Abstract- Rice (*Oryza sativa*) being the staple food crop in most of the countries under varying climate condition. Domestication of this crop invited many diseases and disorders incited by biotic and abiotic factors. Amongst the biotic factors, false smut of rice emerges in the seventies under influence of high yielding nutrition responsive varieties needed to get it managed by the application of different group of fungicides in proper dose at appropriate time. Kresoxyme methyl, Propiconazole and Carbendazim proved themselves well at all concentrations in inhibition of mycelial growth of *Ustilaginoidea virens* in vitro. Standardised dose of test fungicides were validated in the field at appropriate critical stages of crop growth. Kresoxyme methyl treated paddy plot showed least percent spikelet and panicle infection as 1.62 and 2.58 respectively with a severity of 3.08 percent yielded maximum yield of 49.50 q/ha followed by Propiconazole, Carbendazim and Mancozeb. Moreover, treatment of Mancozeb, Chlorothalonil and copper oxychloride showed nonsignificant reduction in percent infection of panicle, percent infected spikelet per panicle and disease severity as well as increase in yield over control.

Keywords- *Rice, False smut, Ustilaginoidea virens and Fungicides*

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Introduction

False smut disease of rice appears in severe form endemically in the III[rd] B zone of Bihar specially Ara, Buxar, Rohtas & Kaimur. It is caused by *Claviceps oryzae sativae* Haswoka (*Ustilaginoidea virens* (Cooke) Takshashi) has been considered to be the most important disease. Through it has also been assumed as an economically less important disease reported from most of the rice varieties worldwide [5]. It also causes significant losses in yield [7 & 9]. In India it has been reported from Bihar, UP, Karnataka, Orissa, A.P, Assam, Haryana, Maharashtra & T.N [8]. Heavy yield losses in different varieties have been reported by [1, 2 & 9]. As a matter of fact less attention is being paid to mitigate this menacing disease. Consequently it has been established in the niche resulting endemic in rice growing areas causing heavy losses to the crop [4]. Upadhaya, A.L *et al* has also reported that the total loss in yield occurs due to infected tillers, smutted grain/panicles [10].The higher side of relative humidity accompanied by cloudy day during flower initiation have been found more congenial of *Claviceps Oryzae sativae* [6]. It has becoming possible threat in increased rice production as a result of outbreak. Hence the present investigations were carried out to find out the effective fungicides *in vitro* &validated *in vivo* conditions so that the false smut of rice can be managed effectively in endemic areas.

Materials and Methods

The following fungicides *viz*; Carbendazim 50WP, Propiconozole 25 EC, Kresoxyme methyl 50WP, Chlorothalonil 75WP, Copper oxychloride 50WP & Mancozeb 75WP have evaluated for their efficiency against *Claviceps Oryzae Sativae* by poisoned food technique at 0.025%, 0.05%, 0.1% 0.15%, 0.2%, 0.25% & 0.3% concentrations separately on PDA medium incubated at 25± 2°C for seven days for measuring mycelial growth of the fungus in Petri dishes described by [12]. Three replications were made for each concentration of all tested fungicides. The efficacies of all fungicides at different concentrations were expressed through percent inhibition over the control which was calculated using Vincent's formulas [11].

$$Percent\ Inhibition\ (I) = \frac{Radial\ growth\ in\ control\ (C) - Radial\ growth\ in\ treatment\ (T)}{Radial\ mycelial\ growth\ in\ control\ (c)} \times 100$$

Uniform spore suspensions of *Claviceps oryzae sativae* was prepared aseptically purified and get it prepared and inoculated by pouring spore suspension drop in the media kept in Petri plates containing different concentration of test fungicides and control having no fungicides as well. Observations of radial growth in mm in each Petri plates were recorded after seven days of incubation. Field trial was conducted in farmers field of Dumraon in RBD fashion of 10 mt^2 plot size replicated thrice (three farmers plot at different location). The following fungicides after standardization of their concentration in vitro *viz* Carbendazim 50WP at 0.1%, Propiconozole 25EC at 0.1%, Kresoxyme methyl at 0.1% Chlorothalonil 75WP at 0.2%, Copper oxychloride 50WP at 0.3% and Mancozeb 75WP at 0.25% were sprayed the paddy crops (MTU7029) thrice at booting stage (80 DAT), 50% flowering (90 DAT) and post flowering stage (105DAT). Observation on false smut infected panicle, infected spikelet/ panicle and disease severity were recorded before harvesting of the crop & the yield was recorded after harvesting of the paddy crops.

Result and Discussion

To find out the appropriate dosages of different fungicides against Claviceps oryzae-sativae, laboratory experiment was conducted in the laboratory of plant pathology, VKSCOA, Dumraon and the result obtained thereof was presented in Table-1. Amongst all the fungicides tested Kresoxyme methyl, Propiconozole and Carbendazimyield hundred percent inhibition of redial mycelia growth at all the concentrations tested except Propiconozole and Carbendazim at 0.25% concentration. This result has also been supported by [3]. Mancozeb, Chlorothalonil and Copperoxychloride also gave good inhibition of mycelial growth at 0.2% to 0.3% concentration.

Table-1 *Evaluation of different fungicides against mycelial radial growth of Ustilaginoidia virens in vitro*

Fungicides	Mycelial Growth in mm at different concentrations						
	Concentration (%)						
	0.025	0.05	0.10	0.15	0.20	0.25	0.30
Carbendazim	7.25(91.94)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)
Propiconazole	4.50(95.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)
Kresoxyme methyl	0.0(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)	0.00(100.00)
Chlorothalonil	75.50(16.11)	52.5(41.67)	37.5(58.33)	21.25(76.39)	17.50(80.56)	15.25(83.06)	13.25(85.28)
Copper oxychloride	82.50(8.33)	58.75(34.72)	41.75(53.61)	35.25(60.83)	30.25(66.39)	27.50(69.44)	24.25(73.06)
Mancozeb	49.50(45.00)	37.25(58.61)	23.25(74.17)	18.75(79.17)	16.25(81.94)	14.50(83.89)	2.25(97.25)
Control	90	-	-	-	-	-	-

Figures in the parameters are percent inhibition of mycelial growth

Table-2 *In vivo evaluation of different fungicides against false smut caused by Ustilaginoidia virens*

Treatment	Fungicides	Dose%	Percent Infected Panicle/m^2	Percent Infected Spikelet/ Panicle	Disease Severity	Yield (Q/ha)
T1	Kresoxim methyl	0.1	1.62	2.58	3.08	49.50
T2	Propiconozole	0.1	2.25	2.95	4.25	46.67
T3	Carbendazim	0.1	3.00	3.42	4.58	45.33
T4	Mancozeb	0.2	3.58	3.50	6.08	40.83
T5	Chlorothalonil	0.2	4.50	5.92	6.75	37.58
T6	Copper oxychloride	0.3	5.08	6.08	7.17	36.25
T7	Control	0	13.00	8.33	14.58	33.67
	S.E.mean(±)		0.21	0.69	0.88	1.31
	C.V.%		7.57	25.37	23.07	5.46
	C.D. at5%		0.64	2.11	2.73	4.02

Thus effective concentrations of all fungicides were standardized for further exploration& validation in the field. A field experiment was conducted at three farmers plot at Dumraon during *kharif* 2017 & 2018 to find out the most effective fungicides at standardized concentration worked at in vitro for the management of false smut diseases of paddy & the result obtained are presented in [Table-2]. From the data depicted in [Table-2] it has been revealed that Kresoxyme methyl treated plot showed least percentage infected panicle and infected grains per panicle to the tune of 1.62 %& 2.58% respectively. The disease severity was also recorded as 3.08 in this treatment. Subsequently the yield of 49.50Q/ha was also recorded with this treated plot which was just followed by Propiconozole and Carbendazim sprayed plots. It has also been agreed with the work of [3]. The percent infected panicle and infected grain per panicle of the plot treated with Propiconazole and Carbendazim were recorded as 2.25 and 2.95 as well as 3.00 and 3.42 respectively. The disease severity and the yield in these two treated plots were also recorded as 4.25 and 46.67 Q/ha as well as 4.58 and 45.33 Q/ha. Chlorothalonil, Mancozeb & Copper oxychloride sprayed paddy plot also gave good results in reducing infection of panicles, grain and ultimate disease severity & increasing the yield over control.

Conclusion

This study has been advocates that the Kresoxyme methyl has more potential to control the fungal pathogen in laboratory as well as in the field among the all test fungicides and could be a better option for the farmers application in the field for the management of the diseases.

Application of research: Viewing the endemicity of this menacing disease, farmers of this area faces huge losses in their yields

Research Category: Crop Disease and Management

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Study area / Sample Collection: Dumraon

Cultivar / Variety name: Rice- BPT 5204

Conflict of Interest: None declared

Ethical approval: Ethical approval taken from Veer Kunwar Singh College of Agriculture, Dumraon (Buxar), 802136, Bihar Agricultural University, Sabour, Bhagalpur, 813210, Bihar, India.
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