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Evaluation of Selected Systemic and Non Systemic Fungicides *In Vitro* and *In Vivo* condition against Web Blight Disease of Urd Bean caused by *Rhizoctonia solani* Kuhn

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ABSTRACT

Six fungicides were tested at different concentration in *in vitro* and *in vivo* for the management web blight of urd bean. Tilt, contaf, and bavistin were screened against *R. solani* at 1.0, 5.0, 10.0, 15.0 and 20.0ppm concentrations for their antifungal activity where as captaf, sulphur, and mancozeb at 1.0, 25.0, 50.0, 100.0 and 400.0ppm concentrations, respectively. At 15ppm concentration bavistin (0.1%), tilt (0.1%) completely checked the growth of the fungus. Based on effectiveness of fungicides in vitro, they were further tested under *in vivo* conditions. Bavistin @ 0.1% applied as seed treatment followed by foliar spray showed lowest disease severity, highest grain yield as well as maximum 1000 grain weight followed by tilt @ .1 per cent.

Keywords : Web blight, *Rhizoctonia solani,* urd bean, fungicides

INTRODUCTION

Urd Bean or Blackgram (*Vigna mungo L.*) is one of the ancient pulse crop and extensively grown in India. Among the fungal diseases web blight of urd bean caused by Rhizoctonia solani Kuhn is a serious problem and causes yield losses up to 20-30 % (Shailbala and Tripathi 2007). It is considered one of the important causes for stagnated productivity of the crop in the country (Dubey and Patel, 2001). The first symptoms appear as small circular brown spot on the leaves. These spot enlarge often show concentric banding and surrounded by irregular water soaked areas. The mycelium on infected leaves appear as spider web thus suggested the name web blight disease. The present study was conducted to evaluate different systemic as well as non-systemic fungicides for effective management of this disease

MATERIALS AND METHODS

Cultures of *R. solani* was isolated from naturally infected urd bean leaves on PDA medium and then it was further purified by hyphal tip method and maintained on PDA in culture tubes at 28± 1°C in BOD incubator for further studies.

Desired concentrations of fungicides were screened using “poison food technique”. Stock solution of each fungicide was prepared by dissolving weighted quantity of fungicide in a measured volume of sterilized distilled water and added to double concentrated sterilized PDA medium. The stock solution was thereafter added to double strength sterilized PDA. The amount of stock solution to be added to medium was calculated using following formula(Eq.1):

$$C_1 V_{1=} C_2 V_2 \qquad \text{(Eq.1)}$$

Where, C_1 = Concentration of stock solution, $C_{1=}$ Concentration of stock solution, V_1 = Desired Concentration (µg/ml), C_2 = Volume (ml) of the stock solution to be added and V_2 = Measured volume (ml) of the medium

Medium amended with desired concentration of selected fungicides was poured into sterilized Petri plates (90 mm diam). For each concentration of fungicide, three replication was maintained. After solidification of medium, the plates were centrally inoculated with 5 mm disc of fungus cut from edge

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of a fully grown culture with the help of sterilized cork borer. Unamended PDA plates, inoculated with test pathogen, served as a control. Three replications were maintained for each concentration of fungicide and incubated at 28±1°C.

Table 1: *In vitro* efficacy of systemic fungicides on radial growth of *R. solani* after incubation at 28±1°C

	Concentrations (ppm) / Radial growth (mm)*									
Fungicides	**1.0 ppm**	**Reduction in radial growth (%)**	**5.0 ppm**	**Reduction in radial growth (%)**	**10.0 ppm**	**Reduction in radial growth (%)**	**15.0 ppm**	**Reduction in radial growth (%)**	**20.0 ppm**	**Reduction in radial growth (%)**
Tilt	29.7	67.0	15.0	83.3	12.0	86.7	7.2	92.0	6.0	93.3
Contaf	32.8	63.5	16.9	81.1	13.5	85.0	12.1	86.5	6.0	93.3
Bevestin	28.0	68.8	12.4	86.1	10.1	88.8	6.0	93.3	6.0	93.3
Chek	90.0	_	90.0	_	90.0	_	90.0	_	90.0	_
LSD 0.05	0.50	0.45	1.01							
CV (%)	1.84									

Experiment was conducted during Kharif seasons of 2008-09 and 2009-10 in RBD with three replications. Seeds of susceptible cultivar Pant-U19 were sown in plots of 3 × 2 m^2 with 30 cm inter row spacing and 10 cm plant to plants.

Pantnagar is a hot spot for web blight disease. However, before the spray of fungicides, all the plots were artificially inoculated with mycelia/ sclerotial fragments (10 ml/ 1L water) of *R. solani* one day before the fungicide spray.

and top and leaves (3 – 5) from each portion were graded as per the rating scale of 1 to 9 (Stone house 1994) as: 1= no lesion/spot on leaves (highly resistance); 3= 1-25% (moderately resistance); 5= >25-50% (moderately susceptible); 7= >50-75% (susceptible); and 9= >75-100% area covered by lesions (highly susceptible). Yield data (kg/ha) and 1000-grain weight (g) were also recorded. The numerical values were further used for the calculation of PDI (per cent disease index).

Table 2 : *In vitro* efficacy of non- systemic fungicides on radial growth of *R. solani* after incubation at 28±1°C

	Concentrations (ppm) / Radial growth (mm)*									
Fungicides	**1.0 ppm**	**Reduction in radial growth (%)**	**25.0 ppm**	**Reduction in radial growth (%)**	**50.0 ppm**	**Reduction in radial growth (%)**	**100.0 ppm**	**Reduction in radial growth (%)**	**400.0 ppm**	**Reduction in radial growth (%)**
Captof	71.6	20.5	45.0	50.0	21.9	76.0	6.0	93.3	6.0	93.3
Mancozeb	84.7	6.0	54.7	39.2	30.9	65.7	9.2	89.7	6.0	93.3
Sulphur	82.4	8.0	50.7	43.7	28.9	68.0	12.3	86.2	6.0	93.3
Chek	90.0	_	90.0	_	90.0	_	90.0	_	90.0	_
LSD 0.05	0.61	0.67	1.51							
CV (%)	1.90									

On the basis of *in vitro* studies effective fungicides were used as seed treatment and foliar spray. The treatments include tilt (0.1%), contaf (0.1%), bevistin(0.1%), mancozeb(0.25%), captaf(0.2%) and sulphur(0.2%) were used as seed treatment and foliar spray. Chemicals were sprayed thrice

RESULTS AND DISCUSSION

The data given in (Table 1 and 2) revealed that all the six fungicides were found significantly superior over check by inhibiting the radial growth of test pathogen. Among systemic fungicides, bavistin was found the most effective followed by

tilt and contaf. Bevistin completely inhibited of radial growth is 93.3% at 20ppm concentrations, respectively. Among non- systemic fungicides, captaf was found the most effective followed by mancozeb ans sulphur. Captaf completely inhibited of radial growth is at 100.0 ppm concentrations, respectively. Apparentlly it is evident that all the systemic fungicide were more effective than non- systemic fungicides when compared under *in vitro* conditions. It is also observed that increased in per cent inhibition was invariably proportional to the increase in the concentration of respective fungicides**.**

Table 3 : Efficacy of fungicides on web blight disease severity during 2008-09 and 2009-10 crop seasons

Treatments	Disease severity*		Reduction in disease severity (%)		Disease Index (%)*	
	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Tilt	10.0 (18.43)	13.3 (21.32)	83.3	79.9	44.3	43.2
Contaf	20.0 (25.36)	21.7 (27.70)	66.7	63.3	44.6	45.6
Sulphur	40.0 (39.23)	35.3 (36.40)	33.3	46.7	50.8	55.2
Captof	36.7 (37.22)	28.3 (32.01	38.9	57.3	46.2	52.4
Bavistin	9.3 (17.22)	10.3 (18.66)	84.4	82.4	43.2	42.6
Mancozeb	36.7 (37.20)	35.0 (36.18)	38.9	47.2	50.2	52.2
Check	60.0 (50.85)	66.3 (54.63)	_	_	_	_
LSD 0.05	15.19	10.73	_	_	_	_
CV (%)	_	20.09	_	_	_	_

*Figures in parenthesis are angular transformed values.

Effect of fungicides on Rhizoctonia blight on under field conditions

The data given in table 3 and 4 revealed that all the treatments significantly decreased disease severity, increased grain yield as well as 1000 grain weight as compared to control plots.

During 2008-09 crop season, among systemic fungicides seed treatment with bavistin and three prophylactic sprays at 25 d interval was found superior over the other treatments giving 84.4% reduction in disease severity followed by tilt. Among non-systemic fungicides seed treatment with captaf and three prophylactic sprays at 25 d interval was found superior over the other treatments giving 38.9% reduction in disease severity which was similar to mancozeb (38.9%) followed by sulphur. Maximum increase in grain yield kg/ha (32.8%) and 1000-grains weight (23.9%) were recorded with bavistin followed by sulphur.

Table 4 : Efficacy of fungicides on grain yield and 1000 grain wt. during 2008-09 and 2009-10 crop seasons Figures in parenthesis are

Treatments	No. of Spary	Dose	Yield (kg/ha)		% increase check		100-grain weight (g)		% increase over check	
			2008-09	2009-10	2008-09	2009-10	2008-09	2009-10	2008-09	2009-10
Tilt	2.0	1.0	1527	1497	30.0	37.1	27.4	29.4	18.5	35.5
Contaf	2.0	1.0	1374.7	1310	22.3	28.1	26.9	27.9	16.8	32.2
Sulphur	2.0	2.0	1166	1180	8.3	20.2	26.0	22.3	14.2	15.3
Captof	2.0	2.0	1211	1150	11.8	18.1	24.2	25.1	7.8	24.6
Bevestin	2.0	1.0	1591.3	1589	32.8	40.8	29.4	30.5	23.9	37.8
Mancozeb	2.0	2.0	1341.3	1363	20.30	30.9	24.1	27.0	7.8	29.8
Check	–	–	1069	941	_	_	22.3	18.9	_	_
CD(P=0.05)	_	_	224.6	259.5	_	_	2.81	4.2	_	_
CV (%)	_	_	9.52	11.31	_	_	6.17	9.14	_	_

During 2009-10 crop season, among systemic fungicides seed treatment with bavistin and three prophylactic sprays at 25 d interval was found superior over the other treatments giving 82.4% reduction in disease severity followed by tilt. Among non-systemic fungicides seed treatment with captaf and three prophylactic sprays at 25 d interval was found superior over the other treatments giving 57.3% reduction in disease severity followed by mancozeb. Maximum increase in grain yield kg/ha 40.8%) and 1000-grains weight (37.8%) were recorded with bavistin followed by sulphur.

Several other workers have also reported the effectiveness of bevistin as well as tilt in other crops like groundnut, cowpea, mung, rice, bean and maize (Horn and Lee 1974; Hepperly et al 1982; Dubey and Dwivedi 1988; Meena and Chattopadhyay 2002; Mathew and Gupta 1996; Misgra 1998; Stonehouse 1994; Sharma and Tripathi 2001; Shailbala and Tripathi 2004).

CONCLUSION

It can be concluded that application of 15ppm concentration bavistin (0.1%), tilt (0.1%) completely checked the growth of the fungus. Based on effectiveness of fungicides in vitro, they were further tested under *in vivo* conditions. Bavistin @ 0.1% applied as seed treatment followed by foliar spray showed lowest disease severity, highest grain yield as well as maximum 1000 grain weight followed by tilt @ .1 per cent.

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