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Evaluation of Different Doses of Fungicides and Biocides against Spot Blotch of Wheat Caused by *Bipolaris sorokiniana*

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A B S T R A C T

Wheat (*Triticum estivum* L.) is the major and important winter cereal food crop grown in India during *Rabi* season. The crop suffer from a number of devastating disease by fungi, bacteria, virus, phytoplasmas, nematodes and many other factors which educe yield and quality**.** The major fungal disease of wheat, spot blotch caused by *Bipolaris sorokiniana* is the most devastating disease in India and several other countries. The diseases affect all areal part of the plant.. Many new fungicides and biocides have been under taken to evaluate with poison food method. Out of nine fugicides in different concentrations of seven fungicides and two biocides (Neemexel and *T. viride*) have been revealed that the dose no. 4th (D_4) have given best result to reducing mycelial growth of *Bipolaris sorokiniana* comparison to others. It has also found that the growth of fungus was fast up to first four days and after that it is gradually reduced. In some concentrations like, 0.12%, 0.25% growth of mycelia was stringent after fifth days of inoculation. The maximum inhibitory effect with 73.33% reduction was recorded at 0.25 % concentration of Nativo 75 WG fungicides which was statistically at per with 0.12% concentration. It was followed by 0.06% concentration with 68.88% reduction was recorded with Raxil 060 FS.

Introduction

Wheat (*Triticum estivum* L.) is the major and important winter cereal food crop grown in India during *Rabi* season. It contributes major part to the food security system and provides more than 50 per cent calories to the people those are mostly dependent on wheat as a staple food (Sahai Suman, 2009). India occupies the second place in term of production and area, among the major wheat growing countries of the world after china. But in India, Uttar Pradesh have rank first both in area and production of wheat amongst the different major wheat growing states *viz*. Punjab, Haryana, Delhi, Rajasthan and M.P. of country and hold 1/3 share in the countries out of the total wheat area and production. However in the background of increasing population, the demand for wheat is increasing day by day, but production and productivity in India are remained stringent for last few

decades which solely contributed due to some biotic and abiotic factors likes' insect, disease, weeds and nutritional deficiency constraints, in which one of the most important reason is disease.

Wheat crop suffers from several diseases which reduce yield and quality. The crop suffer from a number of devastating disease by fungi, bacteria, virus, phytoplasmas, nematodes and many other factors (Joshi *et al.*, 1986). The major fungal disease of wheat, spot blotch caused by *Bipolaris sorokiniana* is the most devastating disease in India and several other countries. The diseases affect all areal part of the plant. The disease adversely affect wheat yield particularly under late sown condition due to the practice of most popular rice – wheat cropping system. The yield losses due to spot blotch disease may vary from variety to varieties and region to region. Nema and Joshi (1971) the pathogen main problem reported 3-20% loss under different agro-climatic condition. The management of disease can be done through cultural, chemical, biological and use of resistant variety.

The cultivation of wheat with resistant verity is cheap and best method but resistant variety may be converted in to the susceptible are due to development of resistant strains among created to this method. Cultural practices (sanitation, crop rotation and summer ploughing) prevented the development to spot blotch disease in the field condition but method fail where it has already appeared in the standing crop. Biological control is easy and cheap method but bio agent having varying growth even slow growth and unfit for the adverse weather condition (Singh, 2003). Hence application of chemical is one of the most effective and widely recommended methods of disease management. Continues use of same chemical may develop resistant strain of pathogen therefore, there is need to change of chemical at a frequent interval of time. Hence many new fungicides and biocides have been under taken to evaluate with poison food method in the present investigation.

Materials and Methods

Isolation of *Bipolaris sorokiniana*

Naturally infected wheat leaf was collected from Student's Experimental Research Farm of C.S.A. Uni. Agri. & Tech., Kanpur. The disease portion of leaves were cut into 2 mm. long pieces by sterilized blade and washed 3-4 times with sterilized water in order to remove the dust and other contamination. These pieces were dipped in 0.1% $HgCl_2$ for about 20-30 second then washed thoroughly in 3-4 times to remove the remaining trace of $HgCl_2$. The pieces were then transferred with the help of sterilized needle in sterilized Petri-dishes containing 2% PDA medium previously poured aseptically and were incubated in BOD at 25 $\pm 1^0$C. The pure culture was established by hyphal tip isolation method (Rangaswami, 2008). Fungus was identified by comprising its morphological character with old identified culture of *Bipolaris sorokiniana* and authentic description as given by Ellis (1971). The stock culture of *Bipolaris sorokiniana* were revived after every fort night and maintained through on PDA in sealed culture tubes at 5^0C in refrigerator.

Collection of fungicide and biocide

The fungicides like Raxil 060FS, Trifloxystrobin 500SC, Trifloxystrobin + Tebeconazole 080 FS, Vitavax, Flint (Trifloxystrobin) 50 WG, Nativo (Trifloxystrobin 25% + Tebeconazole 50%) 75 WG and Tebeconazole 2% DS were provided by Bayer crop Science Limited Mumbai and Hydrabad.

Bioagent like *Sanjeevini* commercial formulation of *Trichoderma viride* was collected from Department of Plant Pathology C. S. Azad University of Agriculture and Technology, Kanpur for the present investigation.

Neem based commercial formulation *Neemexcel* was also collected from local market at Rawatpur, Kanpur.

Preparation of bioagent solution

Seven days old culture was used to prepare homogenous suspension of bio agent. The suspension containing conidia and mycelium bit was churned in a warning blender and strained with cheese cloth. The suspension containing of approximately 103-105 conidia was used for this study.

Solution preparation of fungicides

To study the effect of the different fungicides and biocides on spore germination and growth of pathogen the fungicides *viz.* Raxil 060 FS, Trifloxystrobin 500 SC, Trifloxystrobin + Tebeconazole 080 FS, Vitavax, Flint (Trifloxystrobin) 50 WG, Nativo (Trifloxystrobin 25% + Tebeconazole 50%) 75 WG and Tebeconazole 2% DS and biocides like Sanjeevini and *Neemexcel* of different doses were tested in laboratory.

Raxil 060 FS, Trifloxystrobin 500 SC, Tebeconazole 2% DS, Trifloxystrobin + Tebeconazole 080 FS, Nativo (Trifloxystrobin 25% + Tebeconazole 50%) 75WG, Flint (Trifloxystrobin) 75 WG likes are new fungicides and there is need to standardize it concentrations. Therefore exactly 0.03 mg, 0.06 mg, 0.12 mg and 0.25 mg of six fungicides, were weighted and dissolved in water separately in 100 ml of water to prepare 0.03, 0.06, 0.12 and, 0.25 % concentrations of fungicides.

Effect of doses of fungicides and biocides on mycelial growth of *Bipolaris sorokiniana* (Food Poison Method)

The experiment was conducted by poison food technique as describe by Schmitz (1930).The six fungicides and their four doses to prepare 0.03, 0.06, 0.12 and, 0.25 % concentrations of fungicides, 0.03 mg, 0.06 mg, 0.12 mg and 0.25 mg, were weighted and dissolved in PDA separately in 100 ml of PDA in 250 ml flask. The medium containing fungicide was mixed thoroughly and poured in Petri plate and allow solidifying. Each treatment was replicated three times. One Petri plate contain only medium without any fungicide to serve as a control. Discs of (0.5 cm diameter), mycelial bit was cut by the cork borer and placed at the centre of Petri plate and then Petri-plates were incubated at incubated at 28 $\pm 1^0$C. Observation on the mycelial growth of fungi in each Petri plate was recovered at every 24 hrs up to seven days of incubation. One Petri-plate contain only medium without any fungicide and biocide serve as a control.

Results and Discussion

Effect of doses of fungicides and biocides on mycelial growth of *Bipolaris sorokiniana* (Food Poison Method)

The effect of different concentrations of fungicides and biocides on suppression of mycelial growth of *B. sorokiniana* was recorded after every 24 hour up to 7 days of inoculation.

It was evident from the (Table 1) that suppression of mycelial growth of *B. sorokiniana* began after five days of inoculation. It has also found that the growth of fungus was fast up to first four days and after that it is gradually reduced. In some concentrations like, 0.12%, 0.25% growth of mycelia was stringent after fifth days of inoculation.

Table.1 Effect of different concentration fungicides and biocides on mycelial growth of *B. sorokiniana* (Food Poison Method)

S. No.	Fungicide	Dose	Mycelium growth of *Biopoloris sorokiniana* (Diameter in Cm) 1-7 days							Mean	Reduction in growth %
			1	**2**	**3**	**4**	**5**	**6**	**7**		
1.	Raxil 060 FS	D_1	0.5	1.2	2.5	4.0	4.1	4.2	5.2	3.10	43.33
		D_2	0.5	1.2	2.5	3.8	4.1	4.1	5.2	3.06	42.22
		D_3	0.5	1.2	2.0	2.5	2.6	2.6	2.6	2.00	71.11
		D_4	0.5	1.0	2.3	2.9	2.5	2.5	2.5	2.02	72.22
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	6.32	0.00
	Mean		0.50	1.45	2.74	3.80	4.06	4.30	4.90		
					A		**B**			**A×B**	
	C.D. at 5% (P=0.05)				**0.21**		**0.25**			**0.55**	
2.	Trifloxystrobin 500 SC	D_1	0.5	1.2	2.4	3.8	4.0	4.2	4.2	2.90	53.33
		D_2	0.5	1.2	2.0	3.2	3.8	4.2	4.2	2.72	53.33
		D_3	0.5	1.0	1.4	1.8	2.4	2.8	2.8	1.81	68.88
		D_4	0.5	1.0	1.2	1.5	2.0	2.4	2.8	1.62	68.88
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.32	0.00
	Mean		0.5	1.38	2.29	3.22	3.84	4.34	4.60		
					A		**B**		**A×B**		
	C.D. at 5% (P=0.05)				**0.21**		**0.25**		**0.55**		
3.	Trifloxystrobin+ Tebuconazole 080 FS	D_1	0.5	1.2	2.5	4.1	4.2	4.2	4.2	2.96	53.33
		D_2	0.5	1.2	2.5	3.8	4.1	4.1	4.2	2.90	53.33
		D_3	0.5	1.5	2.0	2.1	2.3	2.5	2.5	1.90	72.22
		D_4	0.5	1.0	1.8	2.0	2.5	2.5	2.5	1.82	72.22
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.30	0.00
	Mean		0.50	1.48	2.64	3.60	4.02	4.30	4.50		
				A		**B**		**A×B**			
	C.D. at 5% (P=0.05)			**0.31**		**0.37**		**0.83**			
4.	Vitavax	D_1	0.5	1.2	2.4	4.1	4.1	4.2	4.2	2.95	53.33
		D_2	0.5	1.2	2.1	2.6	3.0	3.4	4.1	2.40	54.44
		D_3	0.5	1.0	2.3	2.5	2.5	2.5	2.5	1.97	72.22
		D_4	0.5	1.0	2.5	2.5	2.5	9.5	2.5	2.00	72.22
		D_5	0.5	2.5	4.4	5.2	7.0	8.1	9.0	5.24	0.00
	Mean		0.50	0.40	2.74	3.40	3.80	4.14	4.46		
				A		**B**		**A×B**			
	C.D. at 5% (P=0.05)			**0.10**		**0.12**		**0.28**			
5.	Flint (trifloxystrobin) 50 WG	D_1	0.5	1.2	2.4	4.0	4.1	4.2	4.2	2.94	53.33
		D_2	0.5	1.2	2.0	2.8	4.0	4.1	4.2	2.68	53.33
		D_3	0.5	1.0	1.5	2.0	3.2	3.2	3.2	2.08	64.44

		D_4	0.5	1.0	1.5	1.8	3.0	3.0	3.0	1.97	66.66
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.32	0.00
	Mean		0.50	1.38	2.36	3.28	4.26	4.52	4.72		
				A		B		A×B			
	C.D. at 5% (P=0.05)			**0.15**		**0.18**		**0.42**			
6.	Nativo (Triofloxystribin 25% + Tebuconazole 50%) 75 WG	D_1	0.5	1.2	1.8	2.8	3.5	4.6	5.8	2.88	35.55
		D_2	0.5	1.2	1.8	2.5	2.8	2.8	2.8	2.05	68.88
		D_3	0.5	1.2	1.8	2.6	2.8	2.8	2.8	2.07	68.88
		D_4	0.5	1.2	1.8	2.4	2.4	2.4	2.4	1.87	73.33
		D_5	0.5	2.5	4.3	5.6	7.2	7.5	9.0	5.22	0.00
	Mean		0.50	1.50	2.30	3.20	3.74	4.02	4.56		
					A		B		A×B		
	C.D. at 5% (P=0.05)				**0.10**		**0.12**		**0.28**		
7.	Trichoderma viride	D_1	0.5	1.2	2.2	4.0	4.1	4.2	4.2	2.91	53.33
		D_2	0.5	1.2	1.8	2.6	3.2	4.2	4.2	2.53	53.33
		D_3	0.5	1.2	1.5	2.2	2.4	2.8	2.8	1.91	68.88
		D_4	0.5	1.0	1.4	2.0	2.4	2.8	2.8	1.84	68.66
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.32	0.00
	Mean		0.50	1.42	2.26	3.32	3.82	4.42	4.60		
				A		B		A×B			
	C.D. at 5% (P=0.05)			**0.15**		**0.17**		**0.39**			
8.	Neemexcel	D_1	0.5	1.2	2.2	4.0	4.1	4.2	4.2	2.91	53.33
		D_2	0.5	1.2	2.0	3.2	3.8	4.2	4.2	2.72	53.33
		D_3	0.5	1.0	1.8	2.4	2.4	2.8	2.8	1.95	68.88
		D_4	0.5	1.0	1.4	2.0	2.4	2.8	2.8	1.84	68.88
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.32	0.00
	Mean		0.50	1.38	2.36	3.84	3.94	4.42	4.60		
				A		B		A×B			
	C.D. at 5% (P=0.05)			**0.23**		**0.27**		**0.62**			
9.	Tebuconazole 2% DS	D_1	0.5	1.2	2.2	4.0	4.1	4.2	4.2	2.91	53.33
		D_2	0.5	1.2	2.0	3.2	3.8	4.2	4.2	2.72	53.33
		D_3	0.5	1.0	1.8	2.4	2.8	3.2	3.2	2.12	64.44
		D_4	0.5	0.5	1.0	1.8	2.2	2.8	2.8	1.65	68.88
		D_5	0.5	2.5	4.4	5.8	7.0	8.1	9.0	5.32	0.00
	Mean		0.50	1.28	2.29	3.44	3.99	4.50	4.68		
				A		B		A×B			
	C.D. at 5% (P=0.05)			**0.31**		**0.37**		**0.82**			

Where-D_1 = 0.33 ml / lit., D_2 = 0.66 ml / lit., D_3 = 1.25 ml /lit., D_4 = 2.50 ml/ lit., D_5 = Control.
A = It indicate dose level. B = It indicate number of days

The maximum inhibitory effect with 73.33% reduction was recorded at 0.25 % concentration of Nativo 75 WG fungicides which was statistically at par with 0.12% concentration. It was followed by 0.06% concentration with 68.88% reduction was recorded with Raxil 060 FS.

Viswanathan and Narayanaswamy (1992) found that Tricyclazole and Mancozeb at the different concentrations effectively inhibited the spore germination and mycelial growth of *D.oryzae*.

Biswas *et al.,* (2008) also reported that seed treatment with biocides such as *Trichoderma harzianum* and *T. viride* and so on were tested against *D. orzae* and *Rhizoctonia solani* and found that biocides provide good protection of seed against seed borne infection, resulting in enhanced germination and shoot and root length of paddy seeds.

Naresh *et al.,* (2009) also evaluated that out of out of ten fungicides 4 viz. zineb, thiram, TPTA and ziram were found most effective against mycilial growth of *B. sorokiniana.*

Out of six treatments (*i.e.* Tebuconazole, Tetraconazole, Trifloxystrobin + propiconazole, Azoxystrobin + cyproconazole, Trifloxystrobin + cyproconozole and control) including control, the better response found in Tebuconazole and Tetraconazole to effective inhibition on the mycelium growth of *Bipolaris maydis* Yamashita *et al.,* (2010).

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