

Original Research Article

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In vitro Evaluation of Fungicides against *Bipolaris sorokiniana* Causing Spot Blotch of Barley (*Hordeum vulgare* L.)

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ABSTRACT

Keywords

Barley, *Bipolaris sorokiniana*, Different Fungicides

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An experiment conducted in Plant Pathology Laboratory Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Faizabad (U.P.) during 2015 Efficacy of 15 fungicides were evaluated at 0.05%, 0.5%, 0.1% and 2% for studying their inhibitory effect on the mycelia growth of *Bipolaris sorokiniana* by using food poison technique. In present study the data was recorded, the maximum mycelial growth inhibition was recorded in inoculation after 7 days Propiconazole (0.1%) 87.77 %, and Propiconazole (0.05%) 81.57% and radial mycelial growth 11.00 mm and 16.57 mm followed by Hexaconazole (0.2%) and Hexaconazole (0.1 %) 77.98% and 70.37% mycelial growth inhibition and radial mycelial growth 19.81 mm and 26.65 mm. The lowest mycelial growth inhibition was recorded T₁ Ahook 0.5% and T₂ Ahook 0.2% 7.75% and 0.78% and radial mycelia growth 83.01 mm and 89.56 mm. The results revealed that inhibition percentages were increase with the increased in concentration of all fungicides used in this study.

Introduction

Barley (*Hordeum vulgare* L. 2n=14, sub family Poaceae) a crop of winter season is grown eco-friendly worldwide for food, feed and forage under various agro climatic situation. During 2015-16 India had about 6.55 lakh ha area with production of 16.18 lakh metric tonnes and productivity of 24.70 q/ha. In U.P Barley occupied an area of 1.46 lakh ha with a total production of 3.58 lakh metric ton with productivity of 24.50 q/ha. Uttar Pradesh alone contributes more than one third of India's total production of Barley (Anonymous, 2016).

Plant diseases, especially foliar diseases, are one of the factors that contribute most to limit

the Barley production in India. Barley is greatly affected by many fungal diseases, accounting considerable yield loss every year. The global yield losses of Barley caused by foliar diseases are estimated to range from 10% to 40%, amounting to billions of dollars per season (Sharma and Duveiller, 2006).

However, the disease varies from country to country and the Spot blotch disease caused by the fungus *Bipolaris sorokiniana* (teleomorph *Cochliobolus sativus*) is one of the most important fungal disease of Barley found worldwide but is most serious in tropical areas where Barley and wheat are grown many factors, including climate conditions

(rainfall, temperature and humidity) and agricultural practices, influence the development and spread of *Bipolaris sorokiniana* causing several diseases in its host worldwide and produces a broad range of symptoms such as foot and root rot, leaf blotch and black point of seeds and infected seeds can be the main source of inoculums, especially in newly cultivated areas. The survival of free inactive conidia in soil for more than one year and repeated cultivation of the same crop provides another source of infection and alternative hosts such as grasses can also be a source of the infection (Pandey *et al.*, 2005).

Spot blotch (*Bipolaris sorokiniana* (Sacc. Ex.Sorok) Shoem formerly *Helminthosporium sativum*, Syn. *Drechslera sorokiniana* teleomorph *Cochliobolus sativus* (Ito adn Kuribisi) is an important disease of Barley and wheat, commonly occurring in wheat-rice cropping sequence areas of country.

The disease affected all plant parts and can cause up to 100% damage to the crop. Fungicide can be an effective agent to control this disease. They are chemical compound that controls fungal disease by specifically inhibiting or killing the fungus causing the disease

Fungicides that have curative properties reduce disease severity and increase the productivity of crop. Cultural practices often do not provide adequate disease control and resistant cultivars are not available or not acceptable in mark, certain high value crops have an extremely low tolerance for disease symptoms.

In those case using fungicide is the most suitable to fight against diseases. It effectively controls the sudden attack of any disease so epidemic can be avoided easily (McGrath, 2004). The isolates of *B. sorokiniana*

collected from various cities of Bangladesh were examined for their sensitivity. The conventional breeding has little impact on cultivar development in wheat. Almost all the cultivars are derived from seedlings (Litz *et al.*, 1994). The problem is intensified due to lack of resistance in available local and exotic cultivars.

In vitro studies against *B. sorokiniana* are barely sufficient and even precise information on determination of efficacy, sensitivity types of fungicides with minimum inhibitory concentration have not been characterized against *B. sorokiniana* (Iqbal, 2010). Research is needed to control this disease. Chemical control is the most preferable one in respect of India.

In view of the above facts, the present study was undertaken to evaluate the variable effects of some selected fungicides against some *B. sorokiniana*.

Materials and Methods

An experiment conducted in Plant Pathology Laboratory Narendra Deva University of Agriculture and Technology, Narendra Nagar, Kumarganj, Faizabad (U.P.) during 2015 Efficacy of 15 fungicides table 1 were evaluated at 0.05%, 0.5%, 0.1% and 2% for studying their inhibitory effect on the mycelia growth of *Bipolaris sorokiniana* by using food poison technique. (Grover and Moore 1962).

For preparation of different concentration of fungicides, fungicides were weighed with the help of electronic balance. The weighted fungicides were added to sterilized PDA. This PDA is poured in sterilized petridishes. PDA medium without fungicides were served as control. Four replications were maintained for each treatment in complete randomized design.

Table.1 List of the fungicide, trade name, chemical name and supply source

S. No.	Common name	Trade name	Chemical name	Fungicide group
1.	Achook	Achook	Azadirachtin-rich neem formulation	Botanical fungicide
2.	Carbendazim	Bavistin 50W.P.	Methyl 1Hbenzimidazol2ylcarbamate	Benzimidazoles fungicide
3.	Carboxin	Vitavax75 W.P	5,6- dihydro- 2- methyl- 1,4- oxathiin- 3- carboxamide (56)	Oxathiins Fungicide
4.	Copper oxychloride	Blitox	Copper oxychloride	Copper fungicide
5.	Cyclohexamide	Acti- dione2.26% W.P.	4[(2R)2[(1S, 3S, 5S)3,5Dimethyl2oxocyclohexyl]2hydroxyethyl] piperidine2,6dione	Cyanoimidazole (Antibiotic)
6.	Difenconazole	InspireSuper, Stadium	cis,trans3chloro4[4methyl2(1H1,2,4triazol1ylmethyl)1,3dioxolan2yl] phenyl4chlorophenylether	Triazoles
7.	Hexaconazole	Trigger	2(2,4Dichlorophenyl)1(1H1,2,4triazol1yl) hexan2ol	Triazoles
8.	Iprodiane	Chipco 26GT, Raven Iprodione Pro, 18 Plus	3(3,5Dichlorophenyl) Nisopropyl2,4dioxoimidazolidine 1carboxamide	Dicarboximide Fungicide
9.	Kasugamycine	Kasumin	3-O-(2-Amino-4-((carboxyiminomethyl)amino)-2,3,4,6-tetrahydroxy- α -D-arabinohepyran osyl-d-chiro-inositol hydrochloride	Cyanoimidazole (Antibiotic)
10.	Nativo	Nativo 75%	Tebuconazole 50%+Trifloxystrobin 25%	Triazoles
11.	Nimbidine	Nimbidine	Azadirachtin-rich neem formulation	Botanical fungicide
12.	Propiconazole	Banner Maxx, Honor Guard, Procure, Quilt	(\pm)-1-[2-(2,4-dichlorophenyl)-4-propyl-1,3-dioxolan-2-ylmethyl]-1H-1,2,4-triazole	Triazoles
13.	Proponeb	Antracol 70% W.P.	Zinc proyllenebisdithocarbmate (polymeric)	Dithiocarbamate group
14.	Tebuconazole	Folicur, Toledo	(RS)1(4Chlorophenyl) 4,4dimethyl3(1H,1,2,4triazol1ylmethyl) pentan3ol	Triazoles
15.	Tricyclazole	Blasticide	5-methyl-1,2,4-triazolo[3,4-b][1,3]benzothiazole	Triazoles

Table.2 Effects of different fungicides at different concentrations on radial mycelial growth, mycelial growth inhibition of *Bipolaris sorokiniana*

Treatments	Name of Fungicides	Concentration (percent)	Radial growth (mm)	Inhibition percentage
T ₁	Achook	0.5	83.01	7.75 (16.15)
T ₂	Achook	0.2	89.56	0.78 (3.17)
T ₃	Carbendazim	0.1	67.56	24.94 (29.95)
T ₄	Carbendazim	0.05	75.12	16.52 (23.97)
T ₅	Carboxin	0.1	70.23	21.91 (27.92)
T ₆	Carboxin	0.05	50.98	12.78 (20.85)
T ₇	Copper oxychloride	0.1	65.33	27.02 (31.28)
T ₈	Copper oxychloride	0.05	71.60	20.43 (26.86)
T ₉	Cyclohexamide	0.1	71.24	20.78 (27.08)
T ₁₀	Cyclohexamide	0.05	76.81	14.92 (22.69)
T ₁₁	Difenconazole	0.1	59.66	33.69 (35.47)
T ₁₂	Difenconazole	0.05	69.17	32.13 (28.73)
T ₁₃	Hexaconazole	0.2	19.81	77.97 (61.99)
T ₁₄	Hexaconazole	0.1	26.65	70.37 (57.00)
T ₁₅	Iprodiane	0.2	44.72	50.3 45.157
T ₁₆	Iprodiane	0.1	52.05	42.32 (40.56)
T ₁₇	Kasugamycine	0.3	32.24	64.17 (53.21)
T ₁₈	Kasugamycine	0.2	40.31	55.2 (47.96)
T ₁₉	Nativo	0.1	21.00	76.81 (61.19)
T ₂₀	Nativo	0.05	26.22	70.85 (57.306)
T ₂₁	Nimbidine	0.5	80.57	10.46 (18.86)
T ₂₂	Nimbidine	0.2	85.55	4.94 (12.66)
T ₂₃	Propiconazole	0.1	11.00	87.77 (69.51)
T ₂₄	Propiconazole	0.05	16.57	81.57 (64.56)
T ₂₅	Proponeb	0.1	55.25	38.69 (38.46)
T ₂₆	Proponeb	0.05	60.78	32.47 (34.71)
T ₂₇	Tebuconazole	0.1	35.32	60.74 (51.18)
T ₂₈	Tebuconazole	0.05	41.90	54.6 (47.66)
T ₂₉	Tricyclazole	0.1	39.82	55.76 (48.29)
T ₃₀	Tricyclazole	0.05	50.72	43.63 (41.32)
T ₃₁	Control		90.00	0 (0.00)
SEm ±			1.01	0.82
CD (P=0.05)			2.84	2.32
CV (%)			4.51	3.71

() Figures in parentheses are transformed angular value

After solidification, 5 mm discs of *Bipolaris sorokiniana* were cut from the margin of actively growing colony and inoculated on to the center of the Petri dish containing the poisoned PDA medium. Petridishes were incubated at 27 ± 2 °C temperature. Colony diameter was measured after seven days.

Measurement of radial mycelia growth and growth inhibition of *B. sorokiniana*

$$I = \frac{C - T}{C} \times 100$$

Where,

I = Inhibition of mycelium.

C = Colony diameter (mm) in control.

T = Colony diameter (mm) in treatment.

Experimental design and data analysis

Both experiments were laid out under completely randomized design (CRD). Data were transformed by using Square Root Method (Zaman, 1982) for exactly analyzing the data avoiding statistical complication.

Results and Discussion

Fifteen fungi-toxicants used in the present study were evaluated in vitro against *Bipolaris sorokiniana* spot blotch of Barley by Food Poison Technique at the recommended dose along with the other dose of 15 fungi-toxicants. Fifteen fungi toxicants were used in the present study were evaluated in vitro against *Bipolaris sorokiniana* causes spot blotch of Barley by Food Poison Technique using fungi toxicant one recommended dose and one other dose. In present study the data was recorded, the maximum mycelial growth inhibition was recorded in inoculation after 7 days table 2 Propiconazole (0.1%) 87.77 %, and Propiconazole (0.05%) 81.57% and radial

mycelial growth 11.00 mm and 16.57 mm followed by Hexaconazole (0.2%) and Hexaconazole (0.1 %) 77.98% and 70.37% mycelial growth inhibition and radial mycelial growth 19.81 mm and 26.65 mm. The lowest mycelial growth inhibition was recorded T₁ Achook 0.5% and T₂ Achook 0.2% 7.75% and 0.78% and radial mycelia growth 83.01 mm and 89.56 mm respectively. As per result agreed with Hasan *et al.*, (2012), and Samia *et al.*, (2015) Mancozeb, Carbendazim, Propiconazole and Copper Oxychloride was used in the study. No mycelial growth was found even at the lowest concentration of Propiconazole after 7 days of inoculation in all isolates of *Bipolaris sorokiniana*. Chattopadhyay *et al.*, (2013) tested the tricyclazole, it reduces the spore size, average number of septation and extent of sporulation in fungi *in vitro* condition. Singh and Gupta (2000) studied the bioassay of fungicides against *Dreschlera sativus* causing leaf blight of wheat. Tilt was most effective fungicide in inhibiting the mycelial growth. Chandrashekara (2013) and Prem *et al.*, (2013) Fungicide Zineb, Thiram, TPTA and Ziram were completely inhibited the radial growth of *Bipolaris sorokiniana*, *in vitro* The results revealed that inhibition percentages were increase with the increased in concentration of all fungicides used in this study.

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