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In vitro evaluation of fungicides against *Bipolaris sorokiniana* (Sacc.) Shoem

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Abstract
Spot blotch caused by *Bipolaris sorokiniana* is major threat for wheat cultivation due to continuous rise in temperature during the wheat growing season and high humidity coupled with winter rains, spot blotch is getting favourable conditions to develop aggressively and cause damage to wheat crop at larger scale by affecting significant yield loss up to 18-50 per cent under favourable conditions. Looking into significance of disease various non- systemic, systemic and combi product fungicides were evaluated in vitro conditions at three different concentrations for their efficacy against *Bipolaris sorokiniana* by following poisoned food technique. Results revealed that among non-systemic fungicides, irrespective of concentrations tested, the treatment involving captan 50% WP recorded maximum mean per cent mycelial inhibition (85.30%) and least mean per cent mycelial inhibition was recorded in chlorothalonil 75% WP (50.61%). Among the systemic fungicides, combi product fungicides tested, cent per cent inhibition was noticed in treatments involving hexaconazole 5% EC, propiconazole 25% EC and tebuconazole 250% EC, hexaconazole 5% + captan 70% WP, tebuconazole 50% + trifloxistrobin 25% WG and carboxin 37.5% + thiram 37.5% WP. Among the systemic fungicides least inhibition was noticed in thiophanate methyl 70% WP at all three concentrations followed by difenconazole 25% EC while among combi product fungicides tested, , carbendazim 12% + mancozeb 63% WP (62.22%) recorded least inhibition which was followed by fenamidone 10% + mancozeb 50% WG (77.40%).

Keywords: *Bipolaris sorokiniana*, spot blotch, fungicides, bioagents, botanicals, ITKs

Introduction
Wheat (*Triticum* spp.; family: Poaceae; centre of origin: Abyssinia) the versatile cereal crop is also described as “the shuffle of life” or “king of cereals. In India, wheat is the second most important food crop being next to rice and it contributes nearly 25 per cent to the total food grain production. Due to continuous rise in temperature during the wheat growing season and high humidity coupled with winter rains, spot blotch is getting favourable conditions to develop aggressively and cause damage to wheat crop at larger scale by affecting significant yield loss up to 18-50 per cent under favourable conditions (Duvellier *et al.*, 2005) [2]. Little information is available on *in vitro* evaluation of fungicides against *B. sorokiniana* so an attempt was made to evaluate fungicides *in vitro*.

Materials and Method
In vitro evaluation of fungicides
The experiment was conducted at Department of Plant Pathology, College of Agriculture, Dharwad. The systemic fungicides at 0.025, 0.05 and 0.10 per cent concentrations whereas non-systemic fungicides at 0.10, 0.20 and 0.30 per cent concentrations, combi product fungicides at 0.05, 0.10 and 0.20 per cent concentrations, respectively were evaluated by poisoned food technique. The calculated quantities of fungicides were thoroughly mixed in the medium before pouring into Petridishes so as to get the desired concentration of active ingredient of each fungicide separately. Twenty ml of poisoned medium (fungicide/commercially available botanical amended medium) was poured in each of 90 mm sterilised Petridishes and allowed to solidify. The plates were inoculated centrally with five mm disc of eight days old young sporulating culture of *B.* sorokiniana. Controls devoid of fungicides were also maintained. The experiment was conducted in completely randomised block design (CRBD) with three replications in each treatment. The inoculated Petridishes were incubated at 26 ± 1 °C. The colony diameters were measured after eight days when the control plates were full of fungal growth.

Per cent inhibition of growth was calculated by using formula given by Vincent (1947).

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

Where,
I = Per cent inhibition
C = Radial growth in control
T = Radial growth in treatment (fungicide).

Results and Discussion

All the fungicides evaluated were significantly superior over the control with respect to per cent mycelial inhibition. Among the non-systemic fungicides tested at three concentrations (0.10%, 0.20% and 0.30%), maximum per cent mycelial inhibition was recorded in treatments involving the captan 50% WP (86.29%) and mancozeb 75% WP (73.70%) at 0.30 per cent, which were followed by propineb 70% WP (66.29%) and chlorothalonil 75% WP (59.25%) and they are on par with each other. At 0.20 per cent highest inhibition was noticed in captan 50% WP (86.29%) followed by mancozeb 75% WP (72.96%) and least inhibition was observed in chlorothalonil 75% WP (56.29%), followed by propineb 70% WP (65.55%). At
0.10 per cent highest inhibition was noticed in captan 50% WP (83.33%) followed by mancozeb 75% WP (62.22%) and least was observed in chlorothalonil 75% WP (36.30%) followed by propineb 70% WP (57.03%). Irrespective of concentrations of fungicides tested, the treatment involving captan 50% WP recorded maximum mean per cent mycelial inhibition (85.30%), followed by mancozeb 75% WP (69.63%). Least mean per cent mycelial inhibition was recorded in chlorothalonil 75% WP (50.61%) (Table 1a and Plate 1). Earlier workers *viz*., Kulkarni and Ramakrishna (1977), Das (1988) and Singh and Gupta (2000) reported efficacy of mancozeb against *Drechslera oryzae*, *D. sorokinina* and *D. sativum*, respectively.

Among the different systemic fungicides tested, 100 per cent inhibition was noticed at all the three concentrations of hexaconazole 5% EC, propiconazole 25% EC and tebuconazole 250% EC which were significantly superior over rest of the fungicides. Least inhibition was noticed in thiophanate methyl 70% WP at all three concentrations followed by difenconazole 25% EC. Irrespective of fungicide concentration propiconazole 25% EC, hexaconazole 5% EC and tebuconazole 250% EC (100%) were found best in inhibiting the mycelial growth, followed by difenconazole 25% EC (85.81%) and thiophnate methyl 70% WP (49.74%) (Table 1b and Plate 1) these results are in fine tune with the findings of Kavita *et al*. (2017) who reported maximum mycelial growth inhibition by propiconazole 25% EC at 0.10 per cent (87.77%) and propiconazole 25% EC at 0.05 per cent (81.57%) followed by hexaconazole 5
% EC at 0.20 per cent (77.98%) and hexaconazole 5% EC at 0.10 per cent (70.37%).

Among combi product fungicides (Table 1c and Plate 1) at all the three concentrations, maximum inhibition of mycelial growth (100%) was noticed in hexaconazole 5% + captan 70
% WP, carboxin 37.5% + thiram 37.5% WP and tebuconazole 50% + trifloxistrobin 25% WG, which were significantly superior over other fungicides at 0.05 per cent. At 0.10 per cent least inhibition (62.96%) was noticed in carbendazim 12% + mancozeb 63% WP followed by fenamidone 10% + mancozeb 50% WG (85.18%) and remaining fungicides have shown cent per cent inhibition. At 0.20 per cent least inhibition (62.96%) was noticed in carbendazim 12
% + mancozeb 63% WP followed by fenamidone 10% + mancozeb 50% WG. Irrespective of the fungicidal concentrations, hexaconazole 5% + captan 70% WP, tebuconazole 50% + trifloxistrobin 25% WG and carboxin 37.5% + thiram 37.5% WP (100%) were best in inhibiting the mycelial growth and were significantly superior over other fungicides. Least inhibition was observed in carbendazim 12% + mancozeb 63% WP (62.22%) which was followed by fenamidone 10% + mancozeb 50% WG (77.40%). These results are in fine tune with Manu *et al*. 2017 who reported that carbendazim 12% + mancozeb 63% WP at 500 ppm showed complete inhibition of the mycelial growth of *E. turcicum.*

Table 1a: *In vitro* evaluation of non-systemic fungicides against *Bipolaris sorokiniana*

Sl. No.	Fungicide	Per cent inhibition of mycelial growth of fungus			
		Concentration (%)			Mean
		0.10	0.20	0.30	
1	Chlorothalonil (Kavach 75% WP)	36.30 (37. 05) *	56.29 (48.61)	59.25 (50.33)	50.61 (45.35)
2	Captan (Captaf 50% WP)	83.33 (65.90)	86.29 (68.27)	86.29 (68.27)	85.30 (67.46)
3	Mancozeb (Indofil M-45 75% WP)	62.22 (52.07)	72.96 (58.67)	73.70 (59.15)	69.63 (56.56)
4	Propineb (Antracol 70% WP)	57.03 (49.04)	65.55 (54.06)	66.29 (54.51)	62.95 (52.51)
	Mean	59.72 (50.60)	70.26 (56.95)	71.38 (57.66)	67.12 (55.01)
				S.Em. ±	C.D. at 1%
	Fungicides (F)			1.78	5.23
	Concentrations (C)			1.54	4.53
	F x C			1.03	3.02

* Angular transformed values

Table 1b: *In vitro* evaluation of systemic fungicides against *Bipolaris sorokiniana*

Sl. No.	Fungicide	Per cent inhibition of mycelial growth of fungus			
		Concentration (%)			Mean
		0.025	0.05	0.10	
1	Difenconazole (Score 25% EC)	84.44 (66.77) *	86.33 (68.30)	86.66 (68.58)	85.81 (67.87)
2	Hexaconazole (Contaf 5% EC)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
3	Propiconazole (Tilt 25% EC)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
4	Thiophanate methyl (Roko70% WP)	45.18 (42.23)	49.25 (44.57)	54.81 (47.76)	49.74 (44.85)

5	Tebuconazole (Folicure 250% EC)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
Mean		85.92 (67.96)	87.16 (69.00)	88.29 (69.99)	87.11 (68.96)
				S.Em. ±	C.D. at 1%
Fungicides (F)				0.12	0.46
Concentrations (C)				0.09	0.36
F x C				0.20	0.80

* Angular transformed values

Table 1c: *In vitro* evaluation of combi product fungicides against *Bipolaris sorokiniana*

Sl. No.	Fungicide	Per cent inhibition of mycelial growth			
		Concentration (%)			Mean
		0.05	0.10	0.20	
1	Hexaconazole 5% + Captan 70% (Taqat 75% WP)	100.00 (90.00) *	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
2	Fenamidone 10% + Mancozeb 50% (Sectin 60% WG)	60.74 (51.20)	85.18 (67.36)	86.29 (68.27)	77.40 (61.61)
3	Carbendazim 12% + Mancozeb 63% (SAAF 75% WP)	60.74 (51.20)	62.96 (52.51)	62.96 (52.51)	62.22 (52.07)
4	Tebuconazole 50% + Trifloxystrobin 25% (Nativo 75% WG)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
5	Carboxin 37.5% + Thiram 37.5% (Vitavax power 75% WP)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
Mean		84.29 (66.65)	89.62 (71.21)	89.85 (71.42)	87.92 (69.66)
				S.Em. ±	C.D. at 1%
Fungicides (F)				0.18	0.70
Concentrations (C)				0.14	0.54
F x C				0.31	1.21

* Angular transformed values

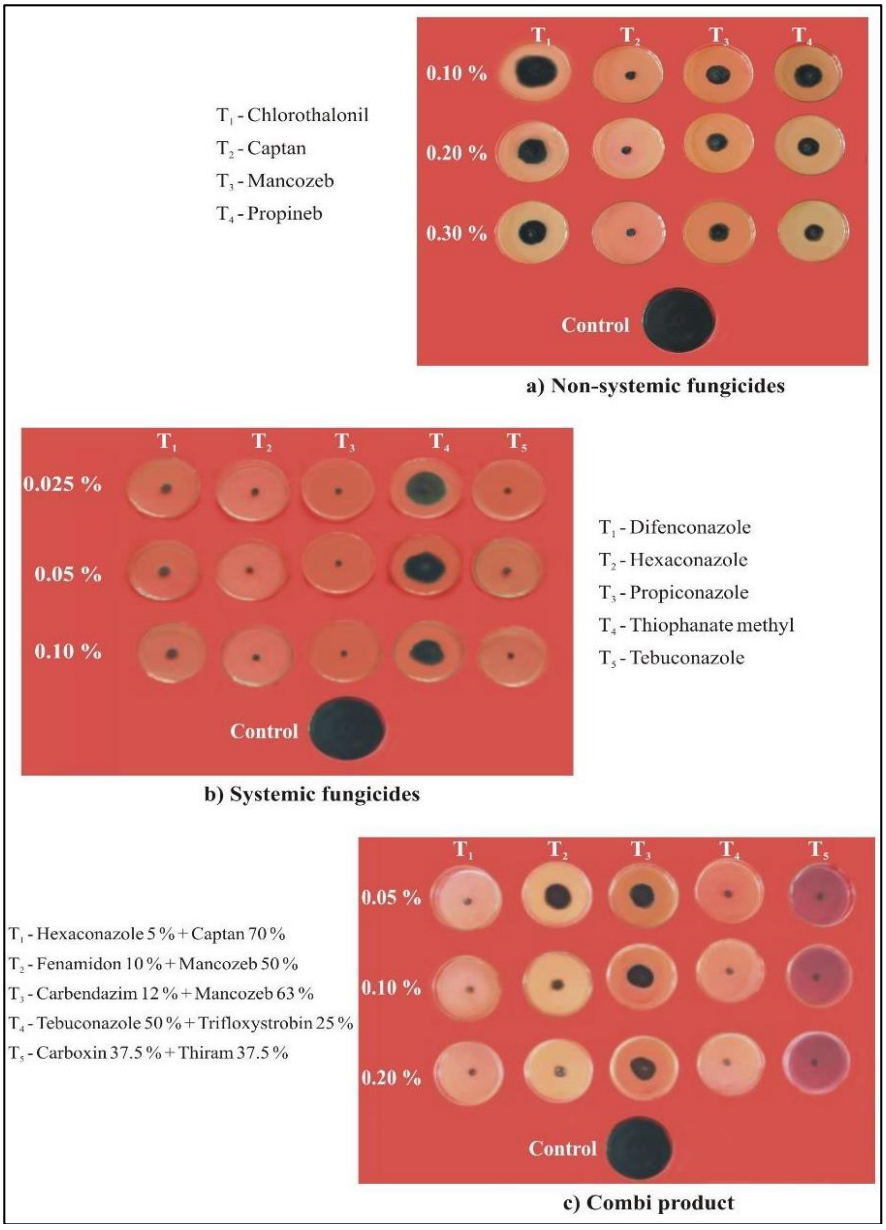

Plate 1: *In vitro* evaluation of fungicides against *Bipolaris sorokiniana*

References

1. Das SR. Control of leaf spot/leaf blight of wheat through fungicides. Indian J Pl. Protec. 1988; 16:273-275.
2. Duveiller E, Kandel YR, Sharma RC, Shrestha SM. Epidemiology of foliar blights (spot blotch and tan spot) of wheat in the plains bordering the Himalayas. Phytopathol. 2005; 95:248-256.
3. Kavita, Pande SK, Yadav JK, Dalbeer. *In vitro* evaluation of fungicides against *Bipolaris sorokiniana* causing spot blotch of Barley (*Hordeum vulgare* L.) Int. J Curr. Microbiol. App. Sci. 2017; 6(10):4734-4739.
4. Kulkarni S, Ramakrishnan K. Epidemiology and control of brown leaf spot of rice caused by *Drechslera oryzae* in Karnataka. Mysore J Agr. Sci. 1977; 11:598.
5. Manu TG, Naik BG, Sayipratap BR, Balagar MS. Efficacy of fungicides, botanicals and bioagents against *Exserohilum turcicum.* Chem Sci. Rev Lett. 2017; 6(24):2100-2107.
6. Singh SN, Gupta AK. Bioassay of fungicides against *Drechslera sativum* causing foliar blight of wheat. In Indian Phytopathological Society 52nd Annual Meeting and National Symposium on Role of Resistance in Intensive Agriculture, Directorate of Wheat Research, Karnal, Abstract. 2000; 11:25.