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Research Article

Evaluation of fungicides, botanicals and bioagents against turcicum leaf blight of maize caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs.

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ABSTRACT

Evaluation of fungicides, botanicals and bioagents against *Exserohilum turcicum*, the causal agent of turcicum leaf blight of maize was conducted at Department of Plant Pathology, University of Agricultural Sciences, Dharwad. The fungicides and phytoextracts evaluated through per cent inhibition of mycelial growth test and poison food technique. Among nine fungicides tested, cristol 56 SL and carboxin 200 FF were most effective with 100 per cent mycelial growth inhibition at 0.025 per cent, 0.05 per cent and 0.1 per cent concentration. Nimbicidin with 71.27 per cent inhibition of mycelial growth was most effective among all the plant extracts. Out of six bioagents tested, *Trichoderma harzianum* was most effective with 70.33 per cent mycelial inhibition.

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INTRODUCTION

Maize (*Zea mays* L.) is a new world graminaceous important coarse cereal crop of the world. . It is cultivated in tropics, sub-tropics and temperate regions under irrigated to rainfed conditions. Maize ranks third in the world after wheat and rice in area and production. Karnataka, Andra Pradesh, Uttar Pradesh, Bihar, Rajasthan, Madhya Pradesh and Punjab are the leading states growing maize on large scale. Among various diseases infecting maize, turcicum leaf blight in maize caused by *Exserohilum turcicum* (Pass.) Leonard and Suggs. has been considered as potentially destructive disease in Karnataka. Turcicum leaf blight of maize is a wide spread disease in Karnataka. The loss in grain yield up to the extent of 28 to 91 per cent has been reported due to this disease (Pandurangegowda *et al.,* 1993; Kachapur and Hegde, 1988 and Harlapur *et al*., 2000). Thus, it has been become inevitable to go for fungicidal spray for the management of the disease. In the present study, some of new chemicals, botanical products and bioagents have been tested in the laboratory condition to find out their efficacy against *Exserohilum turcicum.*

MATERIALS AND METHODS

The study was conducted on evaluation of fungicides and botanical products, phytoextracts as well as bioagents against *Exserohilum turcicum* in Department of Plant Pathology, University of Agricultural Sciences, Dharwad during 2008-09. The efficacy of fungicides and botanical products, phytoextracts and bioagents against *Exserohilum turcicum* was assessed by per cent inhibition of mycelial growth and poison food technique. Fungicides and botanical products were evaluated at 0.025, 0.05 and 0.1 per cent concentrations, while plant extracts were evaluated at 5 and 10 per cent concentrations. The plant extracts were prepared by grinding fresh leaves in a pestle and mortar by using distilled water. The extract was filtered through double layered muslin cloth and made to the required concentration by adding distilled water. Fungicide and phytoextracts suspension was prepared in PDA by adding required quantity of fungicide and phytoextracts to obtain the desired concentration on the basis of active ingredient present in fungicides. Twenty ml of poisoned medium was poured in each of the sterilized Petriplates. Mycelial disc of 0.5 cm was taken from the periphery of ten day old culture and placed in the centre and incubated at 28±2^{0}C till growth of the fungus touched the periphery in control plate. In case of bacterium, mycelial discs of the fungus were kept at opposite ends and bacterial streaks at the centre. The details of fungicides, phytoextracts and

bioagents tested are given below:

Details of phytoextracts used		
Sr. No.	Botanical name	Parts used
1.	*Azadirachta indica*	Oil
2.	*Jatropha curcas*	Leaf
3.	*Pongamia pinnata*	Leaf
4.	*Anona reticulata*	Seed
5.	*Curcuma longa*	Leaf
6.	*Acorqrus galanus*	Leaf
7.	*Vitex negunda*	Leaf
8.	*Azadirachta indica*	Seed

Details of antagonish used and source of their procurement		
Sr. No.	Antagonist	Source
1.	*Trichoderma viride*	Dept. of Plant Pathology, UAS, Dharwad
2.	*Trichoderma harzianum*	Dept. of Plant Pathology, UAS, Dharwad
3.	*Trichoderma virens*	Dept. of Plant Pathology, UAS, Dharwad
4.	*Trichoderma koningi*	Dept. of Plant Pathology, UAS, Dharwad
5.	*Pseudomonas fluoroscens*	Dept. of Agril. Microbiology, UAS, Dharwad
6.	*Bacillus subtilis*	Project Directorate of Biocontrol, Bangalore

RESULTS AND DISCUSSION

Among the nine fungicides tested (Table 1), cristol 56 SL and carboxin 200 FF at all concentrations gave maximum mean mycelial inhibition of fungus (100 per cent) which was significantly superior to all other treatments followed by mancozeb 75 per cent WP (95.44%). The concentration of 0.1 per cent was effective (78.28%) than 0.05 (74.08%) and 0.025 (69.72%) per cent concentration. Carbendazium 12 per cent + mancozeb 63 per cent WP gave 92.93 per cent mycelial inhibition followed by mancozeb 75 per cent WP at 0.025 per cent gave (91.43 per cent) mycelial inhibition. Mancozeb 64 per cent + metalaxyl 8 per cent at 0.025 per cent resulted in 87.70 per cent mycelial inhibition as it was found to be statistically different from thiram 75 WP (85.93 per cent). At 0.05 per cent mancozeb 75 per cent WP (97.33%), carbendazim12 per cent + mancozeb 63 per cent WP (95.26%) and mancozeb 64 per cent + metalaxyl 8 per cent (89.96). Least inhibition of mycelial growth was observed in perfekt at 0.05 per cent (6.96%).

Highest mycelial inhibition with all the test fungicides was observed at 0.1 per cent concentration. Cristol 56 SL and carboxin 200 FF were found to be most effective and gave 100 per cent mycelial inhibition of fungus followed by mancozeb 75 per cent WP (97.56%), carbendiazim 12 per cent + mancozeb 63 per cent WP (96.96%), mancozeb 64 per cent + metalaxyl 8 per cent (94.03%) and thiram (88.83%). Minimum mycelial inhibition was observed in perfekt (8.8%). Among nine fungicides tested cristol 56 SL, carboxin 200 FF, mancozeb 75 per cent WP, carbendiazim 12 per cent + mancozeb 63 per cent WP, mancozeb 64 per cent + metalaxyl 8 per cent and thiram 75 WP were found to be most effective at all concentrations. Perfekt and cristol 74 GL were found least effective (Table 1 and Fig. 1). These results are in agreement with Harlapur *et al.* (2007) who reported that mancozeb and carboxin powder were effective against *E. turcicum.* In the present study. The seed dressing with carboxin 200 FF and foliar spray with botanical products like Cristol 56 SL improved the vigour of plants and thereby reduced the severity of turcicum leaf blight of maize.

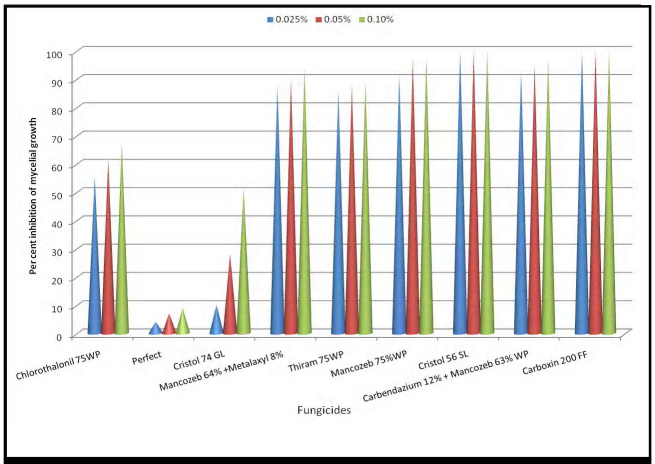

Fig. 1 : *In vitro* evaluation of fungicides against *Exerohilum turcium*

It was found that among the plant extracts, nimbicidin (71.27) was effective than all other plant extracts with respect to per cent mycelial inhibition of *E. turcicum* (Table 2 and Fig. 2). The plant extracts were effective at 10 per cent (33.45%) than at 5 per cent (25.54). Maximum inhibition of 68.85 per cent of mycelial growth was recorded in nimbicidin at 5 per cent concentration which was significantly superior to all other treatments followed by negunda (38.88%) and neem seed kernel extract (NSKE) (37.01%). Least mycelial inhibition at 5 per cent concentration was observed with turmeric leaf extract (01.85%) followed by jatropa (05.18%). Similar results were obtained by Dharanendraswamy (2003) and Harlapur *et al.* (2007) who reported that, neem seed kernel extract (NSKE) @ 5 per cent was highly effective with significantly maximum inhibition of pathogen.

Table 1: *In vitro* evaluation of fungicides and botanical products against *E. turcicum*

Sr. No.	Fungicides	Per cent inhibition of mycelial growth			Mean
		Concentration			
		0.025 %	0.05 %	0.1%	
1	Chlorothalonil 75WP	55.53 (48.20)*	61.43(51.63)	67.33 (55.16)	61.43(51.63)
2	Perfekt	04.04 (11.60)	06.96 (15.31)	08.80 (17.26)	06.60 (14.89)
3	Cristol 74 GL	09.93 (18.38)	28.10 (32.02)	51.06 (45.63)	29.70 (33.03)
4	Mancozeb 64% +Metalaxyl 8%	87.7 (69.50)	89.96 (71.56)	94.03 (75.89)	90.56 (72.14)
5	Thiram 75WP	85.93 (68.00)	87.70 (69.50)	88.83 (70.51)	87.48 (69.32)
6	Mancozeb 75%WP	91.43 (73.01)	97.33 (80.64)	97.56 (81.05	95.44 (77.71)
7	Cristol 56 SL	100 (90.04)	100 (90.04)	100 (90.04)	100 (90.04)
8	Carbendazium 12% + Mancozeb 63% WP	92.93 (74.62)	95.26 (77.47)	96.96 (80.01)	95.05 (77.19)
9	Carboxin 200 FF	100 (90.04)	100 (90.04	100 (90.04)	100 (90.04)
Mean		69.72 (56.64)	74.08 (59.42)	78.28 (62.25)	
S.E.±		0.50	0.63	0.52	
C.D. (P=0.01)		1.90	2.50	2.15	

* Figures in the parentheses indicate arc sine transformed values

Table 2 : *In vitro* evaluation of phytoextracts against *Exserohilum turcicum*

Sr. No.	Phytoextracts	Per cent inhibition of mycelial growth		Mean
		Concentration		
		5%	10%	
1.	*Azadirachta indica*	68.85 (56.10)*	73.70 (59.17)*	71.27(57.62)*
2.	*Jatropha curcas*	05.18. (13.16)	08.88 (17.34)	7.03 (15.38)
3.	*Pongamia pinnata*	18.86 (25.75)	25.55 (30.37)	22.20 (28.12)
4.	*Anona reticulata*	21.47 (27.62)	28.06 (32.00)	24.77 (29.86)
5.	*Curcuma longa*	1.85 (7.82)	5.18 (13.16)	03.51 (10.19)
6.	*Acorqrus galanus*	12.21 (20.46)	26.66 (31.10)	19.44 (26.17)
7.	*Vitex negunda*	38.88 (38.59)	53.30 (46.91)	46.09 (42.78)
8.	*Azadirachta indica*	37.01 (37.49)	46.26 (42.88)	41.64 (40.20)
Mean		25.54 (30.37)	33.45 (35.35)	
S.E.±		0.38	0.31	
C.D. (P=0.01)		1.50	1.20	

* Figures in the parentheses indicate arc sine transformed values

Table 3 : *In vitro* evaluation of bioagents against *Exserohilum turcicum*

Sr. No.	Antagonist	Per cent inhibition of mycelial growth
1.	*Trichoderma viridae* Pers.ex. Fr.	62.93(52.52)*
2.	*Trichoderma virens* Miller	59.23 (50.34)
3.	*Trichoderma harzianum* Rifai	70.33 (57.02)
4.	*Trichoderma koningi* Oudem	61.43 (51.63)
5.	*Pseudomonas fluorescens* Migula	35.13 (36.36)
6.	*Bacillus subtilis* (Ehrenberg) Cohn	39.20 (38.78)
	Mean	54.71 (47.72)
	S.E.±	0.50
	C.D. (P=0.01)	2.10

* Figures in the parentheses indicate arc sine transformed values

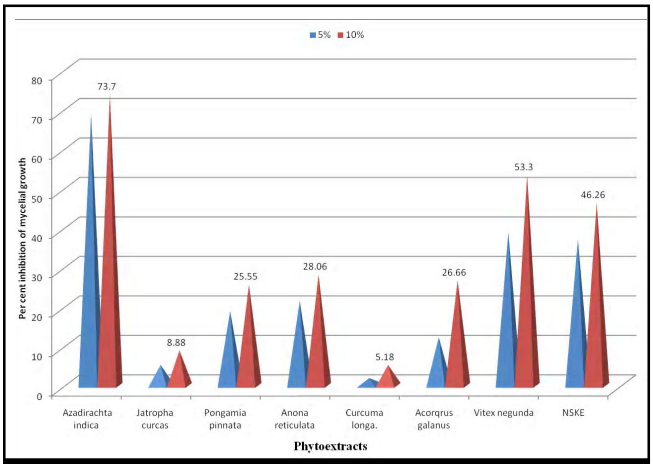

Fig. 2 : *In vitro* evaluation of phytocxtracts against *Exerohilum turcium*

In the present study, besides nimbicidin, NSKE was also effective in inhibiting the growth of *E.turcicum.* The inhibitory action of nimbicidin and NSKE may be due to azadirchtin present in seed kernel and oil which retards the growth and activation of the pathogen. Harlapur *et al.* (2007) tested thirteen botanicals, eight bio-agents and twenty three fungicides *in vitro* against *Exserohilum turcicum*, causal agent of turcicum leaf blight of maize and reported that neem seed kernel extract (NSKE) @ five per cent concentration, among the bioagents *T. harzianum* and mancozeb @0.25 per cent inhibited the maximum mycelial growth. Patil (2000) evaluated systemic and non-systemic fungicides *in vitro* against *E. hawaiiensis* causing leaf blight of wheat and found that propiconazole, difenconazole, hexaconazole and tridemorph showed 100 per cent inhibition. Meena *et al.* (2003) observed the increased efficacy of plant extracts when they were sprayed 24 hours before inoculation. Ramchandra (2000) evaluated antagonists against *E. hawaiiensis in vitro* and found that *T.viridae* and *T. harzianum* reduced the growth and sporulation significantly.

Six biological control agents were screened under *in vitro* conditions against *E.turcicum* for their antagonistic activity by using dual culture method. It is apparent from data presented in Table 3 that all the antagonistic fungi and bacteria inhibited the growth of *E.turcicum* ranging from 35 to 70 per cent. *Trichoderma harzianum* was found to be superior over all treatments with 70.33 per cent mycelial inhibition followed by *Trichoderma viride* (62.93%), *Trichoderma koningi* (61.43%) and *Trichoderma virens* (59.23%). Least mycelial inhibition was observed with bacterial antagonistic organisms such as *Pseudomonas fluorescens* with 35.13 per cent followed by *Bacillus subtilis* with 39.20 per cent. The inhibitory effect of these bioagents was probably due to competition and / or antibiosis. The antagonistic activity of the fungus may be due to toxin production by the fungus trichodermin and fast growing ability which retards the activation of the pathogen. The antagonism of *Trichoderma harzianum* and *Trichoderma viride* observed in the present studies is in tune with the findings of various workers (Mahamood *et al.*, 1995 and Ramchandra, 2000).

Thus, the study indicated that suitable integration of more efficient eco-friendly treatments like bioagents and botanical and botanical products with lesser use of fungicides may provide a better management of the disease. Harlapur *et al.* (2007) tested thirteen botanicals, eight bio-agents and twenty three fungicides *in vitro* against *Exserohilum turcicum*, causal agent of turcicum leaf blight of maize and reported that neem seed kernel extract (NSKE) @ five per cent concentration, among the bioagents *T. harzianum* and Mancozeb @0.25 per cent inhibited the maximum mycelial growth. Patil (2000) evaluated systemic and non-systemic fungicides *in vitro* against *E. hawaiiensis* causing leaf blight of wheat and found that propiconazole, difenconazole, hexaconazole and tridemorph showed 100 per cent inhibition. Meena *et al.* (2003) observed the increased efficacy of plant extracts when they were sprayed 24 hours before inoculation. Ramchandra (2000) evaluated antagonists against *E.hawaiiensis in vitro* and found that *T.viride* and *T. harzianum* reduced the growth and sporulation significantly.

REFERENCES

Dharanendraswamy, S. (2003). Studies on turcicum leaf blight of maize caused by *Exserohilum turcicum.* M.Sc. (Ag.) Thesis, University of Agricultural Sciences, DHARWAD, KARNATAKA, (India).

Harlapur, S.I., Kulkarni, M.S., Wali, M.C and Kulkarni, Srikant (2007). Evaluation of plant extracts, bio-agents and fungicides against *Exserohilum turcicum* (Pass.) Leonard and Suggs. causing turcicum leaf blight of maize *Kar. J. Agric. Sci*, **20** (3): 541-544.

Harlapur, S.I., Mruthunjaya, C.W., Anahosur, K.H. and Muralikrishana, S. (2000). A report on survey and surveillance of maize disease in North Karnataka. *Kar. J. Agric. Sci*, **13**(3): 750-751.

Kachapur, M.R., and Hegde, R.K. (1988). Studies on turcicum leaf blight caused by *Exserohilum turcicum* with special reference to crop loss assessment. *Pl. Path. Newsl*, **6**: 33-35.

Mahamood, A., Javed, N., Ahmad, R. and Raheel, Z.I. (1995). Biological control of maize leaf blight caused by *Helminthosporium turcicum* Pass. *in vitro*. *Pakistan J. Phytopath,* **7**: 62-64.

Meena, R.L., Rathore, R.S. and Mathur, K. (2003). Evaluation of fungicides and plant extracts against banded leaf and sheath blight of maize. *Indian J. Pl. Prot.*, **31** : 94-97.

Pandurangegowda, K.T., Shetty, H.S., Gowda, B.J., Prakash, H.S. and Sangam Lal (1993). Comparison of two methods for assessment of yield losses due to turcicum leaf blight of maize. *Indian Phytopath.*, **45**: 316-320.

Patil, V.S. (2000). Epidemiology and management of leaf blight of wheat caused by *Exserohilum hawaiiensis* (Bugnicourt) Subram and Jain Ex. M. B. Ellis, M.B. Ph.D. Thesis, University of Agricultural Sciences, DHARWAD, KARNATAKA, (India).

Ramchandra, C.G. (2000). Studies on leaf blight of Dicoccum wheat caused by *Exserohilum hawaiiensis* (Bugnicourt) Subram and Jain ex. M.B. Ellis, M.Sc. (Ag.) Thesis, University of Agricultural Sciences, DHARWAD, KARNATAKA (India).

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