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Efficacy of systemic and non-systemic fungicides against *Macrophomina phaseolina* (Tassi) Goid causing mungbean blight

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Abstract
Eight systemic and Twelve non systemic and contact fungicides were evaluated (each (@ 500, 1000, 1500 ppm and 1500, 2000 2500 ppm respectively), i*n vitro* against *Macrophomina Phaseolina*. All the fungicides tested caused significant inhibition at all six concentrations tested over untreated control. Average mycelial inhibition with all the systemic fungicides tested was ranged from 40.11 (Fosetyl-AL) to 100 (Carbendazim and Hexaconazole) percent. However, significantly highest average mycelial inhibition was recorded with the fungicides Carbendazim and Hexaconazole (100%) and the Fungicide Fosetyl-AL was found comparatively less effective with 40.11 percent inhibition, of the test pathogen. Average mycelial inhibition with all the non systemic and contact fungicides tested was ranged from 12.05 (Copperoxy chloride) to 100 (SAFF) percent. However, significantly highest average mycelial inhibition was recorded with the fungicide SAFF (100%). This was followed by Nativo (95.35%), Ridomil-Mz (93.14%), Curzet (91.75%) and fungicides Copperoxy chloride, Propineb and Copper hydroxide were found comparatively less effective with maximum mycelial inhibition of 12.05%, 17.12% and 23.03%, respectively.

Keywords: Bio-efficacy, Blight, Mungbean, *Macrophomina*, Fungicides

Introduction
Green gram is extensively grown throughout Asia, Australia, West Indies, South and North America, tropical and subtropical Africa and India. In India, green gram is being cultivated since ancient time, from sea level to 6000 feet, usually as a dryland crop. India alone accounts for about 2/3rd of total global production of Mungbean. Major states in the country growing mungbean are Maharashtra, Orissa, Andhra Pradesh, Madhya Pradesh, Gujarat, Rajastan, Bihar, Uttar Pradesh and Karnataka. Generally, the production and productivity of pulses including Mungbean are very low. Because the crop is grown on marginal lands with poor management practices, low rainfall, high rate of flower and fruit drop, non uniform maturity, pod shattering and susceptibility to pests and diseases. The diseases caused by fungal, bacterial and viral pathogens are one of the major constraints in the cultivation of mungbean.
Among these diseases, *Macrophomina* blight incited by *Macrophomina phaseolina* (Tassi) Goid has been reported as one of the most important disease causing potential yield losses in Mungbean (Devi and Singh, 1998; Kale 1999 and Zote *et al.*, 2006) [4, 8, 20]. The pathogen mainly cause leaf and stem blight during the growth period and maturity of mungbean crop. Black dot like pycnidia of *M. phaseolina* are formed on blighted leaves and branches. There was 9.38% loss in plant height, 26.32% loss in number of leaves, 30.00% loss in number of pods and 40.00% loss in pod weight per plant due to leaf blight (*Macrophomina phaseolina*) of green gram (Tandel *et al.*, 2010) [18]. Considering the importance of the disease various concentrations of different systemic and non systemic fungicides evaluated against *Macrophomina Phaseolina*.

Materials and Methods
In vitro evaluation of fungicides
The systemic fungicides *viz.* Carbendazim (Bavistin 50 WP), Propiconazole (Tilt 25% EC), Hexaconazole (Contaf 5% EC), Thiophanate methyl (Topsin M 70 WP), Difenconazole (Score 25% EC), Penconazole (Topaz 10% EC), Tebuconazole (Folicur 25% EC), Fosetyl-AL (Aliette 80 WP) were evaluated *in vitro* (each @ 500, 1000 and 1500 ppm), whereas

non-systemic fungicides *viz.* Mancozeb (Dithane M-45 75 WP), Propineb (Antracol 75 WP) Copper oxychloride (Blitox 50 WP), Chlorothalonil (Kavach 75 WP), Carbendazim 12% + Mancozeb 63% (SAAF 75 WP), Copper hydroxide (Kocide 50 WP), Cymoxanil + Mancozeb (Curzet 72 WP), Thiram (Thiride 75 WP), Fenamidone + Mancozeb (Sectin 75 WP), Tebuconazole + Trioxystrobin (Nativo 75 WG), Captan (Captaf 50 WP), Metalaxyl 8 WP + Mancozeb 64 WP (Ridomil MZ 72 WP) were evaluated (each @ 1500, 2000 and 2500 ppm) against *M. phaseolina,* using the Potato dextrose agar as basal culture medium and applying Poisoned food technique (Nene and Thapliyal, 1993) [15]. The required quantity of each chemical was incorporated aseptically in 100 ml of PDA in 250 ml flasks to make a various concentrations fungicides. The medium was shaken well to give uniform dispersal of the chemical and then 20 ml of medium was poured aseptically to each plate with three replications. After solidification, the plates were inoculated with mycelium discs of 5 mm diameter of a week old actively growing pure culture of *M. phaseolina*. The mycelium disc which was placed in the centre of the plates, in an inverted position to make a direct contact with the poisoned medium which was incubated at 27 $\pm$ 2^0C temperature for a week or till the untreated control plates were fully covered with mycelial growth of the test fungus.

Observations on radial mycelial growth and sclerotia / pycniospores production of were recorded at 24 hrs. interval and continued till growth of the test pathogen in untreated control plate was fully covered and Percent growth inhibition calculated (Vincent 1927) [19].

$$\text{Percent inhibition} = \frac{C - T}{C} \times 100$$

Where,
C= growth of the test fungus in untreated control plates
T= growth of the test fungus in treated plates

Results and Discussion

In vitro evaluation of fungicides

Systemic fungicide

The results revealed that (Table 1) all the systemic fungicides tested *in vitro* applying poisoned food technique against *M. phaseolina* significantly inhibited the mycelial growth of the test pathogen over untreated control at all concentrations tested. However, fungicide, Carbendazim and Hexaconazole recorded minimum mean colony diameter (0.00 mm each) and maximum mean inhibition (100 percent each) of mycelial growth of the test pathogen over untreated control (Mean Col. Dia. 90.00 mm and mean inhibition, 0.00%). This was followed by the fungicide, Propiconazole (Mean Col. Dia., 3.81mm mm and mean inhibition, 95.75%), Tebuconazole (Mean Col. Dia. 9.55 mm and mean inhibition, 89.92%), Penconazole (Mean Col. Dia. 11.99 mm and mean inhibition 86.87%), Thiophanate methyl (Mean Col. Dia. 17.94 mm and mean inhibition 80.06%) and Difenconazole (Mean Col. Dia. 23.85 mm and mean inhibition 73.49%). The maximum mean colony diameter (53.89 mm) and minimum mycelial growth inhibition (40.11%) of the test pathogen were recorded by the fungicide Fosetyl-AL. Various concentrations (500, 1000 and 1500 ppm) of all the fungicides tested were found effective in causing mycelial growth inhibition and were found to be increased with increased concentrations. Thus fungicides Carbendazim and Hexaconazole followed by Propiconazole, Tebuconazole, Penconazole Thiophanate methyl, Difenconazole found most fungistatic against the test pathogen and the fungicide Fosetyl-AL was found comparatively least effective.

Table 1: Bioefficacy of systemic fungicides against *M. phaseolina.*

Treatments	Col. dia. *(mm) at Conc.			Av.	% Inhibition*			Av. (%) Inhibition
	500 ppm	1000 ppm	1500 ppm	(mm)	500 ppm	1000 ppm	1500 ppm	
Carbendazim (Bavistin 50 WP)	0.00	0.00	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100 (90.00)
Propiconazole (Tilt 25 EC)	8.68	2.77	0.00	3.81	90.35 (71.94)	96.92 (80.13)	100.00 (90.00)	95.75 (80.69)
Hexaconazole (Contaf 5% EC)	0.00	0.00	0.00	0.00	100.0 (90.0)	100.00 (90.0)	100.00 (90.00)	100 (90.00)
Thiophanate methyl (Topsin M 70 WP)	23.47	17.89	12.46	17.94	73.92 (59.32)	80.12 (63.54)	86.15 (68.21)	80.06 (63.69)
Difenconazole (Score 25 EC)	29.42	23.63	18.51	23.85	67.30 (55.13)	73.74 (59.18)	79.43 (63.06)	73.49 (59.12)
Penconazole (Topas 25 EC)	18.70	10.68	6.60	11.99	79.22 (62.91)	88.13 (69.87)	92.66 (74.35)	86.67 (69.04)
Tebuconazole (Folicur 25 EC)	16.55	7.37	3.55	9.15	81.61 (64.62)	91.80 (73.38)	96.05 (78.68)	89.92 (72.22)
Focetyl-Al (Aliette 80 WP)	65.83	55.52	40.34	53.89	26.85 (31.13	38.31 (38.21)	55.18 (47.98)	40.11 (39.10)
Control	90.00	90.00	90.00	90.00	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
S.E. $\pm$	1.31	1.18	0.85	1.11	0.99	0.96	0.83	0.92
C.D. (P=0.05)	5.34	4.79	3.45	4.52	4.02	3.91	3.36	3.76

* Mean of three replications Figures in parenthesis are arc sine transformed value

Non systemic fungicide

The results revealed that (Table 2) all the non systemic and contact fungicides tested *in vitro* applying poisoned food technique against *M. phaseolina* significantly inhibited the mycelial growth of the test pathogen over untreated control at all the concentrations tested. However, fungicide, SAFF recorded minimum mean colony diameter (0.00 mm) and maximum mean inhibition (100%) of mycelial growth of the test pathogen over untreated control (Mean Col. Dia. 90.00 mm and mean inhibition, 0.00%). This was followed by the

Table 2: Bioefficacy of non-systemic and contact fungicides against *M.phaseolina.*

Treatments	Col dia. (mm) at Conc.			Av. (mm)	% Inhibition*			Av. (%) Inhibition
	1500 ppm	2000 ppm	2500 ppm		1500 ppm	2000 ppm	2500 ppm	
Mancozeb (Dithane M-45 75 WP)	14.31	7.72	5.37	9.13	84.10 (66.53)	91.42 (73.02)	94.03 (75.87)	89.85 (71.80)
Propineb (Antracol 70 WP)	80.83	75.17	67.77	74.59	10.18 (18.44)	16.48 (23.92)	24.70 (29.79)	17.12 (22.35)
Copper oxychloride (Blitox 50 WP)	83.18	81.10	73.17	79.15	7.58 (15.77)	9.89 (18.30)	18.69 (25.61)	12.05 (19.89)
Chlorothalonil (Kavach 50 WP)	16.46	10.15	5.67	10.76	81.71 (64.72)	88.71 (70.43)	93.70 (75.48)	88.04 (70.21)
SAFF 75 WP (Carbendazim 12 WP + Mancozeb 63 WP)	0.00	0.00	0.00	0.00	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)

Copper hydroxide (Kocide 50 WP)	75.57	71.93	60.30	69.26	16.03 (23.55)	20.07 (26.60)	33.00 (35.06)	23.03 (28.48)
Cymoxanil + Mancozeb (Curzet 72 WP)	12.27	6.55	3.45	7.42	86.37 (68.67)	92.72 (74.36)	96.16 (78.72)	91.75 (73.91)
Thiram (Thiride 75 WP)	19.97	16.30	10.13	15.2	77.81 (61.92)	81.88 (64.83)	87.74 (69.52)	82.47 (65.42)
Fenamidone + Mancozeb (Sectin 75 WP)	17.70	13.23	8.63	13.17	80.32 (63.71)	85.26 (67.43)	90.40 (71.96)	85.32 (67.70)
Tebuconazole + Trifoxysrobin (Nativo)	8.35	4.20	0.00	4.18	90.72 (72.34)	95.33 (77.56)	100.00 (90.00)	95.35 (79.96)
Captan (Captaf 50 WP)	22.33	18.31	13.17	17.93	75.18 (60.14)	79.88 (63.35)	85.37 (67.52)	80.14 (63.67)
Ridomil MZ 72 WP (Metalaxyl 8 WP + Manxozeb 64 WP)	10.23	6.00	2.27	6.16	88.62 (70.34)	93.33 (75.07)	97.48 (81.03)	93.14 (75.48)
Control	90.00	90.00	90.00	90.00	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
S.E. ±	1.25	0.76	0.44	0.81	1.19	0.75	0.53	0.82
C.D. (P=0.05)	3.62	2.22	1.27	2.37	3.47	2.18	1.53	2.39

* Mean of three replications Figures in parenthesis are arc sine transformed value

fungicide Nativo (Mean. Col. Dia. 4.18 mm and mean inhibition 95.35%), Ridomil-Mz (Mean Col. Dia. 6.16 mm and mean inhibition 93.14%), Curzet (Mean Col. Dia. 7.42 mm and mean inhibition 91.75%), Mancozeb (Mean Col. Dia. 9.13 mm and mean inhibition 89.85%), Chlorothalonil (Mean Col. Dia. 10.76 mm and mean inhibition 88.04%), Sectin (Mean Col. Dia. 13.17 mm and mean inhibition 85.32%), Thiram (Mean Col. Dia. 15.2 mm and mean inhibition 82.47%) and Captan (Mean Col. Dia. 17.93 mm and mean inhibition 80.14%). The maximum mean colony diameter (79.15, 74.59 and 69.26 mm) and minimum mycelial growth inhibition (12.05, 17.12 and 23.03%) of the test pathogen were recorded by the fungicides Copperoxy chloride Propineb and Copper hydroxide, respectively. Various concentrations (1500, 2000 and 2500 ppm) of all the fungicides tested were found equally effective in causing mycelial growth inhibition and were found to be increased with increased concentrations. Thus fungicides, SAFF, Nativo, Ridomil-Mz- MZ, Curzet, Mancozeb, Chlorothalonil, Sectin, Thiram, and Captan were found most fungistatic against the test pathogen and the fungicides Copper oxychloride, Propineb and Copper hydroxide was found comparatively least effective.

The results obtained in present studies in respect of *in vitro* effect of fungicides are in conformity to those reported early by several workers. Fungicides, Carbendazim, Carbendazim, + Mancozeb (SAFF), Thiophanate methyl, Mancozeb, Propiconazole, Thiram and Captan was reported inhibitory to the *M. phaseolina* causing blight of mungbean and cowpea (Hooda and Grover, 1990; Devi and Singh, 1997; Giri and Peshney, 1993; Gautam and Narain, 1996; Bainade *et al.*, 2007; Mondhe *et al.*, 2008; Suryawanshi *et al.*, 2008; Kar and Sahu, 2009; Magar *et al*., 2011; Chaudhari and Chaudhari, 2012), Parmar *et al.*, (2017) [7, 3, 6, 5, 1, 13, 17, 9, 2, 12, 16].

Khalikar *et al*. (2011) [10] was found Carbendazim, Chlorothalonil, Hexaconazole, Captan and Mancozeb inhibited the growth of *M. phaseolina* causing charcoal rot of safflower. In the present study Copper oxychloride had little inhibition on *Macrophomina phaseolina.* The results are in conformity with Lambhate *et al*. (2002) [11] They reported that Blitox-50 showed poor performance inhibiting of *M. phaseolina* at 0.1, 0.2 and 0.3 percent concentrations respectively but these finding are contradictory with Moradia (2011) [14] who reported that Copper oxychloride was most effective among all the fungicides tested.

Conclusion

The present results indicate that All fungicides (20) evaluated *in vitro* were found fungistatic/antifungal against *M. phaseolina*. However, systemic fungicides Carbendazim, Hexaconazole and Propiconazole (each @ 500, 1000 and 1500 ppm) recorded 100.00, 100.00 and 95.75 percent inhibition, and nonsystemic and contact fungicides SAFF, Nativo and Ridomil-MZ (each (@ 1500, 2000 and 2500 ppm) recorded 100.00, 95.35 and 93.14 percent inhibition, respectively of test pathogen. Thus, all the systemic and non systemic and contact fungicides tested were found fungistatic and caused significant inhibition of *M. phaseolina*, over untreated control.

References

1. Bainade PS, Tripathi BP, Khare N. Effect of chemical and biological control of *Macrophomina phaseolina in vitro* and *in vivo*. Environ. Ecol. 2007; 25(1):29-31.
2. Chaudhari ND, Chaudhari SM. Evaluation of fungicides against *macrophomina phaseolina* (tassi.) goid causing leaf blight and root rot of green gram [*Vigna radiata* (L.)] wilczed. In souvenior of 3rd global conference (ismpp) on plant pathology for food security, held at MPUAT, Udaipur, January, 2012; 10(13):164.
3. Devi TP, Singh RH. Screening of fungicides against seedling mortality of blackgram caused by *Macrophomina phaseolina*. Leg. Res. 1997; 20(2):71-76.
4. Devi Prameela, Singh RH. Cultural variation of *Macrophomina phaseolina* isolates collected from *Vigna mungo*. Indian Phytopath. 1998; 51(3):292-293.
5. Gautam VS, Narain Udit. Efficacy of some fungitoxicants against *Macrophomina phaseolina* causing blight of cowpea. Ann. Pl. Prot. Sci. 1996; 4(1):85-94.
6. Giri GK, Peshney NL. Efficacy of some fungicides *in vitro* against fungi causing leaf spots in Mungbean. J Soil Crops. 1993; 3(2):112-114.
7. Hooda I, Grover RK. Environmental factors affecting control of *Macrophomina phaseolina* by fungicides on mungbean. Pl. Dis. Res. 1990; 5(1):35-37.
8. Kale KJ. Incidence and contol of leaf spot fungal disease of Mungbean (*Vigna radiata* L. Wilczedk). M.Sc. (Agri.) Thesis submitted to Dr. P.D.K.V, Akola, 1999.
9. Kar AK, Sahu KC. Deterioration of seed quality in mung bean by *Macrophomina phaseolina* (Tassi) Goid. and its management. Seed Res. 2009; 37(1/2):139-142.
10. Khalikar PV, Gholve VM, Adsul AK. *In vitro* management of *Macrophomina phaseolina* by chemicals. Int. J Pl. Prot. 2011; 4(1):201-203.
11. Lambhate SS, Chaudhari GK, Mehetre SS, Zanjare SR. *In vitro* evaluation of chemicals against root rot of cotton caused by *Macrophomina phaseolina*. J Maharashtra Agric. Univ. 2002; 27(1):99-100.
12. Magar SV, Kadam JJ, Rite SC, Thaware DS, Potphode PD. Exploration of fungicides and bio-organics against

Macrophomina phaseolina (Tassi.) Goid. causing leaf spot in green gram. Int. J Pl. Prot. 2011; 4(1):17-19.
13. Mondhe MK, Parate RL, Thakur KD, Bhoye BB. Evaluation of leaf extracts and fungicides against *Macrophomina phasiolina* (Tassi) Goid causing green gram leaf blight. J Pl. Dis. Sci. 2008; 3(2):239-240.
14. Moradia AM. Management of *Macrophomina phaseolina* in groundnut through non systemic fungicides. Int. J Pl. Protec. 2011b; 4(1):239-240.
15. Nene YL, Thapliyal PN. Evaluation of fungicides. In: Fungicides in Pl. Dis. Control, (3rd ed.) Oxford IBH Pub. Co., New Delhi, 1993:531-532.
16. Parmar HV, Kapadiya HJ, Bhaliya CM. Efficacy of different fungicides against *Macrophomina phaseolina* (Tassi) Goid causing castor root rot. Int. J Chem. Studies, 2017; 5(5):1807-1809.
17. Suryawanshi AP, Gore DD, Pawar AK, Wadje AG. Efficacy of fungicides against *Macrophomina* blight of mungbean. J Pl. Dis. Sci. 2008c; 3(1):40-42.
18. Tandel D, Sabalpura AN. Effect of nitrogen compounds on the growth and sclerotial formation of *Macrophomina phaseolina* (Tassi) Goid, *in vitro*. Green Farming. 2011; 2(4):489-490.
19. Vincent JM. Distortion of fungal hyphae in the presence of certain inhibitors, Nature, 1927; 159-180.
20. Zote KK, Gore DD, Deshpande GD, Zagade SN, Mulla SM, Chavan AA. Efficacy of fungicides against *Macrophomina blight* of mungbean. Paper presented In National Symposium on Recent Trends in Diagnosis and Management of Chronic and Emerging Plant. Diseases of IPS Zonal Meet. IPS, Nagpur, Nov. 2006; 74:23-24.