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In Vitro Evaluation of Fungicides, Botanicals and Biocontrol Agents Against *Colletotrichum Dematium* Causing Blight in Chickpea (*Cicer arietenum* L.)

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ABSTRACT

Five systemic and five non systemic fungicides, six botanicals and six biocontrol agents were tested on growth inhibition of *Colletotrichum dematium*. Among systemic fungicides SAAF at 0.025% completely inhibited the growth of *Colletotrichum dematium* followed by Carbendazim. Out of five non systemic fungicides Mancozeb at 0.2% completely inhibited fungal growth. Out of six botanicals tested, *Polyalthia longifolia* inhibited 38.55% of mycelial growth of *Colletotrichum dematium* at 10.0% concentration and out of six bioconrol agents *Trichoderma koningii* inhibited growth of *Colletotrichum dematium* upto 53.00%.

Key words : Blight, Botanicals, Chickpea, *Colletotrichum dematium*, Growth inhibition.

Chickpea is one of the important pulse crops in India. Among several diseases affecting chickpea, blight caused by *Colletotrichum dematium* is one of the important disease. The disease causing severe losses in river tracts of Karnataka especially in and around Gulbarga district. The incidence of disease ranged upto 91%. There is lack of information about effective chemicals, botanicals and biocontrol agents. Considering the potentiality of the fungus to cause major damage in chickpea, the fungicides, botanicals and bicontrol agents were tested for their inhibitory effect on growth *in vitro*.

MATERIAL AND METHODS

Five systemic and five non systemic fungicides were tested for their relative efficacy against *Colletotrichum dematium* by poisoned food technique (Sharvelle,1961). The systemic fungicides *viz*., Carbendazim, Triadimefan, SAAF (combination of mancozeb an carbendazim), Difenconazole and Kitazin were tried at 0.025, 0.05 and 0.1 percent concentrations . The non systemic fungicides viz., copper oxychloride; Mancozeb, Chlorothalonil, Metalaxyl and Captan were tried at 0.1, 0.2 and 0.3 percent concentrations. Potato dextrose agar was used for bioassay studies. Sixty ml of medium was taken in 250 ml conical flask and sterilized .When the medium was cooled down to 45^{0}C, measured quantity of fungicides were added to get a required concentration.

The flasks were gently stirred for uniform distribution of the fungicides in the medium. The fungicide amended medium was poured in sterilized Petriplates under aseptic conditions and allowed to solidify. The Petriplates are then inoculated with 5.0 mm discs of actively growing fungal cultue.The discs were cut with the help of a sterilized cork borer. For each treatment three replications were maintained. Suitable checks were maintained where fungal discs were grown under similar conditions on PDA medium without fungicide. The Petriplates were incubated at 25±1^{0}C and the radial growth of the fungus was measured by using the formula given by Vincent (1947)

The effect of plant extracts and biocontrol agents on growth inhibition of *Colletotrichum dematium* was studied under laboratory conditions. Six plant extracts and six biocontrol agents were procured from Agricultural Research Station, Hebballi Farm, Dharwad and tested against *Colletotrichum dematium.*

The plant extracts were nimbicidin, neem leaf extract, neem seed kernel extract, *Polyalthia longifolia*, *Calotropis procera* and *Datura stramonium*.

The biocontrol agents *viz*., *Trichoderma viride*, *Trichoderma harzianum* (UAS, Bangalore), *Trichoderma harzianum* (UAS, Dharwad), *Trichoderma koningii* (TNAU), *Trichoderma hamatum* and *Pseudomonas fluorescens* were tested against growth inhibition of *Colletotrichum dematium.*

About 20 ml of Potato dextrose agar (PDA) was poured into series of Petri plates and allowed to cool. The fungal discs of 5 mm were taken from the active growing culture of *Colletotrichum dematium* and placed in opposite side of test organism in the same plate. Similarly *Pseudomonas fluorescens* was tested by streaking the 24 hours old culture on

Table 1. Effect of systemic fungicides on growth inhibition of *Colletotrichum dematium*

Sl.No	Fungicides	Growth inhibition at different concentrations (%)			Mean*
		0.025	0.05	0.1	
1	Carbendazim (Bavistin)	80.74 (63.94)	85.18 (67.21)	88.15 (69.73)	84.69 (66.89)**
2	Triadimefon (Bayleton)	47.04 (43.28)	68.22 (55.67)	69.33 (55.73)	61.53 (51.65)
3	Difenconazole (Score)	57.44 (49.26)	67.77 (55.37)	71.11 (57.48)	65.44 (53.97)
4	SAAF	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
5	Kitazin (Kitazin-P)	67.77 (57.37)	78.22 (61.89)	81.55 (64.52)	75.84 (60.53)
6	Control	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)
	Mean	68.59 (55.80)	77.87 (61.89)	80.02 (63.44)	75.49 (60.27)
		Fungicides	Concentrations	Fungicides X Concn.	
	SEm±	0.226	0.16	0.392	
	C.D at 1%	0.661	0.468	1.148	

* Mean of three replications ** Arc sine transformed values

Table 2. Effect of non - systemic fungicides on growth inhibition of *Colletotrichum dematium*

Sl.No	Fungicides	Growth inhibition at different concentrations (%)			Mean*
		0.1	0.2	0.3	
1	Copper oxy chloride(Fytolan)	1.55 (7.04)	4.44 (12.11)	5.55 (13.56)	3.84 (11.24)**
2	Chlorothalonil (Kavach)	5.22 (13.02)	22.22 (28.11)	24.88 (29.87)	17.44 (24.65)
3	Mancozeb (Indofil M-45)	52.22 (49.26)	100.00 (90.00)	71.11 (57.48)	77.44 (61.62)
4	Metalaxyl (Ridomil MZ)	48.22 (43.97)	77.11 (61.41)	100.00 (90.00)	71.77 (57.86)
5	Captan (Captaf)	56.00 (48.45)	57.77 (49.49)	64.11 (53.13)	59.29 (50.24)
6	Control	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)
	Mean	27.20 (31.44)	41.92 (40.43)	45.75 (42.53)	38.29 (38.17)
		Fungicides	Concentrations	Fungicides X Concn.	
	SEm±	0.348	0.246	0.603	
	C.D at 1%	1.02	0.72	1.77	

* Mean of three replications ** Arc sine transformed values

Table 3. Effect of botanicals on growth inhibition of *Colletotrichum dematium*

Sl.No	Botanicals	Growth inhibition at different concentrations (%)			Mean*
		2.0	5.0	10.0	
1	Nimbicidin #	6.00 (14.18)	8.55 (16.95)	12.25 (20.44)	12.25 (20.44)**
2	Neem leaf extract	4.44 (12.11)	5.56 (13.56)	8.23 (16.64)	6.07 (14.18)
3	Neem seed kernel extract	9.66 (18.05)	16.65 (24.04)	17.44 (24.65)	14.58 (22.63)
4	*Polyalthia longifolia*	1.56 (7.04)	4.88 (12.66)	38.55 (38.35)	14.99 (22.71)
5	*Calotropis procera*	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)
6	*Datura stramonium*	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)
7	Control	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)	0.00 (0.0)
	Mean	3.09 (9.98)	5.10 (12.92)	12.34 (20.53)	6.84 (15.12)
		Botanicals	Concentrations	Botanicals X Concn.	
	SEm±	0.558	0.365	0.967	
	C.D at 1%	0.64	1.072	2.842	

* Mean of three replications ** Arc sine transformed values

Nimbicidin used at 0.25,0.3 and 0.5% concentrations

PDA in Petri plates longitudinally at the center. Simultaneously 5 mm discs of *Colletotrichum dematium* was placed on either side of streak, then the Petri plats were incubated at room temperature for seven days. Each treatment was replicated three times and appropriate control was maintained. The growth inhibition of *Colletotrichum dematium* was calculated by using the formula given by Vincent (1947).

RESULTS AND DISCUSSION

Out of five systemic fungicides carbendazim (0.1%) inhibited 88.15% growth of the fungus followed by kitazin (81.55%), Difenconazole (71.11) and triadimefon (69.33%) (Table.1). Out of five non systemic fungicides mancozeb completely inhibited fungal growth (100%) at 0.2% followed by captan (64.11%) and chlorothalonil (22.22%) where as copper oxy chloride was found least effective against growth inhibition of the fungus (4.44%) at similar concentrations. SAAF completely inhibited the fungal growth at all the concentrations (0.025, 0.05 and 0.1%), whereas Metalaxyl MZ inhibited 100% fungal growth at 0.3% concentration (Table 2.)

Out of six botanicals tested, *Polyalthia longifolia* resulted in highest inhibition (38.5%) at 10% followed by neem seed kernel extract at 10% concentration (17.40%). The extracts of *Calotropis procera* and *Datura stramonium* did not inhibit the growth at all concentration tested(Table 3).

Out of the six biocontrol agents tested, *Trichoderma koningii* (TNAU) has given highest growth inhibition (53.00%) followed by *Trichoderma harzianum* (UAS, Dharwad (43.33) and *Trichoderma hamatum* (27.77%). The least growth inhibition of fungus was observed in *Pseudomonas fluorescens* and *Trichodrema viride*. (Table 4)

The *in vitro* evaluation of fungicides revealed that the carbendazim (0.1%) and mancozeb (0.2%) were found to be effective in inhibiting the growth of *Colletotrichum dematium*. It was also found that SAAF (combination of mancozeb and carbendazim)

Table 4. Effect of bio control agents on growth inhibition of *Colletotrichum dematium*

Sl.N0	Bio control agents	Inhibition of growth (%)*
1	*Trichoderma viride*	23.00 (28.66)**
2	*Trichoderma harzianum* (UAS, Bangalore),	28.22 (32.08)
3	*Trichoderma harzianum* (UAS, Dharwad),	43.33 (41.15)
4	*Trichoderma Koningii* (TNAU),	53.00 (46.72)
5	*Trichoderma hamatum*	27.77 (31.76)
6	*Pseudomonas fluorescens*	24.11 (29.40)
7	Control	0.00 (0.0)
	SEm±	1.22
	CD at 1% level	4.25

* Mean of three replications ** Arc sine transformed values

and Ridomil-MZ were effective against growth inhibition of *Colletotrichum dematium.* Efficacy of mancozeb has been reported by Kenchaiah (1975), Mesta (1996) and Smith et al. (1999) *in vitro* and Malaraju and Swamy (1998) *in vivo*. Sohi and Rawal (1984) reported that benlate and bavistin reduced yield losses of anthracnose of cowpea caused by *Colletotrichum lindemuthianum.* Thakur and Khare (1990) reported that, the best control of *Colletotrichum dematium* and *Colletotrichum lidemuthianum* were obtained from carbendazim @ 0.1% concentration.

The present studies on botanicals revealed that there is no complete growth inhibition of *Colletotrichum dematium*, but considerable amount of inhibition was noticed only with *Polyalthia longifolia* leaf extract followed by neem seed kernel extract. Annapurna *et al.* (1987) reported *Polyalthia longifolia* was effective against many fungi including *Colletotrichum dematium.* Ashashivpuri *et al.* (1997) reported that, ethanol extracts of neem and *Polyalthia* inhibited the growth of *Colletotrichum capsici.*

In recent years, biological control is gaining much importance in controlling plant diseases due to its ecofriendly and non hazardous nature. In the present investigation *Trochoderma koningii* inhibited the growth of *Colletotrichum dematium* followed by *Trichoderma harzianum* ((UAS, Dharwad). Gupta *et al*., (1991) reported that *Trichoderma harzianum* significantly inhibited the growth of *Colletotrichum dematium in vitro*. Jeyalakshmi *et al*., (1998) found that *Trichoderma* spp. are effective against *Colletotrichum capsici.*

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