International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(1): 77-79

Received: 04-11-2017
Accepted: 05-12-2017

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Effect of fungicides against the mycelial growth, sporulation and spore germination of *Alternaria cassia* causing Alternaria leaf blight of cowpea

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Abstract
Vigna unguiculata L. is widespread in tropical Africa and that it seems reasonable to assume that the cowpea is domesticated and spread from tropical Africa in remote times through Egypt or Arabia to Asia and mediterrian region. Cowpea is cultivated in Asia, Africa, Persia, or south region. Cowpea is distributed worldwide especially in arid and semiarid areas mainly grown both in kharif and spring season in most parts of India. In recent year Alternaria blight of cowpea is the most important disease in India. It occurs in endemic form in some region. The disease has gained importance because of changing climate. Use of fungicide is an alternative method of controlling the diseases or crop in the absence of resistant cultivars or when there is a sudden outbreak of disease. Hence, fungicide would continue to be one of the major tools of integrated disease management (IDM). Evaluation of different fungicides *in vitro* is a handy tool to screen a large number and thus can serve as guide for field testing. So keeping in mind this aspects present study was aimed to identify suitable fungicides use to find out there efficacy against mycelial growth, sporulation and spore germination of *Alternaria cassiae.* Hence the present experiment was conducted at Department of plant pathology laboratory JNKVV Jabalpur with the help of Completely Randomise Block Design and three replication using seven different fungicides with five different concentrations. Fungicides like Mancozeb, Chrothalonil, Propiconazole, Hexaconazole, Difenconazole, Azoxystrobin, and Carboxin are tested using poisoned food technique at 50 ppm, 100ppm, 200ppm, 500ppm and 1000ppm. Findings revealed that Propiconazole was found most effective followed by Hexaconazole and Difenconazole against the test pathogen. Mancozeb chlorothalonil, carboxin and Azoxystrobin were found inhibitory for the mycelial growth, sporulation and spore germination percentage of *A. cassiae*.

Keywords: *Vigna unguiculata, Alternaria cassiae, Fungicides,* PDA

1. Introduction
Cowpea *Vigna unguiculata* (L) walp is an important leguminous vegetable crop for the livelihood of poor people in undeveloped countries and can be used for various purposes such as food crop, cash crop and animal feed (Singh *et al* 1971) [5]. It is considered the most economically important traditional legume crop in Africa (Langyintuo *et al* 2003) [3] and possibly one of the oldest crop utilized by man (Coetzee 1995) [1]. Cowpea is cultivated in Asia, Africa, Persia, or south region. Cowpea is distributed worldwide especially in arid and semiarid areas mainly grown both in kharif and spring season in most parts of India. In recent year Alternaria blight of cowpea is the most important disease in India. It occurs in endemic form in some region. The disease has gained importance because of changing climate. Use of fungicide is an alternative method of controlling the diseases or crop in the absence of resistant cultivars or when there is a sudden outbreak of disease. Hence, fungicide would continue to be one of the major tools of integrated disease management (IDM). Evaluation of different fungicides in vitro is a handy tool to screen a large number and thus can serve as guide for field testing. Hence the present investigation was aimed to identify suitable fungicides against mycelial growth, sporulation and spore germination of *Alternaria cassiae.*

Material and Methods
Present investigation was aimed to identify the most suitable fungicide to control the incidence of *Alternaria cassiae.* Hence the present investigation was carried out in the Department of Plant Pathology, college of Agriculture, JNKVV, Jabalpur (M.P.) using Completely Randomised Block Design (CRD) with three replications during 2012-13.

Methodology

The fungicides (Mancozeb), Chrothalonil, Propiconazole, Hexaconazole, Difenconazole, Azoxystrobin were weighed as per the desired concentration (50 ppm, 100ppm, 200ppm, 500ppm and 1000ppm) and mixed thoroughly in the 250 ml conical flasks containing warm PDA under aseptic conditions. The uniform mixture was then poured in the sterilized plates @ 20 ml per plate and allowed to solidify. Mycelial disc of five mm diameter was cut from 7 days old culture of pathogen and was inoculated in the centre of each plate. The inoculated plates were incubated at co28±2 °C till the pathogen completely occupied the control plate. Three replications were maintained for each treatment, while the plates without fungicides were serve as control. An observation on radial growth (Colony diameter) was recorded in cross way from 24 hours of incubations till the complete growth of pathogen (90mm) in controls plates. To test the spore germination, two drops of fungicide suspensions along with spores were placed in a cavity slide and incubated at 28±2 °C for 24 hours and thereafter germination percentage were recorded.

Percent growth inhibition of pathogens was calculated as described by Vincent (1947) [7]

I = C-T/C x100

Where,

I= Percent inhibition

C= Radial growth of control

T= Radial growth in treatment

Result and Discussion

Findings revealed that all the fungicides significantly inhibited the growth of fungus at all the concentration and radial growth ranged from 00 to (71.33 mm) in treatments as compared to control (90.00mm). Among the fungicides Propiconazole was found to be most effective followed by Hexaconazole and Difenconazole. Propiconazole inhibited the growth of fungus even at 50 ppm. Hexaconazole and Propiconazole exhibited (46mm) and (42.66mm) mycelial growth after 10 days of inoculation. There was a positive correlation between inhibitions of growth with the increased concentration of the fungicides studied.

Hexaconazole and Difenconazole showed (93.3%) and (86.6%) mycelial growth inhibition at 1000ppm concentration. All the fungicides significantly inhibited the sporulation as well as spore germination of all the fungicides Propiconazole, Hexaconazole and Difenconazole shows poor sporulation which results completely inhibit the sporulation. Other fungicides show moderate to nil sporulation. Out of all the fungicides Hexaconazole found to be most effective followed by Propiconazole and Difenconazole in spore germination. Spore germination percentage of Hexaconazole at 50 ppm was (8%), 100ppm (5.3%), 200ppm (2.6), 500ppm (1.3) and 1000ppm (0) spore percentage was observed.

Also Propiconazole significantly inhibit the spore germination percentage at 50ppm (10.6%), 100ppm (8%), 200ppm (5.3), 500ppm (2.6), and 1000ppm (2) was observed (Fig:1).

Inhibition of spore germination observed in Difenconazole at 50ppm (9.3%), 100ppm (4%), and 200ppm (4%) 500ppm (1.3%) and 1000ppm (1%). All the fungicides significantly inhibit the sporulation at all concentration of fungicides i.e. 50ppm, 100ppm, 200ppm, 500ppm and 1000ppm (Table: 1 & Table:2). The present finding is similar to that reported by Sharma and Pandey (2011) [4] against *A. cassiae*. Effectiveness of Carbendazim 12% + Mancozeb 63%, Tebuconazole, Hexaconazole has been reported against the *Alternaria alternata* (Lakhtaria RP. 1978) [2]. Vihol, JB. et. al. (1978) They also obtained cent per cent inhibition of *A. sesami* using Hexaconazole and Difenoconazole..

Table 1: Efficacy of fungicides on the mycelial growth of *A. cassia*

Sr. No	Fungicides	Mean radial growth(mm)* Concentration (ppm)					Percent growth inhibition at 1000 ppm
		50	100	200	500	1000	
1	Mancozeb	79.3	56.7	53.0	50.6	22.0	75.5
2	Chlorothalonil	78.0	58.0	55.3	56.0	27.3	69.7
3	Propiconazole	42.7	30.7	30.7	21.3	12.7	86.0
4	Hexaconazole	46.0	36.7	31.3	28.0	6.0	93.3
5	Difenconazole	46.7	44.0	32.7	22.7	12.0	86.7
6	Azoxystrobin	47.3	41.3	41.3	26.7	18.	80.0
7	Carboxin	71.3	57.3	41.3	28.0	21.3	76.3
	Control	90.0	90.0	90.0	90.0		
S. Em±		0.527	0.526	0.676	0.471	0.577	
C. D. (P = 0.05%)		1.581	1.581	2.027	1.413	1.739	

Table 2: Effect of fungicides on sporulation and spore germination of *A. Cassia*

S. No	Fungicides	Sporulation					Spore germination percentage				
		50	100	200	500	1000	50	100	200	500	1000
1	Mancozeb	+++	++	++	+	_	24	17.3	21.3	17.3	0
2	Chlorothalonil	+++	++	++	+	_	24	20	20	12	0
3	Propiconazole	+	+	+	+	_	10.6	8.0	5.3	2.6	0
4	Hexaconazole	+	+	+	+	_	8.0	5.3	2.6	1.3	0
5	Difenconazole	+	+	+	+	_	9.3	4.0	4.00	1.3	0
6	Azoxystrobin	+++	++	+	+	_	25.3	17.3	12.00	8.00	0
7	Carboxin	+++	+++	+	+	_	29.3	22.6	16.00	12.00	0

*Mean of four replications

-nil, poor, ++Moderate, +++ good, ++++Abundant

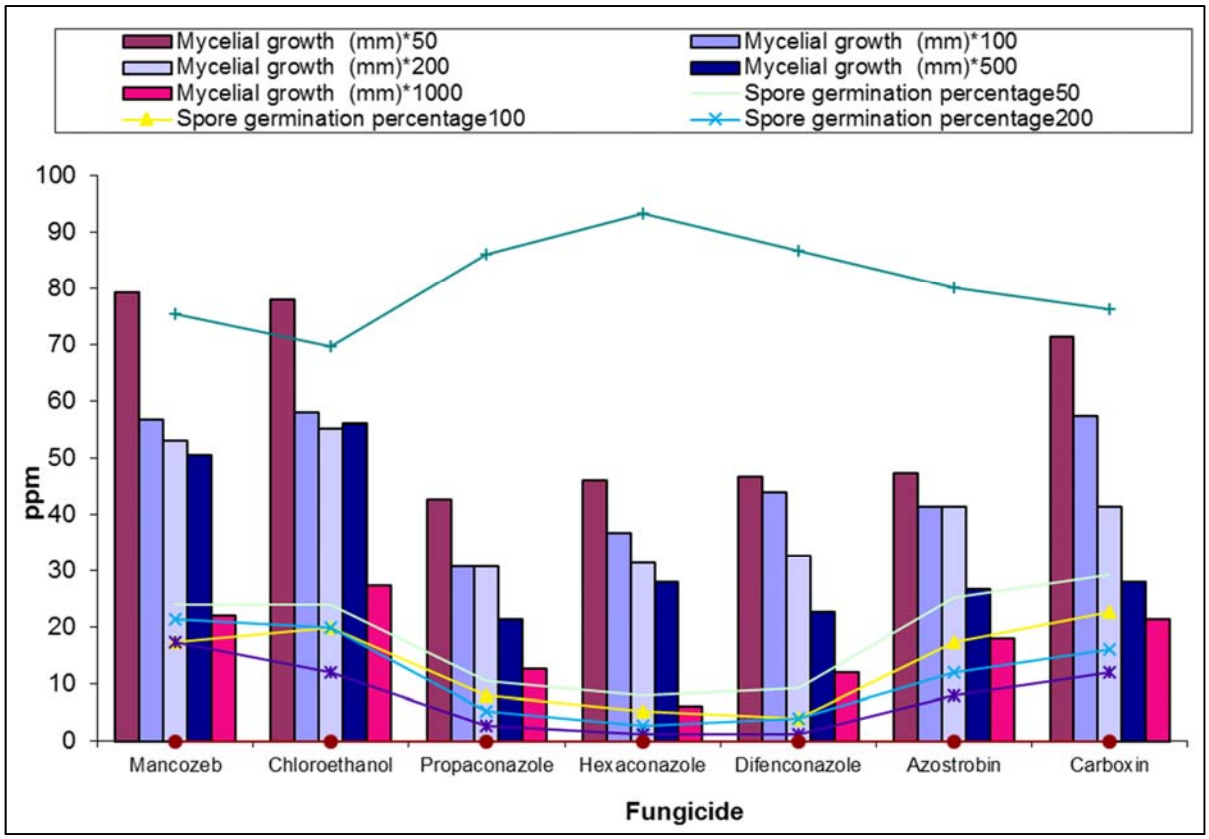

Fig 1: Effect of fungicides on the mycelial growth, sporulation and spore germination of *Alternaria cassia*

Conclusion

Fungicide Propiconazole found to be most effective in inhibiting the mycelial growth, sporulation and spore germination percentage of *A. cassia*.

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