

# *In vitro* efficacy of different fungicides against *Alternaria macrospora* causing leaf blight of cotton

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## ABSTRACT

A total of sixteen fungicides which included six systemic, five non systemic and five combi products which differed significantly with respect to fungicides concentrations and their interactions were evaluated for their efficacy against *Alternaria macrospora* by poisoned food technique. Among the six systemic fungicides evaluated against *A. macrospora*, hexaconazole and propiconazole recorded the cent per cent inhibition of mycelial growth at all the concentrations (0.05 %, 0.1 % and 0.15 %) and least inhibition of mycelial growth was recorded by carbendazim (26.01 %). Out of five non systemic fungicides evaluated, mancozeb recorded the maximum inhibition of 95.29 per cent followed by captan 92.68 per cent and copper oxy chloride recorded the minimum inhibition of 68.7 per cent. Among five combi fungicides evaluated *in vitro* (tebuconazole 50 % + trifloxystrobin 25 %) recorded the complete inhibition (100 %) at all concentrations (0.1 %, 0.2 % and 0.3 %) and least inhibition of mycelial growth 86.01 per cent was recorded by (captan 70 % + hexaconazole 5 %).

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## INTRODUCTION

Cotton (*Gossypium* spp.) is popularly referred as “white gold” which belongs to the botanical family Malvaceae and could be a premier harvest of most countries with a colossal potential to generate employment both in rural and concrete sectors. India is the sole country where, all four cotton species are grown because of the wide variety of agro-environmental and soil conditions that permits the cultivation of different species having varied staple length.

Among the Indian states, Karnataka ranks sixth in

area with 5.75 lakh hectares and eighth in production with 18.0 lakh bales of 170 kg with the productivity of 532 kg ha<sup>-1</sup> (Anonymous, 2019).

Cotton is principally cultivated in Raichur, Dharwad, Bagalkote, Vijayapura, Bellary, Belagavi, Gadag, Haveri, Chitradurga, Davangere, Shivamogga, Mysuru and Chamarajnarag districts.

The production potential of the crop has not been exploited to the full extent due to many abiotic and biotic factors. Cotton is affected by many foliar diseases such as *Alternaria* blight (*Alternaria macrospora*), grey

(Areolate) mildew (*Ramularia areola*), rust (*Phakospora gossypii*) and soil borne diseases like wilt (*Fusarium oxysporum* f. sp. *vasinfectum*) and root rot (*Macrophomina phaseolina*) and one of the bacterial diseases i.e., bacterial blight (*Xanthomonas campestris* pv. *malvacearum*).

Among fungal diseases, *Alternaria* blight (*Alternaria macrospora* Zimm.) results in the losses of 26.59 per cent (Monga *et al.*, 2013). As the severity of disease is increasing during period of recent years there is need of control measures. So, considering these points, the present investigation was carried out to evaluate sixteen different fungicides under *in vitro* and the effective chemicals can be used as foliar spray for effective management of *Alternaria* blight under field conditions.

## MATERIAL AND METHODS

The efficacies of the fungicides were tested against *A. macrospora* by using poisoned food technique. The required concentrations of chemicals were weighed and incorporated into sterilized, cooled potato dextrose agar. Twenty ml of cooled molten PDA medium was poured into 90 mm sterilized Petri plates and all the plates were inoculated with actively growing seven mm old mycelial disc of the pathogen separately. Three replications were maintained for each treatment. These plates were incubated at 25°C for 15 days and colony diameter was recorded. Per cent inhibition of mycelial growth over control was calculated by using the formula (Vincent, 1947).

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

where,

I = Per cent inhibition of mycelial growth

C = Growth of mycelium in control

T = Growth of mycelium in treatment.

### Systemic fungicides:

Sr. No.	Chemical name	Trade name	Per cent concentration
1.	Azoxystrobin	Amistar 23 % SC	0.05 %, 0.1 %
2.	Tebuconazole	Folicur 250 % EC	and 0.15 %
3.	Hexaconazole	Contaf 5 % EC	
4.	Propiconazole	Tilt 25 % EC	
5.	Difenoconazole	Score 25 % EC	
6.	Carbendazim	Bavistin 50 % WP	

### Non systemic fungicides:

Sr. No.	Chemical name	Trade name	Per cent concentration
1.	Chlorothalonil	Kavach 75 % WP	0.1 %, 0.2 %
2.	Propineb	Antracol 70 % WP	and 0.3 %
3.	Mancozeb	Indofil M-45 75 % WP	
4.	Copper oxychloride	Blitox 50 % WP	
5.	Captan	Captaf R 50 % WP	

### Combi product fungicides:

Sr. No.	Chemical name	Trade name	Per cent concentration
1.	Carbendazim 12 % WP + Mancozeb 63 % WP	Saaf 75 % WP	0.1 %, 0.2 % and 0.3 %
2.	Captan 70 % + Hexaconazole 5 %	Taqat 75 % WP	
3.	Hexaconazole 4 % + Zineb 68 % WP	Avtar TM 72 %	
4.	Trifloxystrobin 25 % + Tebuconazole 50 % WG	Nativo 75 % WG	
5.	Pyraclostrobin 5 % + Metiram 55 %	Cabriktop 60 % WG	

## RESULTS AND DISCUSSION

Totally 16 fungicides which included six systemic, five non systemic and five combi products which differed significantly with respect to fungicides concentrations and their interactions were evaluated for their efficacy against *A. macrospora* by poisoned food technique. The results are presented in Table 1, 2 and 3.

From the present study, it is clear that most of the fungicides tested were significantly effective in reducing the mycelial growth of *A. macrospora*. All the systemic fungicides showed the inhibition of mycelial growth over control ranged from 26.01 per cent to 100.00 per cent irrespective of concentrations. Hexaconazole and propiconazole recorded the complete inhibition at all the concentrations (0.05 %, 0.1 % and 0.15 %) were proved to be effective fungicides. The next best treatment was tebuconazole which recorded the 97.52 per cent inhibition. Whereas, carbendazim was least effective in inhibiting the mycelial growth (26.01 %).

Five non systemic fungicides were tested *in vitro*, among them mancozeb recorded the maximum inhibition of 95.29 per cent followed by captan 92.68 per cent and

<b>Table 1 : <i>In vitro</i> evaluation of systemic fungicides against <i>Alternaria macrospora</i></b>				
Systemic fungicides	Per cent inhibition of mycelial growth			Mean inhibition (%)
	0.05	0.1	0.15	
Difenconazole	87.45 (69.25)	91.37 (72.92)	92.55 (74.16)	90.46 (72.01)
Tebuconazole	92.55 (74.16)	100.00 (90.00)	100.00 (90.00)	97.52 (80.93)
Hexaconazole	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
Propiconazole	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
Azoxystrobin	35.69 (36.68)	40.39 (39.46)	42.75 (40.83)	39.61 (39.00)
Carbendazim	16.08 (23.64)	22.35 (28.22)	39.61 (39.00)	26.01 (30.67)
Mean	71.96 (58.03)	75.68 (60.45)	79.15 (62.83)	75.60 (60.40)
	S.E. ±	C.D. (P=0.01)		
Fungicides (F)	0.59	1.69		
Concentration (C)	0.39	1.11		
F x C	1.03	3.03		

\* Angular transformed values

<b>Table 2 : <i>In vitro</i> evaluation of non-systemic fungicides against <i>A. macrospora</i></b>				
Non systemic fungicides	Per cent inhibition of mycelial growth			Mean inhibition (%)
	0.1	0.2	0.3	
Mancozeb	85.88 (67.93)	100.00 (90.00)	100.00 (90.00)	95.29 (77.47)
Chlorothalonil	64.71 (53.55)	69.41 (56.42)	76.47 (60.98)	70.20 (56.91)
Copper oxychloride	63.15 (52.63)	70.20 (56.91)	72.94 (58.66)	68.76 (56.06)
Propineb	79.22 (62.88)	87.45 (69.25)	93.33 (75.04)	86.67 (68.58)
Captan	89.80 (71.38)	96.08 (73.74)	97.16 (78.58)	92.68 (74.30)
Mean	82.51 (65.28)	83.53 (66.06)	87.98 (69.71)	82.72 (65.44)
	S.E. ±	C.D. (P=0.1)		
Fungicides (F)	1.40	4.03		
Concentration (C)	1.08	3.13		
F x C	2.42	6.99		

\* Angular transformed values

copper oxy chloride recorded the minimum inhibition of 68.7 per cent. Among the five combi fungicides tested *in vitro* (tebuconazole 50 % + trifloxystrobin 25 %) recorded the complete inhibition at all concentrations (0.1 %, 0.2 % and 0.3 %). The next best treatment was (carbendazim 12 % + mancozeb 63 %) recorded 89.80 per cent inhibition followed by (pyraclostrobin 5 % + metiram 55 %) recorded inhibition of 87.58. Whereas,

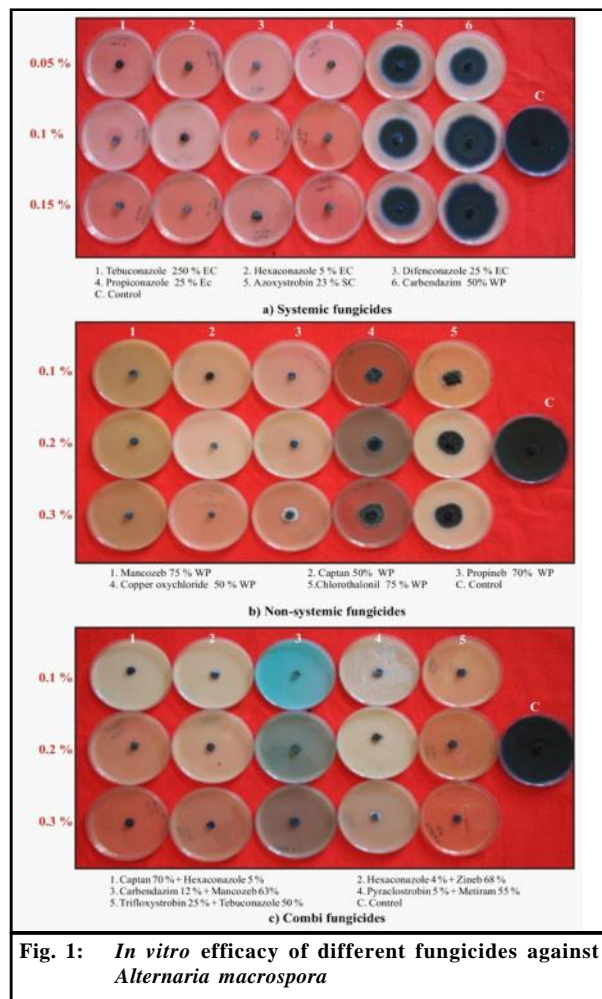
(hexaconazole 4 % + zineb 68 %) recorded 86.14 per cent inhibition which was at par with (captan 70 % + hexaconazole 5 %) with 86.01 per cent inhibition.

These results were further supported by Arun Kumar (2008) who reported that propiconazole and hexaconazole were best at all concentrations (0.1 %, 0.2 % and 0.3 %) which completely inhibited the mycelial growth. Efficacy of these fungicides were also reported

**Table 3 : In vitro evaluation of combi product fungicides against *A. macrospora***

Combi product fungicides	Per cent inhibition of mycelial growth			Mean inhibition (%)
	0.1	0.2	0.3	
Hexaconazole 4 % + Zineb 68 %	80.78 (64.00)	85.10 (67.29)	90.55 (72.16)	86.14 (68.15)
Captan 70 % + Hexaconazole 5 %	81.57 (64.58)	83.92 (66.36)	92.55 (74.30)	86.01 (68.04)
Carbendazim 12 % + Mancozeb 63 %	86.67 (68.58)	89.41 (71.01)	93.33 (75.04)	89.80 (71.38)
Pyraclostrobin 5 % + Metiram 55 %	86.27 (68.25)	86.67 (68.58)	89.80 (71.38)	87.58 (69.37)
Tebuconazole 50 % + Trifloxystrobin 25 %	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)	100.00 (90.00)
Mean	87.05 (68.91)	89.02 (70.65)	93.64 (75.39)	89.90 (71.47)
	S.E. ±	C.D. (P=0.01)		
Fungicides (F)	1.22	3.53		
Concentration (C)	0.95	2.73		
F x C	2.12	6.11		

\* Angular transformed values

**Fig. 1: In vitro efficacy of different fungicides against *Alternaria macrospora***

by Chattannavar *et al.* (2004); Mesta (2006) and Hariprasad *et al.* (2017).

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