

# EFFICACY OF DIFFERENT FUNGICIDES FOR THE MANAGEMENT OF CHILLI ANTHRACNOSE CAUSED BY COLLETOTRICHUM CAPSICI

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## ABSTRACT

Chilli (*Capsicum annum* L.) is an important spice cum vegetable crop. Among various diseases, anthracnose caused by *Colletotrichum capsici* is a major problem in India. All the fungicidal treatments were significantly superior over control in checking the anthracnose disease intensity in both individual year and pooled data. Minimum disease intensity of 19.67 % was recorded in carbendazim 0.05 % which was statistically at par with spraying of 0.2 % mancozeb (20.71 %), 0.2 % carbendazim + mancozeb (22.51 %) and 0.2 % copper oxychloride (23.16 %). Maximum fruit yield of 3383.47 kg/ha was recorded with three sprayings of carbendazim 0.05 % which was statistically at par with mancozeb 0.2 % (3317.54 kg/ha) and carbendazim + mancozeb 0.2 % (3103.76 kg/ha). The economics of different treatments revealed that carbendazim 0.05 % or mancozeb 0.2 % sprayed at 15 days interval starting from the appearance of the disease was most effective for the control of anthracnose disease of chilli and get higher healthy fruit yield and cost benefit ratio.

## INTRODUCTION

Chilli (*Capsicum annum* L.) is an important spice cum vegetable crop, often referred to as *Capsicum*, hot pepper, sweet pepper or paprika. Chilli cultivation has existed for several hundred years as a sustainable form of agriculture in India and in many other countries. It is an annual herbaceous vegetable and spice grown in both tropical and sub-tropical regions. India accounts for 25% of the world's total production of chilli. This crop is a significant source of income making India the world's single largest producer and exporter to the USA, UK, Canada, Saudi Arabia, Singapore, Malaysia, Germany and many more countries across the world. It is an important condiment and has a valuable role in our daily diet; increasing the taste and palatability of the food (Homasani, 1993). The sustainability of chilli-based agriculture is threatened by a number of factors. Main biotic stresses such as bacterial wilt, anthracnose, viruses, nematodes and several insect pests have been reported to impair the crop productivity (Isaac, 1992). Among all disease, anthracnose caused by *Colletotrichum capsici* (Sydow) Butler and Bisby is a major problem in India and one of the more significant economic constraints to chilli production worldwide, especially in tropical and subtropical regions (Than *et al.*, 2008). This disease caused both pre- and post-harvest fruit decay (Bosland and Votava, 2003). It causes severe damage to fruits in the field as

well as in storage and take heavy toll upto 84 per cent (Thind and Jhooty, 1985). Badly infected fruits may lose their normal red colour and turn straw coloured or in some cases, pale white. Economic losses caused by the disease are mainly attributed to lower fruit quality and marketability. Several workers have attempted to control anthracnose of chilli by use of different fungicides (Sharma and Thakore, 1999; Deshmukh *et al.*, 2004; Rathore, 2004, Gopinath *et al.*, 2006). Considering the severity of this disease and its frequent occurrence in the fields, spoilage during transit and storage it has been felt necessity to develop effective management strategies. Thus, attempts have been made to evaluate the efficacy of different fungicides against anthracnose of chilli for two consecutive years for the protection of disease with increase yield and cost benefit ratio.

## MATERIALS AND METHODS

A field trial was conducted in *Kharif* 2006-07 and 2007-08 at Ranpur (Deesa) in randomized block design with four replications to study the efficacy of different fungicides under field condition. Eight different fungicides *viz.*, carbendazim 0.05 % (Bavistin), propiconazole 0.04 % (Tilt), copper hydroxide 0.25 % (Isacide-101), thiophanate methyl 0.07 % (Topsin-M), mancozeb 0.2 % (Dithane M-45), copper oxychloride 0.25 % (Blitox-50), mancozeb + carbendazim

0.2 % (SAAF), difenconazole 0.025 % (Score) and control (without application of fungicide) were evolved to check the efficacy of respective fungicide against anthracnose of chilli. The first spraying was given at the time of appearance of first symptoms of disease on plants in the field. The remaining two sprays were done at an interval of 15 days after first spray. Recommended agronomical package and practices were followed for all the treatments under experiment. The intensity of anthracnose was recorded after ten days of last spray of fungicides. The disease intensity was assessed by randomly selected 10 plants in each treatment using 0-9 grade scale where, 0 = No infection, 1 = 1-10 % infection, 3 = 11-25 % infection, 5 = 26-50 % infection, 7 = 51-75 % infection, and 9 = > 75 % infection before harvesting (Mayee and Datar, 1986). The per cent disease intensity was worked out on the basis of following formula given by Wheeler (1969).

$$\text{PDI} = \frac{\text{Total sum of numerical rating}}{\text{No. of fruits, flowers, leaves, X Maximum grade twigs or stem portion observed} \times \text{value}} \times 100$$

## RESULTS AND DISCUSSION

During the present investigation, it was evident from the data presented in Table 1; Fig. 1 that all the fungicidal treatments tried was significantly superior over control in checking the anthracnose / die-back or fruit rot disease intensity in both

individual year and pooled data. Among different fungicidal sprays, minimum disease intensity was found in carbendazim 0.05 % (20.80 and 18.54%) which was statistically at par with spraying of 0.2 % mancozeb (21.81 and 19.62 %), 0.2 % copper oxychloride (24.15 and 22.17 %) and 0.2 % carbendazim + mancozeb (23.12 and 21.90 %) during both years. Propiconazole 0.025 % found next effective fungicide which recorded 26.38 and 24.71 per cent disease intensity in *Kharif* 2006-07 and 2007-08, respectively.

Two years pooled data also revealed that the minimum disease intensity 19.67 % was recorded in carbendazim 0.05 % which was statistically at par with spraying of 0.2 % mancozeb (20.71 %), 0.2 % carbendazim + mancozeb (22.51 %) and 0.2 % copper oxychloride (23.16 %).

It was evident from the Table 2; Fig. 2 that fruit yield of chilli invariably increased with fungicidal spray as compared to check. Maximum fruit yield recorded with spraying of carbendazim 0.05 % (3257.51 and 3509.44 kg/ha), mancozeb 0.2 % (3139.59 and 3495.50 kg/ha) and carbendazim + mancozeb 0.2 % (2950.02 and 3257.51 kg/ha) which was statistically at par with each other in both the year *Kharif* 2006-07 and 2007-08, respectively. The next best effective fungicide was propiconazole 0.025 % which yielded 2883.53 and 3139.59 kg/ha fruit yield during *Kharif* 2006-07 and 2007-08, respectively.

In pooled data, the maximum fruit yield 3383.47 kg/ha was recorded with three sprayings of carbendazim 0.05 % which

**Table 1: Effect of different fungicides on per cent disease intensity of chilli anthracnose disease under field condition**

Sr. No.	Treatments	Concentration (%)	Per cent disease intensity		
			2006-07*	2007-08*	Pooled*
1.	carbendazim	0.05 %	20.80**(12.61)***	18.54**(10.11)***	19.67**(11.36)***
2.	propiconazole	0.025 %	26.38 (19.74)	24.71 (17.47)	25.54 (18.61)
3.	copper hydroxide	0.2 %	28.58 (22.89)	26.83 (20.37)	27.70 (21.63)
4.	thiophanate methyl	0.07 %	29.33 (23.99)	27.62 (21.49)	28.47 (22.74)
5.	mancozeb	0.2 %	21.81 (13.81)	19.62 (11.28)	20.71 (12.55)
6.	copper oxychloride	0.2 %	24.15 (16.74)	22.17 (14.24)	23.16 (15.49)
7.	carbendazim + mancozeb	0.2 %	23.12 (15.42)	21.90 (13.91)	22.51 (14.67)
8.	difenconazole	0.025 %	29.97 (24.96)	28.31 (22.49)	29.14 (23.73)
9.	Control	-	51.51 (61.26)	48.69 (56.42)	50.10 (58.84)
SEm ±			1.58	1.71	1.77
CD at 5 %			4.61	4.98	5.35
CV %			13.75	15.94	15.63

\*Average of four replication; \*\*Figures outside the parenthesis are original value;\*\*\*Figures in the parenthesis are Arc sin transformed value

**Table 2: Effect of different fungicides on yield of chilli under field condition**

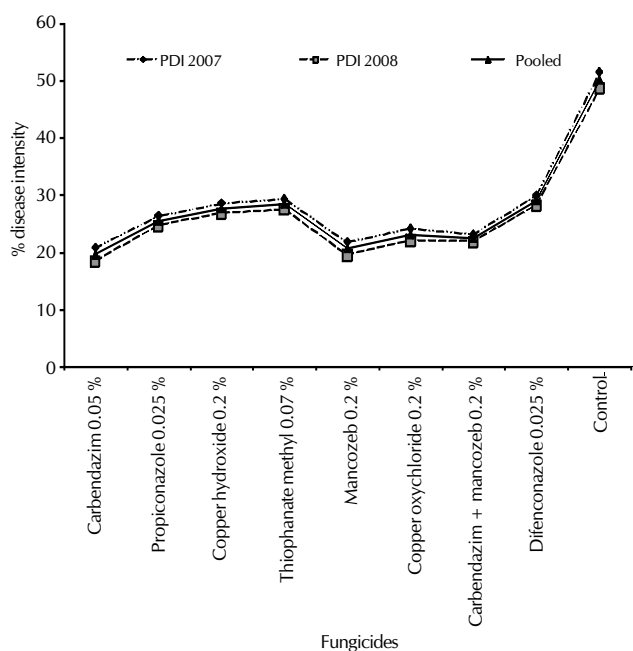
Sr. No.	Treatments	Concentration (%)	Yield (kg/ha)		
			2006-07*	2007-08*	Pooled*
1.	carbendazim	0.05 %	3257.51	3509.44	3383.47
2.	propiconazole	0.025 %	2883.53	3139.59	3011.56
3.	copper hydroxide	0.2 %	2454.54	2758.18	2606.36
4.	thiophanate methyl	0.07 %	2316.05	2655.85	2485.95
5.	mancozeb	0.2 %	3139.59	3495.50	3317.54
6.	copper oxychloride	0.2 %	2476.06	2795.09	2635.57
7.	carbendazim + mancozeb	0.2 %	2950.02	3257.51	3103.76
8.	difenconazole	0.025 %	2303.38	2639.05	2471.21
9.	Control	-	1601.08	1745.62	1673.35
SEm ±			121.131	106.901	114.61
CD at 5 %			353.574	312.038	333.11
CV %			9.38	7.44	9.09

\*Average of four replication

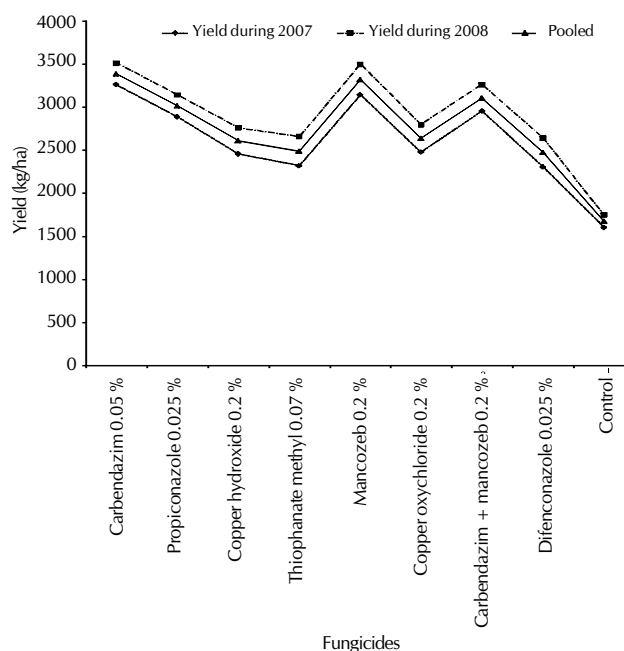
**Table 3: Economics of spraying of different fungicides for the control of anthracnose disease of chilli**

Fungicides	Quantity of fungicides (kg or litre/ha)	Cost of fungicides including labour charges (Rs./ha)	Yield of chilli (kg/ha)	Gross realization (Rs./ha)	Net realization over control (Rs./ha)	CBR
carbendazim	1.5	1725.00	3383.47	50752.13	25651.88	1:14.87
propiconazole	1.5	2832.00	2635.57	39533.55	4433.30	1:5.09
copper hydroxide	3.75	3750.00	2606.36	39095.40	13995.15	1:3.73
thiophanate methyl	1.5	2640.00	2485.95	37289.25	12189.00	1:4.62
mancozeb	3.9	1840.80	3317.54	49763.10	24662.85	1:13.39
copper oxychloride	6.0	2160.00	3011.56	45173.40	20073.15	1:9.29
carbendazim + mancozeb	3.75	2745.00	3103.76	46556.40	21456.15	1:7.82
difenconazole	1.5	5010.00	2471.21	37068.15	11967.90	1:1.05

Market price of fruit @ Rs. 15 /kg



**Figure 1: Effect of different fungicides on per cent disease intensity of chilli anthracnose disease under field condition**



**Figure 2: Effect of different fungicides on yield of chilli under field condition**

was statistically at par with mancozeb 0.2 % (3317.54 kg/ha) and carbendazim + mancozeb 0.2 % (3103.76 kg/ha).

Data from Table 1 and Table 2 revealed that carbendazim 0.05 % proved most effective fungicide against anthracnose of chilli as well as increased fruit yield however it was at par with mancozeb and carbendazim + mancozeb which stand next to carbendazim in respect of disease control and fruit yield of chilli.

The economics of spraying of various fungicides (Table 3) revealed that the highest cost benefit ratio (1:14.87) was obtained by the crop sprayed with three spraying of carbendazim 0.05 % followed by mancozeb 0.2 % (1:13.39).

The present findings are supported by the work of Ekbote (2002) observed that carbendazim (0.1%) significantly reduced the fruit rot intensity (30.47 %) when compared to all the treatments, next best treatment was copper hydroxide (0.25 %) sprayed plots recorded 37.70 per cent disease intensity and the yield was 16.08 q/ha. Ekbote (2005a) recorded less per cent intensity of die-back and highest dry chilli pod yield in the treatment of emcop (0.20%) and was at par with emcop

(0.15% and 0.10%), carbendazim (0.1%) and copper oxychloride (0.25%). Ekbote (2005b) also recorded maximum yield and lowest per cent disease index of chilli fruit rot in the treatment of carbendazim (0.1 %) which was at par with hexaconazole (0.1 %). Gawade *et al* (2009) observed that carbendazim @ 0.1% was found most effective and economical in controlling the disease which recorded least mean foliage anthracnose with higher seed yield and most economical C:B ratio. Thahir Basha *et al* (2010) antagonists were evaluated for their compatibility with commonly used four systemic fungicides viz., carbendazim, thiophanate-methyl, propiconazole, hexaconazole and two non-systemic fungicides viz., mancozeb and copper oxychloride to manage the disease through an integrated approach by combining bioagents and economic use of chemicals. Chaudhary *et al* (2013) observed that Bavistin (carbendazim) was most effective with 93% (68.00% in control) seed germination with no pre or post emergence mortality and increased seedling vigour index of 506.85 which was 306.00 in control.

Hence it is inferred that three sprays of carbendazim @ 0.05%

or mancozeb @ 0.2% at 15 days interval commencing with the onset of the disease not only reduces the disease intensity of anthracnose of chilli but also results in higher healthy fruit yield and benefit ratio.

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