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## Efficacy of fungicides and bioagent against anthracnose disease in bottle gourd caused by (*Colletotrichum lagenarium* (Pass.) Ellis and Halsted)

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### Abstract

Field experiment was conducted during *kharif* 2019 under irrigated conditions in order to find out the effective fungicide for control of the anthracnose of bottle gourd caused by *Colletotrichum lagenarium*. A total of eight treatments having six fungicides and one bio control agent which were proved effective under *in vitro* along with one untreated control were evaluated against anthracnose disease. Propiconazole @ 0.05% recorded (13.87) least disease per cent disease incidence on fruits with highest reduction of anthracnose disease with highest yield 15.78 t/ha and net returns 88,883 Rs/ha with BC ratio 2.38.

**Keywords:** *Colletotrichum lagenarium*, fungicides, bioagent

### Introduction

Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is one of the important cucurbitaceous vegetable crops, which belongs to the family Cucurbitaceae having the chromosome number  $2n=22$ . In India, it is cultivated in an area of 149 thousand hectare with production of 2458 thousand metric tonnes (Anon, 2017) <sup>[1]</sup>. In Karnataka, it is cultivated in an area of 0.65 thousand hectare with production of 8.36 thousand metric tonnes (Anon, 2017) <sup>[1]</sup>. Bottle gourd is affected by a number of diseases *viz.*, powdery mildew (*Erysiphae cichoracearum*), anthracnose (*Colletotrichum lagenarium*), *Alternaria* leaf spot (*Alternaria cucumerina*); CMV etc (Zitter *et al.*, 1998 and Saha, 2002) <sup>[8, 6]</sup>

Over the last decade, the prevalence and severity of anthracnose diseases of bottle gourd caused by *Colletotrichum lagenarium* have been increased rapidly. This disease have become a major limiting factor for the bottle gourd production. This disease was first described during 1867 on gourd fruits in Italy. The bottle gourd anthracnose was first reported by Gardner in 1918 from USA, and was described as *Colletotrichum lagenarium* (Pass.) Ell. and Halst. In India it was first reported by Mundkur on long melon (*Cucumis melo* var. *utilissimus* Roxb.) and bottle gourd (*Lagenaria siceraria* Mol. Standl) to be very serious near Ferozepur in Punjab in 1937. The disease is reported to occur severely in USA, Hungary, Netherlands, Canada, India (Madaan and Grover, 1978) <sup>[4]</sup>

Since the disease is prevalent in Karnataka and causes huge yield loss, there exists a need to find out the fungicidal molecules, which can be effective in managing the disease. Few of the biocontrol agents are also potentially capable of suppressing the pathogen multiplication. Thus bio control agents were also included in disease management programme. Keeping all these points in view, the present research work was undertaken on efficacy of fungicides and bioagent against anthracnose disease in bottle gourd caused by *Colletotrichum lagenarium*

### Material and Methods

A field experiment was conducted during *kharif* 2019 in medium red soil under irrigated conditions in order to find out the effective fungicide for control of the anthracnose of bottle gourd caused by *Colletotrichum lagenarium*. A total of eight treatments having six fungicides and one bio control agent which were proved effective under *in vitro* along with one untreated control were evaluated against anthracnose disease. All the treatments were replicated three times following the randomized block design. Two sprays were given at 40 and 50 days after sowing were given. The per cent disease incidence was calculated.

**Details of Experimentation**

Lay out	: RBD
Plot size	: 4.6 x 6 mt
Treatment	: 08
Replication	: 03
Spacing	: 3 x 0.9 m
Date of sowing	: 29/05/2019
Date of treatment imposed	: 09/07/2019
Variety	: Varad

**Table 1:** Treatment Details

Treatment	Common name	Trade name	Concentration
T <sub>1</sub>	Mancozeb	Indofil M 45	0.20%
T <sub>2</sub>	Propineb	Anthracol	0.25%
T <sub>3</sub>	Hexaconazole	Contaf	0.10%
T <sub>4</sub>	Propiconazole	Tilt	0.05%
T <sub>5</sub>	Tebuconazole	Folicur	0.05%
T <sub>6</sub>	Captan + hexaconazole	Taqat	0.20%
T <sub>7</sub>	<i>Trichoderma harzianum</i>	UHSB product	0.50%
T <sub>8</sub>	Control	-	-

Observations were made on Per cent Disease Incidence for anthracnose disease by counting total number of healthy and infected fruits in each treatment and per cent disease incidence was calculated by using following formulae

$$\text{Per cent Disease Incidence} = \frac{\text{No. of infected fruits in a treatment}}{\text{Total number of fruits in a treatment}} \times 100$$

**Results and Discussion**

Results in Table 2 reveals that after 2<sup>nd</sup> spray propiconazole @ 0.05% recorded (13.87) least disease per cent disease incidence on fruits which was on par with hexaconazole @ 0.1% (20.00), followed by tebuconazole @ 0.05% (29.24) and captan + hexaconazole @ 0.2% (33.11) which was on par

with each other. The untreated control (water sprayed) recorded maximum Per cent Disease Incidence (48.04).

With respect to per cent disease reduction over control, maximum disease reduction was recorded by propiconazole @ 0.05% (71.12%) followed by hexaconazole @ 0.1% (58.36%). The least was noticed in *Trichoderma harzianum* @ 0.5% (11.99%).

Results in Table 3 reveals that economical analysis of fungicidal evaluation for the control of anthracnose in bottle gourd, Propiconazole @ 0.1% gave the highest net return of 88,883/ha, followed by hexaconazole @ 0.1%, which gave next highest net returns of 76,644.5/ha and tebuconazole @ 0.05% gave third highest net returns of 67,527/ha. Propiconazole gave high yield of 15.78t/ha and net returns 88,883/ha with BC ratio 2.38

Triazole antifungal agents inhibit the ergosterol biosynthesis pathway via the inhibition of 14- $\alpha$ -demethylase, the enzyme that removes the methyl group at position C-14 of precursor sterols. Inhibition of this enzyme leads to the accumulation of aberrant sterol intermediates (14- $\alpha$ -methylsterols) on the fungal surface, which results in the arrest of the fungal growth.

These results are in agreement with the findings of Sharma (2018) [7]; where 56.03 per cent disease control by propiconazole. Identical results were obtained by Rao *et al.* (2012) [5] found that foliar application of propiconazole (0.1 per cent) at 45 and 90 days after planting (DAP) were significantly superior in reducing the Per cent Disease Index (20.01) of leaf spot disease. The results were in conformity with the Gopinathan, (2006) [3] who reported that propiconazole at 0.1 per cent caused a reduction of disease incidence (70.00%) of chilli anthracnose and increase in fruit yield by 86 per cent as compared to control. Similar result were obtained by Rao *et al.* (2012) [5]

**Table 2:** Management of anthracnose in bottle gourd using fungicides and bioagent in field conditions

Sl. No	Treatments	Per cent Disease Incidence on fruits	Per cent Disease Reduction over Control (PDC)	Yield t/ha
		After 2 <sup>nd</sup> Spray		
1.	Mancozeb 75 WP @ 0.2%	39.09 (38.64)	18.63	10.62
2.	Propineb 70 WP @ 0.25%	35.16 (36.31)	26.81	11.12
3.	Hexaconazole 5 EC @ 0.1%	20.00 (26.48)	58.36	14.23
4.	Propiconazole 25 EC @ 0.05%	13.87 (21.82)	71.12	15.78
5.	Tebuconazole 250 EC @ 0.05%	29.24 (32.70)	39.13	13.14
6.	Captan 70% + Hexaconazole 5% @ 0.2%	33.11 (35.10)	31.07	11.84
7.	<i>Trichoderma harzianum</i> @ 0.5%	42.28 (40.53)	11.99	10.12
8.	Control	48.04 (43.86)	00.00	9.85
	SEM $\pm$	2.70		2.89
	CD @ 5%	0.88	-	0.94

\* Figures presented in parenthesis are arc sine transformed values

**Table 3:** Economic analysis for management of anthracnose in bottle gourd

Sl. No.	Treatments	Yield (t/ha)	Cost of cultivation (Rs/ha)	Cost of fungicides (Rs/ha)	Total cost /ha (Rs/ha)	Gross Returns/ha (Rs/ha)	Net returns/ha (Rs/ha)	B:C
1	Mancozeb 75 WP @ 0.2%	10.62	36,723	606	37,329	84,960	47,631	1.27
2	Propineb 70 WP @ 0.25%	11.12	36,723	1264	37,987	88,960	50,973	1.34
3	Hexaconazole 5 EC @ 0.1%	14.23	36,723	472.5	37,196	1,13,840	76,645	2.06
4	Propiconazole 25 EC @ 0.05%	15.78	36,723	634.5	37,358	1,26,240	88,883	2.38
5	Tebuconazole 250 EC @ 0.05%	13.14	36,723	870	37,593	1,05,120	67,527	1.79
6	Captan 70% + Hexaconazole 5% @ 0.2%	11.84	36,723	2430	39,153	94,720	55,567	1.41
7	<i>Trichoderma harzianum</i> @ 0.5%	10.12	36,723	375	37,098	80,960	43,862	1.18
8	Control	9.85	36,723	-	36,723	78,800	42,077	1.14

**Note:** Average price of bottle gourd fruits- Rs. 8 / kg

**Summary and Conclusion**

Propiconazole@ 0.05% gave least per cent disease incidence (13.87) on fruits with highest reduction of anthracnose disease with highest yield 15.78 t/ha and net returns 88,883 Rs/ha.

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