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Screening of fungicides against anthracnose disease of mango on nursery seedlings

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Abstract
Mango (*Mangifera indica* L.) is one of the important tropical and subtropical fruit crop. Eventhough it is hardy plant, susceptible to many pests and diseases, among the diseases, anthracnose caused by *Colletotrichum gloeosporioides* is one of the most devastating diseases causing heavy losses in postharvest fruits. But, in the recent years, the disease become more problematic in nursery seedlings as well and it is one of challenging problem to manage disease under nursery. By keeping the view, systemic and nonsystenic fungicides were screened against anthracnose disease under nursery. Among different fungicides tested, minimum per cent disease index (7.50 %) and maximum per cent disease reduction (76.72 %) over control was recorded in trifloxystrobin + tebuconazole at 0.05 per cent concentration followed by tebuconazole (9.72 %) with 69.84 per cent disease reduction over control. Whereas, maximum per cent disease index (24.96 %) with minimum per cent reduction (22.55 %) over control was recorded in mancozeb at 0.3 per cent concentration.

Keywords: mango, anthracnose disease, fungicides, per cent disease control

Introduction

Mango (*Mangifera indica* L.) commonly called as King of fruit, is the most important crop among the tropical and sub-tropical fruit crops belonging to the family Anacardiaceae, which is grown in more than 110 countries of the world. Although mango is considered to be a hardy plant, it is susceptible to various diseases, insect pests and physiological disorders. Among the various fungal diseases, anthracnose caused by *Colletotrichum gloeosporioides* (Penz.) Penz and Sacc. is one of the most serious disease in all mango growing regions of the world. The disease was first identified in India by McRae in 1924[4]. The pathogen causes black spot, leaf blight, blossom blight, fruit rot and in severe cases die-back (Sangeetha, 2003 [6] and Akem, 2006) [2].

To date, fungicides are the most reliable strategy to achieve effective control of anthracnose and safeguard the production in humid regions (Arauz, 2000) [3]. During recent years, the impact of fungicides and antifungal compounds has been recognized as the primary methods for reducing fungal diseases of crops. Resistance to fungicides has become a challenging problem in the management of crop diseases and has threatened the performance of some highly potent commercial fungicides. Hence, screening of fungicides to manage anthracnose disease of mango, is most essential within the reasonable limit of fungicide residues permitted by the importing countries, so as to incorporate the effective ones in the management package.
In view of the above facts, the present study was carried out to select an effective fungicide/s against anthracnose of mango under nursery.

Material and Methods

An experiment was conducted at College of Horticulture, Hiriyur, Chitradurga district, during 2015-16 in relation to manage the anthracnose disease of mango under nursery. Hiriyur is located in the central dry zone (Zone-4) of Karnataka state 13° 57.2871' N latitude, 76° 38.041' E longitude with an altitude of 598 m above mean sea level.
One year old healthy mango seedlings were selected and inoculated with fungal spore suspension (10^6-10^8 spores ml^{-1}) and leave it for 15-20 days for typical anthracnose symptom production. After the symptom production in seedlings, an experiment was laid down in a RCBD with 10 treatments of three replications (five seedlings per each treatment) with nine different systemic and contact fungicides, and a control (without the chemical spray) (table 1).

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Three sprays are conducted at 15 days interval using a hand sprayer. Observations are taken 15 days after final spray and the disease severity was scored using a 0-5 scale (table 2).

$$\text{Per cent disease index (PDI)} = \frac{\text{Sum of the individual disease ratings}}{\text{Number of leaves observed} \times \text{Maximum disease grade}} \times 100$$

(Wheeler, 1969) [8]

$$\text{Percent disease reduction over control (PDC)} = \frac{\text{PDIC}}{\text{PDIT}} \times 100$$

Where,
PDC = Per cent disease reduction over control
PDIC = PDI in control
PDIT = PDI in treatment

Details of treatments imposed for evaluation fungicides under nursery

	Treatments	Concentration (%)
T1	Propineb	0.3
T2	Carbendazim + Mancozeb	0.3
T3	Mancozeb	0.3
T4	Azoxystrobin	0.1
T5	Difenconazole	0.1
T6	Propiconazole	0.1
T7	Tebuconazole	0.1
T8	Trifloxystrobin + Tebuconazole	0.05
T9	Hexaconazole	0.1
T10	Untreated Control	-

Disease scoring or severity scale

Grade	Per cent area of infectionon leaf
0	No infection
1	Up to 5
2	6-10
3	11-20
4	21-50

Results and Discussion

The study was undertaken during 2015-16, with nine treatments and one untreated control as described in material and methods. Totally three sprays were taken at an interval of 15 days. The observations on the mango anthracnose was recorded. Further, these observations are converted into per cent disease index (PDI) using the formulae given by Wheeler (1969) [8]. The per cent disease reduction over control (PDC) was worked out. Statistically analyzed data are presented in table I and figure Ia, Ib and plate I.

Among the nine treatments, minimum per cent disease index (7.50 %) was recorded in trifloxystrobin + tebuconazole at 0.05 per cent concentration with 76.72 per cent disease reduction over control followed by tebuconazole (9.72 %) PDI with 69.84 per cent disease reduction over control and propiconazole (10.72 %) PDI with 66.73 per cent disease reduction over control at 0.1 per cent concentration while, maximum per cent disease index (24.96 %) with 22.55 per cent disease reduction over control was recorded in mancozeb at 0.3 per cent concentration. Whereas, difenconazole (14.93 %) and hexaconazole (13.29 %) were on par with each other with 53.67 per cent and 58.45 per cent disease reduction over control respectively at 0.1 per cent concentration. Similarly, propineb (21.75 %) at 0.3 per cent concentration and azoxystrobin (20.71 %) at 0.1 per cent concentration were also on par with each other with 32.51 per cent and 35.74 per cent disease reduction over control respectively. The highest PDI (32.23 %) was recorded in untreated plot.

Trifloxtstrobin + tebuconazole is a combi-product fungicide belonging to class strobilurin + triazole, which inhibits mitochondrial respiration and interfere in the sterol biosynthesis of fungi respectively. The results were in contrast with Sundravadana et al. (2007) [7] and Adhikary et al. (2013) [1] who recorded azoxystrobin was best in per cent disease reduction of anthracnose, Pushpa et al. (2015) [5] identified that, carbendazim + mancozeb (0.2 %) or carbendazim (0.1 %) or tricyclazole (0.1 %) thrice at ten days interval effectively control anthracnose of mango.

Table 1: *In vivo* evaluation of fungicides against anthracnose disease of mango in nursery sedlings

S. No	Treatments	PDI	Per cent reduction over control
1	Propineb	21.75 (27.81*	32.51
2	Carbendazim + Mancozeb	18.83 (25.73)	41.47
3	Mancozeb	24.96 (29.99)	22.55
4	Azoxystrobin	20.71 (27.08)	35.74
5	Difenconazole	14.93 (22.74)	53.67
6	Propiconazole	10.72 (19.12)	66.73
7	Tebuconazole	9.72 (18.18)	69.84
8	Trifloxystrobin + Tebuconazole	7.50 (15.90)	76.72
9	Hexaconazole	13.29 (21.39)	58.45
10	Untreated	32.23 (34.61)	-
	S.Em ±	1.54	
	C.D. at 5%	4.61	

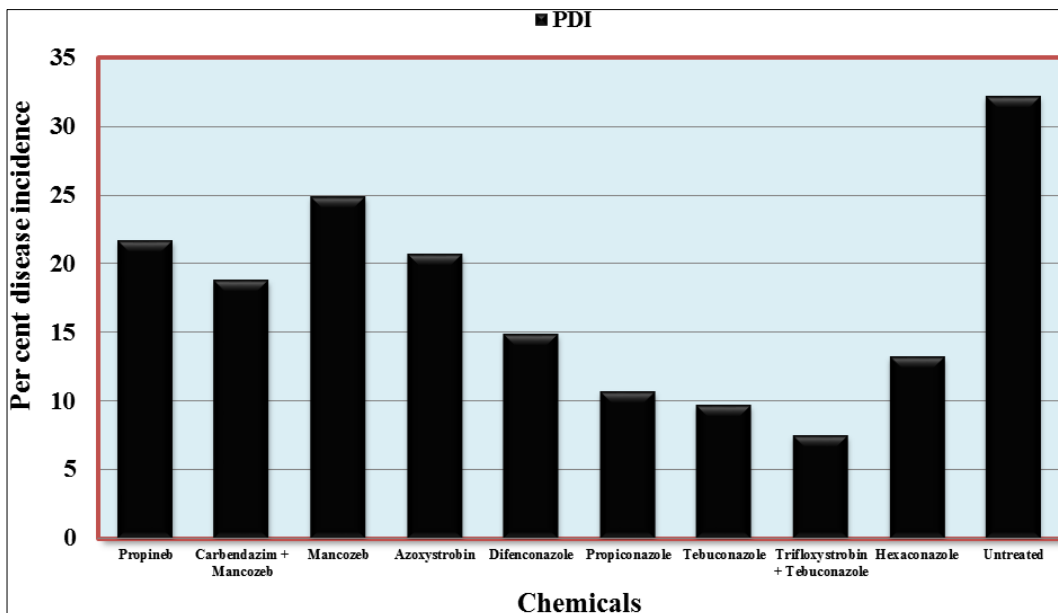***** Figures in the parentheses are Arcsine transformed values

Fig 1a: Per cent disease incidence of anthracnose disease of mango in different fungicidal treatments
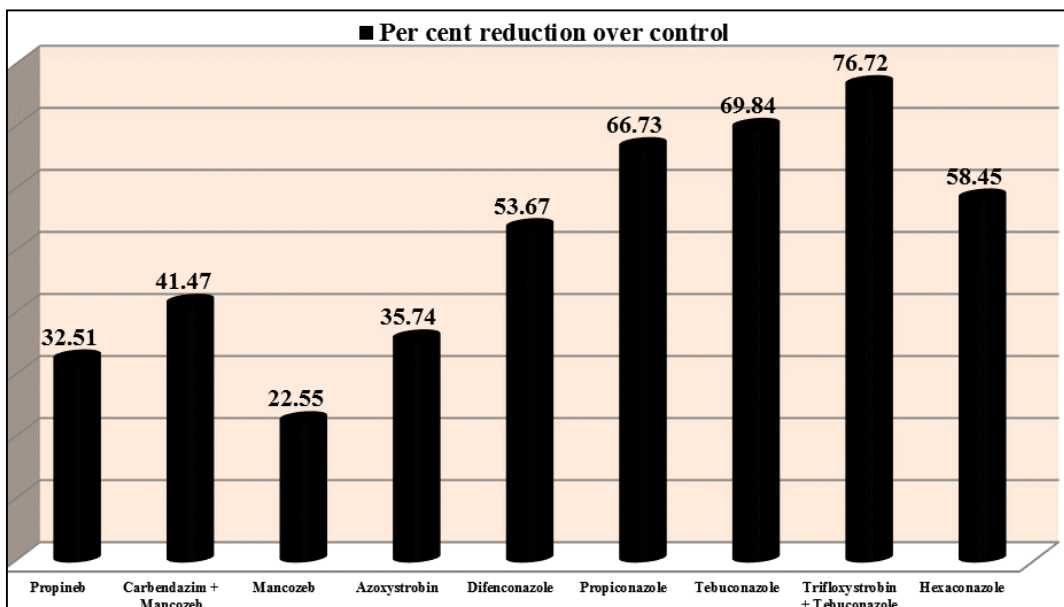

Fig Ib: Per cent reduction of anthracnose disease of mango over control in different fungicidal treatments

| T_3 – Mancozeb | T_8 - Trifloxystrobin + Tebuconazole | T_{10}-Untreated/Control |

Plate I: Evaluation of fungicides against anthracnose disease in mango seedlings

Conclusion

Fungicide treatments on mango seedlings under nursery showed to be very efficient to control anthracnose diaease and its spread to field. This applies particularly for trifloxtstrobin + tebuconazole at 0.05 per cent and tebuconazole at 0.1 per cent concentration. But, Mancozeb and propineb at 0.3 per cent concentration were less effective. The choice of product is therefore a key factor for the control of anthracnose. However, efficacy data from field testing are of great importance to make the right choice. For effective control of anthracnose in seedlings.

Acknowledgement

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