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IN VITRO EVALUATION OF FUNGICIDES AGAINST FUNGUS *Botryodiplodia theobromae*, THE CAUSE OF MANGO DECLINE IN THE PUNJAB

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ABSTRACT

Mango decline has assumed an alarming position due to increasing losses day by day in the orchards of Pakistan. The problem is intensified due to dearth of reliable information and suitable control strategies. The present studies were planned to find out effective fungicides for field application. Five fungicides viz. Topsin-M 70 WP, Crest 50 WP, Pre-cure combi 65 WP, Copxykil 50 WP (copper oxychloride) and Captan 50 WP with two doses of concentration, 50 and 100 ppm, were applied in vitro against *Botryodiplodia theobromae* by food poison technique. Colony diameter in amended petriplates was recorded after 2, 4, 6 and 8 days of inoculation. Topsin-M, Crest and Pre-cure combi proved to be the best fungicides completely suppressing the growth of *B. theobromae* at both tested concentrations while copxykil was least effective with 44.13 mm colony diameter. Topsin-M, Crest and Pre-cure combi showed 100% decrease over control at 50 and 100 ppm doses while Captan and copxykil exhibited only 26.84 and 7.8 and 35.26 and 20.2% decrease at both tested doses, respectively. The results of the present studies will be helpful to devise management strategies for the control of mango decline in the Punjab province of Pakistan.

Key words: *Mangifera indica*, inoculation, food poison, evaluation, colony diameter

INTRODUCTION

Mango (*Mangifera indica* L.) is an important fruit plant of Indo-Pak sub continent and is known to be cultivated from ages. It is the most delicious and nourishing fruit and has a special place in the world fruit market. It enjoys prime place in the list of exportable fruits being good source of foreign exchange earning for Pakistan. The mango is nutritionally rich in carbohydrates, vitamin A and C. In Pakistan, the mango is grown on an area of 99000 hectares with annual production of 1037100 tonnes (Anonymous, 2002-2003). The yield per hectare is quite low as compared to potential of our commercial varieties. To boost the production and minimize the difference, problems in mango culture are required to be redressed. Although soil and climatic conditions are suitable in Pakistan particularly in Punjab and Sindh provinces but diseases are some of the significant causes leading to its low production. Mango decline has emerged as a new threat to mango orchards of Pakistan. Losses are increasing day by day as the predisposed plants dry within days. The present situation necessitates devising suitable management strategies. In vitro evaluation of fungicides is essential to find out effective fungicides for field application. The

attempts to test fungicides against fungus *Botryodiplodia theobromae* under lab conditions are reported (Ahmad et al., 1995).

Shelar et al. (1997) examined the in vitro efficacy of seven fungicides (Aureofungin, Carbendazim, Captan, Benomyl, Mancozeb, Copper Oxychloride and Thiophanate-methyl) against *B. theobromae* using solid and liquid Richard's media. The results demonstrated that Benomyl (0.1%), Captan (0.2%), Carbendazim (0.1%), Mancozeb (0.25%) and Thiophanate-methyl (0.1%) were highly effective against *B. theobromae* in both solid and liquid media. Banik et al. (1998) observed that Carbendazim at 400 ppm completely inhibited the growth of *B. theobromae* followed by Thiophenate-methyl at 450 ppm.

The objectives of the present studies were to screen different fungicides against *B. theobromae* and find out the most suitable ones for field applications. The results of the present work will provide a base to manage quick decline of mango at farmer's fields.

MATERIALS AND METHODS

The experiment was conducted in Complete Randomized Design (CRD) with six treatments and three replications. The in vitro sensitivity of fungus *B. theobromae* to five fungicides viz. Topsin-M 70 WP, Crest 50 WP, Pre-cure Combi 65 WP, Copxykil 50 WP (copper oxychloride) and Captan 50 WP was tested by food poison technique. Two conc. (50 and 100 ppm) of each fungicide were added to Potato dextrose agar (PDA) medium at the time of pouring into 9 cm Pyrex glass Petri plates. After solidification, 5 mm discs of seven days old culture of *B. theobromae* were placed in the center of test plates and incubated at temperature 25^{o}C getting alternate 12 hr cycling of light and darkness. Data on mean colony growth of appearing colonies were recorded after 2, 4, 6 and 8 days of inoculation. Percent decrease over control for two conc. of five fungicides was calculated by the following formula:

$$\frac{\text{Treatment - control}}{\text{Control}} \times 100$$

RESULTS AND DISCUSSION

Topsin-M, Crest and Pre-cure Combi proved to be the best fungicides completely suppressing the growth of *B. theobromae* at both tested concentrations (Table 1). Copxykil exhibited least efficacy showing 5.20, 31.45, 59.90, 80.0 and 5.82, 21.5, 45.97, 75.80 mm colony diameter at 50 and 100 ppm doses after 2, 4, 6 and 8 days of study, respectively. Mean colony growth after all the days of study was 44.13 and 38.19 mm at 50 and 100 ppm doses, respectively.

Topsin-M, Crest and Pre-cure Combi showed 100% decrease over control at both concentrations while Captan and Copxykil exhibited only 26.84 and 7.8 and 35.26 and 20.2% decrease at 50 and 100 ppm, respectively (Table 1). The results are corroborated by the findings of the previous workers. Banik et al. (1998) screened different fungicides against *B. theobromae* in the lab conditions. Carbendazim at 400 ppm completely inhibited the growth of followed by Thiophenate-methyl at 450 ppm. Carbendazim and Thiophenate-methyl belong to the Benzimidazole group and show good efficacy against *B. theobromae*.

Shelar et al. (1997) evaluated the *in vitro* efficacy of seven fungicides (Aureofungin, Carbendazim, Captan, Benomyl, Mancozeb, Copper oxychloride and Thiophanate-METHYL) against *B. theobromae*, the causal agent of dieback disease of mango. Benomyl (0.1%), Captan (0.2%), Carbendazim (0.1%), Mancozeb (0.25%) and Thiophanate-methyl (0.1%) were highly effective against *B. theobromae* in both solid and liquid media.

Mahmood and Gill (2002) examined the *in vitro* effect of Topsin-M (Thiophanate-methyl), Benlate (Benomyl), Daconil (Chlorothalonil) and Cuprocuffaro (Copper oxychloride) at 10, 20, 50 and 100 ppm conc. on the mycelial growth of *B. theobromae*. Topsin-M and Benlate showed good efficacy at 20 and 100 ppm doses. Cuprocuffaro was the least effective fungicide against the fungus at all the tested concentrations. Topsin-M and two new fungicides Crest and

Precure Combi proved equally effective completely inhibiting the growth of fungus at 50 and 100 ppm conc.

Dose of 100 ppm gave better efficacy as compared to 50 ppm after all the days of study. It showed 78.20, 78.42, 75.88 and 63.20% decrease over control after 2, 4, 6 and 8 days of study (Fig. 1). Generally there was decrease in colony growth proportionately with the increase in concentration of fungicides. The use of fungicides in the laboratory vis-à-vis field depends on their in vitro efficacy at minimal, economically acceptable dosages and their efficient and rapid transport to the infection site. The results of the present studies will be helpful to devise management strategies for the control of mango decline in the Punjab province of Pakistan.

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TABLES

Table 1: *In vitro* evaluation of five fungicides against *Botryodiplodia theobromae* by food poison technique

Sr. No.	Treatment	Doses (ppm)	Colony Diameter				Mean	%decrease over control
			2days	4days	6days	8days		
1	Topsin-M	50	0	0	0	0	0	100
		100	0	0	0	0	0	100
2	Crest	50	0	0	0	0	0	100%
		100	0	0	0	0	0	100%
3	Pre-curecombi	50	0	0	0	0	0	100%
		100	0	0	0	0	0	100%
4	Captan	50	2.3	17.72	44.37	75.80	35.04	26.84%
		100	1.65	13.4	37.75	71.25	31.01	35.26%
5	Copxykil	50	5.20	31.45	59.90	80.00	44.13	7.80%
		100	5.82	21.5	45.97	75.80	38.19	20.20%
6	Control		6.15	35.80	69.90	80.00	47.90	-
	Mean		1.92	11.23	23.44	34.80	17.84	-

FIGURES

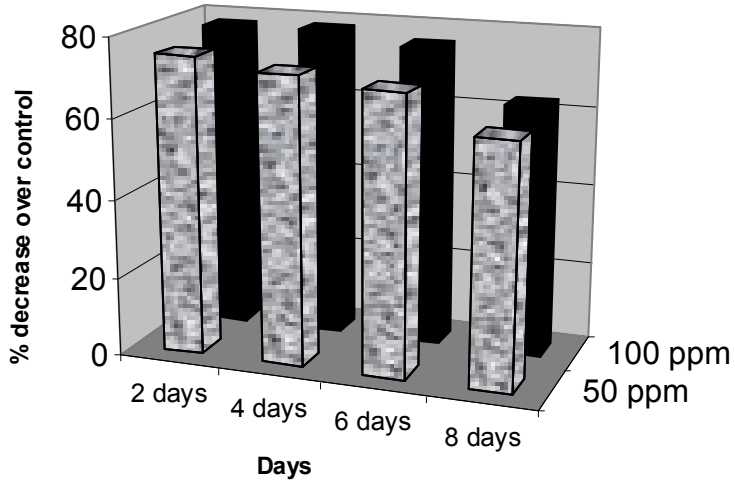

Figure 1: Effect of 50 and 100 ppm concentrations of five fungicides in inhibiting colony diameter of fungus *B. theobromae* after four study periods