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Quick Decline of Mango and *In Vitro* Response of Fungicides Against the Disease

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ABSTRACT

Diseased samples including root and bark from collar portion of the quick decline affected mango plants were collected from Punjab. *Fusarium oxysporum* and *F. solani* were isolated from the root samples of old diseased plants; whereas, freshly affected plants yielded *Fusarium* sp. in lower frequency. *Botryodiplodia theobromae* was isolated from the bark samples. Inoculations with pure culture of *B. theobromae* to the mango seedlings caused 86.7% mortality, which confirmed the cause of quick decline. *In vitro* effect of fungicides on the mycelial growth of *B. theobromae* revealed Topsin-M and Benlate to be effective even at 20 ppm and 100 ppm, respectively. Cuprocuffaro was the least effective fungicide against the fungus at all concentrations.

Key Words: Mango (*Mangifera indica*); Pathogenicity; Fungicides; Control

INTRODUCTION

Mango (*Mangifera indica* L.) is one of the most important fruits of Pakistan and is grown on an area of 93.5 thousand hectares with an annual production of 916.4 thousand tones. In Punjab, its area is about 48.8 thousand ha, which is 45.6% of the total mango fruit area of Pakistan (Anonymous, 1999). Mango plant is subject to attack of a number of diseases like malformation, anthracnose, powdery mildew, die back and bacterial spots. During the recent years, mango plants are facing a malady, which has not been reported previously from Punjab, Pakistan. There is sudden collapse of healthy plants within days keeping leaves in contact but droop down and the bark of the infected plants get rotten. On removal of affected bark, a thick liquid with foul smell ooze out. Initially a portion of the bark is affected and gradually the whole bark near collar portion is rotten thus causing plant collapse.

The present studies were undertaken to investigate the cause of this disease and evaluate some toxicants against the pathogen under *in vitro* conditions.

MATERIALS AND METHODS

A survey in five districts *viz.* Jhang, Khanewal, Multan, Lodhran and T.T. Singh was conducted and diseased samples including roots and bark from collar portion were collected for the isolations of the associated pathogen(s). Isolations were made on Potato Dextrose Agar medium (PDA) and filter paper method. Samples collected from different locations were processed separately. The fungi isolated were identified with the help of keys (Booth, 1977; Neergaard, 1979). All the organisms were maintained on PDA for further studies.

Isolations. The infected roots and bark samples were passed through the process of isolation as described by Pathak (1987). Three layers of well moistened filter papers in plastic petri-dishes and PDA medium (Saleem & Nasir, 1991) were used during this process. All the petri-plates were incubated at 24±1°C for seven days for the isolation of fungi.

Pathogenicity. To test the pathogenicity of the organisms isolated from the samples, mango seedlings (8-10") were transplanted in 12" earthen pots. When the seedlings reached about one feet height, a 2.5 cm portion near the crown area of each seedling was injured and inoculated with 8-10 days old culture of *Botryodiplodia theobromae* and wrapped with scotch tape to keep the culture in contact with the plant. The inoculated plants were kept in the wire house under natural environmental conditions. There were three replications of the experiment each containing five plants. Seedling mortality data were recorded daily upto 60 days. Re-isolations from the dried seedlings yielded the same fungus, which confirmed the pathogenicity.

To test the *in vitro* efficacy of fungicides; Topsin-M, Benlate, Daconil and Cuprocuffaro at 10, 20, 50 and 100 ppm concentrations were added to the autoclaved PDA medium. Agar discs obtained with the help of sterilized cork borer (6 mm) from one-week old culture of *B. theorbromae* were placed in the centre of each dish. Petri-dishes without fungicides served as control and incubated at 24±1°C till the control treatments were fully covered with the fungus mycelium. The experiment was conducted in Completely Randomized Design (CRD) and there were four replications for each treatment. Data on the mycelial growth of *B. theobromae* were recorded.

RESULTS AND DISCUSSION

Out of 77 samples taken from the diseased plants including roots and bark collected from five districts of the Punjab, *B. theobromae* was most commonly isolated from

the bark of the collar portion (Table I). While *Fusarium solani* and *F. oxysporum* were isolated from roots of the old affected plants where as fresh affected plants yielded *Fusarium* sp. in lower frequency. Out of 23 samples collected from Multan, 90% bark samples yielded *B. theobromae*. Similarly, the same fungus was isolated from 85 and 70% samples from Jhang and Lodhran, respectively. However, infected samples taken from Muzaffar Garh and T.T. Singh, both gave 69% *B. theobromae*. Thus, the isolation frequency was ranging from 69 to 90%. Rodriguez *et al.* (1999) recorded the incidence of this pathogen on 5118 ha of mango in Piura area of Peru and reported that this pathogen was detected most commonly in all evaluated areas, which was potentially damaging to mango plants in the area studied.

It was observed that with the inoculations of *B. theobromae,* symptoms of the disease started appearing after 36-45 days. Inoculated plants showed 86.7% mortality, while un-inoculated plants remained healthy (Table II).

Table I. Frequency of *B. theobromae* isolations from bark samples collected from infected plants under different locations

Location	No. of samples	Frequency of *B. theobromae* isolations from bark (%)
Jhang	16	85
Multan	23	90
Muzaffar Garh	13	69
T.T.Singh	15	69
Lodhran	10	70

Table II. Pathogenicity test of quick decline of mango with *B. theobromae*

Treatment	Total seedlings	No. of seedling died	Mortality
Inoculated	15	13	86.7
Uninoculated	15	0	0

The effectiveness of the test fungicides in reducing the mycelial growth of *B. theobromae* varied greatly (Table III). Benlate at 100 ppm while Topsin-M even at 20 ppm completely inhibited the colony growth of *B. theobromae*. There was little fungal growth in Benlate when applied @ 10 and 20 ppm. Daconil was intermediate; whereas, Cuprocaffaro least effective in all concentrations in retarding the colony growth of the fungus. Shelar *et al.* (1997) studied the *in vitro* effectiveness of fungicides against *B. theobromae* and reported that thiophanate-methyl (0.1%) and benomyl (0.1%) can completely suppress the growth of the fungus. Banik *et al.* (1998) found that carbandezim at 400 ppm completely inhibited the linear growth of *B. theobromae* followed by thiophanate-methyl at 450 ppm.

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Table III. Effect of fungicides at four concentrations on the growth of *B. theobromae* on potato dextrose agar medium at 24±1°C

Fungicides	10 ppm		20 ppm		50 ppm		100 ppm	
	Colony diameter (mm)	Per cent decrease over control	Colony diameter (mm)	Per cent decrease over control	Colony diameter (mm)	Per cent decrease over control	Colony diameter (mm)	Per cent decrease over control
Benlate	7.5 h	91.66	5.5 hi	93.88	2.5 ij	97.22	0.0 j	100
Topsin-M	3.5 ij	96.11	1.0 j	98.88	0.0 j	100	0.0 j	100
Daconil	39.5 d	56.11	25.0 e	72.22	14.25 g	88.44	5.0 hi	94.44
Cuprocaffaro	53.0 b	41.11	45.5 c	49.44	18.0 f	80	5.0 hi	94.44
Control	90 a		90 a		90 a		90 a	