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In Vitro Evaluation of Fungicides and Botanicals against Black Banded Disease of Mango incited by *Peziotrichum corticolum* (*Rhinocladium corticolum*) (Massee) Subramanian

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A B S T R A C T

In an *in vitro* experiment, five fungicides *viz.*, Mancozeb 75 % WP, Copper oxychloride 50% WP, Bordeaux mixture (1.0%), Sulphur80% WP, Difenoconazole 25% EC and Thiophanate methyl 70% WP were evaluated against tested pathogen at different concentration. Three botanicals viz., *Azadirachta indica, Lantana camara* and *Polyalthia longifolia* were tested against *P. corticolum* at 10 per cent concentration. Among different fungicides, all the fungicides were statistically inhibited (100%) the mycelial growth of pathogen except Copper oxychloride 50% WP and Sulphur 80%WP. Extract of *Azadirachta indica* shows maximum inhibition against tested pathogen which was recorded 55.55 per cent growth inhibition and it was followed by *Lantana camara* (48.15%) and *Polyalthia longifolia* (46.66%).

Introduction

Mango (*Mangifera indica L.*) belongs to family Anacardaceae is known as "King of fruits" and nectar of God being most palatable and rich in sugar, organic acids and minerals and thus captures great demand for all walks of life (Azhar *et al.*, 2007). India has a rich wealth of mango germplasm with more than 1000 varieties grown throughout the length and breadth of the country. However, only about 21 of them like Alphonso, Banganpally, Chausa, Dashehri, Langra, Totapuri and Kesar are commercially cultivated in different mango growing regions (Yadav, 1997). Among them Alphonso tops the list and is used as one of the choicest and prime variety of India grown along the west coast of India in Maharashtra, Gujarat, Goa and Karnataka which has alone share of over 80 % in total

mango export (Burondkar *et al.*, 2009). The Konkan region comprising of Palghar, Thane, Raigad, Ratnagiri and Sindhudurg districts is famous for the quality mangoes. About 90 percent area under mango in the region is occupied by single cultivar "Alphonso" which is locally called as "Hapus" It thrives and yields best under warm and humid climate of the region and is the best variety for table and processing purpose.

Although India is the largest producer of mango, the productivity is low. This may be due to the diverse climatic conditions in which the mango is cultivated throughout the country. So far, 140 diseases of mango have been reported throughout the world. The diseases such as pink disease, black banded disease and die back are location specific or area specific diseases which are posing an emerging threat to mango orchards particularly in humid tropics. These diseases were reported from few pockets earlier but very meager research work has been done on these diseases as these diseases were considered as minor diseases. In present era of climate change and its impact on human affairs and particularly on crop production, these diseases will be of prime importance in due course of time.

The damage caused to the plants due such diseases is a gradual process but it consequently leads to death of the plants and that too in their maximum bearing phase. Black banded disease commonly occurs in monsoon season especially on the matured branches of 20-30 years old mango plants. The disease is being observed in serious proportions in the coastal belt of the region since the last three to four years

Materials and Methods

All the materials required for present research programme were facilitated by Department of Plant Pathology, Dr. BSKKV., Dapoli and standard methods were used as per the reference of scientific research methodology.

Evaluation of fungicides

The efficacy of six fungicides was tested against *P. corticolum* by poisoned food technique. PDA was used as a basal medium.

Six fungicides were tested against the pathogen by poisoned food technique (PFT) as described by Nene and Thapliyal (1979). Potato dextrose agar (PDA) was used as basal medium and distributed in 100 ml aliquots in each 250 ml Erlenmeyer conical flasks, which were sterilized at 1.054 kg/cm^{2}pressure for 20 minutes. The quantity of every fungicide was calculated for 100 ml medium separately. The weighed quantity of each fungicide was added in lukewarm PDA at 40$\pm$2 ^{0}C, mixed thoroughly and poured into sterilized petri plates and allowed to solidify. The mycelial discs of 5mm diameter were cut from 10 days old culture with the help of a sterile cork borer. A single disc was transferred aseptically to the centre of each plate already poured with poisoned medium. PDA plates without fungicide but inoculated with fungal culture, served as control. The plates were incubated at room temperature (27$\pm$1^{0}C) Three replication per treatment were maintained. The observations on colony diameter were recorded when Petri Plates in control treatment were fully covered with mycelial growth.

Per cent inhibition of growth of the test fungus was calculated by the following formula (Horsfall, 1956)

$$X = \frac{Y-Z}{Y} \times 100$$

Where,

X = Per cent inhibition of mycelium

Y = Growth of mycelium in control

Z = Radial growth of mycelium in treatment

Evaluation of botanicals

The effect of plant extracts on myceliaI growth was studied by Poisoned Food Technique (Nene and Thapliya, 1993). The principle involved in this technique is to poison the nutrient medium with fungi-toxicant and allowing the fungus to grow on it. The potato dextrose agar medium was used as a basal medium. The methodology was same as a mentioned below in the evaluation of fungicides point.

Preparation of aliquot

One hundred gram fresh plant material was weighed and thoroughly washed with tap water followed by sterilized water. The plant material was then homogenized in sterile distilled water 1 ml/g of tissues with a pestle and mortar.

The crude material was then expressed through double-layered muslin cloth and was centrifuged in a centrifuge machine at 5000 rpm for 20 minutes. After centrifugation, the supernatant was taken and pellets were discarded avoid bacterial contamination. This formed the standard plant extract solution (100 per cent).

Results and Discussion

Effect of fungicides on *P. corticolum*

The data depicted in Table 1 revealed that, among the six fungicides comprising four contact and two systemic fungicides, two contact fungicides *viz.*, Mancozeb 75 % WP(0.25%) and Bordeaux mixture (1%) as well as both systemic fungicides (Difenoconazole 25% EC and Thiophanate methyl 70% WP) were completely inhibited the growth of the pathogen in solid medium. They were followed by COC with 33.33 per cent and Sulphur with 18.52 per cent inhibition of the mycelial growth. Gautam*et al.*, (2017) tested 5 contact fungicides, 3 combination fungicides and 3 systemic fungicides against the pathogen and found that Bordeaux mixture, Mancozeb, and COC completely inhibited the mycelial growth. These results are in concurrence with the present findings in respect of Bordeaux mixture and Mancozeb but contradictory in terms of COC.

They also reported that, Difenoconazole is less effective as compared to former fungicides. This is in contradiction with the results of this study as Difenconazole was found to be as effective as Bordeaux mixture and Mancozeb. Venkateswarlu (1989) reported Bordeaux mixture as the best fungicide for control of black banded disease under field conditions. His conclusion is in conformity with present findings.

Effect of botanicals against *P. corticolum*

The aqueous extracts of three plant species were tested against *P. corticolum* to exploit their antifungal properties. All the plant extracts were tested at 10 per cent concentration by using poisoned food technique.

All the three plant extracts were effective against the pathogen and statistically at par with each other (Table 2). However, extract of *A. indica* was numerically superior to the other two extracts. Gautam *et al.*, (2017) reported 11.11 per cent inhibition by using neem leaf extract. The results of Gautam *et al.*, (2017) are remarkably diverging from the results of this study.

Table.1 Effect of different fungicides against *P. corticolum*

Tr. No.	Treatment Detail	Per cent disease incidence		
		Conc. (%)	Mean colony diameter (mm)	Per cent inhibition over control
T_1	Mancozeb 75 % WP	0.25	00.00	100
T_2	Copper oxychloride 50% WP	0.25	60.00	33.33
T_3	Bordeaux mixture	1	00.00	100
T_4	Sulphur	0.25	73.33	18.52
T_5	Difenoconazole 25% EC	0.1	00.00	100
T_6	Thiophanate methyl 70 % WP	0.1	00.00	100
T_7	Control	--	90.00	--
S. Em. ±		1.67		
C.D. at 1%		7.01		

Table.2 Effect of different botanicals against *P. corticolum*

Tr. No.	Treatments	Conc. (%)	Mean colony diameter (mm)	Per cent inhibition over control
T1	*Azadirachta indica*	10	40.00	55.55
T2	*Lantana camara*	10	46.66	48.15
T3	*Polyalthia longifolia*	10	48.33	46.66
T4	Control	-	90.00	-
S. Em. ±		1.86		
C.D. at 1%		8.84		

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