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Bio-effectors for management of grey leaf blight disease on mango

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Abstract

Mango is one of the important fruit crops grown extensively in Gujarat which was found severely affected by grey leaf blight disease at Horticulture farm of Navsari Agricultural University, Navsari. Looking to disease severity, present investigation was carried out to study the biological management measures against the disease in order to minimize the crop losses. The promising antagonists were studied under greenhouse condition on cv. Kesar. Among them *P. fluorescens*, *T. viride* and *T. harzianum* were found promising as potential biological control agents against grey leaf blight of mango.

Keywords: Mango, antagonists, *Pestalotia anacardii*, grey leaf blight

Introduction

Mango is known as king of fruits not only in the Indian sub-continent but also the world over. Botanically, mango belongs to the genus *Mangifera* which finds its origin in South-East Asia and Indo-Myanmar regions. The genus, *Mangifera* comprises of 41 species (Mukherjee, 1985), however total reported species now stands at 39 (Mukherjee and Stolon, 1989). All the edible cultivars of mango represent the species *indica* which originated in the Indian sub-continent. Looking to the seriousness of the disease and economic importance of the crop in this area, present investigations were undertaken to study the behaviour of the disease and to generate necessary information for suitable biological management measures to minimize crop losses.

Materials and Methods

Eight known antagonists viz., *Trichoderma viride* Pers.Fr (Navsari isolate), *Trichoderma harzianum* Rifai (Navsari isolate), *Trichoderma longibrachyatum* (Pune isolate), *Aspergillus niger* (IARI isolate), *Pseudomonas fluorescens* (Navsari isolate), *Pseudomonas aeruginosa* (Waghai isolate), *Chaetomium globosum* Kunze (IARI isolate) and *Bacillus subtilis* Ell. (Navsari isolate) were tested by dual culture technique (Dennis and Webster, 1971) [2], pathogen at periphery (Asalmol *et al.*, 1990) [1] and pathogen at centre (Asalmol *et al.*, 1990) [1] methods *in vitro* against *P. anacardii*.

On the basis of good performance of fungal and bacterial antagonists under *in vitro* condition, effective antagonists were evaluated in the pot trial against grey leaf blight of mango under green house. Variety Kesar was used for the study. Five treatments of effective antagonists with one check were laid out in completely randomized design. One year healthy mango seedlings with 8-10 leaves were selected and inoculated with *P. anacardii* @ 2×10^6 spores/ml by pin pricking method in *in vitro* condition. There were three repetitions. Seven days after inoculation of the pathogen and its successful development, then the antagonists viz., *Trichoderma viride* Pers.Fr (Navsari isolate), *Trichoderma harzianum* Rifai (Navsari isolate), *Bacillus subtilis* Ell. (Navsari isolate), *Pseudomonas fluorescens* (Navsari isolate) and *Pseudomonas aeruginosa* (Waghai isolate) were sprayed @ 2×10^8 cfu/ml each separately. Observations on per cent disease intensity (PDI) were recorded at seven days interval after application of antagonists and disease ratings were recorded on the basis of grade scale (0-5) given by Patel (1988) [7] mentioned as follows

Scale Description
0 : Completely healthy – No spots
1 : 1 to 10 per cent area of leaf infected
2 : 11 to 25 per cent area of leaf infected
3 : 26 to 50 per cent area of leaf infected
4 : 51 to 75 per cent area of leaf infected
5 : More than 75 per cent area of leaf infected and defoliation

$$PDI = \frac{\sum \text{Ratings of infected leaves observed}}{\text{No. of leaves observed} \times \text{Maximum disease score}} \times 100$$

The data were analyzed, interpreted and the per cent disease control was worked out.

Fungal and bacterial antagonists were studied under greenhouse condition, in the pots against grey leaf blight of mango on cv. Kesar.

Results and Discussion

The hazardous effect of chemicals used in plant disease management has diverted plant pathologists to find out the alternative method with little or no adverse effect on environment. Notable success of disease control through use of antagonistic microorganisms in the laboratory, green house and field had been achieved during past several years and based on this information; there is a possibility of developing biological control of plant disease under field conditions. Antagonists viz., *Trichoderma viride*, *T. harzianum*, *T. longibrachyatum*, *Aspergillus niger*, *Pseudomonas*

fluorescens, *P. aeruginosa*, *Chaetomium globosum* and *Bacillus subtilis* were tested by three different methods *in vitro* for their antagonism against *P. anacardii*. Among them best antagonists viz. *P. fluorescens*, *T. viride*, *T. harzianum*, *P. aeruginosa* and *B. subtilis* were checked their antagonism of one year old mango seedlings under green house condition. The results presented in Table- 1, revealed that all the antagonists studied in pot culture against *P. anacardii* causing grey leaf blight of mango were found significantly superior over control. Among them minimum per cent disease intensity was observed in *P. fluorescens* (11.24%) followed by *T. viride* (14.21%), *T. harzianum* (21.12%), *P. aeruginosa* (26.13%) and *B. subtilis* (29.89%). Maximum per cent disease control (74.07%) was observed in *P. fluorescens*, which was found superior over rest of the treatments. Next best antagonist in order was *T. viride* (67.21%) followed by *T. harzianum* (51.27%). *P. aeruginosa* (39.71%) was found to be moderately effective whereas, *B. subtilis* (31.03%) was least effective against grey leaf blight disease as compared to rest of the treatments.

Table 1: Effect of antagonists against *Pestalotia anacardii* under greenhouse condition

Sr. No.	Test organism	Per cent disease intensity	Per cent disease control
2	<i>Trichoderma harzianum</i> Rifai (Navsari isolate)	27.34 (21.12)	51.27
3	<i>Bacillus subtilis</i> Ell. (Navsari isolate)	33.13 (29.89)	31.03
4	<i>Pseudomonas fluorescens</i> (Navsari isolate)	19.56 (11.24)	74.07
5	<i>Pseudomonas aeruginosa</i> (Waghai isolate)	30.73 (26.13)	39.71
6	Control (only <i>P. anacardii</i> inoculation)	41.16 (43.34)	-
	S.Em. ±	0.55	
	C.D. at 5%	1.68	
	C.V. %	3.25	

* Figures indicate arcsin transformed values ** Figures in parenthesis are original values

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It clearly indicated effectiveness of *P. fluorescens*, *T. viride* and *T. harzianum* against *P. anacardii* and can be promising potential biological control agents.

The results are in close line with Ping *et al.* (2007) [8] and Karthikeyan *et al.* (2002) [3], wherein they observed antagonistic effect *Trichoderma* sp. against *Pestalotiopsis* sp. isolated from pine tree and coconut respectively. Also Sanjay *et al.* (2008) [9] reported biocontrol agents such as *Trichoderma* sp. and *Pseudomonas* sp. most inhibitory against *Pestalotiopsis* spp. causing grey blight disease of tea in nurseries. Whereas the present results are in controversy with the results of Okigbo and Osuinde (2003) [6], in which they found that *B. subtilis* NCIB 3610 considerably reduced the disease symptoms on mango produced by *Pestalotiopsis mangiferae*.

Conclusion

Fungal and bacterial antagonists were studied under greenhouse condition in pot against grey leaf blight disease of mango on cv. Kesar. Among all the antagonists screened against *P. anacardii* causing grey leaf blight disease of mango, *P. fluorescens*, *T. viride* and *T. harzianum* were found to be promising as potential biological control agents.

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