Effect of plant products on the mycelial growth and conidial germination of *Colletotrichum gloeosporioides* causing anthracnose disease of mango fruits

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Abstract : The effect of plant extracts on the mycelial growth and conidial germination of *Colletotrichum gloeosporioides* causing anthracnose disease of mango fruits tested under *in vitro* conditions. Twenty six plant extracts belonging to 21 families were tested for the effect on mycelial growth and conidial germination of the pathogen. The plant extracts *of Adenocalyma alleaceum and Bougainvillea spectabilis* were most effective in inhibiting the mycelial growth completely upto tenth day. The conidial germination was recorded at different intervals upto 24 h. As observed in mycelial growth there was no conidial germination in *Adenocalyma alleaceum and Bougainvillea spectabilis.*

Key words : Mango, anthracnose, biocontrol, plant products.

Introduction

Mango (Mangifera indica L.) is a major fruit crop in India and other tropical countries. In India, twenty different genera of fungi are known to attack mango fruits during post harvest handling (Pathak, 1980) of which anthracnose caused by *Colletotrichum gloeosporioides* was the most important one (Snowdon, 1990). Anthracnose has been reported to cause heavy damage in mango to the extent of 6.0 to 15.0 per cent in different parts of India. (Tandon, 1967). Fungicides are primary means of controlling post harvest diseases and they have recently come under special scrutiny as posing potential oncogenic risks when applied to processed foods. Biological control offers an alternative for the chemical control of post harvest diseases of fruits which includes use of plant products and antagonistic organisms. Keeping this in view, the present study was taken up to find out effective plant products for the management of mango anthracnose.

Materials and Methods

Efficacy of plant extracts

Twenty six plant extracts were collected for evaluating their antifungal activities against C *gloeosporioides* both for spore germination and mycelial growth at Plant Pathology lab, TNAU. Among them, two species found effective were selected and used for further studies.

Preparation of plant extracts (Cold water extract)

Fresh leaf / fruit / flower materials of plant species were used for extraction. They were first washed with distilled water, then ground in a pestle and mortar by adding sterile water at the rate of 1:1 W/V and filtered through muslin cloth. This formed the standard plant extract solution (100%). The above extracts were diluted to 10 per cent by adding sterile water. The plant extracts so prepared were heated to 40-50°C for 10 min. to avoid contamination (Jagannathan and Narasimhan, 1987).

Effect of plant extracts on mycelial growth

The inhibitory effect of the plant extracts on mycelial growth was assayed by poisoned food technique (Bagchi and Das, 1968).

Effect of plant extracts on conidial germination

The conidia of the pathogen used in the study were harvested separately by flooding with sterile water and scrapping the culture with a glass rod (Montgomery and Moore, 1938).

Results and Discussion

Several plant products were found to inhibit the growth of pathogens hence an experiment was conducted to screen the plant products against *C. gloeosporioides.* Twenty six plant extracts belonging to 21 families were tested for the mycelial growth and conidial germination of the pathogen.

All the plant products tested reduced the mycelial growth significantly compared to control (Table 1). Among them three were highly effective

(more than 75 per cent reduction) two were effective (50 to 75 per cent reduction) twelve were moderately effective (25 to 50 per cent reduction) and nine were less effective (0 to 25 per cent reduction). The two plant extracts *Adenocalyma alleaceum* and *Bougainvillea spectabilis* were most effective and inhibited the mycelial growth completely till the tenth day. While in *Piper cubabe* the mycelial growth was inhibited till the sixth day. The growth was completely inhibited upto 4 days in the plant extracts *Abutilon indicum, Acalypha indica, Agiratum coninjoides, Allium cepa* (leaf), *Boerhaavia diffusa, Ocimum sanctum, Terminalia cephula* and *Tridax procumbens.*

The effect of plant extracts on the conidial germination of C *gloeoyporioides was* studied at different intervals and the results are presented in (Table 2) The data show that all the plant extracts tested significantly reduced the conidial germination over control. The conidial germination was recorded at different intervals upto 24 h. As observed in mycelial growth there was no conidial germination in *Adenocalyma alleaceum and Bougainvillea spectabilis The Piper cutbabe* extract followed the above two extracts in inhibiting the conidial germination.

Among the twenty six plant extracts screened against *C. gloeosporioides, Adenocalyma alleaceum* and *Bougainvillea spectabilis* were very effective in controlling the growth, conidial germination and disease development. Several workers have shown the possibility of controlling the post harvest diseases using plant products. Ark and Thompson (1959) effectively protected the peaches from brown rot caused by *Monilinia fructicola*

Table 1. Effect of plant extracts on the mycelial growth of *C. gloeosporioides*

Plant extracts	Radial mycelial growth (mm)*				Per cent reduction over control
	Incubation period (days)				
	4	6	8	10	
Abutilon indicum (leaf)	0.0^{i}	17^{j}	40^{k}	55^{lm}	37.37
Acalypha indica (leaf)	0.0^{i}	10^{l}	37^{m}	52^{n}	41.11
Adenocalyma alleaceum (leaf)	00^{i}	0.0^{n}	0.0^{s}	00^{t}	100.0
Aegle marmelous (leaf)	00^{i}	12^{m}	24^{p}	39^{q}	55.41
Agiratum coninjoides (leaf)	00^{i}	18^{l}	41^{j}	56^{l}	36.58
Allium cepa (leaf)	00^{i}	10^{n}	22^{q}	31^{r}	65.23
Anderographis paniculatus (leaf)	09^{h}	19^{h}	46^{l}	57^{k}	34.99
Azadirachta indica (leaf)	20^{i}	31^{e}	64^{e}	83^{e}	6.00
Azadirachta indica (seed)	12^{g}	27^{g}	51^{h}	64^{l}	27.52
Boerhaavia diffusa (leaf)	00^{i}	16^{k}	40^{k}	55^{m}	38.05
Bougainvillea spectabilis (leaf)	00^{i}	00^{o}	00^{s}	00^{t}	100.00
Casuarina equisetifolia (leaf)	13^{g}	30^{d}	52^{fg}	69^{f}	21.55
Catheranthus roseus (leaf)	19^{d}	31^{e}	61^{d}	77^{d}	12.80
Catheranthus roseus (flower)	12^{fg}	28^{e}	53^{f}	66^{g}	24.92
Eucalyptus globulus (leaf)	24^{ab}	38^{a}	67^{ab}	86^{d}	1.81
Ipomea cornea (leaf)	15^{e}	29^{e}	55^{e}	72^{e}	18.80
Lawsonia alba (leaf)	12^{fg}	28^{f}	51^{gh}	65^{h}	26.39
Mirabilis jalaba (leaf)	10^{h}	24^{g}	52^{gh}	63^{l}	28.99
Nerium odorum (leaf)	00^{i}	17^{j}	38^{n}	56^{lm}	36.58
Ocinum sanctum (leaf)	00^{i}	00^{o}	12^{r}	21^{s}	75.88
Piper cubabe (fruit)	23^{b}	37^{a}	66^{b}	86^{d}	1.81
Prosopis juliflora (leaf)	00^{i}	16^{k}	35^{o}	51^{o}	42.58
Terminalia chebula (fruit)	00^{i}	14^{l}	32^{o}	46^{b}	47.59
Tridax procumbens (leaf)	18^{d}	32^{c}	60^{d}	76^{d}	13.59
Vitex negundo (leaf)	21^{c}	33^{b}	64^{e}	83^{r}	5.66
Zizyphus jujuba (leaf)	25^{a}	38^{a}	68^{a}	88^{a}	-
Control					

* Mean of three replications

In a column, means followed by a common letter are not significantly different at the 5% level by DMRT

ible 2. Effect of plant extracts on the mycelial growth of *C. gloeosporioides*

Plant extracts	Conidial germination (%)				Per cent reduction over control
	Incubation period (h)				
	6	12	18	24	
butilon indicum	10.00 (18.43)[b]	27.33 (31.52)[f]	46.33 (42.90)	55.00 (47.87)[b]	17.97
calypha indica	7.33 (15.71)[d]	25.00 (30.00)[i]	43.67 (41.36)	52.67 (46.53)[b]	40.60
denocalyma alleaceum	0.00 (3.18)[i]	0.00 (3.18)[n]	0.00 (3.18)	0.00 (3.18)[b]	100.00
egle marmelous	4.00 (11.54)[g]	15.67 (23.32)[l]	37.00 (37.46)	44.00 (41.55)[b]	50.38
giratum coninjoides	7.67 (16.08)[d]	40.33 (39.42)[f]	59.67 (50.58)	67.33 (55.14)[b]	24.07
llium cepa	3.00 (9.97)[h]	12.67 (20.85)[hk]	33.33 (35.26)	40.00 (39.23)[b]	54.89
nderographis paniculatus	7.33 (15.71)[d]	25.00 (30.00)[l]	56.33 (48.64)	68.33 (55.75)[b]	22.94
zadirachta indica	10.00 (10.43)[h]	48.33 (44.04)[c]	70.33 (57.01)	84.00 (66.42)[b]	5.27
zadirachta indica	7.00 (15.34)[d]	42.33 (40.59)[b]	59.67 (50.58)	67.67 (55.35)[b]	23.68
'oerhaavia diffusa	6.00 (14.18)[ef]	36.67 (37.27)[g]	49.33 (44.62)	53.67 (47.10)[b]	39.47
'ougainvillea spectabilis	0.00 (3.18)[i]	0.00 (3.18)[n]	0.00 (3.18)	0.00 (3.18)[b]	100.00
'asuarina equisetifolia	10.33 (18.75)[b]	46.00 (42.71)[d]	59.67 (49.01)	69.33 (56.37)[b]	21.81
'atheranthus roseus	9.33 (17.79)[bc]	48.33 (44.04)[b]	70.00 (56.79)	85.33 (67.48)[b]	3.77
'atheranthus roseus	10.67 (19.07)[ab]	35.67 (36.67)[b]	58.00 (49.60)	66.00 (54.33)[b]	25.57
'ucalyptus globulus	11.00 (19.37)[a]	51.33 (45.76)[b]	70.00 (56.79)	86.67 (68.57)[b]	2.26
pomea cornea	8.33 (16.78)[c]	45.67 (45.52)[b]	64.33 (53.33)	73.33 (58.91)[b]	17.30
'awsonia alba	6.67 (14.97)[e]	45.67 (45.52)[b]	63.33 (52.73)	70.33 (57.61)[b]	20.68
Mirabilis jalaba	7.67 (16.08)[b]	46.67 (43.09)[b]	64.00 (53.13)	72.00 (58.05)[b]	18.80
Nerium odorum	4.67 (12.48)[b]	40.00 (39.23)[f]	60.00 (50.77)	66.33 (54.53)[b]	25.20
Ocinum sanctum	5.33 (13.35)[b]	28.00 (31.95)[k]	46.00 (42.71)	58.00 (49.60)[b]	34.59

contd...

Table 2 continues...

Plant extracts	Conidial germination (%)				Per cent reduction over control
	Incubation period (h)				
	6	12	18	24	
Piper cubabe	2.33 (8.78)[b]	10.00 (18.43)[b]	24.33 (29.55)	28.00 (31.95)[b]	68.42
Prosopis juliflora	11.00 (19.37)[b]	50.33 (45.19)[b]	70.00 (56.79)	85.33 (67.48)[b]	3.77
Terminalia chebula	8.67 (17.12)[b]	30.00 (33.21)[b]	48.67 (44.24)	52.33 (46.33)[b]	40.98
Tridax procumbens	8.00 (16.43)[b]	22.00 (27.97)[b]	39.00 (38.65)	48.67 (44.24)[b]	45.11
Vitex negundo	8.67 (17.12)[b]	46.67 (43.09)[b]	67.00 (54.94)	80.67 (63.92)[b]	9.02
Zizyphus jujuba	10.33 (18.75)[b]	49.67 (44.81)[b]	69.00 (56.17)	84.33 (66.68)[b]	4.90
Control	11.67 (19.98)[b]	52.33 (46.34)[b]	82.67 (65.41)	88.67 (70.33)[b]	

* Mean of three replications
In a column, means followed by a common letter are not significantly different at the 5% level by DMRT
The values in the parentheses are arcsine transformed values.

with deodorized garlic preparations. Sholberg and Shimizu (1991) reported the decay inhibition in strawberry and peach fruit by hinokitol, an antifungal compound derived from the trunk of Japanase cypress. Ghaouth and Wilson (1995) screened the 300 species of plants belonging to 43 families against *Bollytis cinerea*, among them five per cent showed fungicidal activity.

Conclusion

Among the twenty six plant extracts screened against *C. gloeosporioides, Adenocalyma alleaceum* and *Bougainvillea spectabilis* were very effective in controlling the growth and conidial germination.

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