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# Antimycotic effect of certain plant extracts against mycelial growth and fruit infection caused by *Colletotrichum* musae, *Botryodiplodia theobromae* and *Fusarium solani* in Banana

**P Renganathan and KR Saravanan**

**Abstract**
The results of *in vitro* experiment revealed that the maximum inhibition observed in the leaf extract of Ocimum (10%) exerted respectively 82.22 and 80.00 per cent mycelial growth with C. *musae* and *B. theobromae.* Where as F. *solani* was effectively controlled by the leaf extract of neem (10%) recording mycelial growth of 1.30 mm as compared to control. Leaf extract of casurina (10%) exerted the least inhibition of all three pathogens. *In vivo* experiment revealed that the fruits inoculated with C. *musae, B. theobromae* and F. *solani* when the fruits dipped in ocimum leaf extract (10%) exerted maximum lesion size was reduced to 0.8, 1.0 and 0.8 cm from 4.00 cm, 4.20 cm and 3.5 cm in control respectively. Vilvum leaf extract (10%) was the least inhibitory recording the growth of 2.2 cm of *B. theobromae,* 2.0 cm of C. *musae* and 1.9 cm of F. *solani.*

**Keywords:** Plant extract, *Colletotrichum musae, Botryodiplodia theobromae, Fusarium solani,* poisoned food techniques, fruit dip, Banana

## Introduction
Banana (Musa *paradisiaca* L.) are widely grown in India with great socioeconomic significance and interwoven in the cultural heritage of the country. Based on the diverse uses, banana and plantains are classified as dessert bananas, cooking bananas and beer bananas. They are also referred as roasting banana due to some specific uses in the African continent. Banana is grown in more than 30 countreis.

Banana fruit is considered to be a "poor man's apple" because of its high nutritive value and comparatively low price. Banana fruit infected by several pathogens. Among the pathogens, *C. musae, B. theobromae* and *F. solani* are the most prominent pathogens.

Several studies were conducted earlier on the effective chemical management of the disease. The use of chemicals on post-harvest diseases leads to environment pollution and residual toxicity in agricultural produce. Therefore the recent strategy of developing efficient and environmentally safe method of disease management by the use of plant products are gaining momentum at present.

## Materials and Methods
### Preparation of plant extract (Shekhawat and Prasada, 1971)
The freshly collected plant materials were separately washed with tap water, then with alcohol and finally with repeated changes of sterile distilled water. These were ground in a pestle and mortar by adding sterile distilled water @ 1 ml/g of leaf tissue. The extract was expressed by squeezing through two layers of muslin cloth, subsequently through what man no. l filter paper and finally passed through seitz filter to eliminate bacterial contamination. This formed the standard plant extract solution (100%). The extract was further diluted to 10 per cent concentration by adding the requisite quantities of sterile distilled water/medium. All the plant products were used at 10 per cent concentration.

### Poisoned food technique *in vitro* (Schimitz, 1930)
The plant extracts with PDA at 10 per cent concentration was poured into the sterile petriplates. The plates were inoculated with a six mm diameter disc of *C, musae, B. theobromae, F. solani* using a sterile cork borer. Three replications were maintained for each treatment. The plates were incubated at room temperature. The radial growth of the colony was measured seven days after incubation. The results of mycelial growth were expressed as

percentage of inhibition over control. The per cent inhibition of mycelial growth was calculated by using the formula of
C Where,
I - inhibition of mycelial growth
C - Growth in control
T - Growth in treatment

**Fruit dip treatment in *vivo* (Datar and Ghule, 1988)**
Fruit dip treatments with different plant extracts were tried to test their effect against post-harvest diseases of banana fruits. Post infectional treatments were given on the 'monthan' cultivar of banana stage-2 (More yellow than green) was inoculated with respective post-harvest pathogens *viz. C. musae, B. theobromae* and *F. solani* and after 24 hours, they were dipped in the respective plant extracts (10%) like ocimum, neem, eucalyptus, prosopis, nithiyakalyani, vilvum and thumbai for 30 min.
The fruits were kept in polythene bag in proper (85-90 per cent RH) moisture and incubated at room temperature. Fruits without plant extracts served as control. The lesion size was measured in cm after seven days incubation. The results were expressed as lesion/ distal and inhibition over control.

**Results and Discussion**
*In vitro* The results of the *in vitro* screening of the extracts of 16 plant species belonging to 11 families carried out against *C. musae, B. theobromae, F. solani* revealed that the leaf extract of ocimum (10%) exerted respectively 82.22 and 80.00 per cent inhibition on the mycelial growth with *C. musae, B. theobromae* followed by neem leaf extract (10%) which recorded significantly less inhibition of mycelial growth accounting for 72.22 and 70.22 per cent respectively as compared to control. The mycelial growth of *F. solani* was also significantly inhibited by neem leaf extract (10%) with the mycelial growth accounting for 85.22% inhibition as compared to control. This was followed by the leaf extract of ocimum (10%) and eucalyptus (10%) the growth inhibition by which worked out to 76.13 and 72.72 per cent growth respectively. The leaf extract of eycalyptus (10%) nithiyakalyani (10%) and prosopis (10%) significantly reduced the growth of *C. musae, B. theobromae* and *F. solani* as compared to that of Ocimum and neem. Leaf extracts of casurina (10%) exerted the least inhibition of 7.77 per cent with *B. theobromae*, 11.11 per cent with *C. musae* and 12.50 per cent with F. *solani as* compared to control (Table 1).

**Table 1:** Efficacy of plant extracts against rnycelial growth of *Colletotrichum musae, Botryodiplodia theobromae* and *Fusarium solani in vitro*

| Plant extracts (10%) | C. *musae* | | *B, theobromae* | | *F. solani* | |
|---|---|---|---|---|---|---|
| | Mycelial growth (cm)* | Growth inhibition (%) | Mycelial growth (cm)* | Growth inhibition (%) | Mycelial growth (cm)* | Growth Inhibition (%) |
| *Pungamia pinnata* | 4.40 | 51.11 | 4.60 | 48.88 | 4.20 | 52.27 |
| *Vitex negundo* | 5.40 | 40.00 | 5.70 | 36,66 | 5.10 | 42.04 |
| *Polyalthia longifolia* | 6.00 | 33.33 | 6.20 | 31.11 | 5,80 | 34.09 |
| *Acacia Arablca* | 5.20 | 42.22 | 5.50 | 38.88 | 4.90 | 46.59 |
| *Eucalyptus glopulus* | 270 | 70.00 | 2.90 | 67.77 | 2.40 | 72.72 |
| *Prosopis julifiora* | 3.20 | 64.44 | 3.40 | 62.22 | 3.00 | 65.90 |
| *Ficus indica* | 7.00 | 22.22 | 7.30 | 18.88 | 6.80 | 22.72 |
| *Ricinus communis* | 6.50 | *27.77* | 6.80 | 24.44 | 6.30 | 28.40 |
| *Lantana camera* | 4.20 | 53.33 | 4.50 | 50.00 | 4.00 | 54.54 |
| *Ocimum sanctum* | 1.60 | 82.22 | 1.80 | 80.00 | 2.10 | 76.13 |
| *Azadirachta indica* | 2.50 | 72.22 | 2.70 | 70.22 | 1.30 | 85.22 |
| *Casuarina equisetifolia* | 8.00 | 11.11 | 8.30 | *111* | 7.70 | 12.50 |
| *Mentha viridis* | 4.50 | 50.00 | 4.80 | 46.66 | 4.20 | 52.27 |
| *Catheranthes roseus* | 3.50 | 61.11 | 3.70 | 58.88 | 3.20 | 63.63 |
| *Leucas aspera* | 3.90 | 56.66 | 4.10 | 54.44 | 3.50 | 60.22 |
| *Aegle narmelos* | 3.80 | 57.77 | 4.00 | 55.55 | 3.70 | 57.95 |
| Control ' | 9.00 | - | 9.00 | - | 8.80 | - |

* Mean of three replications
CD (PO.05)
Extracts = 0.117
Pathogen = 0.049
ExP = 0.204

**Table 2:** Efficacy of plant extracts against fruit infection by *Colletotrichum musae, Botryodiplodia theobromae* and *Fusarium solani in vivo*

| Plant extracts (10%) | C. musae | | 8. *theobromae* | | F. *solani* | |
|---|---|---|---|---|---|---|
| | Mycelial growth (cm)* | Growth inhibition (%) | Mycelial growth (cm)* | Growth inhibition (%) | Mycelial growth (cm)* | Growth inhibition (%) |
| *Ocimum sanctum* | 0.8 | 77.50 | 1.0 | 76.19 | 0.8 | 77,14 |
| *Eucalyptus globulus* | 1.4 | 65,00 | 1.5 | 64.28 | 1.3 | 62.85 |
| *Prosopis juliflora* | 1.6 | 60.00 | 1.8 | 57.14 | 1.6 | 54,28 |
| *Catheranthes roseus* | 1.9 | 52.50 | 2.1 | 50.00 | 1.5 | 57.14 |
| *Aegle marmelos* | 2.0 | 50.00 | 2.2 | 47.61 | 1.9 | 45.71 |
| *Leucas aspera* | 1.7 | 57.50 | 1.9 | 54,76 | 2.1 | 51.42 |
| Control (distilled water) | 4.0 | - | 4.2 | - | 3.5 | - |

* Mean of three replications
CD (P=0.05)
Extracts = 0.119
Pathogen = 0.078
ExP = 0.206

Shekhawat and Prasada (1971) reported that palmarosa oil (0.1%) and garlic bul'b extract (10%) exhibited cent per cent growth inhibition followed by thulasi and datura leaf extracts (10%) on *Altemaria tenuis in vitro.* Singh and Singh (1991) reported that neem leaf, bark, fruit and bulb extracts and neem oil were inhibited spore germination and the mycelial growth

of *Rhizopus arrhizus* and *Botryodiplodia theobromae* which infected the mango fruits (Patil *et al*. 1992). The leaf extracts (10%) of vilvum and prosopis effectively inhibited the mycelial growth of *Altemaria*

*Tennis causing* fruit rot of chillies (Muthulakshmi, 1990 and Sujathabai, 1992).

*In vivo* the results on the efficacy of the effective six plant extracts selected based on the *in vivo* screening used against the pathogens in the present investigation are presented (Table 2). The lesion size developed on the fruit inoculated with *C. musae, B. theobromae* and F. *solani* was reduced to 0.8, 1.0 and 0.8 cm from 4.00 cm, 4.20 cm and 3.50 cm in control respectively. When the fruits were dipped in ocimum leaf extract (10%) this was followed by that of eucalyptus which respectively recorded 1.4, 1.5 and 1.3 cm lesion size due to inoculation of the above three pathogens. Prosopis and thumbai leaf extracts (10%) on par in inhibiting the growth of C. *musae,* and *B. theobromae* in the treated fruits. Vilvum leaf extract (10%) was the least inhibitory recording the growth of 2.2 cm of *B. theobromae,* 2.0 cm of C. *musae* and 1.9 cm of *F. solanl.*

Mohan *et al.* (1989) also reported that banana fruits dipped in ocimum extracts (10%) significantly reduced the growth of post-harvest pathogens. Chauhan and Joshi (1990) reported that eucalyptus oil (2%) and caster oil (10%) used as mango fruit dip treatments controlled anthracnose in mango.

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