

Efficacy of plant extracts for antifungal activity against the rice foot rot pathogen *Fusarium moniliforme* Sheldon

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ABSTRACT

Aqueous extracts from twenty plant species were tested for their antifungal activity against *Fusarium moniliforme* inciting foot rot of rice. Test results showed a differential activity of the plant extracts against the mycelium growth. The maximum inhibitory effect was shown by rhizome extracts of *Curcuma domestica* against the mycelium growth of the test fungi. The seed extracts of *Azadirachta indica* and *Acacia arabicae* also showed strong inhibitory effect on mycelial growth. The root extracts of *Acacia catechu*, leaf extracts of *Aegle marmelos*, seed extracts of *Cassia fistula*, leaf extracts of *Adhatoda vasika* and leaf extracts of *Clerodendron inerme* showed appreciable inhibitory effect against *M.moniliforme* .

Key words: rice, foot rot, *Fusarium moniliforme*, management, plant extract

The foot rot of rice caused by *Fusarium moniliforme* is considered as an important disease. This has been reported to cause 3.7% to 70% loss in yield in different countries (Bagga and Kumar, 1999). Attempts have been made to manage the disease either by treating with chemical compounds (Goyal, 2001) or through plant extracts (Bowers and Locke, 1997; Patni *et al.*, 2005). In the present study, efficacy of twenty plant extracts was tested for antifungal activity against the foot rot pathogen.

Plant materials viz. fruit, leaves, rhizome, root, and seed were collected from various parts of Haryana and their neighboring states on the basis of their traditional values (Usher, 1971). The collected plant materials were thoroughly washed with tap water, followed by distilled water and kept in dark in between filter papers at room temperature till completely dry. Each plant sample was individually grounded into powder for preparation of extract. *Fusarium moniliforme* used for the study was obtained from the Division of Plant Pathology, IARI, New Delhi. The cultures were maintained at 4°C on Yeast Glucose Agar medium with periodic sub-culturing. Plant part extract (15% w/v) was prepared by brewing in hot water. Fifteen gram dry powder of each plant sample was weighed and put in a cheesecloth bag and suspended in 100ml of boiling distilled water for 20 minutes. The

extract was allowed to stand for 20 minutes and decanted off in to the flask and final volume was raised 100ml. by adding boiled distilled water. The supernatant was used for assay. The antifungal activity of each plant part extract was determined by measuring the mycelium growth inhibition of test fungi as described by Bragulat *et al.*, 1991. A known volume of 15% plant sample extract was supplemented with yeast extract, glucose and agar. The medium was sterilized by autoclaving at 15lb. pressure for 15 minutes. Yeast Glucose Agar plates, without any plant extract supplementation, was run as control. The test inoculum consisted of a disc 0.65cm. in diameter cut out from the edge of a growing fungal colony on glucose agar medium using a sterilized cork borer and placed at the centre of the agar medium under sterilized condition. The experiments were conducted in triplicates along with equal number of controls. The fungus was incubated at 27 ± 1°C and the growth of the fungal colony was measured after five days. The percentage inhibition was calculated by the formula as:

$$\% \text{ Inhibition} = [(C-T) \times 100/C]$$

Where C = Diameter of control, T = Diameter of test.

It was observed that out of twenty plant extracts tested, rhizome extracts of *C. domestica* (67.15%) showed maximum inhibitory effect against the mycelium

Table 1. Anti-fungal activities of plants-extracts against *Fusarium moniliforme*

Plant species	Family	Part used	Percentage inhibition of mycelium growth (Mean \pm SD)
<i>Acacia arabicae</i> Willd.	Mimosaceae	Seed	50.60 \pm 1.12
<i>Acacia catechu</i> Willd.	Mimosaceae	Root	47.76 \pm 1.46
<i>Adhatoda vasica</i> Nees.	Acanthaceae	Leaf	32.80 \pm 2.48
<i>Aegle marmelos</i> (L.)	Rutaceae	Leaf	47.67 \pm 1.86
<i>Albizia stipulata</i> (Benthm.)	Mimosaceae	Seed	13.52 \pm 1.46
<i>Anthocephalus cadamba</i> (Mig.)	Rubiaceae	Leaf	-
<i>Azadirachta indica</i> (A.) Juss.	Meliaceae	Seed	54.05 \pm 0.38
<i>Brassicae juanca</i> (L.)	Cruciferae	Seed	16.98 \pm 3.86
<i>Cannavis sativa</i> (L.)	Cannabidaceae	Leaf	14.86 \pm 1.66
<i>Capparis decidua</i> (Roth.)	Capparidaceae	Seed	15.32 \pm 1.98
<i>Carissa carandus</i> (L.)	Apocynaceae	Fruit	6.38 \pm 3.22
<i>Cassia fistula</i> (L.)	Leguminosae	Seed	35.90 \pm 1.46
<i>Casuarinae equisetifolia</i> (L.)	Casuarinaceae	Seed	-
<i>Cedrela toona</i> (Roxb.)	Meliaceae	Leaf	-
<i>Ceiba pentandra</i> (Benth.)	Bombraceae	Seed	5.00 \pm 3.46
<i>Citrus limon</i> (Burmam.)	Rutaceae	Seed	-
<i>Clerodendron inerme</i> (Gaertn.)	Verbenaceae	Leaf	32.00 \pm 1.82
<i>Colvillea wallichii</i> (L.)	Boraginaceae	Leaf	-
<i>Curcuma domastica</i> (L.)	Zingiberaceae	Rhizome	67.15 \pm 0.46
<i>Cuscuta reflexa</i> (L.)	Convolvulaceae	Whole Plant	9.91 \pm 2.98

growth of *F. moniliforme* (Table 1). The seed extracts of *A. indica* (54.05%) and seed extracts of *A. arabicae* (50.60%) were observed to show moderate inhibitory effect against the mycelium growth of *F. moniliforme*. Five plants showed moderate inhibitory effect against the mycelium growth of test fungus i.e. root extracts of *A. catechu* (47.76%), leaf extracts of *A. marmelos* (47.67%), seed extracts of *C. fistula* (35.90%), leaf extracts of *A. vasika* (32.80%), leaf extracts of *Clerodendron inerme* (32.00%) and while seven plants have shown insignificant inhibition of mycelium growth against the test fungus and rest five plants samples did not show any inhibitory activity.

Among the different plants screened, the rhizome extracts of *C. domastica* was strongly effective against the test fungi. The plant is reported to possess antifungal properties against phytopathogenic fungi (Ishratniaz *et al.*, 1994; Natrajan *et al.*, 2001). The seed extract of *A. indica* showed strong inhibitory activity against the mycelium growth of *F. moniliforme* (Table 1). The plant is reported to possess antifungal properties against phytopathogenic fungi (Sharma and

Nanda, 2000; Newton *et al.*, 2002). The root extracts of *Acacia catechu* showed inhibitory activity, which could be due to the presence of some antimicrobial phytochemicals (Chopra *et al.*, 1992; Pandey, 1993). The plant extracts of *A. arabicae*, *B. juanca*, *C. sativa*, *C. deciduas*, *C. pentandra*, *C. inerme* and *C. reflexa* used in this study were tested for the first time as inhibitor of the test fungi.

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