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Antifungal activity of plant extracts with potential to control plant pathogens

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Introduction:

Agriculture is a back bone of our country, Whole economy of India is related with agriculture so there is need to control the various fungal diseases. The fungi are major disease causing agents on plants and can lose up to 90% agricultural yield. Fungal pathogens are mainly damage of foodstuffs, grains during storage and standing crops in the field. Such plant products are unfit for human consumption by retarding their nutritive value and often by producing mycotoxins (Marin et. al. 1999; Janardhana et. al. 1998). A significant portion of the agriculture produce in the country and the world over become unfit for human consumption due to mycotoxins contamination of grains especially those produced by species of *Aspergillus* (Janardhana et, al. 1999; Chandra and Sarbhoy, 1997; Devi et. al. 2001).

The use of synthetic chemicals as antimicrobial for management of plant diseases has indeed increased crop protection but with considerable deterioration of environmental quality and human health (Culter and Culter 1999). In agriculture the crop loss due to plant pathogens has become major concern.

Increased usage of different chemicals based products to control these pathogens has resulted in problems like residual effect of chemicals in agri based products and also increased resistance for chemicals in target pathogens and environmental pollution. Chemical fungicide are now used as primary means for the control of plant diseases in storage seed, seed germination and field condition so the other alternative control methods are needed because of the resistance to fungicide among fungal pathogens, high cost of these chemical fungicide and environment effect i.e. pollution of soil, water air. The use of plant extracts products as

disease control methods have been studied, since they have no toxicity, less environmental effects and widely acceptable (Lee et. al. 2007).

The present study was an attempt to investigate and evaluate the antifungal activity of different five plants extracts with ethanol, petroleum ether and water against two plant pathogens like *Aspergillus niger* and *Fusarium oxysporium.* All the plants showed significant antifungal activity against *Aspergillus niger* and *Fusarium oxysporium.* Out of Five plant extract in ethanol and petroleum ether *Morinda citrifolia* and *Physalis minima* showed maximum zone of inhibition.

Materials and Methods:

Plant Collection: The plants were collected from different region of Udgir, Mahaharashtra. Antimicrobial efficiency of five medicinal plant like *Morinda citrifolia, Cassia fistula, Annona Squamosa, Vitex nedungo* and *Physalis minima* used in this study.

Sterilization of Plant Materials: The disease free and fresh plants were selected. About 10 gm of fresh and healthy leaves were taken for each solvent extraction. They were washed with water for three times. Then surface sterilized with 0.1% $Hgcl_2$ for 20 seconds, again the leaves were washed thoroughly with distilled water.

Preparation of Plant Extracts: Sterilized plant leaves 10 gm were taken in organic solvents such as ethanol, petroleum ether and water. Then they were ground well with the help of mortar and pestle, the plant materials were subjected to centrifugation for 10 min. then it was filtered through whatman no. 1 filter paper. These plant extracts add 5 ml of ethanol, petroleum ether and water and stored further antimicrobial screening purpose.

Screening for Antifungal assay: In this method potato dextrose agar medium were used. Antifungal activity was screened by agar well diffusion method (Perez et. al. 1990). The different plant extracts with ethanol, petroleum ether and water were tested against plant pathogen *Aspergillus niger* and *Fusarium oxysporium.* 1ml of plant extract was 5ml of these solvent and water. The PDA medium was poured in to the sterile petriplates and allowed to solidity. The test fungal culture was spread over the media. These inoculated petriplates were incubated at 25^0 c for 48 to 72 hrs. Test fungus was allowed to grow on poisoned plate. After the incubation the plates were observed for formation of clear incubation zone around the well, it indicated the presence of antifungal activity. The zone of inhibition was calculated.

Result and Discussion:

Effect of Antifungal activity of some medicinal plants against *Aspergillus niger*

Antifungal activity of five medicinal plants extracts was tested against *Aspergillus niger* by agar well diffusion method.

Table 1: antifungal activity of leaf extracts of five plants in Ethanol, petroleum ether and water against *Aspergillus niger* (1ml of 10% extracts in 20 ml PDA).

Sr.No.	Name of the Medicinal Plant	Zone of Inhibition (mm)		
		Ethanol	Petroleum ether	Water
1	*Morindia citrifolia* L.	38	35	09
2	*Cassia fistula* L.	12	10	00
3	*Annona squamosa* L.	10	08	02
4	*Vitex nedungo* L.	23	21	07
5	*Physalis minima* L.	29	27	05

These five plants extract with Ethanol and petroleum ether of *Morindia citrifolia* L. exhibited maximum activity (37 & 35 mm) zone inhibition compared with other plant extracts. Plant extract of *Physalis minima* L. (29 mm & 27 mm) and *Vitex nedungo* L. (23 & 21) showed prominent antifungal. Ethanol and Petroleum ether of *Cassia fistula* L. (12mm & 10 mm) showed moderate activity. Plant extract of *Annona squamosa* L. (10 & 08 mm) showed minimum activity. The results of antifungal activity of plant extracts in water showed less activity against *Aspergillus niger.*

Table 2: antifungal activity of leaf extracts of five plants in Ethanol, petroleum ether and water against *Fusarium oxysporium* (1ml of 10% extracts in 20 ml PDA).

Sr.No.	Name of the Medicinal Plant	Zone of Inhibition (mm)		
		Ethanol	Petroleum ether	Water
1	*Morindia citrifolia* L.	37	34	12
2	*Cassia fistula* L.	10	07	02
3	*Annona squamosa* L.	13	08	03
4	*Vitex nedungo* L.	30	27	07
5	*Physalis minima* L.	32	30	10

These five plants extract with Ethanol, petroleum ether and water as a solvent tested antifungal activity. *Morindia citrifolia* L. showed maximum activity (37 &34 mm) in ethanol and petroleum ether. The plant extract of *Physalis minima* L. (32 & 30 mm) and *Vitex nedungo* L. (30 & 27 mm) showed moderate activity. Ethanol and petroleum ether with plant extract of *Cassia fistula* L. and *Annona squamosa* L. showed minimum activity. The antifungal activity of these five plants extracts in water solvent showed less or no activity against *Fusarium oxysporium.*

In this study gave an idea that ethanol and petroleum ether solvent and plant extracts of *Morindia citrifolia* L. and *Physalis minima* L. showed maximum antifungal activity. The spectrum activity observed in the present study may be indicative of the present of bioactive principles in these plants.

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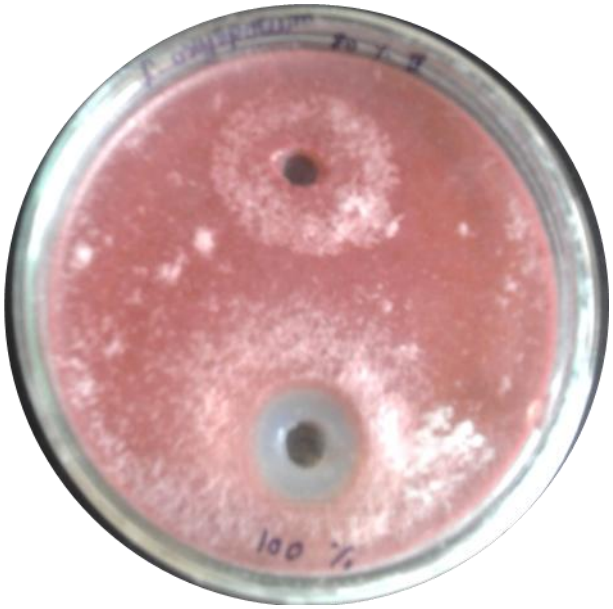

Plate I: Antagonistic activity against *F.. oxysporum*