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Studies on the Effect of Extracts of Aromatic Plants on Fungal Growth

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Annotation: Article describes Bio-control of pathogenic fungi
Keywords: Anti-fungal, Medicinal, Aromatic Plants

I. ABSTRACT

The plant extracts are likely to have stimulatory effect in very low concentrations and inhibitory effect on higher concentrations on mycelial growth of fungi. Studies carried out on the effect of different concentrations of extracts obtained from leaves on growth of fungi. Plants widely used as spices, condiments or medicinal were selected for making the extracts. Plant extracts were screened against eight fungal strains such as Alternaria, Colletotrichum, Curvularia, Fusarium, Helminthosporium, Pestalotia, Phytophthora, and Rhizoctonia. Extracts were prepared from fresh, washed plant tissues after boiling. Concentrations were then inoculated with different fungal strains. In this study Eugenia, Citrus and Alpinia have shown inhibitory growth on Colletotrichum.

II. INTRODUCTION

Plant pathogens such as fungi, bacteria, nematodes and viruses cause various diseases in plants or may damage the plants [Montesinos, 2003]. However, many fungicides are toxic to humans and they can cause environmental contamination or may result in fungicide residues on food products [Moenne-Loccoz *et al*, 1998]. The environmental impact and the potential health risks related to the use of these compounds have raised serious concerns [Abad *et al* 2007]. The growth of phytogenenic fungi in crops is also responsible for the off-flavour formation and production of allergenic compounds [Nielsen and Rios 2000, Bhatnagar and Cormick 1988]. Higher plants are known to be the source of several biologically active chemicals, namely alkaloids, flavanoids, phenols, terpanoids etc. Due to their nonphytotoxic and systematic nature such chemicals may prove more useful than several synthetic fungicides in controlling plant diseases. The fungi toxicity of terpanoides, phenols and alkaloids has been well established now. Several reports are available to show the toxicity of extracts obtained from some plant parts against mycoflora including pathogenic fungi. But not much study has been done on the effect of plant extracts in different concentrations on fungi. Despite the intensive prophylactic use of antifungal drugs, the incidence of fungal infections has increased due to growing resistance [Stein *et al* 2005, Svetaz *et al* 2010].

III. MATERIALS AND METHODS

A. Plant Materials

The extracts of four plants (Eugenia, Cinnamomum, Citrus, Alpinia) have been evaluated for their antifungal activity. They were collected within and outside the campus of Kariavattom, University of Trivandrum.

B. Extract Preparation

Fresh leaves of the plants were washed thoroughly with distilled water. Fifty grams of materials were taken, cut into pieces after removing the midvein. They were boiled in 500ml D.W for thirty minutes. The extracts were filtered through double layered cheese cloth, and dilutions were made, and transferred into flasks.

C. Fungal Strains

Extracts were tested against eight important fungal pathogens. They are isolated from infected leaves, fruits, and vegetables. They were identified and maintained in the laboratory in potato dextrose agar for their growth.

D. Antifungal Test

To determine the rate of growth inhibition, by the selected plant extracts, Czapek-Dox-Medium was used. Microbial growth inhibition was determined as the diameter of the inhibition zones around the discs (mm). Czapek-Dox-Medium 50 ml was added to each of the flask including Control. Autoclaved samples were cooled using waterbath. Then 15ml were pumped into petriplates. 3 replicates were made for each dilution. Equal portion of the inoculum of fungi culture was transferred to the centre of the petriplate. After 5 days, diameter of the colony was measured.

IV. RESULTS AND DISCUSSION

Results were encouraging as several plants showed inhibition of spore germination. Many of these plant extracts have potential for bio fungicide.

The growth inhibition value of plant extracts on fungal growth strains is shown in Table 1 below.

Table 1: Growth inhibition values in centimetres

Plants/ Fungi	Conc.	Al	Co	Cu	Fu	He	Pe	Ph	Rh
Eug	1	5.5	4.3	5.9	5.5	8.5	4.5	6.0	10.2
	1/2	5.3	4.8	5.7	5.7	8.4	4.8	6.2	10.0
	1/4	5.1	5.4	5.6	6.8	8.3	4.9	6.6	9.8
	Control	5.0	5.2	5.1	6.9	7.8	5.0	6.6	9.7
Cin	1	4.0	4.3	4.5	4.7	9.4	3.2	4..0	3.5
	1/2	3.9	4.3	4.8	4.6	9.3	3.4	4.7	3.2
	1/4	3.8	4.5	5.0	4.1	9.2	3.9	4.8	3.8
	Control	3.8	4.5	5.1	3.8	9.2	4.0	5.0	2.7
Cit	1	4.2	3.3	4.5	4.1	6.2	4.2	4.7	3.1
	1/2	4.3	3.5	4.8	4.5	6.1	4.5	4.3	2.9
	1/4	4.5	3.8	5.0	4.8	6.1	4.6	4.2	2.8
	Control	4.6	4.0	5.1	5.3	5.9	4.6	4.1	2.8
Alp	1	3.7	3.8	4.2	3.4	8.1	3.4	3.3	3.1
	1/2	3.5	4.2	4.5	3.5	7.8	3.6	2.5	2.8
	1/4	3.2	4.8	4.8	3.8	7.7	3.9	2.3	2.8
	Control	2.8	5.2	5.0	3.9	7.6	4.0	2.3	2.7

Eug: Eugenia caryophyllata, Cin: Cinnamomum zeylanicum, Cit: Citrus limon, Alp: Alpinia galanga
Al: Alternaria, Co: Colletotrichum,Cu: Curvularia,Fu: Fusarium, He: Helminthosporium,
Pe: Pestalotia, Ph: Phytophthora, Rh: Rhizoctonia

Out of the four plants tested only Citrus leaves have inhibitory effect on Alternaria. Growth of Colletotrichum is inhibited by Eugenia, Citrus, and Alpinia. The most promising one is the Citrus leaf extract, which have inhibitory action on five fungi. The most interesting factor is that all the plant extracts tested accelerated the growth of Rhizoctonia.

V. CONCLUSION

It can be concluded that the aqueous extracts of these plants exhibited promising antifungal activities and were capable of inhibiting growth of fungi. This results can be used for pest management studies. Further phytochemical research is needed to identify the active principles responsible for the antifungal effects of these medicinal plants.

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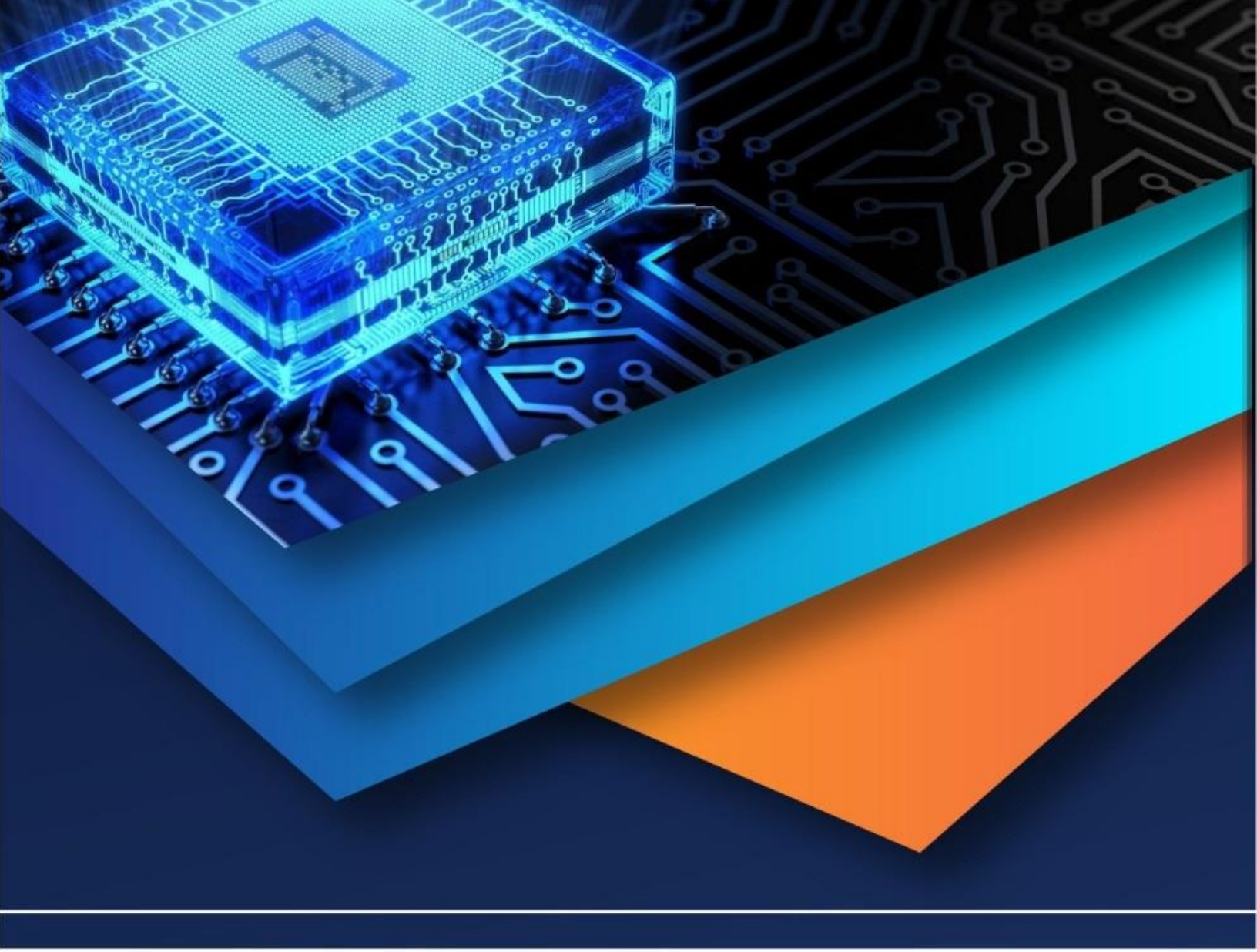

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