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Inhibitory activity of flowers of *Calycopteris floribunda*, *Humboldtia brunonis* and *Kydia calycina* against fungal pathogens causing rhizome rot of ginger

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ABSTRACT

The present study was conducted to evaluate antifungal potency of aqueous extract of flowers of *Calycopteris floribunda* (Roxb.) Poiret (Combretaceae), *Kydia calycina* Roxb (Malvaceae) and *Humboldtia brunonis* Wall (Caesalpiniaceae) against *Fusarium oxysporum* f.sp. *zingiberi* and *Pythium aphanidermatum* isolated from rhizome rot specimens of ginger by poisoned food technique. The test fungi were inoculated on potato dextrose agar plates poisoned with aqueous extract of flowers (10%). The flower extracts were found to be inhibitory to test fungi as evidenced by reduction of mycelial growth of test fungi in poisoned plates. Among flowers, *C. floribunda* has shown higher inhibition of test fungi than other flowers. *P. aphanidermatum* was inhibited to more extent than *F. oxysporum*. Further, *in vivo* studies are required to recommend the flower extracts for controlling rhizome rot pathogens.

KEYWORDS

Rhizome rot of ginger;
Antifungal activity;
Flowers;
Poisoned food technique.

INTRODUCTION

Ginger (*Zingiber officinale* Rosc.) belongs to the family Zingiberaceae is an important commercial crop. Its aromatic rhizomes are used as a spice and a medicine. India is the largest producer of ginger and accounts for about 1/3rd of total world production. Ginger is grown in Kerala, Karnataka, West Bengal, Andhra Pradesh, Orissa, Arunachal Pradesh and Sikkim. It is an important crop which earns a sizeable amount of foreign exchange for the country[1,2,3]. However, the production of ginger is largely affected by a number of diseases caused by bacteria, fungi, viruses, mycoplasma and nematodes. Most common diseases of ginger are bacterial wilt caused by *Ralstonia solanacearum*, rhizome rot caused by *Pythium* species, *Fusarium* species, *Sclerotium* species, *Pseudomonas* species and others. The disease management involves cultural,

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biological and chemical approaches for pathogen suppression[3-8].

Crop loss caused by root rot-causing fungal pathogens is a significant problem which is most commonly controlled by the use of chemical fungicides. However, residual effects, costs and the development of resistance in pathogens increased interest in alternatives such as plant based extracts, antagonistic microbes and others to traditional synthetic chemical fungicides[9]. Plants and the products derived from them are found to be useful candidates for controlling phytopathogenic fungi. Several studies have shown that the plants possess inhibitory activity against fungal agents including plant pathogenic fungi[10-14]. In the present study, we have evaluated antifungal potency of aqueous extract of flowers of *Calycopteris floribunda* (Roxb.) Poiret (Combretaceae), *Kydia calycina* Roxb (Malvaceae) and *Humboldtia brunonis* Wall (Caesalpiniaceae) against *Fusarium oxysporum* f.sp. *zingiberi* and *Pythium aphanidermatum* isolated from diseased ginger.

EXPERIMENTAL

Collection and identification of plant materials

The flowers of *C. floribunda*, *H. brunonis* and *K. calycina* were collected from different regions of Shivamogga district and authenticated by Dr. Vinayaka K.S, Lecturer, Department of Botany, Indira Gandi Government College, Sagar-577401, Karnataka, India.

Extraction

The flowers were shade dried and powdered in a blender. 10g of each powdered flower was added to 100ml of distilled water, boiled for half an hour and filtered through 4-fold muslin cloth followed by Whatman filter paper (No. 1) and subjected for antifungal studies[14].

Antifungal activity of aqueous extract of flowers

The antifungal effect of flower extracts was screened by employing Poisoned food technique. In brief, sterile Potato dextrose agar plates poisoned with flower extracts (10%) were inoculated with the test fungi *viz*., *F. oxysporum* and *P. aphanidermatum* isolated previously from ginger with soft rot symptoms[14]. Fungal discs of 5mm diameter cut from the periphery of 5 days old cultures, placed at the centre of poisoned and control plates and incubated for 5 days at 28°C. Diameters of fungal colonies in control and poisoned plates was measured in mutual perpendicular directions was measured. The experiment was repeated two times and average diameter of colony was noted. Antifungal activity, in terms of reduction in mycelial growth (%), was determined using the formula:

Inhibition of mycelial growth (%) = (C– T/ C) × 100, where 'C' is average diameter of fungal colony in control plates and 'T' is average diameter of fungal colony in poisoned plates[14].

RESULTS AND DISCUSSION

In the present study, we have determined the effect of aqueous extracts of flowers against two pathogenic fungi *F. oxysporum* and *P. aphanidermatum* isolated from soft rot specimen of ginger by poisoned food technique. Poisoned food technique has been routinely employed to screen antifungal effect against fungi and reduction in the mycelial growth of fungi in poisoned plates on comparing with control plates indicates antifungal activity. It has been employed by several researchers to evaluate antifungal activity of plants[12-14]. The flower extracts have shown inhibition of mycelial growth of test fungi. The diameters of fungal colonies on poisoned plates were lesser than that of diameter of fungal colonies on control plates which indicated the presence of antifungal principles in the extracts. Among flowers, highest inhibitory efficacy was shown by *C. floribunda* followed by *H. brunonis* and *K. calycina*. *P. aphanidermatum* was inhibited to high extent when compared to *F. oxysporum* (TABLE 1; Figure 1). A few studies have been done which report the antifungal activity of plants against pathogens of rhizome rot ginger[10] observed fungitoxic efficacy of certain plant extracts against *P. aphanidermatum* and *F. solani* isolated from rhizome rot specimen of ginger. It was found that *Azadirachta indica* and *Ferula asafeotida* caused maximum inhibition of *P. aphanidermatum* and *F. solani* respectively. In a previous study[14], showed inhibition of *P. aphanidermatum* and *F. oxysporum*, isolated from soft rot specimen of ginger, by leaf and pericarp extract of *Polyalthia longifolia*.

TABLE 1: Antifungal activity of flower extracts against test fungi

Flower extract	Colony diameter in cm	
	F. oxysporum	P. aphanidermatum
Control	3.5	3.6
C. floribunda	2.2	2.1
K. calycina	3.1	2.5
H. brunonis	2.5	2.2

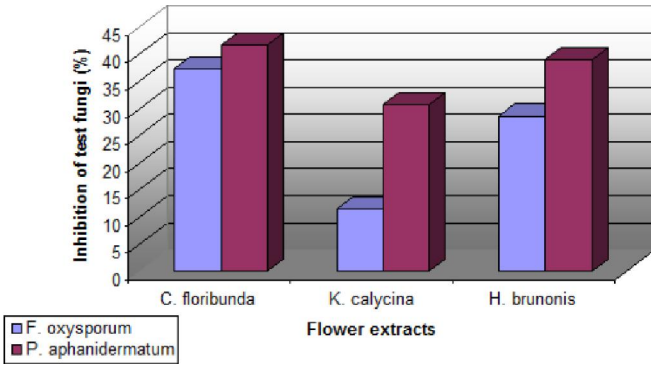

Figure 1 : Inhibition of test fungi (%) by flower extracts

CONCLUSION

A marked inhibition of rhizome rot pathogens by flower extracts was observed in this study. The inhibitory efficacy could be attributed to the presence of antifungal principles present in the extracts. Further, *in vivo* antifungal trials are to be conducted to recommend the flower extracts for controlling fungal diseases of ginger.

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