IN VITRO EVALUATION OF ANTIFUNGAL ACTIVITY IN THREE DIFFERENT SPECIES OF COSTUS

G. Sulakshana* and A. Sabitha Rani

Department of Botany, Osmania University College for Women, Koti, Hyderabad-500095, India.

ABSTRACT

Antifungal activity of the three species of Costus (Costus speciosus, Costus pictus and Costus igneus) was evaluated in vitro against eight different fungal species by employing various concentrations of methanolic rhizome extract (0.5 – 2.0 mg). The rhizome extract inhibited the growth of all the test fungi and maximum activity was observed at 2.0 mg concentration in all the three species. The zone of inhibition ranged from 9mm to 18mm in various fungal species and increased with the increase in the concentration of test solution. Among the three species, C. pictus showed slightly higher antifungal activity followed by C. speciosus and C. igneus. High zone of inhibition was observed against Cladosporium. This was followed by Colletotricum crassipes, Armillaria mellea, Colletotricum capsici, Rhizopus oryzae and Candida albicans. Lesser inhibition was found for Aspergillus terreus and Aspergillus niger.

KEYWORDS: Antifungal activity, Costus species, Bioassay, Zone of inhibition, Rhizome extract.

INTRODUCTION

Higher plants are the source of numerous chemicals of commercial significance. They have impressive biological properties like antifungal, antibiotic, insecticide, pharmacological activities and are used as drugs, fragrance, food flavors, colors etc. In recent years, there is a great demand for plant-based products because of broad biological activities, low impact on environment and safety to non-target organisms. During last few decades, many plant species were screened and plants with high bioactive compounds were identified. Costus (Family: Costaceae) is an important medicinal plant widely used in traditional and commercial...
formulations. It is commonly known as spiral ginger or crepe ginger. The rhizomes of *Costus* are a rich source of diosgenin, which is used in the preparation of steroidal drugs.\(^1\) The species *Costus* are used traditionally for their stimulant, carminative, diuretic, digestive, antiseptic and anthelmintic properties.\(^2\) It is mainly used for treating diabetes.\(^3\) In the present work, rhizome extract of three species of *Costus* (*C.speciosus, C.pictus* and *C.igneus*) were tested for its antifungal activity using Agar cup bioassay.

**MATERIAL AND METHODS**

**Collection of Plant material**

The rhizomes of the three species of *Costus* (*C.speciosus, C.pictus* and *C.igneus*) were collected from the plants established in the Botanical garden of the Osmania University College for Women, which were originally brought from Kerala.

**Extraction**

The rhizomes were washed with tap water for several times and cut into small pieces. Air-dried, finally powered material was extracted with methanol using Soxhlet apparatus. The extract was further concentrated in rotavapour and residues were weighed. Different concentrations of stock solutions (0.5mg to 2.0mg) were prepared by dissolving the extract in DMSO (Dimethyle Sulphoxide).

**Test Organism**

Eight test organisms, *Aspergillus niger* (MTCC 281), *Rhizopus oryzae* (MTCC 262) *Aspergillus terreus* (MTCC 1281), *Cladosporium species* (MTCC 1003) *Colletotricum crassipes* (MTCC 2223), *Collectotricum capsici* (MTCC 2071), *Armillaria mellea* (MTCC 409) and *Candida albicans* (MTCC 183) were obtained from the Institute of Microbial Technology, Chandigarh. All the test cultures were maintained on Potato Dextrose Agar (PDA) media with regular sub-culturing.

**Bioassay**

Agar cup bioassay was employed for testing antifungal activity of plant extract.\(^4\) The ready-made PDA medium (Himedia,39g) was suspended in distilled water and autoclaved at pressure of 15lb/in\(^2\) for 20min. Seven days old cultures of test organisms (0.5ml) were inoculated onto the medium. After inoculation, cups were scooped out from Petri plates with 8mm sterile cork borer. To each cup, different concentrations of test solutions (0.5mg to 2.0mg) were added. Controls were maintained with DMSO only. The treated and the controls
were kept in an incubator at 26°C for 24h to 78h and inhibition zones were measured. Three to four replicates were maintained for each treatment.

RESULTS

In the present study, antifungal activity of rhizome extract of the three species i.e C.pictus, C.speciosus and C.igneus was tested against eight different fungal species. The antifungal activity of rhizome extract varied with varying concentration of test solution (0.5 to 2.0 mg). At 0.5 mg concentration of extract, the antifungal activity was very low. The diameter of inhibition zones ranged from 9mm to 18mm among different fungal strains and increased with the increase in concentration of test solution. Maximum antifungal activity was observed at 2.0 mg concentration of rhizome extract (Table.1). Among eight fungal species, high inhibition zones were observed in Cladosporium. (Fig.1). This was followed by Colletotricum crassipes, Armillaria mellea, Colletotricum capsici, Rhizopus oryzae and Candida albicans respectively. Aspergillus terreus and Aspergillus niger showed less inhibition zones compared to others organisms (Fig.2).

Among the three Costus species, higher antifungal activity of rhizome extract against all the test fungi was observed with C.pictus followed by C.speciosus. Low activity was reported in C.igneus.

![Fig.1: Antifungal activity of Costus rhizome extract against different fungi.](image-url)
DISCUSSION

The use of plant extracts and phytochemicals with antifungal properties are of great significance in treating various fungal infections. Many studies have been conducted to prove
such efficiency in a number of medicinal plants and most of them are restricted with crude extracts. In the present study, antifungal activity of rhizome extract at various concentrations (0.5 -2.0 mg) of the three species i.e C.pictus, C.speciosus and C.igneus was tested against eight different fungal species. The zone of inhibition increased with the increase in concentration of the test solution. There are several reports on screening of plant extracts against fungal pathogens.\[5, 6, 7\] Since plants have co-evolved with the pathogens, it is reasonable to accept a variety of such compounds with specific as well as general antifungal activity.\[8\]

**CONCLUSION**

The present study clearly showed that the rhizome extract of the three Costus species possess antifungal activity against different fungi tested, which included plant pathogens also. Among the three species of Costus, higher activity was found in C.pictus. Therefore these plants with broad range of antifungal activity can be utilized in the development of commercial formulations for controlling many plant diseases in an eco-friendly way.

**REFERENCES**
