

Antifungal activity of selected plant extracts against phytopathogenic fungi *Aspergillus niger*

R. Raji¹ and K. Raveendran²

¹*Regional Agriculture Research Station, Ambalavayal, India*

²*Department of Botany, Sir Syed College Taliparamba, India*

ABSTRACT

*In this present study five different plants used in traditional Indian medicine were examined against *Aspergillus niger*. The extracts of 5 plants exhibited varying degrees of inhibition activity against the fungi. Among the 5 plants studied 4 plants showed maximum antifungal activity and the remaining one show minimum antifungal activity.*

Keywords: *Aspergillus niger*, Antifungal, medicinal plants

INTRODUCTION

Medicinal plants represent a rich source of antimicrobial agents [Mahesh & Satish]. Many of the plant materials are used in traditional medicine are readily available in rural areas at relatively cheaper than modern medicine [Mann *et al*]. The effects of plant extracts on bacteria have been studied by a large number of researchers in different parts of the world [Reddy *et al*, Dhanalakshmi *et al*, Sanmati & Pradeep, Muthu Kumaran *et al*].

Much work has been done on ethno medicinal plants in India [Maheshwari *et al* & Negi *et al*]. Interest in a large number of traditional natural products has increased [Taylor *et al*]. Plants are the sources of natural pesticides that make excellent leads for new pesticide development [Arokiyaraj *et al*, Gangadevi *et al*, Satish *et al*, Brinda *et al*, Jagadish *et al*, Milind Pande *et al*, Shanmugavalli *et al*, Swarna Latha & Neelakanta Reddy and Vetrivel Rajan *et al*].

Aspergillus niger as a saprophyte in soil causes black mould of onion, garlic and shallot; stem rot of *Dracaena*; root stalk rot of *Sansevieria*; and boll rot of cotton; spoilage of cashew kernels, dates, figs, vanilla pods and dried prune. Crown rot of groundnut is the most serious plant disease caused by *A. niger*. The main objective of this study was to investigate the inhibitory effects of different organic solvent extracts from forty nine medicinal plant species against *A. niger* and to evaluate the potential application of medicinal plant based treatments to control diseases caused by *A. niger*.

Spices and herbs have been used for thousands of centuries by many cultures to enhance the flavor and aroma of foods. Early cultures also recognized the value of using spices and herbs in preserving foods and for their medicinal value. Scientific experiments since the late 19th century have documented the antimicrobial properties of some spices, herbs, and their components [Shelef & Zaika]. Many herbs and spices are known to exert antioxidant activity and are useful for preventing lipid oxidation in living organisms as well as in foods.

Medicinal plants have been used for a wide variety of purposes for many thousands of years in India and all over the

world. In particular, extracts and oils of these plants have formed the basis of many applications, including raw and processed food preservation, pharmaceutical, alternative medicine, and natural therapies. Recently, the antimicrobial activity of various plant extracts has been studied against many microorganisms in Turkey. Spices have been used to combat snakebites, poor eyesight, stomach disorders, sleeping problems, poor circulation, sores, colds, muscular aches, gout, lumbago, poor digestion, motion sickness, and hangovers [Baytop & Hamburger *et al*].

Aspergillus niger as a saprophyte in soil causes black mould of onion, garlic and shallot; stem rot of *Dracaena*; root stalk rot of *Sansevieria*; and boll rot of cotton; spoilage of cashew kernels, dates, figs, vanilla pods and dried prune. Crown rot of groundnut is the most serious plant disease caused by *A. niger*. The main objective of this study was to investigate the inhibitory effects of different organic solvent extracts from 5 medicinal plant species against *A. niger* and to evaluate the potential application of medicinal plant based treatments to control diseases caused by *A. niger*.

MATERIALS AND METHODS

Plant Collection

The plants were collected from the non-irrigated cultivated lands in and around Kannur (Dt.), Kerala. Medicinal plants species such as *Abrus precatorius* L. (Papilionaceae), *Aegle marmelos* (L.) Correa ex Roxb. (Rutaceae), *Aporosa lindleyana* Baill (Euphorbiaceae), *Areca catechu* L. (Arecaceae), *Brassica juncea* (L.) Czern. (Brassicaceae) were taken for the antifungal study.

Sterilization of Plant Materials

The disease free and fresh plants were selected. About 2g of fresh and healthy leaves were taken for each solvent extraction. They were washed with distilled water for three times. Then surface sterilized with 0.1% mercuric chloride for 20 seconds. Again the leaves were washed thoroughly with distilled water (three times).

Preparation of extract

The plants were brought to the laboratory and carefully washed separately under tap water to remove debris and dust particles. These are then rinsed in distilled water and weighed (100gms). Plants were ground in a sterile mortar. The resulting paste was added to 100 ml of sterile distilled water in 250 ml beaker, stirred vigorously and allowed to stand for 1 hour and then filtered through sterile cotton cloth to obtain water extract.

Microbial cultures and growth conditions

The plant extracts were assayed for antifungal activity against the fungal strain *A. niger*, obtained from Microbial Type Culture Collection, Research lab Department of Botany Taliparamba. This fungus was grown on PDA plate at 28°C and maintained with periodic sub-culturing at 4°C.

Potato Dextrose Agar (PDA) Medium (pH 6.7)

Potato - 250g

Dextrose - 15g

Agar - 18g

Distilled water - 1000ml

Every 15ml of sterile potato dextrose agar medium was poured into sterile petridishes after flaming the top of the conical flask. 5ml of either crude or aqueous extract of each plant was added. The solution in each petridish was gently swirled and allowed to solidify. The extract amended medium in the petridishes were inoculated separately at the centre with each test fungus and incubated at room temperature for 14 days (a sterile needle was used to inoculate fungal strains to these petridishes). The medium without any extract served as control.

Incubation period of 24- 48hours at 28°C was maintained for observation of antifungal activity of plant extracts. The antifungal activity was evaluated by measuring zones of inhibition of fungal growth surrounding the plant extracts. The complete antifungal analysis was carried out under strict aseptic conditions.

RESULTS AND DISCUSSION

Antifungal activity of 5 botanical extracts was assayed and data on effect of plant extracts on the growth of *A. niger* presented in Table 1. The data revealed that significant reduction in growth of *A. niger* was observed with extracts of 5 medicinal plants and the extracts showed significant differences in their mode of action.

Table 1. Antifungal activity of some medicinal plants against *Aspergillus niger*

Botanical name	Family	Local name	Part tested	<i>Aspergillus niger</i>
<i>Abrus precatorius</i> L.	Papilionaceae	Kunni	Leaf	*
<i>Aegle marmelos</i> (L.) Correa ex Roxb.	Rutaceae	Koovalam	Leaf	*
<i>Aporosa lindleyana</i> Baill	Euphorbiaceae	Vittil	Leaf	+
<i>Areca catechu</i> L.	Arecaceae	Adakka	Kernels	*
<i>Brassica juncea</i> (L.) Czern.	Brassicaceae	Katuku	Seed	*

* maximum activity, + minimum activity

In addition to this antifungal activity *Abrus precatorius* L. seeds possess anticataract and antioxidant activities, which might be helpful in preventing or slowing the progress of cataract [Muthuswamy *et al*]. *Aegle marmelos* (L.) Correa ex Roxb. is an essential ingredient of several ayurvedic formulations. A study was undertaken to evaluate the effectiveness of this plant in polyherbal antidiarrhoeal formulation by comparing its antidiarrhoeal and antispasmodic effect with Mebarid; an antidiarrhoeal Ayurvedic formulation [Prashant *et al*]. Further *in vivo* studies and investigations on the isolation and identification of active components in these five plants may lead to chemical entities with potential for clinical use in the prevention and treatment of cataract.

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