

Evaluation of antimicrobial activity of Jackfruit Leaves (*Artocarpus heterophyllus*, Lam.)

R.Durga¹, G.Kanimozhi² and M.Ayyanar³

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Abstract

This study was carried out with an objective to investigate the antibacterial and antifungal potentials of leaves of *Artocarpus heterophyllus*. The aim of the study is to assess the antimicrobial activity and to determine the zone of inhibition of extracts on some bacterial strains. The antibacterial activity was carried out against *Enterococcus pneumoniae*, *Bacillus* sp, *Klebsiella pneumoniae* and *Pseudomonas* Sp and antifungal activity was carried out against *Aspergillusniger*, *A.flavus* and *A.terreus*. The antimicrobial activity was determined in the extracts using agar disc diffusion method. The overall results showed that in all concentration of inoculation, the methanolic extract of the leave produced more antimicrobial activity against *Enterococcus pneumonia* than other species. The antimicrobial activity of the *Artocarpus heterophyllus* was due to the presence of various secondary metabolites. Hence, this plant can be used to discover bioactive natural products that may serve as leads in the development of new pharmaceuticals research activities.

Keywords: Antimicrobial, Aspergillus, Bioactive pharmaceuticals, Enterococcus.

R. Durga

PG & Research Department of Botany and Microbiology, A.V.V.M. Sripushpam College (Autonomous), Poondi-613 50, Thanjavut Dt, Tamilnadu.

email: durgarajkumar67@gmail.com

Introduction

Plants which have been chosen for medicinal purpose over the decades will be the most obvious choice of examining the current search for therapeutically effective new drugs with anticancer (Dewick, 1996), antimicrobial (Phillipson and Wright, 1996) and antihepatotoxic compounds. Jack fruit *Artocarpus heterophyllus* is available in the markets of India in spring and summer seasons and it is third largest harvested fruit after mango and banana. It has been listed in rarely utilized plants because it is considered as fruit of lower social class people in Asian countries. Various parts of the tree like leaves, stem, fruit, bark and roots found to have numerous medicinal values (Hakim 2005).

Jackfruit is a richest source of carbohydrates, minerals, carboxylic acids, dietary fiber, ascorbic acid and thiamine (Rahman 1999). The protective role of phytochemicals has been associated with their antimicrobial activity. The antimicrobial activity of plants is due to the presence of phenolic and flavonoid compounds, which offer various health benefits for human being. From the previous literature it is well known that jackfruit *Artocarpus heterophyllus* has various healing properties against human diseases and especially more importance were given towards the antioxidant activity from leaf, bark, and fruit extracts (Loizzo 2010; Omar 2011), antiviral activity (Tamma 2006), anticancer activity (Sun 2017), anti-inflammatory activity (Wei 2005), and antibacterial (Khan 2003a; Loizzo 2010) and antifungal potential (Trindade 2006) of several extracts and fractions of jackfruit and its parts.

So in accordance with previous studies, the present work is aimed to evaluate the antimicrobial of methanolic extract of jackfruit *Artocarpus heterophyllus* leaves.

MATERIALS AND METHODS

Collection of Sample

The jackfruit leaves samples were collected from Kollankarai, Thanjavur (DT). Tamil nadu, India.

Taxonomical classification

Class :Dicotyledonae

Order : Rosales

Family :Moraceae

Genus :*Artocarpus*

Species :*heterophyllus*



Antimicrobial activity

The anti-microbial activity of the plant extracts were carried by disc diffusion method (Bauer 2014). A suspension of tested microorganisms was spread on Muller-Hilton Agar (MHA) medium. The sterile filter paper discs (6mm in diameter) were individually impregnated with different concentration of plant extract prepared in methanol and then placed into the agar plates which had previously been inoculated in the tested microorganisms. The plates were subsequently incubated overnight at 37°C. After incubation the zone of inhibition were measured. For control methanol discs were used. All tests were performed in triplicate.

Table 1: Antibacterial activity of methanolic leaf extracts of A. hererophyllus

Concentration	Zone of inhibition in (mm)				Amoxicillin
	250	500	750	900	
<i>Proteus vulgaris</i>	8.6 6±0 .57	7.66± 1.52	12.66±0 .57	14.3 3±1. 15	22±1
<i>Bacillus subtilis</i>	9±1 .73	16.33 ±1.52	17.66±1 .52	19± 1	21±0. 57
<i>Pseudomonas aeruginosa</i>	11. 66± 1.1	13.66 ±1.52	16.66±1 .15	19.6 6±1. 52	21±1

RESULTS

Antimicrobial activity

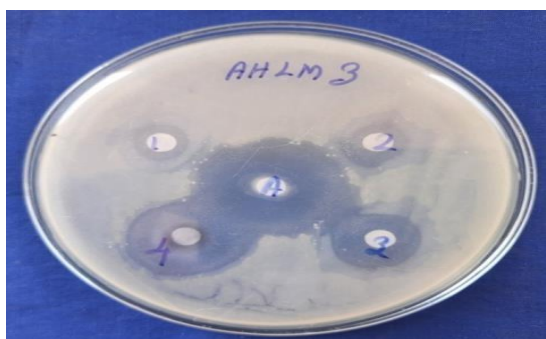
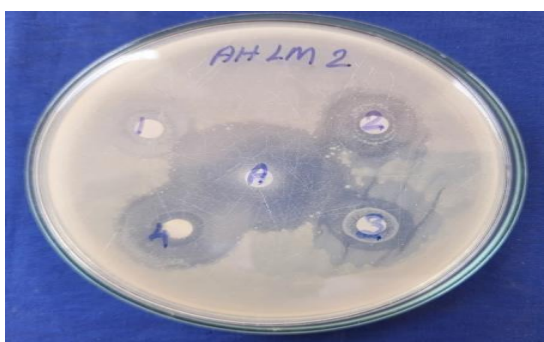
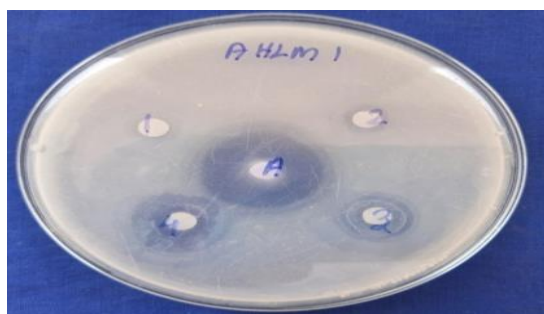
Antibacterial activity of methanolic leaf extracts

The methanol extract of *Artocarpus heterophyllus* leaves in different concentration (μ l) showed the zone of inhibition(mm) against bacterial species such as *Enterococcus pneumoniae*, *Bacillus sp*, *Klebsiella pneumoniae* and *Peudomonas Sp* (Table 1). The overall results showed that in all concentrations of inoculation, the methanolic extract of the leaves produced more antimicrobial activity against *Enterococcus pneumonia* than other species

Table 2: Minimum inhibitory concentration of AHLM

	<i>Proteus vulgaris</i>	<i>Bacillus subtilis</i>	<i>Pseudomonas aeruginosa</i>
Methanol	187.5	187.5	93.75
Standard (Amoxicillin)	31.25	62.5	31.25

Figure 1: Antibacterial activity of AHLM against the *Proteus vulgaris*, *Bacillus subtilis*, *Pseudomonas aeruginosa*



DISCUSSION

Plant based antimicrobial compounds have various biological potentials as they serve the purpose without any side effect which is often associated with the synthetic compounds. Sreelatha *et al.* (2018) reported that ethyl acetate extract of fruit of *A.heterophyllum* showed the highest antibacterial activity against *Staphylococcus aureus*(16 mm) and *Candida albicans*(29 mm) and antifungal activity against *C.albicans*. Khan *et al.* (2003) studied the broad spectrum of antibacterial activity of methanolic extracts of *A. heterophyllum* fruits. Prasad *et al* (2014) revealed that Acetone extract of the Jackfruit leaves exhibited good antimicrobial activity against the selected human pathogens i.e. *Pseudomonas aeruginosa* and *Staphylococcus aureus*.

In relation to previous works, the present work showed methanol extract of leaves of jackfruit *A. heterophyllum* had produced significant antimicrobial activity against *Enterococcus pneumonia* than other species and better antifungal activity against *A.flavus* when compared to other fungal species.

Antimicrobial properties of medicinal plants are being increasingly reported from different parts of the world. The World Health Organization estimates that plant extract or their active constituents are used as folk medicine in traditional therapies of 80% of the world's population. In the present work, the extracts obtained from *Artocarpus heterophyllum* show strong activity against most of the tested bacterial and fungal strains. The results were compared with standard antibiotic drugs. In this screening work, extracts of *Artocarpus heterophyllum* were found to be not inactive against any organism, such as Gram-positive, Gram-negative, and fungal strains were resistant to all the extracts of *Artocarpus heterophyllum*. The methanolic extract of the leaves extracts of *Artocarpus heterophyllum* were found to be active on most of the clinically isolated microorganism as compared with standard drugs. The present study justified the claimed uses of leaves in the traditional system of medicine to treat various infectious disease caused by the microbes. However, further studies are needed to better evaluate the potential effectiveness of the crude extracts as the antimicrobial agents. The present results will form the basis for selection of plant species for further investigation in the potential discovery of new natural bioactive compounds. Further studies which aimed at the isolation and structure elucidation of antibacterial active constituents from the plant have been initiated. However, there is scope for further clinical studies which can be carried out to explore the utility and efficiency in the treatment of chronic diseases.

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