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# Preliminary Phytochemical tests, Physicochemical Parameters and Anti bacterial activity of *Artocarpus heterophyllus*

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**ABSTRACT**

**Background:** The therapeutic action of the plant mainly depands on its chemical constituents. In this study, experiments were carried out in order to evaluate the effect of extraction on Preliminary Phytochemical tests, Physicochemical parameters and antimicrobial activity of *Artocarpus heterophyllus.*

**Methods :** Detremination Of Total Ash, Acid Insoluble Ash, Alcohol Soluble Extractive, Water Soluble Extractive values are done by Physicochemical parameters.Antimicrobial activity done by cup and plate method.

**Results and Discussion:** A Preliminary Phytochemical analysis was carried out and finally concluded that the presence of tannins, alkaloids, phenols,saponins,proteins,carbohydrates, flavonoids, fixed oils and sterols in the extract. For physicochemical parameters obtained result of extractive values for total ash - 27.50, acid insoluble-19.05, alcohol soluble-13.05 and Water soluble - 24.92 %w/w is very high. The methanolic extract of *Artocarpus heterophyllus* showed maximum antimicrobial activity against E.coli.

**Conclusion:** The *Artocarpus heterophyllus* extract showed very strong positive test for carbohydrates and saponins. For Sterols, flavonoids and alkaloids showed strong effect. Phenols and tannins showed moderate effect.The hexane and ethyl acetate extracts showed moderate antibacterial effect. Methanolic extract was used to test the antimicrobial activities against one Gram positive and one Gram negative bacteria. methanolic extract of leaf was found to be exhibit maximum antimicrobial activity against E.coli.

**KEYWORDS**: *Artocarpus heterophyllus*, Preliminary Phytochemical tests ,Physicochemical parameters and Antimicrobial activity

## Introduction

MORACEAE, the mulberry family of the rose order (Rosales), with about 40 genera and some 1,000 species of deciduous or evergreen trees and shrubs, distributed mostly in tropical and subtropical regions[1]. Plants of the family contain a milky latex and have alternate or opposite leaves and small, petal less male or female flowers. The fruits of many species are multiple because fruits from different flowers become joined together. The family of flowering plants compromising about 38 genera and over 1180 species [2,3]. most are wide spread in tropical and sub tropical regions, less so in temperate climates. It is a large, evergreen tree, 10-15m in height, indigenous to the evergreen forests at altitude of 450-1,200m and cultivated throughout the hotter parts of India.

It requires a soil which is well drained but moist, with a pH of 4.3 to 8.0 and with medium soil fertility. The optimum temperature is 19 to 29$^{c}$, altitude at approx. 1600 meters above sea level and the annual rain fall between 1000 and 2400 mm [4] .

It is native to parts of South and Southeast Asia and is believed to have originated in the southwestern rain forests of the Western Ghats in the Indian Subcontinent.[5] The jackfruit tree is well suited to tropical lowlands, and its fruit is the largest tree-borne fruit, reaching as much as 35 kg (80 lb) in weight, 90 cm (35 in) in length, and 50 cm (20 in) in diameter [6]. The jackfruit tree can produce about 100 to 200 fruits in a year [7].The jackfruit tree is a widely cultivated and popular food item throughout the tropical regions of the world. Jackfruit is the National fruit of Bangladesh[8]. The jackfruit has played a significant role in Indian agriculture for centuries [9]. Archeological findings in India have revealed that jackfruit was cultivated in India 3000 to 6000 years ago. It has also been widely cultivated in southeast Asia

## Materials and Methods

### Plant material collection and authentification

The plant material of *Artocarpus heterophyllus* was collected in parvathipuram, vizianagaram (dist) Andhra Pradesh, India in December 2016. The plant species was authenticated by Pro. Bodaih Padal, Taxonomist, Department of botany, Andhra university, Visakhapatnam. The voucher specimens (22212) were deposited in the herbarium, college of pharmaceutical sciences, Andhra university.

The literature study revealed that not much Phytochemical work was carried out on *Artocarpus heterophyllus* . In the view of the prevalent use mentioned by the folklore in the treatment of inflammation and also due to little Phytochemical work reported, a systemic approach was followed to isolate chemical constituents from whole plant.

### Extraction process

The collected leaves were dried under shade and powdered. The powdered materials were soxhlet extracted.

### Soxhlet Extraction:

The dried powdered materials of leaves of the plant were extracted with soxhlet apparatus successively three times with Hexane, Ethyl acetate , 30 % aq. methanol. The obtained extracts were concentrated and dried completely, weighed and stored in a dessicator.

**Table No:1. Extraction**

| Plant Material | Extracts | No.of cycles | Weight of the extract |
|---|---|---|---|
| 750 grams of dried leaves | Hexane | 3 | 11g |
| | Ethyl acetate | 3 | 19g |
| | 30%aq.Methanol | 3 | 66.7g |

### Phytochemical Analysis

The Phytochemical analysis of the extracts were carried out by the standard methods provided by Odebiyi, Ramstard and waterman and prepared extract was tested for the type of chemical constituents present by known qualitative tests.

**Physicochemical parameters**
The ash values and extractives values were performed according to the official methods described in the Indian pharmacopeia and WHO guidelines on quality control methods for medicinal plant materials.

**Detremination Of Total Ash**
About 2 to 3 grams (accurately weighed) ground leaves powder was taken in a silica crucible previously ignited and weighed. It was incinerated by gradually increasing the heat not exceeding dull red heat (4500C) until free from carbon, cooled and weighed. The percentage of

ash was calculated with reference to the air dried powder. The procedure was repeated five times to get constant weight.

**Determination Of Acid Insoluble Ash**
The total ash was boiled for 5 minutes with 10% w/v dilute hydrochloric acid and filtered through an ash less filter paper (whatmann no. 41). The filter paper was ignited in the silica crucible, cooled and acid insoluble ash was weighed.

**Determination Of Alcohol Soluble Extractive**
5 grams of the leaf powder was macerated with 100 ml of alcohol of the specified strength in a closed flask for 24 hrs, shaking frequently during 6 hrs and allowing it to stand for 18 hrs. It was filtered rapidly taking precautions against loss of alcohol and 25 ml of the filtrate was evaporated to dryness in a tarred bottomed shallow dish at 1050C and weighed. The percentage of alcohol soluble extractive was calculated with reference to the air dried powder.

**Determination Of Water Soluble Extractive**
About 5 grams of the leaf powder was added to 50 ml of water at 800C and to it 2 grams of keiselghur was added and filtered. 5 ml of the filtrate was transferred to a tarred evaporating dish, the solvent was evaporated on a water bath, drying was continued for half an hour, finally it was dried in a hot air oven for 2 hours and weighed. The percentage of water soluble extractive was calculated with reference to air dried drug.

**Evaluation of antibacterial activity:**
Determination of zone of inhibition by cup plate method. The cylinder plate assay of drug potency is based on measurement of the diameter of zone of inhibition of microbial growth surrounding cylinders (cups), containing various dilutions of test compounds. A sterile borer was used to prepare four cups of 6 mm diameter in the agar medium spread with the micro-organisms and 0.1 ml of inoculum. These cups were spread on the agar plate by spread plate technique. Accurately measured (0.05 ml) solution of each concentration and reference standards were added to the cups with a micropipette. All the plates were kept in a refrigerator at 2 to 8°C for a period of 2 hours for effective diffusion of test compounds and standards. Later, they were incubated at 37°C for 24 hours. The presence of definite zone of inhibition of any size around the cup indicated antibacterial activity. The solvent control was run simultaneously to assess the activity of dimethyl sulphoxide and water which were used as a vehicle. The experiments were performed three times. The diameter of the zone of inhibition was measured and recorded.

**Results**
**Table:2 Preliminary Phytochemical tests of the Methanolic extract of A. *heterophyllus***

| Name of the test | Crude extract |
|---|---|
| Alkaloids | +++ |
| Carbohydrates | ++++ |
| Amino acids | + |
| Phenols | ++ |
| Tannins | ++ |
| Terpenoids | +++ |
| Saponins | ++++ |
| Flavonoids | +++ |
| Cardiac Glycosides | - |
| Proteins | ++ |
| Fixed oils and fats | + |
| Steroids | +++ |

*Weak (+), moderate (++), strong (+++), very strong (++++), absent (--).

**Table 3:Physicochemical Parameters:**

| Parameters | Extractive value results(%w/w) |
|---|---|
| Total ash | 27.50 |
| Water soluble | 24.92 |
| Acid insoluble | 14.06 |
| Alcohol soluble | 13.05 |

**Table No:4.Antibacterial activity of *Artocarpus heterophyllus* leaf extract**

| Plant Extract | Dose | Zone of inhibition(mm) Gram positive (S.aureus) | Zone of inhibition(mm) Gram negative( E.coli) |
|---|---|---|---|
| Hexane extract | 50 µg/ml | 0.00 | 0.00 |
| | 100 µg/ml | 0.73 | 0.89 |
| Ethyl acetate extract | 50 µg/ml | 4.9 | 5.6 |
| | 100 µg/ml | 6.1 | 6.2 |
| Methanolic extract | 50 g/ml | 7.9 | 6.5 |
| | 100g/ml | 9.2 | 9.6 |
| Standard ( amikacin | - | 12.3 | 12.7 |
| Control | | 0.9 | 0.9 |

**Discussion**
Phytochemial screening of leaf extract revealed that alkaloids, carbohydrates, terpenoids, steroids, saponins were the major phytochemical constituents in leaf of *Artocarpus heterophyllus*. Methanolic extract of *Artocarpus heterophullus* was found to be exhibit maximum antimicrobial activity against E.coli. With respect to the zone of inhibition, it can be concluded that the maximum range of zone of inhibition was exhibited by leaf extract with the high concentration. The Gram-positive bacterial strains were found to be more susceptible to the extracts of various plant parts tested as compared to Gram-negative bacteria.

From the present study it can thus be concluded that medicinal properties of *Artocarpus heterophyllus* is by virtue of the presence of several phytochemical constituents and the antimicrobial activities is exhibited against several pathogenic microorganisms. However further research is needed in this aspect to investigate the potentialities of a wide range of extractants to cure several ailments. Activities of the various extracts were comparable to those of standard antibacterial agent Amaikacin and methanol as a control. Demonstration of antibacterial activity of *A. heterophyllus* against the various bacterial strains tested is an indication of the possibility of sourcing alternative antibiotic substances in this plant for the development of newer antibacterial agents[10,11]

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