



## PHYTOCHEMICAL ANALYSIS AND ANTIMICROBIAL ACTIVITY OF *ARTOCARPUS HIRSUTUS*: AN *IN VITRO* STUDY

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### ABSTRACT

In the present study effort was aimed to evaluate phytochemical components and antimicrobial activity of *Artocarpus hirsutus* edible fruit part with different organic solvent extracts by Soxhlet extraction method with analytical grade solvents viz., methanol and petroleum ether. This study reports the potent phytochemical components which were observed qualitatively. The *in vitro* antimicrobial activity was performed by agar well diffusion method against the clinically important bacterial strains viz., *Staphylococcus aureus* (NCIM 2492), *Bacillus subtilis* (NCIM 2439) and *Klebsiella pneumoniae* (NCIM 2719) with the concentration of different extracts ranged from 25 to 75 $\mu$ L. It has shown the concentration dependent antimicrobial activity. This study reveals the presence of phytochemical components like alkaloids, flavonoids, saponins, terpenoids. The study shows the effective antimicrobial activity against *Staphylococcus aureus* and *Klebsiella pneumoniae* bacterial strains with maximum zone of inhibition compared with standard drug tetracycline.

**KEY WORDS:** *Artocarpus hirsutus*, Edible fruit, phytochemical components Antimicrobial.



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## INTRODUCTION

*Artocarpus hirsutus* belongs to the family Moraceae and this family comprises of 50 different species. They are evergreen and deciduous trees growing in the southern regions of India. The important source of this plant is edible fruit, leaves, bark and also economically good in timber. The other *Artocarpus* genus like *Artocarpus heterophyllus* (jack fruit), *Artocarpus altilis* (breadfruit) have medicinal value in their source as an edible aggregate fruit <sup>1</sup>. *Artocarpus hirsutus* (wild jack fruit) is distinctively well known as sources of traditional medicine, food and industry <sup>2</sup>. Plants are vital for the existence as well as remedies for human diseases because they contain components of therapeutic value <sup>3</sup>. The increasing toxicity and allergic manifestations of the synthetic drugs use of medicinal plants is growing worldwide <sup>4</sup>. Plants are potent biochemical factories and have been components of phytomedicine i.e., any part of the plant may contain active components<sup>5</sup>. Investigation of medicinal value of *Artocarpus hirsutus* have added a great deal in the field of phytochemistry with regard to their availability of complex phytochemical components, antibacterial activity, antihelmentic, anti-inflammatory and antiviral. There has been growing interest regarding thousands of bioactive compounds that have been produced by this plant species <sup>6</sup>. A number of *Artocarpus* species are used as traditional medicine in South-East Asia; they contain medicinally important secondary metabolites possessing useful biological activities <sup>7</sup>. The medicinal actions of plants are unique to particular plant species <sup>8</sup>. Therefore, it is worthwhile to use modern tools for verifying therapeutic potential of *Artocarpus hirsutus* edible fruit. Such information may unravel novel treatment strategies for disorders <sup>9</sup>. Based on the arena of research data and review this study was taken to investigate phytochemical analysis and to evaluate antibacterial activity of edible fruit extracts present in this plant which is known to have pharmacological importance.

## MATERIALS AND METHODS

The *Artocarpus hirsutus* edible fruit was collected from the surroundings of Western Ghats region Karnataka. Fruit material was authenticated by Prof. Krishna V, Head and Chairman, Dept of Biotechnology, Kuvempu University and voucher specimen were deposited in the same department. Fruits were separated from the plant and shade dried. Dried fruit material is pulverized into fine powdered form, filtered through a mesh and an approximate amount of powdered material is subjected to Soxhlet extraction method with analytical grade solvents with varying polarity such as methanol and petroleum ether. The crude fruit extracts obtained was evaporated completely and processed for the further use.

### 1. Phytochemical Screening

Chemical tests were carried on methanolic and petroleum ether extracts of *Artocarpus hirsutus* fruit. Standard procedures were employed to identify the phytochemical constituents as described by <sup>10, 11, 12, 8</sup>.

### 2. Antimicrobial activity

#### Determination of antimicrobial activity

#### Test microorganisms used

Antimicrobial activity of *Artocarpus hirsutus* fruit extracts were tested against the following bacterial strains *Staphylococcus aureus* (NCIM 2492), *Bacillus subtilis* (NCIM 2439), *Klebsiella pneumoniae* (NCIM 2719) were obtained from Institute of Microbial Technology, Chandigarh and maintained on Nutrient agar (NA).

#### Bioassay for bacterial strains

*Staphylococcus aureus* (NCIM 2492), *Bacillus subtilis* (NCIM 2439), *Klebsiella pneumoniae* (NCIM 2719) were inoculated by streaking using a loop onto plates containing Nutrient Agar (NA) media and incubated at 32°C for 24hr. To carry out agar diffusion assay, the bacterial suspensions were prepared in sterile distilled water.

**Agar diffusion assay**

The modified agar well diffusion method was employed<sup>13</sup>. The bacterial suspensions were inoculated onto nutrient agar media by spread plate technique. Once it is dried, 4mm diameter wells were punched onto the media. Tetracycline was used as a standard antibiotic (0.5 mg/mL), 10 mg/mL fruit extracts of *Artocarpus hirsutus* were dissolved in DMSO (Dimethyl Sulfoxide) from which 25, 50 and 75 microlitres of each fruit extract got was added into agar wells. The plates were sealed and incubated at 32° C for 24 hr. The inhibition zone diameter was recorded after the incubation period along the two cardinal diameters and averaged. Same procedure was repeated with the fruit extracts and inhibition zone diameters were recorded<sup>13, 14, 15</sup>. All the experiments were conducted in quadruplicates.

**RESULTS AND DISCUSSIONS****1. Phytochemical analysis**

The *Artocarpus hirsutus* plant is rich in polyphenolic compounds. All the estimated phytochemical analysis of *Artocarpus hirsutus* fruit extracts is presented in Table 1.1. Phenolic compounds including flavonoids seem to be typical in all the genus of *Artocarpus* like *Artocarpus heterophyllus*, *Artocarpus altilis*<sup>16, 17, 18</sup>. The analysis revealed the presence of alkaloids, flavonoids, saponins and terpenoids in the methanolic fruit extract of *Artocarpus hirsutus*. Terpenoids was absent in the petroleum ether fruit extract. The findings and results of this study encourages for potent antimicrobial activity.

**Table 1.1**  
**Presence of different Phytochemicals screened in *Artocarpus hirsutus***

| Compounds         | Methanolic | Petroleum ether |
|-------------------|------------|-----------------|
| <b>Alkaloids</b>  | +          | +               |
| <b>Tannins</b>    | -          | -               |
| <b>Flavonoids</b> | +          | +               |
| <b>Saponins</b>   | +          | +               |
| <b>Steroids</b>   | -          | -               |
| <b>Terpenoids</b> | +          | -               |
| <b>Glycoside</b>  | -          | -               |

(+present, - absent)

**2. Determination of Antimicrobial Activity**

The antimicrobial activity of *Artocarpus hirsutus* fruit extracts against *Staphylococcus aureus*, *Bacillus subtilis* and *Klebsiella pneumoniae* as shown in Table 2.1 and Figure 2.2. It has shown that concentration dependent antimicrobial activity in all the assays. Methanolic extract

isolated from fruit of *Artocarpus heterophyllus* have good active antibacterial activity<sup>19, 20, 21</sup>. Methanolic extract of *Artocarpus hirsutus* exhibited good inhibition activity against *S.aureus*, *B.subtillis* and *K.pneumoniae* and Petroleum ether extract showed low inhibition activity against the bacterial strains respectively.

Methanolic extract and Petroleum ether extracts of *Artocarpus hirsutus* showed good inhibition to the growth of bacterial strains and promising antimicrobial activity against bacterial strains comparison with standard antibiotic Tetracycline. The present study discusses the significance of *Artocarpus hirsutus* plant as a valuable source of secondary metabolites like alkaloids, flavonoids, saponins and terpenoids from the fruit extracts. Further, it revealed the

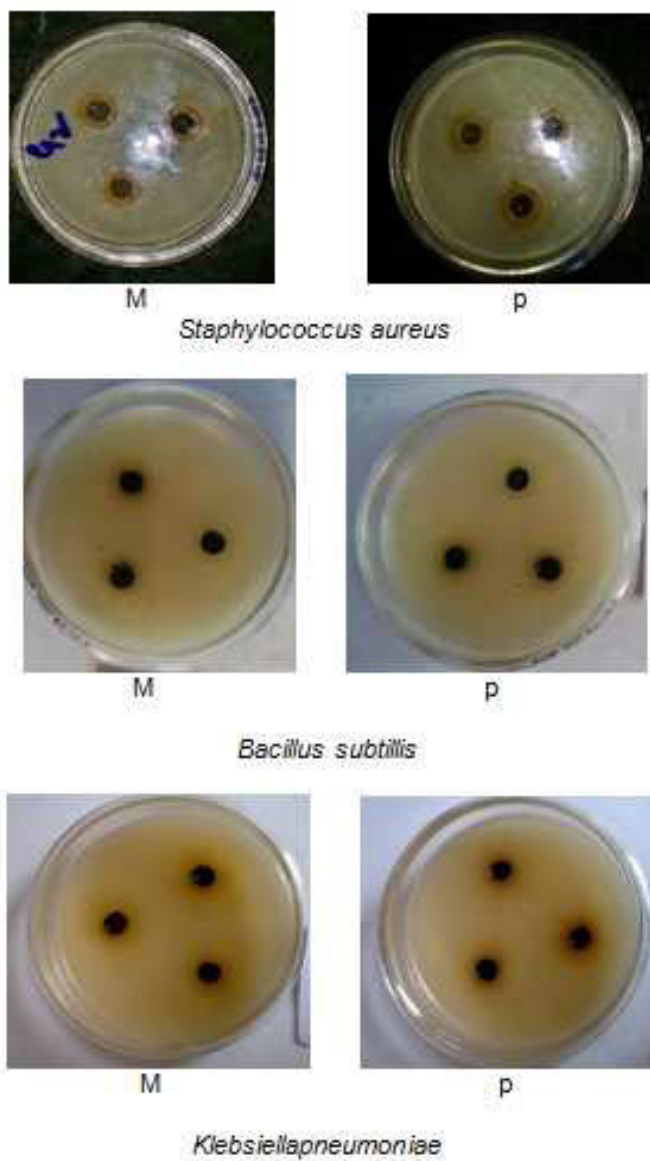
remarkable antimicrobial activity of *Artocarpus hirsutus* fruit extracts comparison with the standard antibiotic. Methanolic extract showed the maximum zone of inhibition against *S.aureus* and *K. pneumoniae* (17mm) and petroleum ether extract has shown zone inhibition diameter (15mm) against *S.aureus*. This study would be a base for the further isolation of novel components from the fruit material.

**Table 2.1**  
**Antimicrobial activity of *Artocarpus hirsutus* fruit extracts against bacterial strains.**

| Bacterial strains    | Inhibition zone diameter in mm**         |    |    |                 |    |    |
|----------------------|--|----|----|-----------------|----|----|
|                      | Concentration in $\mu\text{L}/\text{mg}$ |    |    |                 |    |    |
|                      | Methanolic                               |    |    | Petroleum ether |    |    |
|                      | *1                                       | 2  | 3  | *1              | 2  | 3  |
| <i>S. aureus</i>     | 10                                       | 15 | 17 | 12              | 12 | 15 |
| <i>B. subtilis</i>   | 11                                       | 13 | 16 | 10              | 13 | 14 |
| <i>K. pneumoniae</i> | 12                                       | 14 | 17 | 11              | 12 | 13 |

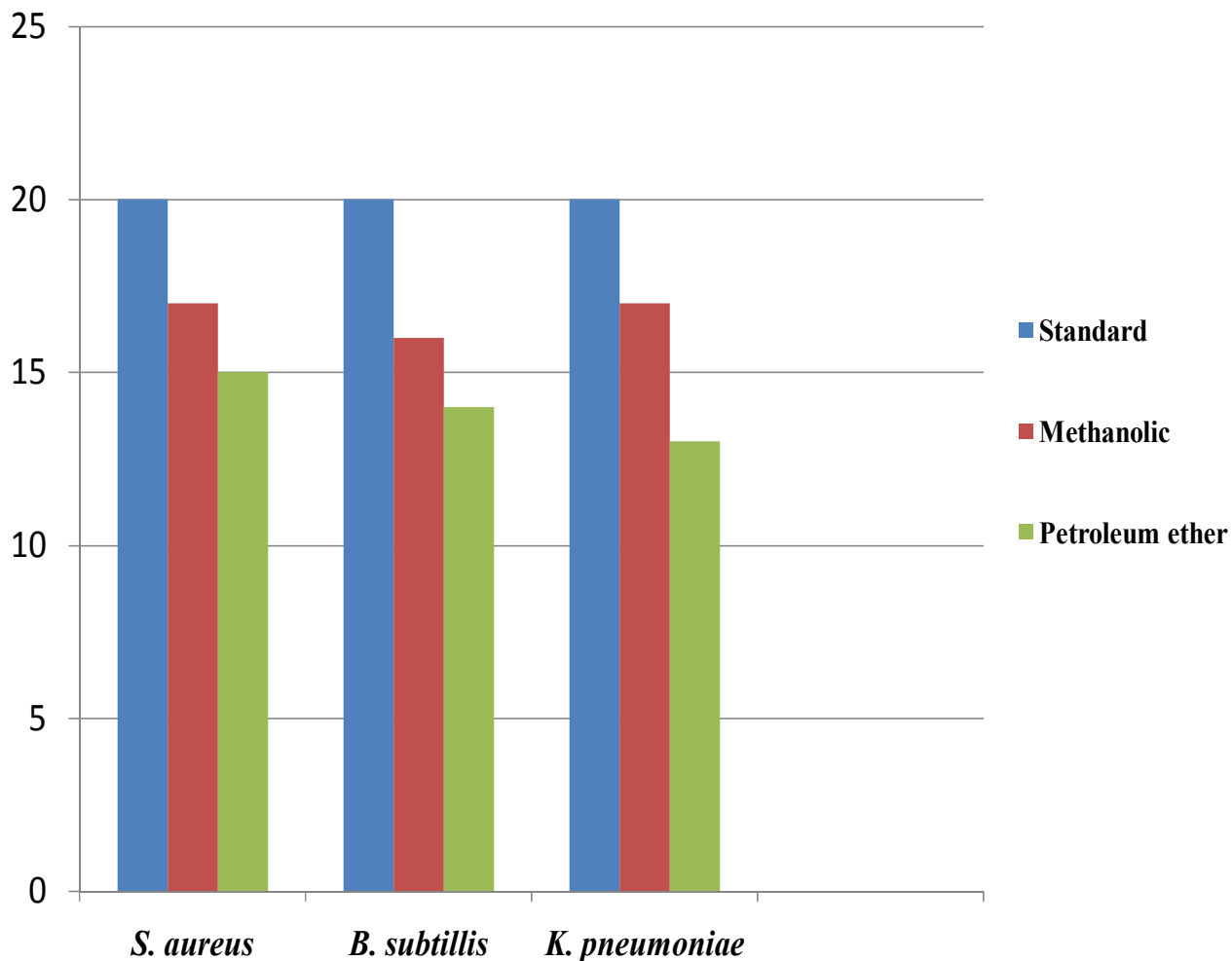
\*Concentration of extracts: 25  $\mu\text{L}$ , 50  $\mu\text{L}$ , 75  $\mu\text{L}$ .

\*\* Each value in the table was obtained by calculating the average of three experiments



**Figure 2.2**  
***Inhibition of Artocarpus hirsutus* fruit extracts on bacterial strains.**  
***M-methanol P- petroleum ether***

**Antimicrobial activity of *Artocarpus hirsutus* fruit different extracts**



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