

Antibacterial and Antifungal Approaches of *Ficus racemosa*

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ABSTRACT

Ficus racemosa also called as *Ficus glomerata* Roxb. is a species of plant in the family Moraceae. Popularly known as the Audumbar, cluster fig tree, Indian fig tree or gular (gular). Different parts of plant shows Antibacterial, Antitussive, Anthelmintic, Antidiarrhoeal, Anti-cancer, Anti-inflammatory activities etc. on various extracts. Latest and previous studies have concluded the beneficial aspects of fruit of the plant shows Antimicrobial, Antibacterial and Antifungal activity using different cultures and extracts. **Materials and Methods:** The method was adopted for preparation of plant extracts. The media used for antibacterial test was Nutrient agar/broth. The culture medium was inoculated with the microorganism separately suspended in nutrient broth. The antibacterial activity was evaluated by measuring the diameter of zone of inhibition observed. The broth dilution method was adopted for determination of MIC value against the pathogens. **Results and Discussion:** The ethanoic and ethyl acetate extract showed more promising antimicrobial activity as compared to Water, Hexane and Chloroform extract. In well diffusion method, the ethyl acetate extract had showed significant bactericidal activity.

Key words: *Ficus racemosa*, Moraceae, Soyabean casein digest agar, Anthraquinone glycosides.

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History

- Submission Date: 26-11-2018;
- Review completed: 13-12-2018;
- Accepted Date: 29-12-2018

DOI : 10.5530/pj.2019.11.53

Article Available online

<http://www.phcogj.com/v11/i2>

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INTRODUCTION

Ficus racemosa popularly known as the Audumbar, cluster fig tree, Indian fig tree or gular (gular) which is also called as *Ficus glomerata* Roxb, is a plant species belongs the family Moraceae. In India, the tree fruits are called gular. Glucan acetate was the major component of fruits. The other components were lupeol acetate, friedelin, glucanol, tiglic acid, taraxasterol and hydrocarbons.¹ The leaves the plant is rich in triterpenoids (basically lanosterol), flavonoids, alkaloids and tannins. Glucan acetate and racemosic acid are the new triterpenes.² The bark of tree is said to have healing power. The major component of the stem bark was Bergenin which is a flavonoid. The other major components of the stem bark were glycosides sterols (β -sitosterol, stigmasterol, α -amyrin acetate, lupeol and lupeol acetate), (leucocyanidin-3-O- β -D-glucopyranoside, leucopelargonidin-3-O- β -D-glucopyranoside, leucopelargonidin-3-O- β -D-glucopyranoside and leucopelargonidin-3-O- α -L-rhamnopyranoside); and tannins (ellagic acid).³ The trunk bark contains various types of sterols like β -sitosterol, lupenol and stigmasterol.² The latex rich in various types of steroids such as isoeuphorbol, β -sitosterol, euphol, 4-deoxyphorbol, cycloartenol and cycloeuphordenol.¹

Different parts of *Ficus racemosa* shows Antibacterial, Hepatoprotective, Antitussive, Antiulcer, Wound healing, Anthelmintic, Antidiuretic effect, Antidiarrheal, Chemo preventive effect on the nephron, Anticancer, Anti-inflammatory activities etc. on various extracts.⁴ Antibacterial means anything to destroy bacteria or

suppresses their growth.⁵ Antimicrobial activity is the process of inhibiting or killing the disease caused due to microbes while Antifungal activity is destroy fungi or inhibiting fungal growth.⁶ Latest and previous studies have concluded the beneficial aspects of fruit of the plant shows Antimicrobial, Antibacterial and Antifungal activity using different cultures comparing various extracts.⁷⁻⁸

MATERIALS AND METHODS

Experimental Section

All the chemicals and reagents used were from Bhavichem.

The media and broth used for microbial culture were from Hi-Media Pvt. Limited, Bombay, India.

Plant material

The authenticated sample was collected from local market of Mumbai

Preparation of plant extracts

The method was adopted for preparation of plant extracts with little modifications. Briefly

Five 10 g portions of each of the powdered plant material of the fruit of the tree were soaked separately in 100 ml of water, chloroform, ethyl acetate, hexane and ethanol for 72 h. Each mixture was stirred after every 12 h using a sterile glass rod. At the end of extraction, each extract was passed through Whatmann filter paper no1.⁹

Cite this article: Pingale T, Duse P, Ogale S. Antibacterial and Antifungal Approaches of *Ficus racemosa*. Pharmacogn J. 2019;11(2):355-7.

Determination of Antibacterial and Antifungal Activity Culture Media

The media used for antibacterial test was Nutrient agar/broth.

Inoculum

The bacteria were inoculated into soyabean casein digest agar/broth and incubated at 37°C for 4h and the suspension were checked to provide approximately 105 CFU/ml.

Microorganisms used

The bacterial test organisms *E. coli*, *Klebsiella pneumoniae*, *Streptococcus aureus* and *Salmonella typhi* and the fungal test organisms used for study were *Candida albicans* and *Aspergillus niger*.

Determination of antimicrobial activity

The agar well diffusion method was modified. Nutrient agar medium was used for bacterial cultures. The culture medium was inoculated with the microorganism separately suspended in nutrient broth. A total of 8 mm diameter wells were punched into the agar and filled with plant extracts (1mg/ml) and solvent blank (hydro-alcohol as the case may be). Standard antibiotic Chloramphenicol (concentration 1mg/ml) was simultaneously used as positive control. The bacterial plates were then incubated at 37°C for 24 h. The antibacterial activity was evaluated by measuring the diameter of zone of inhibition observed. The same procedure was done for determining antifungal activity but in this case standard antibiotic (Ketokonazole, concentration 1mg/ml) was used as positive control and fungal plates were incubated at 37°C for 72 h. Here also the diameter of zone of inhibition observed was measured.¹⁰

Determination of MIC

The broth dilution method was adopted for determination of MIC value against the pathogens. The plant extracts (1 mg/ml) were serially diluted in different aliquots and the final volumes of the aliquots were made up to 1 ml with N-saline (0.85 % NaCl). Equal amount of the specific pathogen were added in different aliquots and the test tubes were kept for 48 h at 300°C. The minimum dilution of the plant extract that kills the bacterial and fungal growth was taken as

MLC (Minimum lethal count) while the minimum dilution of plant extract that inhibits the growth of the organism was taken as MIC.¹¹

Phytochemical screening of the different parts of the tree

Different conventional methods were followed to determine qualitatively the presence of phytochemical constituents present in the extract.¹²

RESULTS

Phytochemical tests for the presence of active metabolites in the ficus racemosa fruits.

All extractive were negative for alkaloid and anthraquinone glycosides.

Determination of antimicrobial activity

Antimicrobial activity MIC concentration (mg/ml) (Table 3)

DISCUSSION

The dried fruits extracts of ficus racemose was obtained by maceration method. The yield of water, chloroform, ethyl acetate, hexane and ethanol extracts was found to be 9.18 w/w, 1.82 w/w, 12.98 w/w, 1.09 w/w and 5.23 w/w respectively.

Table 1: Extractive Value.

| solvents | water | chloroform | Ethyl acetate | Hexane | Ethanol |
|-------------------|----------|------------|---------------|----------|----------|
| Extractive value* | 9.18 w/w | 1.82 w/w | 12.98 w/w | 1.09 w/w | 5.23 w/w |
| Colour | Brownish | Brownish | Brownish | Greenish | Brownish |

* Each value is an average of three determinations.

Table 2: Phytochemical tests.

| Extractive | Glucanol | Tiglic acid | Taraxasterol | Lupeol acetate | Friedelin | Hydrocarbon |
|---------------|----------|-------------|--------------|----------------|-----------|-------------|
| Water | + | + | - | - | - | - |
| Chloroform | - | - | - | - | - | - |
| Ethyl acetate | + | + | + | - | - | - |
| Hexane | - | - | - | - | - | - |
| Alcohol | - | - | + | - | - | - |

Table 3: Antimicrobial activity MIC concentration (mg/ml).

| Organism | MIC Conc. Mg/ml | | | | |
|--------------------|-----------------|---------|--------|------------|---------------|
| | Water | Alcohol | Hexane | Chloroform | Ethyl acetate |
| <i>E. coli</i> | 3.12 | 1.56 | 6.16 | 6.25 | 1.32 |
| <i>S. aureus</i> | 6.25 | 3.12 | 4.28 | 3.12 | 0.98 |
| <i>S. typhi</i> | 3.12 | 1.56 | 5.32 | 6.25 | 1.76 |
| <i>K. pnem.</i> | 2.78 | 1.56 | 6.49 | 3.12 | 1.52 |
| <i>A. niger</i> | 1.24 | 1.68 | 5.69 | 4.32 | 1.39 |
| <i>C. albicans</i> | 1.56 | 0.78 | 6.56 | 3.12 | 2.19 |

The preliminary phytochemical analysis of extracts have showed the presence of Glucanol, Tiglic acid, Taraxasterol, Lupeol acetate, Friedelin, Hydrocarbon, in addition to this they showed the presence of carbohydrate and mucilage.

The Water, Ethanol, Hexane, Chloroform and Ethyl acetate extracts of *Ficus racemosa* were subjected to *in vitro* antimicrobial studies by well diffusion method.

The ethanolic and ethyl acetate extract showed more promising antimicrobial activity as compared to Water, Hexane and Chloroform extract.

In well diffusion method, the ethyl acetate extract had showed significant bactericidal activity against *E.coli*, *S. aureus*, *S. typhi*, *K. pnem* at concentration 1.32mg/ml, 0.98mg/ml, 1.76mg/ml, 1.52mg/ml respectively and fungistatic against *Aspergillus niger* and *C. albicans* at concentration 1.39 mg/ml and 2.19mg/ml respectively in Table (3).

CONCLUSION

The minimum inhibitory concentration of combined extract was found to be 1 mg/ml.

The antimicrobial activity of water, chloroform, ethyl acetate, hexane and ethanol extracts of *Ficus racemosa* L was probably due to of some important secondary metabolites observed in preliminary phytochemical tests.

Therefore, this property of chemical component in these herbs can be used to discover natural bioactive products that potentially enhance the therapeutic value in the development of novel pharmaceutical research activities and suggesting for using potential antibacterial agents to cure bacterial infection.

ACKNOWLEDGEMENT

Firstly, we are thankful to our Principal Dr. Sunita Ogale from VIVA Institute of Pharmacy, Virar to motivate and helping us for conducting this study. We are also thankful to Bhavichem for providing us Laboratory chemicals and reagents. We are also acknowledge to Hi-Media Pvt. Limited, Bombay, India for providing the media and broth used for microbial culture.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

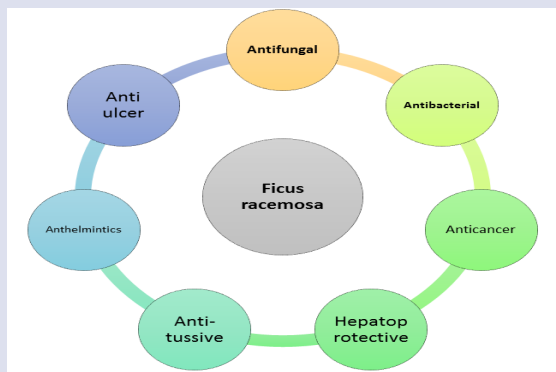
ABBREVIATIONS

MLC: Minimum Lethal Count; MIC: Minimum Inhibitory Concentration; CFU: Colony Forming Unit

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GRAPHICAL ABSTRACT



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SUMMARY

- *Ficus racemosa* also called as Audumbar is a species of plant in the family Moraceae. This plant have various activities. Different part of plant shows different activity. In this article proves antibacterial activity of *Ficus racemosa* using ethanolic and ethyl acetate extract. Therefore, this property of chemical component can be used to enhance the therapeutic value in the development of novel pharmaceutical research activities and suggesting for using potential antibacterial agents to cure bacterial infection.

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