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Original Research Article

ANTIBACTERIAL ACTIVITY OF FRUITS OF *FICUS GLOMERATA*

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Abstract

Antibacterial activity of various extracts of the fruits of *Ficus glomerata* (Family: Moraceae) were tested on gram positive and gram negative bacteria using zone of inhibition. The bacteria used in the test were *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Staphylococcus aureus*. The benzene, chloroform and aqueous extracts of fruits of *Ficus glomerata* exhibited significant antibacterial action against all the micro-organisms at higher concentrations (500µg/ml and 1000 µg/ml).

Keywords: *Ficus glomerata*, antibacterial activity, zone of inhibition, *Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Staphylococcus aureus Bacillus subtilis*, *Pseudomonas aeruginosa*, *Escherichia coli* and *Staphylococcus aureus*.

Introduction

Plants are source of many valuable secondary metabolites which serves as plant defense mechanisms against predator such as micro organism, insects and herbivores which have been proved to be a potential antimicrobial compounds [Marjorie, 1999]. There is a tremendous increase in search of antimicrobial plant extracts due to the fact that the resistance offered against antibiotic by the microorganism, in short the effective life span of any antibiotic is limited. One such plant which has number of traditional uses is *Ficus racemosa* Linn. Syn. *Ficus glomerata* Roxb. (Moraceae) commonly known as 'Jagya-dumur' (Ben-gali), 'Gular' (Hindi) and 'Udumbara' (Sanskrit) is a well known moderate sized to large spreading tree with ovate, ovate-lanceolate leaves. Most parts of this plant are used in the Indian traditional system of medicine for the treatment of various diseases. The leaves are used in dysentery, diarrhoea, billious affection and in dysmenor-rhoea; barks and fruits are also used in dysentery, diarrhoea and in diabetes (Anonymous, 1952; Chopra

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et al., 1958; Kirtikar and Basu, 1975; Nadkarni *et al.*, 1976). The antidiarrhoeal evaluation (Mandal *et al.*, 1997a) and hypoglycemic activity (Mandal *et al.*, 1997b), anti-inflammatory activity (Mandal *et al.*, 1998a) and hepato-protective activity (Mandal *et al.*, 1998b, 1999) of the leaf extract of *F. racemosa* has already been reported from our laboratory. Based on its use in dysentery and diarrhoea in traditional practice and its antidiarrhoeal effect, the present study was undertaken to evaluate the antimicrobial activity of the extracts of *F. racemosa* which is reported here. Since there is no report on antibacterial activity of fruits of *Ficus glomerata* against these four microorganisms, an attempt was made to evaluate the antibacterial activity of petroleum ether, chloroform, acetone, methanol and aqueous extract of the plant by agar diffusion method using *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa* as test organism.

Materials and methods: Plant material:

Ficus glomerata was collected and authenticated by Department of Botany, Mangalore University, Mangalore. A voucher specimen has been preserved in our Department for the future reference.

Extraction procedure

Shade dried fruits (96.3 g) were coarsely powdered and subjected to successive solvent extraction by continuous hot extraction (soxhlet). The extraction was done with different solvents in their increasing order of polarity such as petroleum ether (60-80 ^{0}C), benzene, chloroform, acetone, ethanol and water. Each time the marc was air dried and later extracted with other solvents. All the extracts were concentrated by distilling the solvent in a rotary flash evaporator. The yield was found to be 4.67, 0.72, 0.51, 3.21, 12.126 and 8.9% w/w with reference to the air dried plant. The dried extracts were dissolved in dimethyl sulphoxide (DMSO) and subjected to antibacterial activity.

Preliminary phytochemical screening

The coarse powder of fruits of *Ficus glomerata* (25g) was subjected to successive extraction with different solvents in their increasing order of polarity from petroleum ether (60 -80 ^{0}C), benzene, chloroform, acetone, ethanol and water. The extracts were concentrated and subjected to various chemical tests to detect the presence of different phytoconstituents [Kokate, 1990].

Microorganisms and media:

Gram Positive Bacteria: *Staphylococcus aureus, Bacillus subtilis*

Table 1: Antibacterial activity of different extract of fruits of *Ficus glomerata* against Gram negative organisms

Pseudomonas aeruginosa

Concentration used [µg/ml]	**Zone of inhibition of extract in mm *Pseudomonas aeruginosa***			
	PEE	**CE**	**EE**	**AQE**
100	12	9	5	9
250	13	11	6	11
500	14	12	6	12
1000	15	14	6	14
Penicillin [10]				8

Escherichia coli

Concentration used [µg/ml]	**Zone of inhibition of extract in mm *Escherichia coli***			
	PEE	**CE**	**EE**	**AQE**
100	6	9	4	7
250	8	9	5	8
500	8	11	5	10
1000	10	12	5	11
Penicillin [10]				9

Table 2: Antibacterial activity of different extract of fruits of *Ficus glomerata* **against Gram positive organisms**

Bacillus subtilis

Concentration used [µg/ml]	**Zone of inhibition of extract in mm *Bacillus subtilis***			
	PEE	**CE**	**EE**	**AQE**
100	8	7	5	10
250	9	8	5	11
500	10	9	6	13
1000	12	11	6	14
Penicillin [10]				10

Staphylococcus aureus

Concentration used [µg/ml]	**Zone of inhibition of extract in mm *Staphylococcus aureus***			
	PEE	**CE**	**EE**	**AQE**
100	7	6	5	6
250	9	7	5	8
500	11	9	6	9
1000	11	10	6	10
Penicillin [10]				10

PEE-petroleum ether extract; CE-chloroform extract; EE-ethanol extract; AQE-aqueous extract.

Gram positive Bacteria: ***Staphylococcus aureus, Bacillus subtilis &*** Gram Negative Bacteria: *Escherichia coli*, *Pseudomonas aeruginosa* Bacteria's were obtained from the Department of Microbiology, NGSM. Deralakatte, Mangalore. The bacterial stock cultures were maintained on Muller Hinton agar and stored at 4^0C.

Antibacterial activity:

The extracts obtained above were screened for their antibacterial activity in comparing with standard antibiotic Penicillin (10 µg/ml) *in-vitro* by disc diffusion method [Greenwood et al.,2002] using *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli* and *Pseudomonas aeruginosa* as test organism. Each extract were indi-vidually loaded on the 3 mm sterile disc at the concentration of 100, 250, 500 and 1000 µg/ml and subjected to antibacterial activity. The results were recorded by measuring the zone of growth inhibition surrounding the disc. The experiments were done in triplicate.

Results and Discussion:

The results of antibacterial activity are given in the Table 1 and 2. From the tables, it is clear that benzene, chloroform and aqueous extract at 500 & 1000µg/ml concentrations have shown antibacterial activity equivalent to that of standard against all the tested organism. Benzene, chloroform and aqueous extracts have shown better activity than the standard against all the four microorganisms. Benzene and aqueous extract was effective against *Pseudomonas aeruginosa.* Aqueous extract was only effective against *Bacillus subtilis* and chloroform extract was most effective against *Escherichia coli*. Benzene *extract above 250*µg/ml was effective against *Staphylococcus aureus.*

It is concluded that the plant extract possess antibacterial activity against test organism used. The zone of inhibition varied among suggesting that the varying degree of efficacy and different phytoconstituents of herb on the target organism. Preliminary phytochemical screening of different extracts showed the presence of alkaloids, tannins, saponin, flavonoids, steroids and glycosides. The antibacterial activity of the plants may be due to the presence of various active principles in the fruits. Further studies

are needed to isolate and characterize the bioactive principles to develop new antibacterial drugs.

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