Antibacterial activity of *Ficus benghalesis* var. *krishnae* (C. DC.) C. DC. against pathogenic bacterial strains

Somkuwar Subhash1*, Sahare Manisha1, Kamble Rahul B1 and Choudhary RR2

1Dept. of Botany, Dr. Ambedkar College, Deeksha Bhoomi, Nagpur. MS, India
2Sant Gadge Maharaj College, Hingna. Nagpur, MS, India
*Corresponding author Email: ssomkuwar@gmail.com

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<th>ABSTRACT</th>
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<td>Available online on <a href="http://www.ijlsci.in">http://www.ijlsci.in</a></td>
<td>Medicinal plants have been used as an alternative source and remedy from centuries for treating human diseases because they contain numerous active constituents of therapeutic value. The methanolic and DMSO extracts of various plant parts viz. prop roots, stems, leaves, and fruits of <em>Ficus benghalensis</em> var. <em>krishnae</em> (C.DC) C.DC. has been studied for antibacterial activity against the pathogenic bacteria <em>Bacillus subtilis</em>, <em>Escherichia coli</em>, and <em>Pseudomonas aurignosa</em>. Ampicillin antibiotic disc was used as standard. Various selected parts of <em>F. benghalensis</em> var. <em>krishnae</em> in methanolic and DMSO extract were observed positive minimum inhibition zone against <em>Escherichia coli</em>, <em>Pseudomonas aurignosa</em> and <em>Bacillus subtilis</em>.</td>
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**INTRODUCTION**

*Ficus* is a genus of about 800 species and 2000 varieties of woody trees, shrubs and vines in the family Moraceae occurring in most tropical and subtropical forests worldwide (Hamed, 2011). *F. benghalensis* is the world’s largest tree in terms of its spread (Riffle 1998) with some old trees covering over an acre of ground. The tree’s name "banyan" refers to the merchants who set up shop under the spreading trees (Riffle 1998). The *F. benghalensis* is used from the traditional medicine for eye-disease, constipation, toothache, inflammation, leucoderma, headache, fever, rheumatic affections, asthma cigarettes, antidote for snakebites and relieve stomachache. (Kubo, et al, 1990; Trease, et al, 1988, Kirtikar, et al, 1994; Apichart, et al 1995).

Medicinal plants have been used as an alternative source and remedy from centuries for treating human diseases because they contain numerous active constituents of therapeutic value (Nostro et al, 2000). The development of microbe resistance antibiotics has led the researches to investigate the alternative sources for the treatment of resistant strains (Hammer et al., 1999). Presently 80% of the world population believes on plant derived medicines and serves as first line of defense in maintaining health and combating many diseases (Veale et al, 1992). However, their scientific study has been made possible only after the development of microbiology. Natural
antimicrobials can be derived from roots, stems, leaves, flowers and fruits of plants, various animal tissues etc (Gordon, 2001). Over 50% of clinical drugs have originated from natural products (Suffness and Douros, 1982). In general, bacteria have the genetic ability to transmit and acquire resistance which is utilized as therapeutic agents (Cohen, 1992). Secondary metabolites compounds exhibit inhibitory effect against bacteria (Sato et al, 1996).

Many workers worked out some exercises on F. benghalensis var. krishnae, Joshi et al. (2012) performed phytopharmacognostic study on Ficus krishnae L while Sidhu et al. (2014) tested antihyperglycemic activity of petroleum ether leaf extract of Ficus krishnae L. on alloxan-induced diabetic rats. Thus, in the present study, extracts of plants parts of F. benghalensis var. krishnae have been investigated for their antimicrobial activities against various pathogenic bacteria.

MATERIALS AND METHODS

Collection of plant material
The plant parts of F. benghalensis var. krishnae were collected from Civil lines, Nagpur. Fresh and healthy part such as leaves, stem, fruit and prop root were used for extraction. All these plant parts were thoroughly washed with tap water and then with distilled water to remove the soil and dust particles and further shade-dried. Dried materials of plant parts were blended into fine powder with the help of electric grinder and store in airtight zip lock bags.

Test organisms
The human pathogenic bacteria viz, Bacillus subtilis, Escherichia coli, and Pseudomonas aurignosa were used for antibacterial activity. The above bacterial culture was maintained in nutrient agar slant at 4°C for further studies.

Preparation of plant extract
The 10 gm of fine powder of leaf, stem, fruit and prop root of selected taxa were extracted using 60 ml of solvent of methanol and DMSO (Dimethyl Sulphoxide). The contents were kept in orbital shaker for 48 hours. The extracts were filtered out and dried in hot air oven at 40°C and stored in refrigeration at 4°C for further use.

Preparation of sterile disc
Whatmann’s filter disc was punched into 5mm disc and sterilized with the help of autoclave. Each sterilized disc was concentrated individually with each plant extracts. Precaution was taken to prevent the flow of solvent extract from the disc to the outer surface and allow drying in air. After sometime another dose of extracts were applied on discs, dried again and stored at 4°C.

Assay of Antimicrobial activity using Disc Diffusion method
2.8 gm of nutrient agar was dissolved in 100 ml of distilled water with the help of microwave oven and autoclaved it. About 15ml of nutrient medium was poured into each sterilized petriplates. After solidification, 500ul of fresh culture of pathogenic bacteria with phosphate buffer saline (PSB, pH 7.0 to 7.2) were swabbed on the petriplates. The discs were kept on agar plates using sterile forcep. The plates were incubated for 24 hours at 37°C. After incubation the inhibitory zones were formed and the diameter around the disc was measured in mm.

Standard antibiotic disc
The antibacterial activity of plant extracts against pathogenic bacteria was compared with commercially available antibiotic. The antibiotic disc of ampicillin was placed on nutrient medium agar petriplates. The plates were incubated at 37°C for 24 hours and inhibition zone were measured in mm as per Daniyan and Muhammad (2008) methodology. The entire tests were done in triplicate.

RESULT AND DISCUSSION

The prop root extract of methanol showed equal antibacterial activity against Escherichia coli and Pseudomonas aurignosa (15mm) but no antibacterial activity against Bacillus subtilis. The methanolic leaf extract showed higher antibacterial activity against Pseudomonas aurignosa (15mm), in E coli (9mm) and lower in Bacillus subtilis (6mm). The methanolic stem extract showed maximum antibacterial activity against Escherichia coli (7mm) and in Bacillus subtilis and Pseudomonas aurignosa (6mm). The methanolic fruit extract showed equal antibacterial activity against both Escherichia coli and Pseudomonas aurignosa (7mm) and no response were observed against Bacillus subtilis. The DMSO prop root extract showed...
Table 1: Minimum Inhibition Zones (MIC) Diameter (in mm) of Methanol and DMSO extract of different parts of *Ficus benghalensis* var. *krishnae*

<table>
<thead>
<tr>
<th>Plants parts</th>
<th>Plant extracts</th>
<th>E. Coli</th>
<th>B. subtilis</th>
<th>P. aurignosa</th>
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<tr>
<td></td>
<td>Std</td>
<td>Sample</td>
<td>Std</td>
<td>Sample</td>
</tr>
<tr>
<td>Prop Root</td>
<td>Methanol</td>
<td>20</td>
<td>15</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>DMSO</td>
<td>17</td>
<td>20</td>
<td>9</td>
</tr>
<tr>
<td>Leaf</td>
<td>Methanol</td>
<td>20</td>
<td>9</td>
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</tr>
<tr>
<td></td>
<td>DMSO</td>
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<tr>
<td>Stem</td>
<td>Methanol</td>
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<td></td>
<td>DMSO</td>
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<tr>
<td>Fruits</td>
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<td>DMSO</td>
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Fig. 1

maximum antibacterial activity against *Escherichia coli* (20 mm) and equal in both *Pseudomonas aurignosa* and *Bacillus subtilis* (10 mm). The DMSO leaf extract showed higher antibacterial activity against *Pseudomonas aurignosa* (10 mm), in *Bacillus subtilis* (7 mm) and lower in *E coli* (6 mm). The DMSO stem extract showed higher antibacterial activity in *Escherichia coli* (20 mm) and *Pseudomonas aurignosa* (9 mm) and lower in *Bacillus subtilis* (6 mm). The DMSO fruit extract showed higher antibacterial activity against *Escherichia coli* (9 mm), lower in *Bacillus subtilis* (6 mm) and no antibacterial activity against *Pseudomonas aurignosa*. The standard antibacterial drug ampicillin showed higher inhibition zone against *Pseudomonas aurignosa* and lower against *Bacillus subtilis* when taken as average of standards in respective bacteria (Table 1, Fig. 1).

The similar findings has been suggested by (Uma *et al.*, 2009) on *Ficus religiosa* L. and *Ficus bengalensis* L. as a potent antimicrobial agent from the various solvent extracts against enterotoxigenic *Escherichia coli* in vivo.

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CONCLUSION

*Ficus benghalensis* var. *krishnae* is an Indian traditional plant which also has medicinal property. The present study revealed that the antimicrobial activity of methanol and DMSO extracts of plant parts has showed measurable antimicrobial activity against *Escherichia coli*, *Pseudomonas aeruginosa* and *Bacillus subtilis*. Hence the development of proper procedures and formulations for effective use of sustainable vegetative parts of this plant as antimicrobial agents is more required in the future.

REFERENCES


