

**IN VITRO ANTIMICROBIAL ACTIVITY OF LEAVES AND BARK EXTRACTS OF *FICUS RELIGIOSA* (Linn.)**Gampa Ramakrishnaiah\* and T. Hariprasada<sup>2</sup>

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**ABSTRACT**

In the present study we investigated antimicrobial activity of diethyl ether and methanol extractions of bark and leaves of *Ficus religiosa* plant against three bacteria (*E.coli*, *Staphylococcus aureus* & *Pseudomonas aeruginosa*) and one fungi (*Aspergillus niger*). The results showed that the methanol extracts of both leaves and bark showed antimicrobial activity on three tested bacteria and no effect on *A.niger*. In methanol extracts *S.aureus* showed maximum sensitivity (inhibition zone 28mm) followed by *E.coli* (inhibition zone 16mm) and *Pseudomonas aeruginosa* (inhibition zone 12mm). Diethyl ether extracts of leaves were also showed maximum inhibition on *S.aureus* followed by *E.coli* and *P.aeruginosa*. Both methanol and diethyl ether extracts of bark showed antimicrobial activity on three types of tested bacteria and very less inhibition activity on *A.niger*. But comparatively bark extracts of both the solvents were showed less antimicrobial activity than leaves extracts on the tested microbes.

**KEY WORDS:** antimicrobial activity, bacteria, *Ficus religiosa***INTRODUCTION**

Medicinal plants are naturally gifted with invaluable bioactive compounds which form the backbone of traditional medicines. The use of plants as medicines antedates history. There has been an increasing interest worldwide on therapeutic values of natural products from plants due to disenchantment with modern synthetic drugs. Approximately 80% of the 4,000 inhabitants of the earth rely on herbal medicines for their primary health<sup>1</sup>. Interest in medicinal plants with antibacterial properties has revived due to several problems associated with the use of antibiotics<sup>2</sup>. Plants are rich source of bioactive compounds and thus serve as important raw materials for drug production<sup>3</sup>. Many works have been done which aim at knowing the different antimicrobial and phytochemical constituents of medicinal plants using them for the treatment of microbial infections as possible alternative to chemically synthetic drugs to which many infectious microorganisms have become resistant.

*Ficus religiosan* is commonly known as people tree in English. In India it is known by several vernacular names, the most commonly used ones being Asvatthah (Sanskrit), sacred fig

(Bengali), Peepal (Hindi), Arayal (Malayalam), Ravi (Telgu) and Arasu (Tamil)<sup>4</sup>. It belongs to Moraceae family. Peepal tree is one of the most familiar trees in India. It is one of the longest living trees of the world. *Ficus religiosa* is used in traditional medicine for about 50 types of disorders including asthma, diabetes, diarrhea, epilepsy, gastric problems, and inflammatory disorders, infectious and sexual disorders<sup>5</sup>. The barks of *F. religiosa* is an important ingredient in many Ayurvedic formulations, such as Nalpamaradi tailam, Chandanasavam, Nyagrodhadi churna and Saribadyasavam<sup>6&7</sup>. In this context we selected historically important ancient plant of India i.e *Ficus religiosa* to study its antimicrobial activity against some selected microbes.

**MATERIALS AND METHODS:****Collection of plant material:**

Fresh leaves of *Ficus religiosa* were collected from the Sree Vidyanikethan Engineering College campus, A.Rangampet, Tirupati, Andhra Pradesh, India. The leaves and bark were washed under running tap water, air dried and then ground into powder by using electric grinder.

**Methanol extraction of leaves and bark of *Ficus religiosa*:**

Both the dried leaves and bark were powdered (each 10g) and extracted separately with ethanol in a Soxhlet extractor. The extracts obtained were stored in refrigerator at 4° C for further use.

**Diethyl ether extraction of leaves and bark of *Ficus religiosa*:**

Both the dried leaves and bark were powdered (each 10g) and extracted separately with diethyl ether in a Soxhlet extractor. The extracts obtained were stored in refrigerator at 4° C for further use.

Ampicillin (20 mg) was used as a positive control.

**Microbes used:**

Two Gram negative bacteria (*E.coli* and *Pseudomonas aeruginosa*), one Gram positive bacteria (*Staphylococcus aureus*) and one fungus (*Aspergillus niger*) were collected from the Department of Microbiology, S.V.University, Tirupati, A.P. India and were used in the present study. All the bacterial samples were maintained in nutrient agar slants. The fungus sample was maintained in PDA medium plates.

**Screening of antibacterial and anti fungal activity:**

*In vitro* antibacterial and antifungal studies were conducted against selected bacteria and fungus using disc diffusion method<sup>8</sup>. Two types of solvents (methanol & diethyl ether) were used for bark and leaves extractions. The different concentrations of methanol and diethyl ether extractions (100, 200, 300 & 400 mg/ml) of both bark and leaves of people tree were prepared. The Whatman no: 1 filter paper discs size of 30mm was used for disc diffusion method. Paper discs were incubated in plant extracts for overnight at room temperature and air dried before used in the experiments.

**RESULTS AND DISCUSSION**

The antimicrobial activity was measured as zone of inhibition of two types of solvent extracts on three bacteria and one fungus. Table 1 & 2 showed the antimicrobial activity of methanol and diethyl ether extracts of both leaves and bark of *Ficus religiosa* on selected microbes.

In table one the methanol extracts of leaves and bark were showed antimicrobial activity against three bacteria. At lower concentrations methanol extracts showed less antimicrobial activity and showed higher activity at 400mg/ml concentration three tested bacteria. Both *Bacillus subtilis* (2.8 & 2.2mm) and *E.coli* (2.4 & 1.8mm) bacteria

showed higher inhibitions than *P.aurignosa* (2.2 & 1.1mm) in methanol extractions of leaves and bark. But at lower concentrations no activity and at higher concentrations (40mg/ml) very less activity was observed against fungi (*A.niger*). It is in line with the studies of phytochemistry and pharmacological properties of *Ficus religiosa* by Inder kumar Makhija et al<sup>9</sup>.

In table two diethyl ether extracts of leaves and bark were showed varied antimicrobial activity against tested three bacteria and no activity against on *A.niger* in all concentrations. In case of diethyl ether extract of bark *E.coli* (1.0 & 0.9mm) and *B.subtilis* (1.4 & 1.2mm) bacteria showed inhibition and no activity on *Pseudomonas aurignosa* and *A.niger*. Diethyl ether extracts of leaves showed inhibitory activity on three tested bacteria and no activity on *A.niger*. It indicates that the diethyl ether extract of leaves and barks had no activity on *A.niger* in all tested concentrations. The results showed that the methanol leaves and barks extracts of *Ficus religiosa* had considerable inhibition activity on tested bacteria than diethyl ether extracts of leaves and bark of the *Ficus religiosa*.

**CONCLUSION**

*Ficus religiosa* is an important Indian traditional plant has a number of bioactive compounds. The present study revealed that the antimicrobial activity of methanol extracts of bark and leaves of the plant has more antimicrobial activity than

diethyl ether extracts. Hence the development of proper procedures and formulations for effective use of the plant parts as antimicrobial agents is more required in the future.

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**REFERENCES:**

1. Mukherjee PK and Wahil A, Integrated approaches towards drug development from Ayurveda and other system of medicine, J Ethnopharmacol, 2006, 103, 25-35.
2. Chetty, K.M., Flowering Plants of Chittoor. 1st Edn. Andhra Pradesh, India, 2008. pp: 132.
3. Warriar, P.K., Indian medicinal plants-A compendium of 500 species, Orient Longman Ltd. Chennai, Vol. III, 1996, 38-39.
4. Singh D, Singh B, Goel RK "Traditional uses, phytochemistry and pharmacology of *Ficus religiosa*: A review." J Ethnopharmacol. February 2, 2011; 134: 565-583.
5. Sivarajan, V.V. and Balachandran, I., Ayurvedic drugs and their sources, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi, 1994, 374-376.
6. Simha, K.R.G. and Laxminarayana, V., Indian J. Trad. Know. 2007, 6, 648-652.
7. Newman DJ, Cragg GM and Snader KM, Natural products as sources of new drugs over the period 1981-2002, J Nat Prod, 2003, 66, 1022-1037.
8. Farag RS, Daw ZY, Hevedi FM, El-baroty GSA. Antimicrobial activity of Egyptian species essential oils. J.Food Protection. 1989; 52(9): 665-67.
9. Inder Kumar Makhija , Indra Prakash Sharma and Devang Khamar., Phytochemistry and Pharmacological properties of *Ficus religiosa*: An overview. "Annals of Biological Research, 2010, 1 (4): 171-180.

**Table: 1. Antimicrobial activity of methanol extracts of leaves and bark of *Ficus religiosa*.**

| S.No | Tested microbes              | Methanol extracts                          |          |          |          |  |          |          |          |
|------|------------------------------|--|----------|----------|----------|--|----------|----------|----------|
|      |                              | Leaves extract<br>Zone of inhibitions (mm) |          |          |          | Bark extract<br>Zone of inhibitions (mm) |          |          |          |
|      |                              | 10 mg/ml                                   | 20 mg/ml | 30 mg/ml | 40 mg/ml | 10 mg/ml                                 | 20 mg/ml | 30 mg/ml | 40 mg/ml |
| 1    | <i>E.coli</i>                | 0.7  | 0.9      | 1.1      | 2.4      | 0.6                                      | 0.7      | 0.9      | 1.8      |
| 2    | <i>Pseudomonas aurignosa</i> | 0.6  | 0.8      | 1.0      | 2.2      | --                                       | --       | 0.8      | 1.1      |
| 3    | <i>Bacillus subtilis</i>     | 0.9  | 1.2      | 1.5      | 2.8      | 0.8                                      | 1.0      | 1.2      | 2.2      |
| 4    | <i>Aspergillus niger</i>     | --   | --       | --       | 1.6      | --                                       | --       | 1.0      | 1.2      |

• Values were the mean of five replicates.

**Table: 2. Antimicrobial activity of diethyl ether extracts of leaves and bark of *Ficus religiosa*.**

| S.No | Tested microbes              | Diethyl ether extracts                     |          |          |          |  |          |          |          |
|------|------------------------------|--|----------|----------|----------|--|----------|----------|----------|
|      |                              | Leaves extract<br>Zone of inhibitions (mm) |          |          |          | Bark extract<br>Zone of inhibitions (mm) |          |          |          |
|      |                              | 10 mg/ml                                   | 20 mg/ml | 30 mg/ml | 40 mg/ml | 10 mg/ml                                 | 20 mg/ml | 30 mg/ml | 40 mg/ml |
| 1    | <i>E.coli</i>                | 0.5  | 0.7      | 0.9      | 1.0      | 0.4                                      | 0.6      | 0.7      | 0.9      |
| 2    | <i>Pseudomonas aurignosa</i> | 0.4  | 0.6      | 0.7      | 0.9      | --                                       | --       | --       | --       |
| 3    | <i>Bacillus subtilis</i>     | 0.8  | 1.0      | 1.2      | 1.4      | 0.7                                      | 0.9      | 0.9      | 1.2      |
| 4    | <i>Aspergillus niger</i>     | --   | --       | --       | --       | --                                       | --       | --       | --       |

• Values were the mean of five replicates.

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