

## Therapeutic Properties of *Ficus Regligiosa*

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### Abstract

Medicinal plants have played a vital role in maintaining and improving human health from past thousands of years. History of human civilization and discovery of herbal medicines are running parallel from ancient time till date. Among hundreds of medicinal plants, *Ficus* tree has a significant role in promoting health and alleviate illness. *Ficus religiosa* commonly known as Peepal tree is regarded as sacred tree to both Hindus and Buddhists. It contains enormous range of pharmacological activities like ant diabetic, antimicrobial, analgesic, wound-healing etc. The present review describes the morphological, phytochemical and pharmacological aspects of *F. religiosa*.

### Key words

Medicinal plants, *Ficus religiosa*, antimicrobial, morphological, phytochemical, Pharmacological, Peepal.

### I. INTRODUCTION

Plants have been used in treating human diseases for past thousands of years.<sup>1</sup> Since prehistoric times, men and women of Eurasia and the Americas acquired a tremendous knowledge of medicinal plants.<sup>2</sup> All of the native plant species discussed in detail in this work was used by native people in traditional medicine. Medicinal plants have curative properties due to the presence of various complex chemical substances of different composition, which are found as secondary plant metabolites in one or more parts of these plants. Herbal medicine is based on the principle that plants contain natural substances that can promote health and alleviate illness. In recent times, focus on plant research has increased all over the world and a large body of evidence has collected to show immense potential of medicinal plants used in various traditional systems. Today, we are witnessing a great deal of public interest in the use of herbal remedies.

This review emphasizes the traditional use and clinical potentials of *F. religiosa*. *F. religiosa* Linn is commonly known as Peepal belongs to family Moraceae.<sup>3-5</sup> Six parts of the trees (i.e., seeds, bark, leaves, fruit, latex and roots) are valued for their medicinal qualities. The only one part not used for therapeutic purposes is the wood because it is highly porous. In India, since ancient times it has got great mythological, religious, medical importance and considered as the oldest tree in Indian art literature.<sup>6-8</sup>

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>9</sup> Moreover, the barks of *F. religiosa* is an important ingredient in many Ayurvedic formulations, such as Nalpamaradi tailam, Chandanasavam, Nyagrodhadi churna and Saribadyasavam.<sup>10,11</sup> In medicinal field, *F. religiosa* is gaining great attention because it has many compounds which are beneficial in treatment of many diseases like diabetes, skin diseases, respiratory disorders, central nervous system disorder, gastric problems etc.<sup>12,13</sup>

## 1. Classification

Domain: Eukaryota

Kingdom: Plantae

Subkingdom: Viridiaeplantae

Phylum: Tracheophyta

Subphylum: Euphyllophytina

Infraphylum: Radiatopses

Class: Magnoliopsida

Subclass: Dilleniidae

Superorder: Urticanae

Order: Urticales

Family: Moraceae

Tribe: Ficeae

Genus: Ficus

Specific epithet: *Religiosa Linnaeus*

Botanical name : *Ficus religiosa*

## 2. Vernacular names

Sanskrit: Pippala

Assamese: Ahant

Bengali: Asvattha, Ashud, Ashvattha

English: Pipal tree

Gujrati: Piplo, Jari, Piparo, Pipalo

Hindi: Pipala, Pipal

Kannada: Arlo, Ranji, Basri, Ashvatthanara, Ashwatha, Aralimara, Aralegida, Ashvathamara, Basari, Ashvattha

Kashmiri: Bad

Malayalam: Arayal

Marathi: Pipal, Pimpal, Pippal

Oriya: Aswatha

Punjabi: Pipal, Pippal

Tamil: Ashwarthan, Arasamaram, Arasan, Arasu, Arara

Telugu: Ravichettu

### **Morphological characters**

*F. religiosa* (L.) is a large perennial tree, glabrous when young, found throughout the plains of India upto 170m altitude in the Himalayas. The stem bark and leaves of *F. religiosa* are reported phytoconstituents of phenols, tannins, steroids, lanosterol, stigmasterol, lupen-3-one. The active constituent from the root bark *F. religiosa* was found to be  $\beta$ -sitosterol-D-glucoside, The seeds contain phytosterolin,  $\beta$ -sitosterol, and its glycoside, albuminoids. The fruit of *F. religiosa* contained appreciable amounts of total phenolic contents, total flavonoid.<sup>14</sup>

### **3. Botanic description**

*F. religiosa* is a large deciduous tree with or no aerial roots which is commonly found in India. It is native from India to Southeast Asia which grows up to 5000ft with the trunk which reaches up to 1 meter. Bark is grey with brownish specks, smooth, exfoliating in irregular rounded flakes.

Leaves alternate, spirally arranged and broadly ovate, glossy, coriaceous (leathery), dark green leaves, 10-18 by 7.5-10 cm, with unusual tail-like tips, pink when young, stipulate, base-cordate. Petioles are slender and 7.5-10 cm long. Galls on leaves.

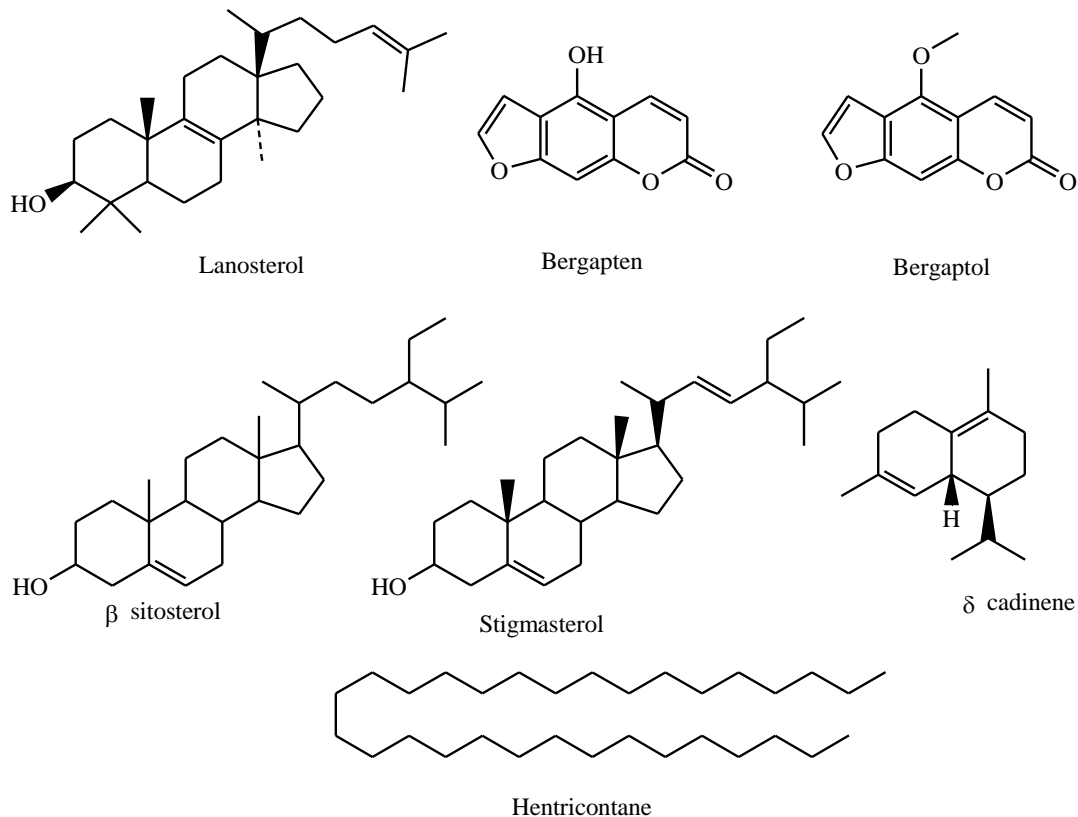
Flowers axillary sessile, unisexual.

Fruits are circular in shape called as Figs which are enclosed in inflorescences. When fruits are raw, they are green in colour during summer but after ripening they turn black through rainy season.<sup>15</sup> The specific epithet 'religiosa' alludes to the religious significance attached to this tree. The prince Siddhartha is said to have sat and meditated under this tree and there found enlightenment from which time he became a Buddha. The tree is therefore sacred to Buddhists and is planted beside temples.

### **4. Phytochemical analysis**

Phytochemistry can be defined as the chemistry of those natural products which can be used as drugs or plant parts with the emphasis on biochemistry. Preliminary phytochemical screening of *F. religiosa* barks, showed the presence of tannins, saponins, flavonoids, steroids, terpenoids and cardiac glycosides.<sup>16,17</sup> The barks of *F. religiosa* showed the presence of bergapten, bergaptol, lanosterol,  $\beta$ -sitosterol, stigmasterol, lupen-3-one,  $\beta$ -sitosterol-D-glucoside (phytosterolin), vitamin K<sub>1</sub>.<sup>18-21</sup> Apart from this, tannin, wax, saponin,  $\beta$ -sitosterol, leucocyanidin-3-O- $\beta$ -D-glucopyranoside, leucopelargonidin-3-

0- $\beta$ -D-glucopyranoside, leucopelargonidin-3-O- $\alpha$ -L- rhamnopyranoside, lupeol, ceryl behenate, lupeol acetate,  $\alpha$ -amyrin acetate, leucoanthocyanidin and leucoanthocyanin are also found in bark.<sup>22</sup>



**Figure 1: Active components of *F. religiosa***

The fruit of *F. religiosa* comprises asgaragine, tyrosine, undecane, tridecane, tetradecane, (e)- $\beta$ -ocimene,  $\alpha$ -thujene,  $\alpha$ -pinene,  $\beta$ -pinene,  $\alpha$ -terpinene, limonene, dendrolasine, dendrolasine  $\alpha$ -ylangene,  $\alpha$ -copaene,  $\beta$ -bourbonene,  $\beta$ -caryophyllene,  $\alpha$ -trans bergamotene, aromadendrene,  $\alpha$ -humulene, alloaromadendrene, germacrene, bicyclogermacrene,  $\gamma$ -cadinene and  $\delta$ -cadinene.<sup>23</sup> Leaves contain campesterol, stigmasterol, isofucosterol,  $\alpha$ -amyrin, lupeol, tannic acid, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tyrosine, methionine, valine, isoleucine, leucine, n-nonacosane, n-hentricontanen, hexa-cosanol and n-octacosan.<sup>20-22</sup> Alanine, threonine, tyrosine have been reported in seeds of *F. religiosa*.<sup>24</sup> The crude latex of *F. religiosa* shows the presence of a serine protease, named religiosin. The structures of active components are exhibited in figure 1. All six parts of the tree i.e., seeds, bark, leaves, fruit, latex and roots are highly useful for their medicinal properties except wood because of its highly porous nature (Table 1).

Plant parts	Traditional uses (as/in)
Bark	Diarrhoea, dysentery, anti-inflammatory, antibacterial, cooling, astringent, gonorrhoea, burns
Leaves shoots	Hiccups, vomiting, cooling, gonorrhoea Purgative, wounds, skin disease
Leaf juice	Asthma, cough, diarrhoea, gastric problems

Dried fruit	Fever, tuberculosis, paralysis
Fruit	Asthma, digestive
Seeds	Refrigerant, laxative

**Table 1: Medical use of different parts of *F. religiosa***

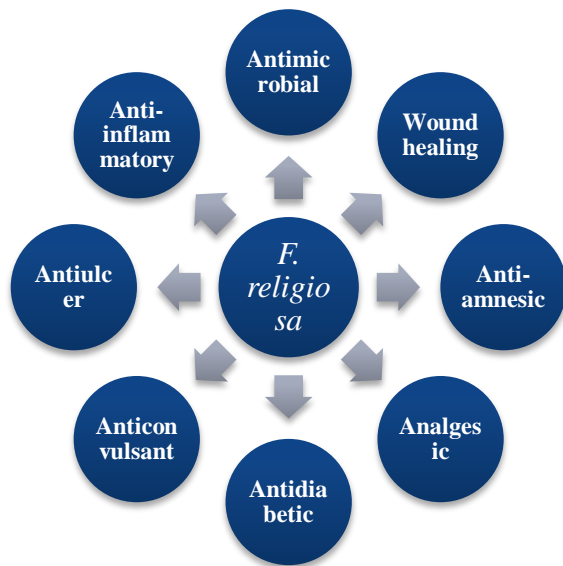
### **5. Pharmacological activities present in *F. religiosa***

The Whole parts of the plant exhibit wide spectrum of activities such as anticancer, antioxidant, antidiabetic, antimicrobial, anticonvulsant, anthelmintic, antiulcer, antiasthmatic, anti amnesic etc. as shown in figure 2.

**Antimicrobial activity:** The antimicrobial activity of ethanolic extracts of *F. religiosa* (leaves) was studied using the agar well diffusion method. The test was performed against four bacteria: *Bacillus subtilis* (ATCC 6633), *Staphylococcus aureus* (ATCC 6538), *Escherichia coli* (ATCC 11229), *Pseudomonas aeruginosa* (ATCC 9027) and against two fungi: *Candida albicans* (IMI 349010) and *Aspergillus niger* (IMI 076837). The results showed that 25mg/ml of the extract was active against all bacterial strains and effect against the two fungi was comparatively much less.<sup>25</sup>

Iqbal et al. explored that *F. religiosa* bark methanolic extract was 100% lethal for *Haemonchus. contortus* worms during *in vitro* testing.<sup>26</sup> The acetone extracts of seven plant species *Tamarindus indica*, *F. indica*, *F. religiosa*, *Tabernaemontana livaricate*, *Murraya koenigii*, *Chenopodium album* and *Syzygium cuminii* were evaluated for their ovicidal activity. *Murraya*, *Tabernaemontana* and *Chenopodium* showed 70%, 75% and 66.6% ovicidal action at 100% dose level whereas at the same dose level *T. Indica*, *F. indica*, *F. religiosa* and *S. cuminii* showed 48.3%, 41.6%, 13.3%, 53.3% ovicidal action respectively.<sup>27</sup> According to Uma et al different extracts (methanol, aqueous, chloroform) of the bark of *F. religiosa* has inhibitory effect on the growth of three enteroxigenic *E. coli*, isolated from the patients suffering from diarrhoea.<sup>28</sup>

**5. Wound healing activity:** This activity was explored by incision and excision wound models using *F. religiosa* leaf extracts which was prepared as lotion (5 and 10%) were applied on Wistar albino strain rats. Povidine iodine 5% was used as Standard drug. High rate of wound contraction, decrease in the period for epithelialisation, high skin breaking strength were detected in animals treated with 10% leaf extract ointment when compared to the control group of animals. It has been reported that tannins possess ability to increase the collagen content, which is one of the factor for promotion of wound healing.<sup>29, 30</sup>



**Figure 2: Pharmacological activities of *Ficus religiosa***

**7. Anti-amnesic activity:** The anti-amnesic activity was investigated using *F. religiosa* methanol extract of figs of *F. religiosa*. Figs are known to comprise a high serotonergic content and modulation of serotonergic neurotransmission which plays a crucial role in the pathogenesis of amnesia.<sup>31</sup> Scopolamine (1 mg/kg, i.p.) was administered before training for induction of anterograde amnesia and before retrieval for induction of retrograde amnesia in both models. TL in the EPM, step down latency (SDL), number of trials, and number of mistakes in the MPA were determined in vehicle control, *F. religiosa* figs treated (10, 50, and 100mg/kg, i.p.) and standard groups (piracetam 200mg/kg, i.p.).<sup>32</sup>

**8. Analgesic activity:** Sreelekshmi et al. found the analgesic activity of stem bark of *F. religiosa* using the acetic acid-induced writhing (extension of hind paw) model in mice using Aspirin as standards drug.<sup>33</sup> It showed dropping in the number of writhing of 71.56 and 65.93%, respectively at a dose of 250 mg/kg and 500 mg/kg. Thus, it can be concluded that extract showed the analgesic effect probably by inhibiting synthesis or action of prostaglandins.

**9. Antidiabetic activity:** Aqueous extract of *F. religiosa* in doses of 50 and 100 mg/kg exhibited pronounced reduction in blood glucose levels. This nature of effect was related with the hypoglycaemic drug glybenclamide. It has been also proved that *F. religiosa* significantly increases serum insulin, body weight, glycogen content in liver. Bark of *F. religiosa* shows similar effects and exhibits maximum fall of the blood sugar level.<sup>34</sup>

#### **10. Anticonvulsant activity**

Figs of the plant *F. religiosa* have been reported to contain highest amount of Serotonin which is responsible for its anticonvulsant effect.<sup>35</sup> Further, Singh and Goel investigated the anticonvulsant effect of methanolic extract of *F. religiosa* figs on Maximal electroshock-induced convulsions (MES), Picrotoxin-induced convulsions, and pentylenetetrazole-induced convulsions (PTZ).<sup>7</sup> In Ayurveda it is claimed that leaves of *F. religiosa* also possess

anticonvulsant activity.<sup>36</sup>The anticonvulsant effect of the extract obtained from the leaves of *F. Religiosa* was evaluated against PTZ (60mg/kg, i.p) induced convulsion in albino rats. The study revealed 80 to 100 % protection against PTZ-induced convulsions when given 30-60minutes prior to induced convulsion, respectively. Patil et al demonstrated that the anticonvulsant effect of the aqueous aerial root extract of *F. religiosa* is effective in management of chemically-induced seizures in rats.<sup>37</sup> The extract was evaluated against strychnine-induced convulsions and pentylenetetrazole-induced convulsions animal models.

### **11. Antiulcer activity**

*F. religiosa* is one of the plants that have been traditionally used in the India and Malays folklore medicine to treat gastric ulcer.<sup>38</sup> The ethanol extract of stem bark showed potential antiulcer activity. The antiulcer activity was evaluated in vivo against indomethacin and cold restrained stress induced gastric ulcers and pylorus ligation assay. The extract (100, 200 & 400 mg/kg) significantly reduced the ulcer index in all assay used.<sup>39</sup> Administration of *F. religiosa* significantly reduced the ulcer index.<sup>40</sup>The hydroalcoholic extract of leaves also presented antiulcer activity. The activity of extract was evaluated against pylorus ligation-induced ulcers, ethanol-induced ulcers and aspirin-Induced ulcers. Determination of antiulcer effect was based upon ulcer index and oxidative stress.

### **12. Anti-inflammatory activity**

*F. religiosa* has found to be potential anti-inflammatory & analgesic property. The mechanism underlying the effect is the inhibition of PG's synthesis. It was found that the leaf extract of *F. religiosa* has potential anti-inflammatory activity against carrageenan induced paw oedema. The inhibitory activity was found due to inhibition of release of histamine, serotonin (5HT), Kinins and PG's.<sup>41</sup>

The methanol extract of stem bark of *F. religiosa* has inhibitory effect on carrageenan-induced inflammation in rats due to the inhibition of the enzyme cyclooxygenase (COX) leading to inhibition of PG's synthesis. Further, various studies revealed that tannin present in the bark possess anti-inflammatory effect.<sup>33</sup>Moreover, it has been shown that methanolic extract of stem bark of *F. religiosa* is known to suppress inflammation by reducing both 5-HT & bradykinin (BK).Mangiferin isolated from drug has anti-inflammatory activity against carrageenan-induced paw oedema.<sup>42</sup>Figure (3) indicates the activity of various extracts of *Ficus religiosa* on inflammation. Viswanathan et al investigated the anti-inflammatory and mast cell proliferative effect of aqueous extract of bark of *F. religiosa*.<sup>43</sup>The anti-inflammatory effect was evaluated against acute (carrageenaninduced hind paw oedema) and chronic (cotton pellet implantation) models of inflammation.

### **13. Conclusion**

Presently enormous research group are showing curiosity and interest in the medicinal properties of *F. religiosa*. Although scientific studies have been carried out on a large number of Indian botanicals, a considerably smaller number of

marketable drugs or phytochemical entities have entered the evidence-based therapeutics. Efforts are therefore needed to establish and validate evidence regarding safety and practices of Ayurvedic medicines.

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