Review Article

Ficus Religiosa (Peepal): A Phytochemical and Pharmacological Review

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ABSTRACT

Ficus religiosa L., commonly known as Peepal tree known to be a native Indian is a medicinally important tree species belonging to the Moraceae family. It is a large evergreen tree found throughout the India. This tree is popular indigenous system of medicine like Ayurveda, Siddha, Unani, and Homeopathy. Ficus religiosa is sacred tree, which is having great traditional uses as well as pharmacological activities. Almost all parts of the tree are useful in traditional system. The various parts like leaf, bark, fruit, and seeds are beneficial in treatment of gastrointestinal diseases, healing and curative, heart diseases, constipation, mumps and boils, gynaecological problems, fever and joint pains, respiratory problems, skin diseases orodental and ear problems. Ficus religiosa tree shows pharmacological activities analgesic, antioxidant, anticonvulsant, antimicrobial, wound healing, ant amnesic, anti-acetyl cholinesterase, proteolytic activity. The present review is hence an effort to give detailed survey of the literature on its pharmacognosy, photochemistry and medicinal applications.

Keywords: Ficus religiosa, pharmacognosy, phytochemistry, medicinal applications.

INTRODUCTION

Medicinal plants have played a significant role in maintaining human health and improving the quality of human life for thousands of years and have served humans as valuable components of medicines, seasonings, beverages, cosmetics and dyes.Numerous plants synthesize substances that are useful in the maintenance of health in humans and animals¹. With a view to increasing the wide range of medicinal usages, the present day entails new drugs with more potent and desired activity with less or no side effects against particular disease².

The genus *Ficus* (Moraceae) constitutes one of the largest genera of angiosperms includes with more than 800 species and 2000 varieties of *Ficus* genus, occurring in most tropical and subtropical forests worldwide³.

VEDIC HISTORY

Ficus religiosa, commonly known as Peepal, is the most popular member of the genus Ficus and it is known by more than 150 names. *Ficus religiosa* has got mythological, religious and medicinal importance in Indian culture. References to *Ficus religiosa* are found in several ancient holy texts like Arthasastra, Puranas, Upanishads, Ramayana, Mahabharata, Bhagavadgita and Buddhistic literature etc⁴. *Ficus religiosa* is a variety of fig tree that was already known as the bodhi tree. even before Gautama Buddha sat under its branches meditating and achieved enlightenment. It is the oldest depicted tree in Indian art and literature and it can be said that this is the mythical 'World Tree' or the 'Tree of Life' of the Indian subcontinent. This plant is considered sacred by the followers of Hinduism, Jainism and Buddhism, and hence the name 'Sacred Fig' was given to it. Siddhartha Gautama is referred to have been sitting underneath a Bo Tree when he was "enlightened" (Bodhi) or "awakened" (Buddha). Thus, Bo Tree is well-known symbol for happiness, prosperity, longevity and good luck⁵. Ficus religiosa (Bo-Tree) is well-known symbol for happiness, prosperity, longevity and good luck. The name 'Sacred Fig' was given to it because it is considered sacred by the followers of Hinduism, Jainism and Buddhism⁶. Peepal tree or sacred fig is a large deciduous tree. It is often planted near temples and holy places. It is supposed to be one of the longest-living trees and there is one in Sri Lanka which is said to be over one thousand years old. This tree grows very fast and roots are attached to the trunk as if

they are pillars supporting it. The tree needs lots of space, and the soil must be deep enough to let the roots grow down a long way. It is sometimes also called kalpvruksha⁷.

The Brahma Purana and the Padma Purana, relate how once, when the demons defeated the Gods, Vishnu hide in the peepal. Therefore spontaneous worship to Vishnu can be offered to a peepal without needing his image or temple. The Skanda Purana also considers the peepal, a symbol of Vishnu. He is believed to have been born under this tree. Some believe that the tree houses the Trimurti, the roots being Brahma, the trunk Vishnu and the leaves Shiva. The Gods are said to hold their councils under this tree and so it is associated with spiritual understanding. The peepal is also closely linked to Krishna. In the Bhagavad Gita, he says: "Among trees, I am the ashvattha." Krishna is believed to have died under this tree, after which the present Kali Yuga is said to have begun. Five-trees (Panchavat) are considered sacred in India.

They are:

- 1. Fig tree,
- 2. A wild fig (Sycamore) tree (Gular),
- 3. Banyan tree,
- 4. Pakar (citron-leaved), Indian fig tree,
- 5. Mango tree.

According to the Skanda Purana, if one does not have a son, the peepal should be regarded as one. As long as the tree lives, the family name will continue. To cut down a peepal is considered a sin equivalent to killing a Brahmin, one of the five deadly sins or Panchapataka. According to the Skanda Purana, a person goes to hell for doing so. Some people are particular to touch the peepal only on a Saturday. The Brahma Purana explains why, saying that Ashvattha and peepala were two demons who harassed people. Ashvattha would take the form of a peepal and peepala the form of a Brahmin. The fake Brahmin would advise people to touch the tree, and as soon as they did, Ashvattha would kill them. Later they were both killed by Shani. Because of his influence, it is considered safe to touch the tree on Saturdays. Lakshmi is also believed to inhabit the tree on Saturdays. Therefore it is considered auspicious to worship it. Women ask the tree to bless them with a son tying red thread or red cloth around its trunk or on its branches⁸

TAXONOMY / BOTANICAL CLASSIFICATION⁹

Domain:	Eukaryota	
Kingdom:	Plantae	
Subkingdom:	Viridaeplantae	
Phylum:	Tracheophyta	
Subphylum:	Spermatophytina	
Infraphylum:	Angiospermae	
Class:	MagnoliopsidaBrongniart.	
Subclass:	Dilleniidae.	
Super order:	Urticanae	
Order:	Urticales	
Family:	Moraceae	
Division:	Magnoliophyta	
Tribe:	Ficeae	
Genus:	Ficus (FY-kus) Linnaeus	
Specific epithet: religiosa L.		

NOMENCLATURE

'Ficus' is the Latin word for 'Fig', the fruit of the tree. 'Religiosa' refers to 'religion' because the tree is sacred in both Hinduism and Buddhism and is very frequently planted in temples and shrines of both faiths. 'Bodhi' or its short form 'Bo' means 'supreme knowledge' or 'awakening' in the old Indian languages. 'Pipal' relates (I believe) to the same ancient roots which give rise to English words like 'Pip' and 'Apple' and therefore mean something like 'fruit-bearing tree'. 'Ashwattha' and 'Ashvattha' come from an ancient Indian root word "Shwa" means 'morning' or 'tomorrow'. This refers to the fact that Ashwattha is the mythical Hindu world tree, both indestructible and yet ever-changing: the same tree will not be there tomorrow¹⁰.

VERNACULAR NAMES¹¹

Sanskrit:	Pippala
Assamese:	Ahant
Bengali:	Asvattha, Ashud, Ashvattha
English:	Pipal tree
Guajarati:	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

HABITAT

Ficus religiosa is known to be a native Indian tree, and thought to be originating mainly in Northern and Eastern India, where it widely found in uplands and plane areas and grows up to about 1650 meters or 5000 ft in the mountainous areas. It is also found growing elsewhere in India and throughout the subcontinent and Southern Asia, especially in Buddhist countries, wild or cultivated. It is a familiar sight in Hindu temples, Buddhist monasteries and shrines, villages and at roadsides. People also like to grow this sacred tree in their gardens. Ficus religiosa has also been widely planted in many hot countries all over the world from South Africa to Hawai and Florida but it is not able to naturalize away from its Indian home, because of its dependence on its pollinator wasp, Blastophaga quadraticeps. An exception to this rule is Israel where the wasp has been successfully introduced¹².

The available information on *F. religiosa* has been divided into four sections, which are ethnopharmacology, morphology, phytochemistry and pharmacological studies.

ETHNOPHARMACOLOGY Traditional Uses

F. religiosa is a well known ethnomedicinal tree used in Ayurveda. Its use in the Indian traditional folk medicine also well documented. The use of different parts of *F. religiosa* in traditional system of medicine (Table 1).

DESCRIPTION

a. Macroscopic characteristics General Morphology

Ficus religiosa Linn (Moraceae) commonly known as 'Peepal tree' is a large widely branched tree with leathery, heart-shaped, long-tipped leaves on long slender petioles and purple fruits growing in pairs. This big and old tree is of 30m long.

Small tree or taller strangling climber, with widespreading branches, semi or fully deciduous in monsoon climates and broadly ovate, glossy, leathery, dark green leaves, 5-7 in (12-18 cm) long, with unusual tail-like tips. Bears pairs of rounded, flat-topped green figs, to 1/2 inch (1.5 cm) across, ripening to purple with red dots. The trunk has smooth grey bark and with age this trunk becomes irregularly shaped. It becomes leafless for a brief period in dry habitats¹⁶.



Fig. 1: Leaves of ficus religiosa



Fig. 2: Ficus religiosa tree (peepal)

Plant Parts Traditional Uses (as/in)	Plant Parts Traditional Uses (as/in)
Bark	Astringent, cooling, aphrodisiac, antibacterial against <i>Staphylococcus</i> <i>aureus</i> and <i>Escherichia coli</i> , gonorrhoea, diarrhoea, dysentery, haemorrhoids and gastrohelcosis, anti-inflammatory, burns ¹³ .
Bark Decoction	Cooling, gonorrhea, skin diseases, scabies, hiccup, vomiting ¹⁴
Leaves and tender shoots	Purgative, wounds, skin diseases ¹³ .
Leaf juice	Asthma, cough, sexual disorders, diarrhea, haematuria, toothache, migraine, eye troubles, gastric problems, scabies ¹³⁻¹⁴ .
Fruit	Asthma, laxative, digestive ¹³
Dried fruit	Tuberculosis, fever, paralysis, hemorrhoids ¹⁵ .
Seeds	Refrigerant, laxative ¹³ .
Latex	Neuralgia, inflammations, haemorrhages ¹³ .

Table 1: Ethnomedicinal uses of different parts of F. religiosa

Leaves

When the leaves first appear their colour is redpinkish, but then they turn deep green and grow to about 12 to 18 cm long (5-7 inches). They are attached to long flexible stalks which makes them rustle, flutter and dance in the slightest whiff of wind. The foliage can often be dense. The alternate leaves are heart-shaped, shiny with an elegant tail-like tip which is often called a "drip-tip", guiding water efficiently down to the soil. This prevents sometimes heavy monsoon rain from collecting on the leaves for prolonged periods, which could make them hot in very warm weather. The leaves have 6-8 pairs of side-veins and a further network of very fine veins. This delicate venation and the ability of the leaf to disintegrate easily in water are both clearly illustrated in the greeting cards which are sometimes made with peepal leaves. The leaves are soaked for 8 hours (in warm countries) in a bowl of water and then washed carefully under running water until only the veins remain¹⁷.

Bark

Bark occurs in flat or slightly curved pieces, varying from 1.0 - 2.5 cm or more in thickness; outer surface brown or ash colored; surface uneven due to exfoliation of cork; inner surface smooth and somewhat brownish; fracture - fibrous; taste – astringent¹⁷.

Flowers

The small red flowers appear in February. The tree is dependent on its associated pollinator wasp, *Blastophaga quadraticeps* to set seed¹⁷.

Fruit

Fruits are small, about $\frac{1}{2}$ inch in diameter, similar to that of eye pupil. It is circular in shape and compressed. The tree fruits in May/June and bears a small flat-topped figs (12-13 mm or $\frac{1}{2}$

inch in diameter), which appears in pairs in the angles of the leaves on the twigs (or above the scars in the bark left by fallen leaves). They have 3 basal bracts, are green at first and ripen to a blackish purple (may have reddish dots). The fruiting tree becomes a treat for many different birds and animals¹⁷.

Microscopy

Transverse section of bark shows rectangular to cubical, thick walled cork cells and dead elements of secondary cortex, consist of masses of stone cells; cork cambium distinct with rows of newly formed secondary cortex, mostly composed of stone cells towards periphery. Stone cells found scattered in large groups, rarely isolated; most of parenchymatous cells of secondary cortex contain numerous starch grains and few prismatic crystals of calcium oxalate; secondary phloem a wide zone, consisting of sieve elements, phloem fibers in singles or in groups of two and non lignified; numerous crystal fibers also present; in outer region sieve elements mostly collapsed while in inner region intact; phloem parenchyma mostly thick-walled; stone cells present in single or in small groups similar to those in secondary cortex; a number of ray-cells and phloem parenchyma filled with brown pigments; prismatic crystals of calcium oxalate and starch grains present in a number of parenchymatous cells; medullary rays uni to multiseriate, wider towards outer periphery composed of thickwalled cells with simple pits; in tangential section ray cells circular to oval in shape; cambium when present, consists of 2-4 layers of thinwalled rectangular cells¹⁶.

Physical constants: Total ash 7.86 % w/w, acid insoluble ash 0.41 % w/w, alcohol soluble

extract 7.21 % w/w and water soluble extractive 15.76 % w/w $^{18}\!\!$

PHYTOCHEMICAL CONSTITUENTS

Preliminary phytochemical screening of F. religiosa barks, showed the presence tannins, saponins, flavonoids, steroids, terpenoids and cardiac glycosides.^{18, 19}.

Constituents of the bark

Phytosterols like, lanosterol, β-sitosteryl-Dglucoside, bergapten, bergaptol and stigmasterol have been isolated from the petroleum ether and alcoholic extracts of the bark of F. religiosa (Fig-2).^{20, 21, 22} The bark of F. religiosa comprises around 8.7% of total tannin content.²³ Phenolic components, acid detergent fiber (ADF), neutral detergent fiber (NDF), acid detergent lignin (ADL) and saponins have been identified in the inner bark of F. religiosa.²⁴

The bark also contains tannin, wax, saponin, leucocyanidin-3-0-β-D-glucopyrancoside,

leucopelargonidin-
leucopelargonidin-3-0-α-L-rhamnopyranoside,
lupeol, ceryl behenate, lupeol acetate, α-amyrin
acetate,
leucoanthocyanidinacetate,
leucoanthocyanidin25

Constituents of the fruits

Asparagine and tyrosine are the most abundant amino acids of the fruit pulp of F.religiosa.²⁶ F. religiosa fruits contain a considerable amount of flavonoids namely kaempeferol, quercetin, and myricetin and other phenolic components.²⁴

Constituents of the leaves

Leaves yield campestrol, stigmasterol, isofucosterol, α -amyrin, lupeol, tannic acid, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tryosine, methionine, valine, isoleucine, leucine, nnonacosane, n-hentricontanen, hexa-cosanol and n-octacosan.²⁷⁻²⁹

Constituents of the seeds

The seeds contain phytosterolin, β -sitosterol, and its glycoside, albuminoids, carbohydrate, fatty matter, coloring matter, caoutchoue 0.7– $5.1\%^{27-29}$. Important structures of active constituents present in F. religiosa given below.



Lanosterol



Sigmastrol



β-sitosterol



Kaempferol



Quercetin







Bergapten



Bergaptol



β-sitosteryl-D-glucoside

PHARMACOLOGICAL/PHARMACOGNOSTIC AL ACTIVITIES

Analgesic activity

Sreelekshmi *et al.* investigated the analgesic activity of the *F. religiosa* stem bark methanolic extract using the acetic acid-induced writhing (extension of hind paw) model in mice. Aspirin were used as standards drugs. It exhibited reduction in the number of writhing of 71.56 and 65.93% respectively at a dose of 250 mg/kg and 500 mg/kg. The abdominal constriction is related to the sensitization of nociceptive receptors to

prostaglandins. Thus suggest that extract showed the analgesic effect probably by inhibiting synthesis or action of prostaglandins³⁰

Anti-inflammatory activity

The methanolic extract of the stem bark of *Ficus religiosa* Linn. was screened for its antiinflammatory activity in *Wistar albino* rats and analgesic effects in *Swiss* albino mice. A significant inhibition of carrageenan-induced rat paw oedema, comparable to that produced by indomethacin, the standard anti-inflammatory drug was obtained with all the three doses of the extract. A significant inhibition of acetic acid induced writhing in mice was observed with two doses of the extract. The analgesic effect was comparable to that caused by the standard drug, aspirin. The methanol extract also showed significant anti-lipid peroxidant effects *in- vitro*³⁰.

Antioxidant activity

The antioxidant activity of the aqueous extract of F. religiosa was investigated in streptozotocininduced diabetic rats. Since the oxidative stress is the major cause and consequence of type 2 diabetes.

Free radicals generated during oxidative stress damage the insulin receptors and thereby decrease the number of sites available for insulin function.

The aqueous extract drug reported to contain tannins, flavonoids and polyphenols. At doses 100 and 200 mg/kg of aqueous extracts of F. religiosa shows significantly decrease in fasting blood glucose and increase in body weight of diabetic rats as compared to untreated rats. F. religiosa at 100 mg/kg dose decreased significantly (p<0.05) superoxide dismutase (SOD) and at dose of 200 mg/kg significantly catalase (CAT) (p<0.05) enhanced and glutathione peroxidase (GSH-Px) (p<0.01) activity in type 2 diabetic rats. It modulated the SOD activity in dose dependent manner. Decrease in CAT activity due to less availability of NADPH or gradual decrease in erythrocyte CAT concentration by excessive generation of oxygen radical that inactivates the enzyme. Aqueous extract restored the erythrocyte GSH. Decrease in MDA marker by F. religiosa showed the erythrocyte CAT concentration by excessive generation of oxygen radical that inactivates the enzyme.

Aqueous extract restored the erythrocyte GSH. Decrease in MDA marker by *F. religiosa* showed the ability of rasayana drug (rejuvenators, antioxidant, and relieve stress). The results suggesting that the *F. religiosa*, a rasayana group of plant drug having antidiabetic along with antioxidant potential was beneficial in treatment of type 2 diabetes³¹.

The methanolic extract of F. religiosa showed significant antiradical activity by bleaching 1, 1diphenyl-2picrylhydrazyl (DPPH) radical, EC50 from 11.75 µg was comparable to pyrogallol. It showed good superoxide scavenging potential, EC50 from 50.65 µg comparable to that of ascorbic acid and maximum reductive potential at a concentration of 400 µg, which was comparable to that of gallic acid and tannic acid. These finding suggest the rich phytochemical content of F. religiosa have good antioxidant activity³². The ethanolic extract was subjected to screen for antioxidant activity using DPPH radical scavenging method. The percentage peroxide value for F. religiosa extract was found in the range of 6.34% to 13.35% for the extract with 200 μ g/ml to 1000 μ g/ml strength extract³³. A study was carried to localize the oxidative stress enzymes, peroxidase and catalase; and to quantify the main reactive oxygen species, hydrogen peroxide in F. religiosa. The results explained that plants grown in adverse habitat showed 55% higher H2O2 production with about 30% increase in peroxidase activity. The three substrates tested for peroxidase activity (guaiacol, ascorbate and o-dianisidine), odianisidine was most preferred substrate of F. religiosa. Cytosolic peroxidase activity showed eleven fold increase over cell wall bound peroxidase. Similarly, catalase activity in specimens from adverse habitat showed about two fold increases during day time³⁴.

Anticonvulsant activity

An exhaustive study was performed on figs (fruit) of *F. religiosa* showed promising anticonvulsant activity in experimental model were seizure induced by maximum electroshock (MES), picrotoxin and pentylenetetrazol (PTZ). Along with cyproheptadine, a non selective serotonin antagonist (4 mg/kg, i.p.) was used to study the reversal of protective effect of extract in the above mentioned models. Acute toxicity, neurotoxicity and potentiation of phenobarbitone induced sleep by extract were also studied.

The highest amount of serotonin (5-HT) in figs of this plant as compare to figs of other species reported in Ayurveda. Furthermore serotonergic neurotransmission is known to modulate a wide variety of experimentally induced seizure and is involved in seizure protection in various animal models of epilepsy by altering various GABAnergic and glutamatergic functions.

F. religiosa was measured by using highperformance liquid chromatography (HPLC). The analysis was carried out at 277 nm using 5 μ m particles Hypersil GOLD C-18 RP column as a stationary phase. While 25mM phosphate buffer (pH 2.5) and acetonitrile used as mobile phase at flow rate of 1ml min-1.

It showed an absorption peak with a retention time of 12.563 min same retention time as that of standard serotonin solution. Hence indicate the presence of serotonin in the extract. The study showed significant decrease in the duration of tonic hind limb extension in a dose dependent manner in MES model. In picrotoxin model study extract caused a delay of the latency to clonic convulsions and activity was found to be euipotent as that of diazepam treated group at a dose of 100 mg/kg.

The extract showed no protection against PTZ induced convulsion at any dose. Pre treatment with cyproheptadine showed inhibition of anticonvulsant effect of the extract in both models (MES and picrotoxin).

Further the extract showed no mortality and behavioural changes in acute toxicity model. This study used rotarod test to determine neurotoxic effect like ataxia, abnormal gait, reduced or inhibited righting reflexes and muscle relaxation.

The extract showed no neurotoxicity and all animals able to maintain equilibrium on rotating rod for more than 3 min.

The results confirm and justify the use of *F*. *religiosa* in ethnomedical treatment of epilepsy and presence of high serotonin content in its figs led to hypothesize that figs of *F*. *religiosa* may possess anticonvulsant properties via modulating brain serotonin levels, which will be of clinical usefulness³⁵.

Antimicrobial activity

The antimicrobial activity of ethanolic extracts of *F. religiosa* (leaves) was examined 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 less³⁶.

The antibacterial activity of different extracts from the bark of *F. religiosa* was tested against diarrhoeal enterotoxigenic *Escherichia coli* using disc diffusion method.

The antibacterial activities of extract were compared with standard antibiotics. The sensitivity of the organisms measured in terms of zone of inhibition ranged from 8.00 to 14.00 mm at 4mg/ml of different extract. The results revealed that methanol extract exhibits good activity compared to chloroform and aqueous extract. Petroleum ether and hexane extract did not show any activity³⁷.

Broad-spectrum antibacterial and antifungal properties of Ethanolic extracts of 22 traditionally used Indian medicinal plants were studied for their antimicrobial activity against seven bacteria Salmonella (Staphylococcus aureus. typhimurium, S. paratyphi, S. typhi, E. coli, Shigella dvsenteriae and Pseudomonas aeruginosa) and five filamentous fungi (Aspergillus niger, Alternaria alternata, Fusarium chlamydosporum, Rhizoctonia bataticola and Trichoderma viride).

Of these, 16 plant extracts showed varied level of antibacterial activity against one ormore test bacteria. Similarly antifungal activity was detected among 17 plant extractsrespectively. *F. religiosa* (leaves) demonstrated more antibacterial activity with less antifungal activity³⁸.

Zaidi et al. reported the potential *in vitro* anti-*Helicobacter pylori* activity of medicinal plants from Pakistan that is used to cure GI disorders. *Helicobacter pylori* was isolated from the antral biopsy specimens and confirmed through the standard microbiology procedures.

The 70% aqueous-ethanol extracts of *Ficus religiosa* completely inhibited the growth of *Helicobacter pylori* at 500µg/ml in all strains and demonstrate anti-*Helicobacter pylori* activity with MBC value ranged from 125 to 250µg/ml³⁹.

The acetone extracts of seven plant species *Tamarindus indica, F. indica, F. religiosa, Tabernaemontana livaricate, Murrayakoenigii, 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 respectively⁴⁰.

The preliminary screening of antibacterial activity of *F. religiosa* by agar-well diffusion assay was investigated. The chloroform extracts

of *F. religiosa* showed a strong inhibitory activity against growth infectious *Salmonella typhi, Salmonella typhimurium* and *Proteus vulgar is* at a MIC of 39, 5 and 20 μ g/ml respectively⁴¹.

Wound healing activity

The wound healing activity was investigate by excision and incision wound models using *F. religiosa* leaf extracts, prepared as ointment (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 wereobserved 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 healing⁴²⁻⁴³.

Anti-amnesic activity

The anti-amnesic activity was investigated using *F. religiosa* methanol extract of figs of *F. religiosa* on scopolamine-induced anterograde and retrograde amnesia in mice.

Figs were known to contain a high serotonergic content, and modulation of serotonergic neurotransmission plays a crucial role in the pathogenesis of amnesia.

During study, transfer latency (TL) to the preferred niche in the elevated plus-maze (EPM) and learning avoidance of passive behavior to avoid punishment in the modified passive avoidance paradigm (MPA) served as behavioral models for the assessment of memory.

Scopolamine (1mg/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.).

Cyproheptadine, a non-selective 5-HT1/2 blocker (4mg/kg, i.p.), was administered along with the *F. religiosa* figs to investigate the involvement of serotonergic pathways in the antiamnesic effect of *F. religiosa* figs.

The resulted had anti-amnesic activity against scopolamine induced amnesia, in a dose-dependent manner.

Inhibition of the anti-amnesic effect of *F. religiosa* figs by cyproheptadine substantiates the involvement of serotonergic pathways for its activity⁴⁴.

Anti-acetylcholinestrase activity

Methanolic extract of the stem bark of *F. religiosa* found to inhibit the acetyl cholinestrase enzyme, thereby prolonging the half-life of acetylcholine.

It was reported that most accepted strategies in alzheimer's diseases treatment is the use of cholinesterase inhibitors.

The calculated 50% inhibitory dose (ID50) value was 73.69 µg/ml respectively.

The results confirm and justify the popular traditional use of this plant for the treatment of alzheimer's diseases⁴⁵.

Proteolytic Activity

A comparison of the proteolytic activity of the latex of 46 species of *Ficus* was done by electrophoretic and chromatographic properties of the protein components.

F. religiosa showed significant proteolytic activity⁴⁶.

Anti-ulcer activity

The anti-ulcer activity was investigated using ethanol extract of stem bark of *F. religiosa* against *in vivo* indomethacin- and cold restrained stress-induced gastric ulcer, and pylorus ligation assays.

The extract (100, 200 and 400 mg/kg) significantly (P<0.05) reduced the ulcer index in all assays used. The extract also significantly increased the pH of gastric acid while at the same time reduced the volume of gastric juice, free and total acidities.

The study provides preliminary data on the antiulcer potential of *Ficus religiosa* stem bark and support the traditional uses of the plant for the treatment of gastric ulcer⁴⁷.

Bronchospasm activity

The *in vivo* studies of histamine induced bronchospasm in guinea pigs and *in vitro* isolated guinea pig tracheal chain and ileum preparation were performed.

Pretreatment of guinea pigs with ketotifen (1 mg/kg, p.o.), has significantly delayed the onset of histamine aerosol induced convulsive dyspnea, compared with vehicle control (281.8 \pm 11.7 vs112.2 \pm 9.8).

The administration of methanolic extract (125, 250 and 500 mg/kg, p.o.) did not produce any

significant effect on latency to develop histamine induced preconvulsive dyspnea. Methanolic extract of fruits at a doses (0.5, 1 and 2 mg/ml) has significantly potentiate the EC50 doses of both histamine and acetylcholine in isolated guinea pig tracheal chain and ileum preparation. HPLC analysis of methanolic extract showed the presence of high amounts of serotonin (2.89% w/w)⁴⁸.

Antidiabetic activity

The antidiabetic effect of aqueous extract of *Ficus religiosa* bark (FRAE) in normal glucose loaded hyperglycemic and streptozotocin (STZ) induced diabetic rats, at the dose of 25, 50 and 100 mg/kg were investigated.

The effect was more pronounced in 50 and 100 mg/kg than 25 mg/kg. FRAE also showed significant increase in serum insulin, body weight and glycogen content in iver and skeletalmuscle of STZ- induced diabetic rats while there was significant reduction in the levels of serum triglyceride and total cholesterol. FRAE also showed significant antilipidperoxidative effect in the pancreas of STZ induced diabetic rats⁴⁹.

Immunomodulatory activity

The immunomodulatory effect of alcoholic extract of the bark of *F. religiosa* (Moraceae) in mice was investigated. The study was carried out by various hematological and serological tests. Administration of extract remarkably ameliorated both cellular and tic rats while there was humoral antibody response. It is concluded that the test extract possessed promising immunostimulant properties⁵⁰.

CONCLUSION

Now days, the interest toward the herbal medicines have been increased, because of their ability to treat various diseases. Although the scientific study have been carried out on various Indian botanicals and considerably smaller number of marketable drugs have entered the evidence based therapeutics. Hence the detail study and research work can be carried out on human, so that in future, we can develop different pharmaceutical product.

The multiple benefits of *F.religiosa* made it a true miracle of nature & are highly regarded and used plant in Ayurvedic medicine. It is one of the most versatile plant having a wide spectrum of medicinal activities. This is the unique source of various types of compounds having diverse chemical structure. A drug development

program should be undertaken to develop modern drugs with the compounds isolated from Ficus religiosa. With the availability of primary information, further studies can be carried out like phyto pharmacology of different extracts, standardization of the extracts, identification and of active principles and isolation pharmacological studies of isolated compound. These may be followed by development of lead molecules as well as it may serve for the purpose of use of specific extract in specific herbal formulation.

Numerous studies have been conducted on different parts of *F.religiosa*, but this plant has not yet developed as a drug by pharmaceutical industries. A detailed and systematic study is required for identification, cataloguing and documentation of plants, which may provide a meaningful way for the promotion of the traditional knowledge of the herbal medicinal plants. In view of the nature of the plant, more research work can be done on humans so that a drug with multifarious effects will be available in the future market.

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