

***Ficus religiosa* Linn. (Peepal): A Phyto-Pharmacological Review**

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ABSTRACT

Ficus religiosa is known to be a native Indian tree. It is a familiar sight in Hindu temples, Buddhist monasteries and shrines, villages and at roadsides. It is known to be a sacred plant in India and since ancient times it is widely being used to treat various ailments like skin diseases, heart diseases, constipation, dysentery, snakebite and important constituent of various traditional herbal preparations like shankha vati, chandraprabha vati, kaminivindravan rasa. In recent studies *Ficus religiosa* has been investigated for presence of a wide range of phytoconstituents viz. glycosides, flavonoids, tannin, terpenoids and sterol. This compilation provides comprehensive review of its ethnopharmacological use, phytochemistry, phytopathology, pharmacological activities, traditional and medicinal use.

Keywords: *Ficus religiosa*, phytochemistry, Phytopathology, antioxidant, pharmacological activities.

INTRODUCTION

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 luck¹.

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 kalpvruksha².

Vedic history

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 branches³.

Taxonomy/Botanical classification⁴

Domain: *Eukaryota*
 Kingdom: *Plantae*
 Subkingdom: *Viridiaeplantae*
 Phylum: *Tracheophyta*
 Subphylum: *Spermatophytina*
 Infraphylum: *Angiospermae*
 Class: *Magnoliopsida Brongniart.*
 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 tomorrow⁵.

Common names⁵

Gujrati : Jari, Pipers, Pipal
 Hindi: Pipal, Pipali
 Kanarese: Arani, Ashwatha mara, Pippala, Ragi
 Marathi: Pimpala
 Sanskrit: Ashvattha, Bodhidruma, Pippala, Shuchidruma, Vrikshraj, yajnika.

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 Hawaii 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 introduced⁶.

Description

a. Macroscopic characteristics

General

Small tree or taller strangling climber, with wide-spreading 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 habitats⁷.

Leaves

When the leaves first appear their colour is red-pinkish, 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 remain⁸.

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 – astringent⁸.

Flowers

The small red flowers appear in February. The tree is dependent on its associated pollinator wasp, *Blastophaga quadraticeps* to set seed⁸.

Fruit

The tree fruits in May/June and bears a small flat-topped figs (12-13 mm or ½ 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 animals⁸.

b. Microscopic characteristics

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 thick-walled cells with simple pits; in tangential section ray cells circular to oval in shape; cambium when present, consists of 2-4 layers of thin-walled rectangular cells⁷.

Standardization⁹

Foreign matter- Not more than 2 percent.

Total ash- Not more than 7 percent.

Acid-insoluble ash- Not more than 0.3 percent.

Alcohol-soluble extractive- Not less than 8 percent.

Water-soluble extractive- Not less than 9 percent.

Pests and Diseases

Several pests including various ants which were seen carrying off pollinator wasps from ficus fruits, Hymenoptera and mites that may be parasites of the pollinator

wasps, and staphylinids which were seen entering ficus fruits and eating the pollinator wasps⁹.

Phyto chemistry of *Ficus religiosa* Linn.

Phyto-chemistry is the chemistry of plants or chemical constituents of plants. Phyto chemistry understood in pharmacy as the chemistry of natural products used as drugs or of drugs plants with the emphasis on biochemistry. The constituents are therapeutically active or inactive. The inactive constituents are structural constituents of the plants like starch, sugars or proteins. The inactive constituents have however pharmaceutical uses. The active constituents are secondary metabolites, like alkaloids glycosides, volatile oils, tannins etc. They are single substances or usually mixtures of several substances. The secondary products of metabolism are formed from primary products and the plant is not able to reutilize them and they are deposited in the cells and so are called secondary metabolites¹⁰.

The reported phytoconstituents of stem bark of *Ficus religiosa* Linn. are phenols, tannins, steroids, alkaloids and flavonoids, β -sitosterol-d-glucoside, vitamin K, n-octacosanol, methyl oleanolate, lanosterol, stigmasterol, lupen-3-one¹¹. Stem bark contains three methyl ethers of leucoanthocyanins, delphinindin-3-O- α -L-rhamnoside¹, Pelargonidin-3-O- α -L-rhamnoside (11) and Leucocyanidin-3-O- β -D-galactosyl-cellobioside (111)-along with methyl ether of leucoanthocyanidin isolated from stem bark as characterized; 20-tetratriaconten-2-one, pentatriacontan-5-one and 6 heptatria content-10-one isolated from stem bark and characterized; β -sitosterol- α -D-glucoside and meso anisosal also isolated¹².

The active constituent from the root bark *F. religiosa* was found to be β -sitosterol-d-glucoside, which showed a peral hypoglycemic effect in fasting and alloxan-diabetic rabbits and in pituitary-diabetic rats. The fruits contain 4.9% protein having the essential amino acids, isoleucine, and phenylalanine.^[13] The seeds contain phytosterolin, β -sitosterol, and its glycoside, albuminoids,

carbohydrate, fatty matter, coloring matter, caoutchoue 0.7-5.1%¹⁵ *Ficus religiosa* fruits contain flavonols namely kaempeferol, quercetin, and myricetin¹⁵. Leaves and fruits contain carbohydrate, protein, lipid, calcium, sodium, potassium, and phosphorus. The aqueous extract of dried bark of *Ficus religiosa* has been reported to contain phytosterols, flavonoids, tannins, furanocoumarin derivatives namely bergapten and begapto¹⁶.

The fruit of *Ficus religiosa* contained appreciable amounts of total phenolic contents, total flavonoid, and percent inhibition of linoleic acid. Generally higher extract yields, phenolic contents, and plant material antioxidant activity were obtained using aqueous organic solvents, as compared to the respective absolute organic solvents. Although higher extract yields were obtained by the refluxing extraction technique, in general higher amounts of total phenolic contents and better antioxidant activity were found in the extracts prepared using a shaker¹⁷.

Uses of *Ficus religiosa* Linn.

Nearly every part of the tree can be used as medicine. The leaves are used to feed camels and elephant, and the tree is often the home to the tiny lac insect. When the leaves are dried, they are used for decoration and often painted on. Like all the fig trees many birds and bats love to eat the fruit, and in times when there is little food, villager eats them as well. The wood lasts well in water and is sometimes used for buildings small boats.

"Proper use makes a good remedy even out of poison while a good medicinal plant acts as a poison if used improperly" Charaka-samhita (1000 B.C.).

a. Medicinal Uses

Ficus religiosa is reported to have numerous therapeutic uses in folk medicine viz.: leaf juice has been used for the treatment of asthma, cough, sexual disorders, diarrhoea, haematuria, ear-ache and toothache, migrane, eye troubles, gastric problems and scabies. Leaf decoction has been used as an analgesic for toothache. Fruits for the treatment of asthma, other respiratory

disorders and scabies. Stem bark is used in gonorrhoea, bleeding, paralysis, diabetes, diarrhoea, bone fracture, antiseptic, astringent and antidote¹⁸.

Ficus is used extensively used in traditional systems of medicine like Ayurveda, Unani and Siddha in the form of various formulations. Bark is used in healing ulcers, various skin diseases and scabies and in treatment of diabetes, the root bark is stated to be aphrodisiac. Fruit is laxative and digestive. The fruit powder is also given to enhance fertility and used in dysentery, uterine troubles, ulcers, biliousness, bitter tonic, in blood diseases. All plant parts are acrid, sweetish, cooling and are useful in diseases of blood vagina, uterus, given in leucorrhoea, burning sensation, biliousness and ulcers. The ripe fruit is cooling, alexipharmic, good for burning sensation, foul taste, thirst, biliousness and diseases of blood and heart^{19,20,21,22}.

Powdered dry fruit destroys sorrows of a person. Seeds are laxative and if taken three days during menstruation, sterilizes women for long time. Bark phytosterolin is a powerful CNS stimulant. The fruit extract demonstrated antitumour activity in potato disc bioassay. Fibre from *Ficus religiosa* produces hyper lipidemia²³.

b. Traditional Uses

Healing and curative

Leaves are laxative and a tonic. They relieve feverish feeling of coolness. They are also useful in arresting secretion or bleeding. In such cases, about 50 ml of raw juice of the leaves or 1 teaspoon of powdered dried leaves can be taken with water²⁴.

Heart diseases

The leaves of the peepal are used in the treatment of heart diseases. The leaves are infused in water at night. Distilled the following morning and then stored in white bottles. About 15 ml of this infusion is administered thrice daily. It is highly effective in relieving palpitation of the heart and cardiac weakness²⁴.

Constipation

The leaves of peepal should be dried in the shade and powdered. Pills are made

by adding the required quantity of a solution of anise and jaggery with water. In the same way, the fruits can be dried in shade, powdered and mixed with an equal quantity of sugar. This compound in doses of 4 to 6gms, taken at bedtime with milk, ensures proper bowel movement, the following morning²⁴.

Mumps and boils

Peepal leaves smeared with ghee, warmed over a fire and bandaged over the inflamed part (mumps) to get relieve. A leaf of peepal smeared with ghee can be banged like worm on the boil. If there is any pus formation, it will burst, if it is in preliminary stages, the growth will subside in initial stage itself²⁴.

Gynaecological problems

For many vaginal diseases, a decoction from the bark is employed to cleanse the vagina as a wash. A decoction prepared from the bark of peepul and tamarind or their freshly extracted juice, is given as a drink for patients with difficult menstruation or even absence of menstruation. For pregnant ladies who have a tendency or fear of abortion, six *maashaas* of bark powder is to be given with a decoction of the rind of an orange. This is continued 3-8 times a day for a week²⁵.

Gastrointestinal diseases

Even intolerably severe pain in the stomach is relieved by drinking a decoction of the bark with salt and jaggery. Severe and repeated vomiting is relieved by using the innerbark of the tree. The bark is dried in the shade and powdered finely. This, when mixed with honey repeatedly in a dosage of 4 to 8 *rattis*, relieves vomiting due to *kapha*. Uncontrollable thirst is also quenched by water in which burnt peepul bark is dipped for cooling. An enema from the tree's sprouts, cooked in milk and filtered, is advantageously employed for dysentery, rectal prolapse, haemorrhage and fever²⁵.

Fever and Joint pains

Peepal is effective in fever because of its cooling nature. Burn the bark fully to

ashes. Sieve this through a fine cloth and sprinkle on the bed of a patient with fever and eruptions. Take five *toLaas* (50 gms) of bark and cook it in five liters of water. When the quantity of liquid is reduced to 100ml, filter, add a little honey and let the patient drink a half in the morning and the rest in the evening. This cures rheumatism even where aggravation of all the three *doshas* has occurred²⁵.

Respiratory system

For an asthmatic patient, the powder from the dried fruit is given with water. A cough of any type is relieved by taking it with honey. This is also believed to render the voice sweet and melodious. For whooping cough in children, giving the powder of peepal lac in a dosage of 3 *rattiis* along with 3 *maashaas* of butter, three times a day, has been seen to be beneficial²⁵.

Skin

A patient with *itching or eczema* is advised to drink a decoction of peepal bark. For eruptions, the bark is rubbed on a grind stone with water and the paste is applied gently. This is said to aid maturation of the eruptions. Old peepal trees develop a thin papery cover over the bark. This is dried, powdered fine and stored. For wounds, first smear a thin layer of *gingely* (sesame) oil and then sprinkle this powder so that a thick layer is formed. If discharge from the wound emerges from this layer, apply the oil again, followed by another thick sprinkling of the powder. By these measures, even severe wounds, that are not filling up heal easily²⁵.

Oro dental problems and Ear problems

A decoction or cold infusion of the bark strengthens the gums, heals them, offering relief even in severe toothache. Growing children often suffer from frequent mouth ulcers. A favourite and effective remedy is application of the paste of the powdered bark and tender leaves with honey. Take tender young peepul leaves, grind and cook them in *gingely* (sesame) oil over a low fire. A small quantity of this oil is to be poured into the painful ear, after making it comfortably warm, to relieve pain²⁵.

C. Other Uses

People in India collect the leaves, clean and dry them and paint them with the gold acrylic in order to preserve them for years. From the bark of the tree, reddish dye is extracted. People tie threads of white, red and yellow silk around it to pray for pregnancy. The Peepal tree has its own symbolic meaning of enlightenment and peace²⁶.

Pharmacological/Pharmacognostical activities

Antiulcer activity- The antiulcer potential of the ethanol extract of stem bark of *Ficus religiosa* against *in vivo* indomethacin, cold restrained stress induced gastric ulcer and pylorus ligation assays were validated. 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 ulcer²⁷.

Anticonvulsant activity- The anticonvulsant activity of the aqueous aerial root extract *Ficus religiosa* (25, 50 and 100 mg/kg, p.o.) was investigated in strychnine, pentylenetetrazole, picrotoxin and isoniazid induced seizures in mice. The extract showed no toxicity and protected the animals in the strychnine, pentylenetetrazole tests in a dose dependent manner. Its effect in the picrotoxin and isoniazid tests was less potent. The extract also exhibited dose dependent potentiation of Ach in rat ileum but failed to potentiate the effect of 5-HT in rat fundus strip preparation²⁸.

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. Pre-treatment of guinea pigs with ketotifen (1 mg/kg, p.o.), has significantly delayed the onset of histamine aerosol induced pre-

convulsive dyspnea, compared with vehicle control (281.8 ± 11.7 vs 112.2 ± 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 pre-convulsive 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)²⁹.

Antioxidant activity- The ethanolic extract of leaves of *Ficus religiosa* was evaluated for antioxidant (DPPH), wound healing (incision, excision, histopathological and dead space wound model) and anti-inflammatory (Carageenan induced paw odema) activity. The tested extract of different dilutions in range 200 µg/ml to 1000 µg/ml shows antioxidant activity in range of 6.34% to 13.35%. Significant increase in wound closure rate, skin breaking strength, granuloma breaking strength was observed. The extract shows prominent anti-inflammatory activity as compared to that of standard (Ibuprofen gel)³⁰.

Antiamnesic activity- the effect of the methanol extract of figs of *Ficus religiosa* (FRFE) on scopolamine-induced anterograde and retrograde amnesia in mice was investigated. The methanolic extracts were administered at a dose of 10, 50 and 100 mg/kg, i.p. and scopolamine at 10 mg/kg, i.p. Methanol extract of figs of *Ficus religiosa* showed a significant improvement of memory as it treatment attenuated the scopolamine-induced anterograde and retrograde amnesia dose dependently. Cyproheptadine pretreatment significantly reversed the anti-amnesic effect³¹.

Pharmacognostic evaluation-A detailed comparative pharmacognostic evaluation of the barks of four species, namely *Ficus racemosa*, *Ficus virens*, *Ficus religiosa* and *Ficus bengalensis* which are important ingredient in many Ayurvedic

and traditional formulations, effective in various treatments such as diabetes, skin diseases, ulcers and nervous disorders were studied. *Ficus* barks were sold in Indian market under traditional names such as plaksah, udumbarah, asvattah and vatah. The barks of the species mentioned above are usually interchanged or adulterated with other species of ficus because of the limited knowledge in identification and differentiation. Pharmacognostic evaluation has been carried out with the aim to establish the diagnostic keys of important drugs based on the macroscopic, microscopic and HPTLC profile³².

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 liver and skeletal muscle 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 rats³³.

Antioxidant and Antidiabetic activity-

The aqueous extract of *Ficus religiosa* Linn. was assessed at a dose of 100 and 200 mg/kg orally, it decreases the fasting blood glucose in streptozotocin induced type 2 diabetic rats. The drug had enzyme induction effect with respect to catalase (CAT) and glutathione peroxidase (GSH-Px) activity, however decreased the exaggerated activity of superoxide dismutase (SOD) in type 2 diabetic rats. *F. religiosa* modulated the enzymes of significant antioxidant defense system to combat oxidative stress. Drug at higher dose (200 mg/kg) had more pronounced effect. *F. religiosa*, a rasayana group of plant drug having anti-diabetic activity along with antioxidant potential was beneficial in treatment of type-2 diabetes³⁴.

Wound-Healing activity- The wound healing activity (incision and excision model) of *Ficus religiosa* leaf extract prepared as ointment form (5 and 10%) was investigated. Povidone iodine 5% was used as standard drug. The healing of wound was assessed by the rate of wound contraction, decreased in the period of epithelialization, high skin breaking strength was observed in animals. 10% ointment shows better wound healing activity than 5% concentration³⁵.

Anticonvulsant activity with antiepileptic drugs- Anticonvulsant activity of methanolic fig extracts of *Ficus religiosa* (25, 50 and 100 mg/kg, i.p.) was studied. Seizures induced by maximum electroshock (MES), picrotoxin and pentylenetetrazol (PTZ), cyproheptadine, a nonselective (5HT_{1/2}) serotonin antagonist (4mg/kg, i.p.) was used to study the reversal of protective effect of extract in various animal models. Extract showed no toxicity, potentiated pentobarbitone induced sleep and inhibited seizures induced by MES and picrotoxin in a dose dependent manner. Anticonvulsant effect of extract was comparable to clinically used antiepileptic drugs, phenytoin and diazepam³⁶.

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 humoral antibody response. It is concluded that the test extract possessed promising immunostimulant properties³⁷.

Antibacterial and Antitumor activity- The aqueous, methanol and chloroform extracts of the leaves of *Ficus religiosa* were evaluated for their antibacterial and antitumor activities. These extracts showed an elevated level of antibacterial activity and a reduced antifungal activity. The most sensitive organisms *S. typhi*, *P. vulgaris*, *S. typhimurium* and *E. coli* were inhibited even at lowest concentrations of

the chloroform extracts. Aqueous and methanolic extracts were found to be less active. The antitumor activity conducted by crown gall potato disc assay proved that all the three extracts are efficient in reducing the tumors formed³⁸.

Ethno-botanical evaluation- The new ethno-medico botanical information and traditional use of medicinal plants against kidney and urinary disorders were documented. The use of 68 medicinal plants belonging to 29 families and 58 genera of cold desert was documented against the treatment of kidney and urinary disorders in the tribal communities of Ladakh region in India. These species were used in combination of some exotic species such as *Bergenia ligulata*, *Cinnamomum zylanicum*, *Crocus sativus*, *Elettaria cardamomum*, *Emblia officinalis*, *Ficus religiosa*, *Mangifera indica*, *Punica granatum*, *Santalum album*, *Spondiix axillaris*, *Terminalia belerica*, *Terminalia chebula*, *Zingiber officinale* and some medicinal stones, minerals and salts³⁹.

Antibacterial activity- Ten medicinal plants namely *Commiphora wightii*, *Hibiscus cannabinus*, *Anethum graveolens*, *Emblia officinalis*, *Ficus religiosa*, *Ficus racemosa*, *Ficus benghalensis*, *Ficus tislata*, *Mentha arvensis* and *Mimusops elengi* were screened for potential antibacterial activity against medically important bacterial strains. The ethanol extracts were more potent than aqueous extracts of all the plant studied. *P. aeruginosa* and *S. typhimurium* were the most resistant strains while the most susceptible bacterial strains were *B. cereus* and *P. mirabilis*⁴⁰.

Acetylcholinesterase (AChE) inhibitory activity- Seventy six plant extracts including methanolic and successive water extracts from 37 Indian medicinal plants were investigated for acetylcholinesterase (AChE) inhibitory activity (*in vitro*). Results indicated that methanolic extracts to be more active than water extracts. The potent AChE inhibiting methanolic plant extracts included *Withania somnifera* (root), *Semecarpus anacardium* (stem bark), *Emblia ribes*

(root), *Tinospora cardifolia* (stem), *Ficus religiosa* (stem bark) and *Nordostachys jatamanasi* (rhizome). The IC₅₀ values obtained for these extracts were 33.38, 16.74, 23.04, 38.36, 73.69 and 47.21 µg/ml respectively⁴¹.

Anti-inflammatory activity- The methanolic extract of the stem bark of *Ficus religiosa* Linn. was screened for its anti-inflammatory 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*⁴².

Isolation of compounds- The compounds were analyzed of volatile blends released by respective figs of twenty *Ficus* species to attract their specific pollinating wasps. In all, 99 different compounds were identified. The compounds are mainly terpenoids, aliphatic compounds and products from the shikmic acid pathway. In each species blend there are few major compounds which are generally common among floral fragrances. A possible basis for species-specificity of *Ficus*-wasp interactions is discussed in relation to the patterns of volatiles found in this interspecies comparison⁴³.

Antiulcer activity- Four sitavirya plants viz. *Satavari* (fresh root juice, 1250 mg/kg), *Yastimadhu* (water decoctions of root, 600 mg/kg), *Kutaja* and *aswattha* (water decoctions of bark; 400 and 500 mg/kg respectively) were studied for their effects on different models of gastroduodenal ulcers in rats, when given orally for 3 days. All of them were found to protect the animals against 2 hr cold restraint stress and pylorus ligation

induced gastric and cystamine induced duodenal ulcers⁴⁴.

Antifungal activity- The benzene extract of both the plants i.e. *Ficus infectoria* Roxb. and *Ficus religiosa* Linn. afforded furanocoumarins, bergapten and bergaptol. The isolated compounds of both the plants were assayed against its microorganisms *Staphylococcus aureus*, *Escherichia coli*, *Penicillium gluacum* and *Paramecium* at concentration of 0.2% for aqueous bark extracts and 1x10⁻² M for the isolated compounds. The results indicate bacterial activity of both the compounds bergapten and bergaptol against *S. aureus* and *E. coli*. An antifungal activity of the compounds against *P. gluacum* was also observed⁴⁵.

Isolation of leaf proteins- Leaf protein concentrates from leaves of *Ficus religiosa* and *Mimusopa elengi* Linn have been isolated. Nitrogen contents were estimated to be 12.25% in *F. religiosa* and 11.5% in *M. elengi*. The amino acids obtained by the acid and alkaline hydrolysis of leaf protein concentrates were separated and identified by descending paper chromatography technique. The liquid paper chromatography (LPC) of *Ficus religiosa* was found to be a condensation polymer of L-cystine, L-lysine, L-arginine, DL-serine, DL-aspartic acid, glycine, DL-threonine, D and L-alanine, L-proline, tryptophan, L-tyrosine, DL-methionine, DL-valine, isoleucine and L-leucine⁴⁶.

CONCLUSION

India is sitting on a gold mine of well recorded and traditionally well practiced knowledge of herbal medicine. This country is perhaps the largest producer of medicinal herbs and is rightly called the botanical garden of the world. The study of herbal medicine spans the knowledge of pharmacology, history, source, physical and chemical nature, mechanism of action, traditional, medicinal and therapeutic use of drug. *Ficus religiosa* is 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 isolation of active principles and 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.

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