PHARMACOLOGICAL PROPERTIES, PHYTOCHEMICAL SCREENING AND USES OF MEDITIONAL PLANT FICUS RELIGIOSA LINN. (MORACEAE)

Kesab Shrestha, Janmajoy Banerjee* and Ashis Shrestha

Department of Pharmacy Sunsari Technical College, Dharan, Nepal.

Article Received on 24/04/2015  Article Revised on 18/05/2015  Article Accepted on 11/06/2015

ABSTRACT

Ficus religiosa linn. known as Pippal (peepal) in nepali, Asvatthah in saskrit, belongs to family Moraceae. It is a species of fig native to Nepal, India, Bangladesh, Myanmar, Pakistan, Sri-lanka, South wast china. It is widely being used to treat various diseases like skin diseases, constipation, dysentery, snakebite and important constituent of traditional herbal preparation like chandraprabha vati shankha vati and kamini-vindravan rasa. Bark powder is used to treat hypoglycemic, stomatitis and aphrodisiac. Stem bark is used for the ulcer treatment, asthma, parasympatholytic, viral infection, bacterial infection, protozoan infections, relaxant possess spasmodic effects on smooth muscles and skin diseases. Latex has curing activity for toothache. The fruit extract have antitumor activity and is used to cure purgative and aphrodisiac. 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. Ficus religiosa has been investigated for presence of a wide range of phytochemical constituents like alkaloids, glycosides, flavonoids, tannin, terpenoids, sterol, volatile oils, carbohydrate, fatty matter, phytosterols, furanocoumarin derivatives, phenolic compounds etc. This compilation provides comprehensive review of its ethnopharmacological use, pharmacological activities, traditional use and medicinal use.

KEYWORDS: Ficus religiosa, pharmacological activity, traditional uses, Phytochemical screening.
INTRODUCTION

Peepal tree or *Ficus religiosa* already kown bodhi tree. This plant is considered sacred by the followers of Buddhism, Hinduism and Jainism and sometimes called kalpvruksha. It is a large deciduous tree and often planted near temples and holy places. It is longest-living trees 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.\(^1\)

**Scientific classification**\(^2\)

Botanical classification

Kingdom: Plantae  
Division: Magnoliophyta  
Class: Magnoliopsida  
Order: Rosales  
Family: Moraceae  
Genus: Ficus  
Species: *F. religiosa*  
Binomial name: *Ficus religiosa*

**Description**

A) Macroscopical character

General

*Ficus religiosa* is a large dry season- deciduous or semi-evergreen tree up to 30 meters (98ft.) tall and with a trunk diameter of up to 3 meters or (9.8ft.)\(^3\). It is found topical to sub-topical area, up to 1650 meter or (5000 ft).\(^{1}\)
The leaves first appear their colour is red-pinkish, but then they turn deep green and are cordate in shape 12 to 20 cm long, 5 to 8 cm broad, with a 6-8 cm petiole. They are attached to long flexible stalks. The alternate leaves are heart-shaped, shiny with an elegant tail-like tip. The leaves have 5 to 8 pairs of side-veins and a further network of very fine veins.[1,3]

The plant prefer full sunlight, hot and humid weather and can grow in most soil types, proper watering and loam is the best soil. When planting use soil with PH of 7 or below. It is possible for the plants to grow indoors in a pot. It grows best outside than indoor in pot.[4]

Bark: The bark is slightly curved or flat, varies from thickness up to 1.0 to 3.0 cm (5 to 8 mm). Outer surface is rough irregular grey or ash like color with often covered with lichen which is brown or ash colored. The surface is shallow irregular vertical fissures and uneven due to exfoliation of cork, inner surface smooth, yellowish to orange brown and fibrous.[5]

B) Microscopical character
The macroscopic features of bark of *F. religiosa* show outer thick periderm and inner secondary phloem. Periderm consists phellem and phelloderm. Phellem zone is around 360 mm thick and it is wavy and uneven in transection. Phellem cells are organized into thin tangential membranous layers and the older layers exfoliate in the form of thin membranes. The phelloderm zone is broad and distinct. Phelloderm cells are turned into lignified sclereids. Secondary phloem differentiated into inner narrow non-collapsed zone and outer broad collapsed zone. Non collapsed zone consists of radial files of sieve tube members, axial parenchyma, and gelatinous fibres. Outer collapsed phloem has dilated rays, crushed obliterated sieve tube members, thick walled and lignified fibres, and abundant tannin filled parenchyma cells. Laticifers are fairly abundant in the outer secondary phloem zone. Phloem rays are both uniseriate and multiseriate. Multiseriate rays are homocellular and uniseriate rays are either homocellular or heterocellular.[5]

PHYTOCHEMISTRY
Preliminary phytochemical screening of *F. religiosa* barks, showed the presence tannins, saponins, flavonoids, steroids, terpenoids, cardiac glycosides also presence of bergapten, bergaptol, lanosterol, β-sitosterol, stigmasterol, lupen-3-one, β-sitosterol-d-glucoside (phytosterolin), vitamin k1. The bark also contains tannin, wax, saponin, β-sitosterol, leucocyanidin-3-O-β-D glucopyranoside, leucopelargonidin-3-O-β-D glucopyranoside,
leucopelargonidin-3-0-α-L- rhamnopyranoside, lupeol, cerylbehenate, lupeol acetate, α-amyrin acetate, leucoanthocyanidin and leucoanthocyanin.[5]

The reported phytoconstituents of stem bark of *F. religiosa* Linn. are phenols, tannins, steroids, alkaloids, flavonoid, β-sitosteryl-d-glucoside, vitamin K, noctacosanol, methyl oleanolate, lanosterol, stigmasterol, lupen-3-one. The most abundant flavonoid present in *Ficus religiosa* is quercetin. Aqueous extract of dried bark contain phytosteols, flavonoids, tannins, furanocoumarin derivatives namely bergapten and begaptol. Root contain β-sitosteryl-d-glucoside, fruit consist protin (myricetin), flavonoid and linoleic acid asgaragine, tyrosine, undecane, tetradecane, α-pinene, β-pinene, α-terpinene, limonene, dendrosaline, dendrosaline α-ylangene, α-copaene, β-bourbonene, β-caryophyllene, α-trans bergamotene, aromadendrene, α-humulene, alloaromadendrene, germacrene, bicyclogermacrene, γ-cadinene and δ-cadinene. Seed bear phytosterolin B-sitosterol, glycoside, albuminoids, carbohydrate, fatty matter, coloring matter caoutchoue. Leaves also consists of various compounds like campestrol, stigmasterol, isofucosterol, α- amyrin, lupeol, tannic acid, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tryosine, methionine, valine, isoleucine, leucine, n-nonacosane, n-hentricontanen, hexa-cosanol and n-octacosan.[6]
Stigmasterol

Fig: Some active compounds present in Ficus religiosa.

PHARMACOLOGICAL ACTIVITIES

F. religiosa possess a broad range of pharmacological activities. Fresh plant materials, crude extracts and extracted components of F. religiosa show a wide spectrum of in vitro and in vivo pharmacological activities.

Wound healing activity

The ethanol bark extract and leaf extracts of F. religiosa was reported to possess wound healing. High rate of wound contraction, decrease in the period for epithelialisation, high skin breaking strength were observed in animals treated with 10% leaf extract when compared to the control group of animals treated with standard drug Povidine iodine. It has been reported that tannins possess ability to increase the collagen content, which is one of the factor for promotion of wound healing.\(^6\)

Antidiabetic activity

An aqueous bark root extract showed maximum fall of the blood sugar level. Ficus religiosa modulates the enzymes of antioxidant defense system to combat oxidative stress. As a result glutathione was restored and inhibited the formation of malondialdehyde, proving its anti-diabetic activity. It has been reported that aqueous extract of F. religiosa showed reduction in blood glucose levels. The effect was compared with glybenclamide, oral hypoglycaemic drug. The aqueous extract of F. religiosa showed significant increase in serum insulin, body weight, glycogen content in liver and skeletal muscle of experimental diabetic rats, also reduced the serum triglyceride and total cholesterol level. The results suggested potential traditional use of F. religiosa.\(^7,8\)
Bronchospasm activity
The in vivo studies of Ficus religiosa fruits have been found to be ineffective against histamine induced bronchospasm in guinea pigs and methanolic extract of the fruits have shown to potentiate the bronchoconstriction induced by both histamine and acetylcholine on guinea pig tracheal chain. It also shows antiasthmatic activity. The alcoholic bark extract of ficus religiosa is also used for the treatment of bronchial asthma. The extract showed inhibitory effect on both acetylcholine induced and histamine induced asthma which exert antiasthmatic action. (Molhotra et al, 1960)

Antimicrobial activity
Aqueous extract of F. religiosa shows high antimicrobial activity against selected pathogenic organisms B. subtilis with about 24mm inhibition zone and markedly inhibit the growth of P. Aeruginosa. The preliminary screening of antibacterial activity of F.religiosa against Bacillus cereus and Escherichia coli. It has also been reported the chloroform extracts of F. Religiosa showed a strong inhibitory activity against growth infectious organism Salmonella typhi, Salmonella typhimurium and Proteus vulgaris.

Proteolytic activity
The latex of Ficus religiosa has been done by electrophoretic and chromatographic properties of the protein components and F. religiosa has showed a significant proteolytic activity.

Anti-ulcer activity
An anti-ulcer activity of the ethanol extract of stem bark of F. religiosa against in vivo indomethacin- and cold restrained stress-induced gastric ulcer. The extract significantly 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 and reduce total acidities. Also the F. religiosa stem bark support the traditional uses of the plant for the treatment of gastric ulcer.

Hypolipidemic activity
Dietary fiber content of food namely peepalbanti (F. religiosa), cellulose, and lignin were predominating constituents in peepalbanti, fed at 10% dietary level to rats, induced a greater resistance to hyperlipidemia than cellulose. Teent had the most pronounced hypocholesterolemic effect that appeared to operate through increased fecal excretion of cholesterol as well as bile acids. Dietary hemicellulose showed a significant negative
correlation with serum and liver cholesterol and a significant positive correlation with fecal bile acids. The dietary fiber influenced total lipids, cholesterol, triglycerides, and phospholipids of the liver to varying extents.\[15\]

**Anticancer activity**

Fruit extracts of *F. religiosa* exhibited antitumor activity in the potato disc bioassay. None of the tested extracts showed any marked inhibition on the uptake of calcium into rat pituitary cells.\[16\]

**Immunomodulatory activity**

The immunomodulatory effect of alcoholic extract of the bark of *F. religiosa* was investigated and study was carried out by various hematological and serological tests in mice. Administration of extract remarkably ameliorated both cellular and humoral antibody response and extract shows immunostimulant properties.\[17\]

**Anthelmintic activity**

*F. religiosa* bark methanolic extract shows 100% lethal for Haemonchus contortus worms.\[18\]

The stem and bark extracts of *F. religiosa* proved lethal to Ascaridia galli in vitro. The latex of some species of *Ficus* (Moraceae) *Ficus inspida, F. carica* was also reported to have anthelmintic activity against Syphacia obvelata, Aspiculuris tetraptera, and Vampirolepis nana.\[19\]

**Anti-amnesic activity**

The anti-amnesic activity was investigated using *F. religiosa* methanol extract of figs 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.\[20\]

**Analgesic activity**

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. This suggests that extract showed the analgesic effect probably by inhibiting synthesis or action of prostaglandins.\[21\]
Anti-acetylcholinesterase activity
Methanolic extract of the stem bark of *F. religiosa* found to inhibit the acetylcholinesterase 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. It also repotated traditional use of this plant for the treatment of alzheimer’s diseases.[22]

Antioxidant activity
The aqueous and alcoholic extract of roots possess remarkable antioxidant activity showing increased levels of various enzymatic activities likes glutathione peroxidase (GPX), glutathione S-transferase (GST), glutathione reductase (GRD), superoxide dismutase (SOD) and catalase (CAT) and decreased level of lipid peroxidation (LPO). *F. religiosa* root extracts showed significant antioxidant activity against carbon tetrachloride-induced liver injury in rats.[23] It has good superoxide scavenging potential comparable to that of ascorbic acid and maximum reductive potential comparable to that of gallic acid and tannic acid. Recent study has also revealed that the methanol extract of *F. religiosa* containing high total phenolic and total flavonoids contents, exhibits high antioxidant activity.[24] Studies have shown that plants of *Ficus religiosa* can grow in adverse habitats having 55% or higher water production with about 30% increase in peroxidase activity. Guaiacol, ascorbate and o-dianisidine are the three most preferred substrates of *F. religiosa* tested for peroxidase activity.[25]

Anti-inflammatory activity
The methanolic extract of stem bark of *F. religiosa* has shown significant anti-inflammatory activity and effect has been observed in acute and chronic models of inflammation. The extract also protected mast cells from degranulation induced by various degranulators. A paste of the powdered bark is a good absorbent for inflammatory swellings and can be used to treat burns. The methanol extract demonstrated that the extract inhibited the production of nitric oxide and proinflammatory cytokines which are related to inhibit inflammation.[26]

Anticonvulsant activity
The methanol extract of *F. religiosa* exhibits dose-dependent anticonvulsant activity against maximum electroshock- and picrotoxin-induced convulsions through serotonergic pathways modulation. The anticonvulsant activity of the extract is studied in strychnine-, pentylenetetrazole-, picrotoxin- and isoniazid-induced seizures in mice.[27]
**Hepatoprotective**

*F. religiosa* stem bark powder shows significant hepatoprotective activity against Paracetamol induced hepatotoxicity on rats. Paracetamol intoxication in normal rats elevated the levels of SGPT, SGOT, ALP, total bilirubin significantly and histologically showed the disarrangement and degeneration of normal hepatic cells indicating acute centrilobular necrosis. The rat treated with alcoholic extract and aqueous extract showed a significant reduction in all the biochemical parameter elevated by paracetamol. Ethyl acetate and pet ether extract showed moderate reduction in biochemical parameters.[28]

**Nephroprotective**

Alcohol extract of *F. religiosa* stem bark reduced the blood urea nitrogen level close to normal value against the toxic effects induced by anti-Tuberculosis drug like rifampicin and isoniazid in rabbits. The histopathological studies of kidney of normal rabbit indicated that in the proximal convoluted tubules nuclei and renal parenchyma were normal in appearance and its structure. Kidney of treated rabbits showed severe degree of infiltration in the glomerulus without renal tubular space between the glomerulus, congestion in the renal parenchyma, necrosis and condensed nucleus. The rabbits treated with extract show normal appearance of the nuclei with no condensed nucleus without any necrosis but at some places there was mild congestion. Kidney tubular cells structure was normal in appearance.[29]

**Anti-Diarrhoeal**

Acetone extract of stem bark of *F. religiosa* was administrated to castor-oil-induced rats at a dose level of 200 mg/kg showed marked reduction in the number of diarrhea stools and total weight of diarrhoeal faeces and, frequency and consistency of diarrhea.[30]

**Laxative**

Aqueous extract of *F. religiosa* leaves extract was showed significant laxative activity on albino wistar rats. and reduced loperamide induced constipation in dose dependent manner. The extract induced a significant enter pooling and excretion of Cl⁻, Na⁺, K⁺ and Ca²⁺ in the intestinal fluid.[31]

**USES**

Ethno-medicinal uses and medicinal values of different parts of *F. religiosa. Ficus religiosa* has been extensively used in traditional medicine. Its bark, fruits, leaves, roots, latex and
seeds are medicinally used in different forms and sometimes in combination with other herbs.\textsuperscript{[32]}

**Bark**

The barks of *F. religiosa* is an important ingredient in many Ayurvedic formulations, such as *Nalpamaraditailam, Chandanasavam, Nyagrodhadichurn* and *Saribadyasavam*.\textsuperscript{[5]}

The Bark is used for cooling and astringent and is useful in inflammation and glandular swellings of neck. Also used as aphrodisiac, antibacterial against *Staphylococcus aureus* and *Escherichia coli*, gonorrhoea, diarrhoea, dysentery, haemorrhoids and gastrohelcosis, anti-inflammatory, burns. The paste of powdered bark is used in cases of anal fistula and as absorbent for inflammatory swellings and also used in burns. Bark decoction has Cooling effect and used to treat gonorrhea, skin diseases, scabies, hiccups, vomiting.\textsuperscript{[6,32]}

Bark uses: Used in healing wounds, as antiinflammation, used in haemorrhoids, used in gastrohelcosis, used in burn, used as astringent, used in cooling, used as aphrodisiac, used as antibacterial against Escherichia coli and staphylococcus aureus.\textsuperscript{[33]}

**Leaves**

The leaves alone are used to treat constipation (Purgative), wounds, skin diseases and with young shoots are act as strong laxative. In Nepal leaf juice with honey is used for multipurpose such as for diarrhoea, asthma, cough, earache, toothache, and migraine, in gastric problems and in haematuria, migraine, eye troubles, gastric problems, scabies. In addition, the leaves of *Ficus religiosa* have also shown significant memory enhancing activity. Leaf decoction is used analgesic for toothache.\textsuperscript{[32,33]}

**Fruit and seeds**

The seeds and fruits are digestive laxative, and refrigerant. The dried fruit, pulverized and taken in water for a fortnight removes asthma, tuberculosis, fever, paralysis, hemorrhoids. The ripe fruit is cold in potency and good for burning sensation. It act as cardiac tonic and is useful to cure the diseases of Vagina. It also cures vomiting, anorexia and edema. The fruit extract of plant have antibacterial activity. Latex is used for neuralgia, inflammations, haemorrhages.\textsuperscript{[32,33]}
CONCLUSION

*F. religiosa* is a widely branched deciduous tree with leathery, heart shaped, long tipped leaves. *Ficus religiosa* one of the most versatile plants having a wide variety of medicinal activities therefore used in treatment of several types of diseases like diarrhoea, diabetes, urinary disorder, burns, haemorrhoids, gastrohelcosis, skin diseases, convulsion, tuberculosis, fever, oxidative stress, bacterial infection etc.

Bark uses: Used in healing wounds, as antiinflammation, used in haemorrhoids, used in gastrohelcosis, used in burn, used as astringent, used in cooling, used as aphrodisiac, used as antibacterial against Escherichia coli and staphylococcus aureus.

The plant has various types of compounds having diverse chemical structure. Numerous studies have been conducted on different parts of *F. religiosa*, but still this plant has not yet developed as a drug by pharmaceutical companies.

REFERENCE


