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Ficus religiosa: A wholesome medicinal tree

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Abstract

Medicinal plants play a vital role in improving health of people. Hundreds of medicinal plants have been used to cure various diseases since ancient times. *Ficus religiosa* (Peepal) has an important place among herbal plants. Almost every part of this tree i.e. leaves, bark, seeds and fruits are used in the preparation of herbal medicines. Therapeutic properties of this tree in curing a wide range of diseases can be attributed to its richness in bioactive compounds namely flavonoids, alkaloids, tannins, saponins, phenols etc. Its antimicrobial, anti-diabetic, anticonvulsant, wound healing, anti-inflammatory and analgesic properties have made it a popular herbal tree and its parts are placed as important ingredient in modern pharmacological industry. The documentation of traditional and modern usage of *F. religiosa* under one heading can help researchers to design and develop new functional foods from *F. religiosa*.

Keywords: *Ficus religiosa*, bioactive compounds, nutritional composition, medicinal properties

Introduction

Genus *Ficus* has 750 species of woody plants, from which *Ficus religiosa* is one of the important and usable species (Sharma *et al.*, 2016) [44] and (Joseph and Raj, 2010) [30]. *Ficus religiosa*, commonly known as peepal is one of the oldest trees in Indian literature (Singh *et al.*, 2015) [46] and (Gautam *et al.*, 2014) [12]. Its existence can be traced back to the Indus valley civilization (300 BC – 1700 BC) where it was embarked on the currency of that time (Pandey and Pandey, 2016) [39]. The tree finds its documentation in the holy books of Hinduism such as Arthasastra, Puranas, Upanishads, Ramayana, Mahabharata, Bhagavad Geeta and Buddhist literature. It belongs to family *Moraceae* and genus *Ficus*. It derived its botanical name from two words i.e. '*Ficus*' a Latin word for 'fig' and '*Religiosa*' refers to 'religion' indicating its importance in Hindu and Buddhist religions (Bhalerao and Sharma, 2014) [4]. The detailed classification of tree has been presented in Table 1. The tree is native to India and is believed to originate mainly in Northern and Eastern India. It is also found in its neighboring countries like Bangladesh, Pakistan, Nepal, Sri-Lanka and China. *F. religiosa* is known by more than 150 names (Bhalerao and Sharma, 2014) [4] and some of the common names of *F. religiosa* have been discussed in Table 2. Even in India, it has various names in different regions according to their languages such as Peepal in Hindi, Ashwatha in Sanskrit (Gautam *et al.*, 2014) [12]. A detailed list of Indian names of Peepal has been provided in Table 3.

Because of its contribution in historical events it has an important place in medicinal, mythological and religious systems of India and hence this tree is mostly seen near religious places (Rutuja *et al.*, 2015) [43]. The tree grows very large in size with wide spreading branches and brown colored bark. It has thin shiny leaves and the fruit is compressed and circular in shape. New immature leaves are red pinkish in color which turns into deep green at the stage of maturity (Panchawat, 2012) [38]. Flowering occurs in February, onset of fruits start in summers and ripening is complete before the onset of rainy season (Bhalerao and Sharma, 2014) [4]. Fruits grow in pairs together to form a single mass. Immature fruits are green in color which changes to blackish purple after ripening (Dharmender *et al.*, 2010) [10].

All parts of this tree are rich in phytochemicals and are used in various food and medicinal preparations. The ripe fruits of *F. religiosa* are edible and rich source of proteins and minerals (Ruby *et al.*, 2000) [42] and (Verma *et al.*, 2015) [48]. Fruits are rich in phytochemicals like flavonoids, terpenoids, glycosides etc. which are known to cure diseases like asthma and digestive disorders (Makhija *et al.*, 2010) [35]. The leaves contain phytochemicals such as flavonoids, terpenoids, tannins etc., which are effective in curing ailments like hiccups, vomiting, gonorrhoea etc. (Bhalerao and Sharma, 2014) [4]. The bark contains phytochemicals like tannins, saponins, flavonoids etc. which show beneficial effects in health conditions such as diarrhoea, dysentery, inflammation, bacterial infections, bleeding and paralysis (Singh and Jaiswal, 2014) [47].

All these photochemical make it important remedial plant especially for people who cannot afford commercial medicines. Value added products prepared from *F. religiosa* are also available in the market. The documentation of edible parts of tree, their availability, nutritional composition, phytochemicals and related health benefits can help food researchers to design new functional foods and nutraceuticals. This will also open up new ways for the application of this underutilized fruit. Therefore, in the present review an attempt has been made to discuss nutritional value, phytochemicals, medicinal properties and future food prospects of *F. religiosa*.

Table 1: Scientific classification of *Ficus religiosa*

Domain	Eukaryota
Kingdom	Plantae
Subkingdom	Viridaeplantae
Phylum	Tracheophyta
Subphylum	Euphylllopsida
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Urticales
Family	Moraceae
Tribe	Ficeae
Genus	<i>Ficus</i>
Specific epithet	Religiosa Linnaeus
Botanical name	<i>Ficus religiosa</i>

(Sharma *et al.*, 2016) [44], (Singh and Jaiswal, 2014) [47] and (Parasharami *et al.*, 2014) [41]

Table 2: Common names of *Ficus religiosa* in different countries

India	Peepal, pupil
China	Putishu
German	Bobaum, pepulbaum
Arabic	Teen mukadas, teen asnam
Spanish	Higuera de agva
Italian	Fico del diavolo
Swedish	Tempelfikus
Sri lanka	Bodhi tree

(Al-Snafi, 2017) [2] and (Kariyawasam, 1995) [32]

Table 3: Various names of *Peepal tree* in India

Assam	Ahant
Bengali	Aswatha, asud, aswat
English	Pipul, peepal tree
Gujrati	Piplo, pipul, jari
Hindi	Pipal, pipar, pipali
Kannada	Arali, aswaththa, basari, ranji
Kashmiri	Bad
Malayalam	Arasu, arayal, thullal
Marathi	Pimpal, ashvatha
Nepal	Pipal
Oriya	Jari, aswatha
Punjabi	Pipal
Sanskrit	Bodhivriksha, pippala, ashwatha
Telgu	Ravichettu
Tamil	Kanavam
Urdu	Peepal

(Singh and Jaiswal, 2014) [47] and (Gautam *et al.*, 2014) [12]

Nutritional composition

All parts of *F. religiosa* have balanced nutritional composition. Fresh fruits of *F. religiosa* have been reported to have moisture content of 62.4 g/100 g. The fruits are also rich in macronutrients and micronutrients. Fresh fruits are reported to be a good source of carbohydrates (21.2 g/100 g) and crude fiber (9.9 g/100 g). It is also a fair source of protein (2.5 g/100

g) and fat (1.7 g/100 g). Calcium (289 mg/100 g) is the most abundant mineral present in fresh fruit (Bhogaonkar *et al.*, 2014) [6]. Dried fruits of *F. religiosa* have been reported to have moisture content of 18.8 g/100 g and ash content of 4.44 g/100 g. Amounts of carbohydrates are reported approximately to be 68.33 g/100 g of fresh sample (Verma and Gupta, 2015) [48]. Protein content of dried fruits is reported to be 8.48 g/100 g on drying. Dietary fiber, calcium and iron has reported 69.43 g, 848 mg and 6 mg/100 g, respectively in dried fruit (Verma and Gupta, 2015) [48]. Besides fruit, leaves and bark of *F. religiosa* are also known for their medicinal value and have been used for the treatment of various diseases (Ruby *et al.*, 2000) [42]. Leaves are reported to have moisture content is 50.50g and 19.20 g/100 g of carbohydrates, 13.55 g/100 g of proteins and 2.5 g/100 g of fats (Wangkheirakpam and Laitonjam, 2012) [49]. Moisture content of bark has been reported to be 62.4 g/100 g. The carbohydrates and proteins content of bark are reported to be 15.4 g/100 g, 2.5 g/100 g, respectively. It is rich in minerals and a high mineral content of 13.1 g/100 g fresh basis has been reported. Dried bark powder is excellent source of iron 623 mg/100g (Singh *et al.*, 2015) [46]. A detailed composition of the various parts of *F. religiosa* is described in Table 4.

Table 4: Nutritional composition of parts of *Ficus religiosa*

Part of <i>Ficus religiosa</i>	Proximate composition (per 100 g)	References
Fresh fruits	Moisture content	62.4 g
	Carbohydrates	21.2 g
	Proteins	2.5 g
	Fats	1.7 g
	Crude fiber	9.9 g
	Ash content	2.3 g
	Calcium	289 mg
Dried fruits	Moisture content	18.8 g
	Carbohydrates	68.33 g
	Proteins	8.48 g
	Fats	0.143 g
	Dietary fiber	69.43 g
	Ash content	4.44 g
	Calcium	848 mg
Leaves	Moisture content	50.50 g
	Carbohydrates	19.20 g
	Proteins	13.55 g
	Fats	2.5 g
	Crude fiber	26.1g
	Ash content	12.9 g
	Calcium	1.67 mg
	Iron	0.18mg
	Copper	0.105 mg
	Manganese	0.355 mg
	Bark	Zinc
Moisture content		62.4 g
	Carbohydrates	15.4 g
	Proteins	2.5 g
	Fat	1.7 g
	Crude fiber	9.9 g
	Ash content	13.1 g
	Calcium	16.1 mg
	Iron	623 mg

Bioactive compounds in *Ficus religiosa* and related animal studies

F. religiosa has been reported to have medicinal properties like antibacterial, anti-diabetic, anti-amnesic, anti-ulcer and anti-oxidant properties in the presence of chemical

compounds (Gautam *et al.*, 2014) [12]. The bark of this tree contains lanosterol, β -sitosteryl-D glucoside, bergaptol, bergapten, steroids, flavonoids, alkaloids and phenol content. The presence of these chemical compounds makes it effective against bacteria like *Azobacter chroococcum*, *Bacillus cereus*, *β -megaterium*, *Streptococcusfaecalis* (Al-Snafi, 2017) [2]. The leaves have been reported to have bioactive compounds (campesterol, stigmasterol, isofucosterol, tannins, arginine, serine, aspartic acid, glycine, threonine, alanine, proline, tryptophan, tyrosine, methionine, valine, isoleucine) which help in preventing gastric problems. The methanolic, ethanolic and aqueous extracts can be made from bark, leaves and fruits (Rutuja *et al.*, 2015) [43]. The fruits have been reported with bioactive compounds such as asparagine, tyrosine, undecane, tridecane, tetradecane, ocimene,

limonene, dendrolasine, flavonoids (kaempeferol, quercetin, myricetin) and other phenolic components (Rutuja *et al.*, 2015) [43]. All these phytochemicals have been reported to exert medicinal properties such as anti-bacterial, anti-diabetic, anti-convulsant, anti-amnesic etc. The extracts of *F. religiosa* are used to prepare traditional medicines by *Hakims or Vaidis* (Traditional doctors). Many animal studies have been reported by researchers or scientists which strengthen the claims made regarding the medicinal and curative properties of different parts of the tree. Animal studies with bioactive compounds have been given in Table 5. Anti-diabetic property of bark of *F. religiosa* has been reported in streptozotocin induced type 2 diabetic rats with the usage of aqueous extracts of bark (Al-Snafi, 2017) [2] and (Kaur *et al.*, 2011) [33].

Table 5: Bioactive compounds of *Ficus religiosa* and reported animal studies

Part used	Bioactive compounds	Medicinal property	Animal study	Mechanism of action	Reference
Fruits	Terpenoids, glycosides, flavonoids, serotonergic content.	Bronchoconstriction activity	Methanolic extract of fruits (0.5, 1 and 2 mg/ kg of body weight) showed significant effects in histamine and acetylcholine induced guinea pig	Significantly potentiated the EC(50) doses of both histamine and acetylcholine	(Ahuja <i>et al.</i> , 2011) [1] (Chandrasekar <i>et al.</i> , 2010) [7]
		Anti-fertility activity	Methanolic extract of fruits (1%) showed anti-fertility effects on uterus of goats	Decreased diameter of uterine glands and myometrium thickness	(Goyal <i>et al.</i> , 2013) [13]
Bark	Steroids, flavonoids, alkaloids, phenol content, glycosides, tannins, saponins, polyphenolic compounds, sterols.	Anti-diabetic	Aqueous extract of bark (50 and 100 mg/kg of body weight) showed hypoglycemic effects in streptozotocin induced type 2 diabetic rats	Serum insulin levels were increased and triglycerides were decreased	(Pandit <i>et al.</i> , 2010) [40] (Kumar <i>et al.</i> , 2018) [11]
		Anti-inflammatory activity	Ethanolic extract of bark (100 mg/kg of body weight) showed anti-inflammatory effects in carrageen induced golden syrian hamsters	Reactive oxygen species were increased in their body	(Murugesan <i>et al.</i> , 2012) [37]
		Anti-ulcer activity	Ethanolic extract of bark (200 and 400 mg/kg of body weight) showed antiulcer effects in male albino wistar rats	Volume of gastric juice and free acidity were reduced	(Khan <i>et al.</i> , 2011) [34]
Leaves	Flavonoids, terpenoids, tannins, phenols, sterols.	Wound healing activity	Ethanolic extract of leaves (300 mg/kg of body weight) showed wound healing activity in wistar albino strain rat	Significant increase in wound closure rate, skin breaking strength, granuloma breaking strength was observed	(Charde <i>et al.</i> , 2017) [8]
		Anti-parkinson activity	Petroleum ether extract of leaves (400 mg/kg of body weight) showed anti-parkinson effects in induced experimental rats	Motor performance improved and oxidative damage was reduced	(Bhangale <i>et al.</i> , 2016) [5]
		Anti-ulcer activity	Ethanolic extract of leaves (2000 mg/kg of body weight) showed anti-ulcer property in albino mice	Ulcer area prevented and gastric secretion was reduced	(Gregory <i>et al.</i> , 2013) [14]
		Anti-asthmatic activity	Aqueous extract of leaves (150 and 300 mg/kg of body weight) showed anti-asthmatic property in guinea pigs	Development of histamine-induced pre-convulsion dyspnea was delayed	(Kapoor <i>et al.</i> , 2011) [31]
Roots	Tannins, alkaloids, saponin, β -sitosteryl-D-glucoside.	Anti-convulsant activity	Aqueous extracts of roots (100 mg/kg of body weight) showed anti convulsant activity in pentylenetetrazol induced mice	Increased latency of onset of convulsions	(Singh <i>et al.</i> , 2018) [45]
		Wound healing activity	Ethanolic extracts of roots (10% ointment) showed wound healing activity in wistar albino rats	Period for epithelialisation was decreased and hydroxyproline content was high	(Murti <i>et al.</i> , 2011) [36]
Latex	Alkaloids, glycosides, amino acids, flavonoids, tannins.	Nephro-protective effects against acute renal failure	Methanolic extracts of latex (200 mg/kg of body weight) showed nephroprotective activity in cisplatin induced acute renal failure in wistar adult male rats	Levels of urea and creatinine were decreased	(Yadav and Srivastava, 2013) [50]

		Hepatoprotective effect	Methanolic extracts of latex (300 mg/kg of body weight) showed hepatoprotective effect in cisplatin induced liver injury in wistar rats	Inflammatory infiltrate was degenerated	(Yadav, 2015) [51]
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Other uses of *Ficus religiosa*

F. religiosa is being used to cure various infections and food poisonings. The bark is used to cure skin diseases, mouth ulcers, diabetes and bone fracture. Leaves are used in conditions like vomiting, gonorrhoea etc. these can also be consumed in the form of juice in conditions like asthma, cough, diarrhea, gastric problems. Shoots are used in treating skin problems (Singh and Jaiswal, 2014) [47]. Stem can be used in treatment of urinary disorders and problems of digestive system. The dried powder of fruits has been used in treatment of respiratory problems like asthma (Panchawat, 2014) [38]. Many present day herbal medicines contain parts of *Ficus religiosa* as an ingredient. Different parts can be consumed

either in raw form (powder, extract) or in form of indigenous medicines (either alone or in combination with other herbs) for specific ailments.

Herbal remedies of *Ficus religiosa*

F. religiosa is a traditional religious plant in India and is used in treatment of several health ailments as a home based remedy either singly or in combination with other herbs (Herry, 2016) [16]. It has been traditionally used in the treatment of heart ailments, nose bleeding, diabetes, constipation, fever, jaundice etc. Detailed account of herbal remedies has been given in Table 6.

Table 6: Herbal remedies of *Ficus religiosa*

Health problem	Part used	Remedy	References
Heart disease	Leaves	Soaking of leaves overnight and consumption of its extract thrice a day has curative effect on cardiac problems	(Aaria, 2016) [29]
Wound healing	Leaves	Leaves tied on bleeding wound are reported to immediately stop the flow of blood	(Anupama, 2014) [25] (Panchawat, 2012) [38]
Constipation	Leaves	Pills of the powdered leaves along with fennel seeds (saunf) and jaggery are reported to be beneficial in constipation	(Aaria, 2016) [29]
Mumps and infection	Leaves	A bandage of leaves coated with ghee and slightly exposed to fire is reported to treat mumps and infection (skin abscess or boils)	(Panchawat, 2012) [38]
Fever and flu	Leaves	Twice a day consumption of consumption of a mixture of five leaves of <i>F. religiosa</i> milk and sugar can cure fever and flu	(Aaria, 2016) [29]
Jaundice	Leaves	Twice a day intake of extract of two-three leaves of <i>F. religiosa</i> mixed with water and sugar can cure jaundice	(Anupama, 2014) [25]
Nose bleeding	Leave sap	Putting of a few drops of leaves sap in nostrils have been reported to stop nose bleeding	(Aaria, 2016) [29]
Ear problem	Leaves	Cooking of filtrate of grinded leaves in gingely (sesame) oil and its application on the diseased part has been reported to get relief from ear pain	(Bhalerao and Sharma, 2014) [4] (Anupama, 2014) [25]
Dental care	Bark	Fresh twigs of <i>F. religiosa</i> are used as toothbrush (<i>Daatun</i>). It gives strength to gums and is used to kill bacteria	(Bhalerao and Sharma, 2014) [4]
Skin problem	Bark	Paste of bark powder mixed with honey gives freshness to face by applied on skin	(Panchawat, 2012) [38]

Ayurvedic formulations of *Ficus religiosa*

F. religiosa is consumed as herbal medicine in Ayurvedic medicinal system as a treatment for several ailments. Parts of *F. religiosa* can be consumed in the form of oil, as ointments, capsules, tablets or in raw form. Each formulation has its own function and can be effective in particular kind of disease. *F. religiosa* also being consumed in the powder form by drying it and grind in traditional grinders. Powder form is also very

effective for some conditions like diabetes mellitus (DM), urinary disorders etc. Powder of stem bark of *F. religiosa* is considered more effective if taken with honey, before or after meal (Anupama, 2014) [25]. Similarly, there are various products or formulations available in market which is known to treat diseases. Detailed account of these formulations has been given in Table 7.

Table 7: Some Ayurvedic formulations of *Ficus religiosa*

Name/product (manufacturer)	Part of <i>F. religiosa</i> / Dosage	Effective in conditions	References
Nalpamardi thailam/Nalpamaradi oil (Kerala ayurveda, Nagarjuna)	Bark of <i>F. religiosa</i> /Few drops apply on skin and twice in day.	Dermatitis, scabies, eczema, acne, urticaria and blemishes	(Singh <i>et al.</i> , 2018) [45] (Ayurtimes.com 2018) [23]
Sarasa syrup/Ayurvedic proprietary medicine (Imis)	2 tsp in 4 tsp of water twice a day	Dermatitis, itching, urticaria, eczema and fungal infections	(Imispharma.com 2018) [27]
Nyagrodhadi churna/Ayurvedic medicine in powder form (GMP guidelines and Vhca Ayurveda)	Stem bark of <i>F. religiosa</i> is used/1-3gm with honey	Diabetes, urinary disorders like dysuria	(Anupama, 2014) [25]
Sarivadyasava/Kerala ayurveda saribadyasavam, kottakkal saribadyasavam	Bark of <i>F. religiosa</i> /Twice a day with equal amount of water	Urinary diseases, renal diseases	(Ayurtimes.com 2018) [24]
Panchavalkadi tailam/Ayurvedic skin care oil (Arya Vaidya Pharmacy)	Bark of <i>F. religiosa</i> /applied with cotton for one hour	Eczema, dermatitis, herpes and skin conditions with bleeding	(Ayurmedinfo.com 2018) [15]

Herbal food products available in market

F. religiosa has been used as ingredient in food products like arjun tea, neotea arasa and candies. Arjun tea acts as antioxidant, contains micro nutrient Coenzyme Q10 and is effective in lowering cholesterol and curing heart disease. Neotea arasa contains flavonoids and sterols which are

effective against jaundice and heart disease. The dry fruit powder is being used in candies for treatment of asthma, alternatively it can be consumed after mixing with water. Some of the food products containing *F. religiosa* have been discussed in Table 8.

Table 8: Some food products of *Ficus religiosa*

Products/Dosage	Part used	Bioactive compounds	Health Benefits	Reference/Source
Arjun tea/One cup twice a day	Bark	Flavonoids, Anti-oxidant, micro nutrient CoEnzyme-Q10	Helps to maintain heart function, levels of triglycerides, LDL, VLDL, and pumping capacity of heart	(Amazon, 2018) [19]
Neotea arasa ilai/1-2 teaspoon	Leaf powder	Flavonoid, sterols	Laxative, remove jaundice, heal from heart disorders like cardiac weakness	(Amazon, 2018) [20]
Neotea arasam pattai powder/mix 5gm of powder in water	Bark	Steroids, flavonoids, alkaloids	Helpful for teeth, stretch in ankles, remove stammer, eye pain	(Amazon, 2018) [21]
Neotea arasam pala powder/as prescribed by doctor	Fruits	Terpenoids, glycosides, flavonoids, serotonergic content	Helpful in fever, relief from nosebleed and, stretch in ankles	(Amazon, 2018) [22]
Slim honey/1-2 tablespoon twice a day	<i>F. religiosa</i>	Tannins, saponins, flavonoids, sterols	Improve body efficiency; reduce weight; natural glow, clear skin, instant energy, increase immunity, better digestion	(Indiamart, 2018) [28]
Oil pulling Concentrate/1 tablespoon	<i>F. religiosa</i>	Steroids, flavonoids, alkaloids	Prevent bad breath, whiter teeth, and healthier gums, alleviated allergies and improved lymphatic system	(Drtungs.com 2018) [18]

Conclusion

F. religiosa is a rich source of nutrients as well as phytochemicals. Richness in vital components make it a wholesome tree with several medicinal and health properties. It has been used traditionally to cure many diseases and is also an important ingredient of Ayurveda herbs. Animal based studies have proved its effectiveness to prevent and cure diseases and hence strengthened its claim of herbal medicine. The use of *F. religiosa* in the food preparations can help to meet the future demands of nutraceuticals and functional foods.

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