

MEDICINAL AND PHARMACOLOGICAL PROPERTIES OF DIFFERENT *FICUS* SPECIES: A REVIEW

¹Lakhwinder Singh,²Antulkumar,³Anujchoudhary,⁴Gurwinder sran
^{2,3,4}Phd scholar,¹Assistant professor

¹Post Graduate Department of agriculture gss dgs khalsa college patiala
^{2,3,4}Department of botany, Punjab Agricultural university Ludhiana

Abstract: The genus *Ficus* (Family-Moraceae) is commonly known for its religious status in India but its medicinal values are familiar throughout the world. The medicinal aspects of *Ficus* plant are well known in ayurveda, homeopathic and other medicinal system. Since, every part of *Ficus* tree such as roots, stem, bark, latex and leaves possesses aesthetic properties and the specific phytochemical constituents including lanosterol, stigmasterol, sitosterol, kaempferol, quercetin, myricetin, bergapten, bergaptol, leucoanthocyanin, lupeol, psoralen, friedelin, rutin, taraxosterol, saponins, monoterpenes and other pharmaceutical product used to cure skin diseases, cardiovascular disease, renal disease, joint pains, ear problems, gastro-intestinal disease, piles, menorrhagia, healing and curative wounds, boils and mumps, constipation, respiratory problems, fibrositis, sprains, hepatic and gastovascular disorders considerably from last few decades. Medicinal system achieved a great progress in exploration on medicinal properties of *Ficus* species. Fruits of some *Ficus* species is edible from ancient civilization and also leveraging intratribal communities. In this review, the pharmacological and medicinal value of genus *Ficus* have been discussed to provide collective information on multipurpose use of sacred plant as to promote the cultivation at commercial level.

Keywords: *Ficus*, medicinal, Moraceae, pharmacological properties.

Introduction

The genus *Ficus* is a Latin word used for 'Fig' i.e., the fruit of the tree. *Ficus* grows all over India in hills and forests. It grows around water streams and also in cultivated lands. It is medium tall and growing up to a height of 10-16 meters with rich green foliage which provides a good shade. It is an evergreen large tree belongs to Moraceae family. *Ficus bengalensis* is considered as the National tree of India and is a Sacred tree of Buddhist's and Hindus. *Ficus* genus is an important tree group having various chemical constituents of permissive medicinal value. Fig history is perhaps as old as that of Adam, Eve and the forbidden apple. In addition the Bible says that Adam and Eve used the leaves of Fig, growing in the garden of Eden, for clothing themselves after they had committed sin by eating the forbidden apple. Archaeological findings give clues about the primitive diets in which Fig is used. The backbone of mesopotamian agriculture also considered figs as one of the major crop plant. Fig is considered as one of the richest source of vitamin A. There are about eleven species of Genus *Ficus* i.e., *Ficus bengalensis*, *Ficus religiosa*, *Ficus racemosa*, *Ficus semicordata*, *Ficus subincisa*, *Ficus rumphii*, *Ficus sarmentosa*, *Ficus palmata*, *Ficus hispida*, *Ficus carica* and *Ficus auriculata* (Kapoor 1990, Subramanian and Misra 1978).

Origin and geographical Distribution

Ficus is thought to be originating from Eastern and Northern India. The native Indian tree, widely found in plain areas and uplands region of the mountainous areas and grows up to about 1600 m or 4750 ft from sea level. It is a familiar sight in gompas or Buddhist monasteries, Hindu temples, shrines and other sacred places in rural and urban areas. It is also growing as a cosmopolitan species so found in a wide range in India and its native areas. It is also distributed in wild or cultivated form throughout the Southern Asia and other subcontinent regions, especially in Buddhist countries. People also like to grow this sacred tree in their gardens. *Ficus* has also been widely planted in many hot countries all over the world from South Africa to Florida and Hawaii but it is unable to naturalize away from its native home, because of its dependence on its pollinator wasp, *Blasto-phaga quadraticeps*. To overcome this problem the wasp has been successfully introduced in Israel. It grows well in tropical, semi-tropical regions, monsoon and rain forests with moderate to ample rainfall. Humid air and moist soil are well suited for its growth and is drought resistance and withstand mild frost (Husain et al, 1992)

Taxonomy

Domain: Eukaryota
Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Urtales
Family: Moraceae
Genus: *Ficus*

Occurrence of phytoconstituents in different parts of *ficus* sp.

Part	Type	Constituents	Reference
Leav	Flavono	Quercetin acetylglucoside, luteolin, luteolin-6C-hexose-8C-pentose, Quercetin rutinoside, Quercetin glucoside, apigenin rutinoside, rutin, biochanin-A, Quercetin, Kaempferol	Vaya and Mahmood (2006) and Vallejo et al. (2012)
	Triterpenoid	oleanolic acid, lupeol acetate, methyl maslinate, Bauerenol and calotropenyl acetate.	Saeed and Sabir (2002)
	Organic acid	Oxalic acid, citric acid, quinic, fumaric and shikimic acids, coumaric, pinocembrine, bergapten, pyrogallol, galangins, 3-psoralen, phenolics, 3,5-dimethoxy, quercetin and pinostrobin chysin, phenolptethlin, protocatechol, vanillin, cinnamic, malic acid.	Oliveira et al. (2009) and El-Shobaki
	Phenolic compound	Q-3-rut (quercetin 3-O-rutinoside), CQA (5-O-caffeoylquinic acid), CQA (3-O-caffeoylquinic acid), ferulic acid, 5-QOA-3-Glu (quercetin 3-O-glucoside)	El-Shobaki 2009
Late	Fatty acids	Pentadecylic acid, cis-10 heptadecenoic acid, oleic acid, elaidic acid, linoleic acid, arachidic acid, heneicosylic acid, behenic acid, palmitic acid, tricosylic acid, margaric acid, stearic acid, lignoceric and Myristic acid,	Oliveira et al. (2010)
	Phytosterols	Lupeol, lanosterol, b-sisterol, b-amyrin, a-amyrin, Betulol, lupeol and acetate.	Oliveira et al. (2010)
Seed	Amino acids	Cysteine, histidine, ornithine, tryptophan, Leucine, glutamine, serine, lysine, glycine, alanine, phenylalanine, tyrosine, asparagine.	Oliveira et al. (2010)
Fruit	Volatile compound	Linalool, epoxy linalool, sesquiterpenes, a-guaiene, trans-bergamotene, caryophyllene, cadine and a-calacorene Pentanal, hexanal, heptanal, benzaldehyde and octanal 7,1-butanol-methyl, 1-pentanol, 1-hexanol, terpenes such as monoterpenes a-pinene, limonene, eucalyptol, b-caryophyllene, b-pinene, thujene, terpinolene and cis-linalool oxide, heptanol, muurolene-D, germacrene, phenylpropyl alcohol, phenylethyl alcohol, 1-butanol-methyl, a-bourbonene,	Oliveira et al. (2010)
Root	Sterols	6-O-Acyl-b-D-glucosyl-b-sitosterols, methanamine, cyclopentanone, methyl phenylindole, cyclopropane octanal, arsenous acid, hexadecanoic acid, palmitic acid and 9,11-octadecadienoic acid. high flavonoids	Rubnov et al. (2001)

Medicinal and Pharmacological Properties

1. *Ficus religiosa*:

Antimicrobial activity: The investigation of anti-amnesic activity in mice by using methanol extract of figs of *F. Religiosa* on retrograde amnesia and scopolamine-induced anterograde. Figs were known to contain a high serotonergic content, and modulation of serotonergic bacteria: *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Escherichia coli* and *Bacillus subtilis*, against two pathogenic fungi: *Candida albicans* and *Aspergillus niger*. The results showed that 25 mg/ml of the extract was active against all bacterial strains and effect against the two fungi was comparatively much less.

Wound healing activity: By using *F. religiosa* leaf extracts incision and excision wound models, the wound healing activity was investigated. *F. Religiosa* leaf extracts, prepared as ointment (5 and 10%) were applied on Wistar albino strain rats. The high skin breaking strength was observed in rat. The treated leaf extract ointment of 10% ointment when compared to the control group of rat populations. It has been observed that fig possess high tannins content that has ability to increase the promotion of collagen which act as a wound healing factor.

Antidiabetic activity: The antidiabetic effect of aqueous extract of *Ficus religiosa* bark at the different doses of 25, 50 and 100 mg/kg were investigated in streptozotocin and normal glucose-loaded hyperglycemic induced diabetic rats (Kalaichelvan 2009).

Antioxidant activity: In streptozotocin-induced diabetic rats the antioxidant activity of the aqueous extract of *F. religiosa* was investigated. Major cause of type 2 diabetes is the oxidative stress. Aqueous extracts of *Ficus religiosa* shows significant decrease in fasting blood glucose and increase in body weight at 100 and 200 mg/kg dose in diabetic rats compared to untreated rats.

Proteolytic activity: *Ficus religiosa* showed significant proteolytic activity in a comparison of 46 species of *Ficus*, in which proteolytic activity of latex was done by electrophoretic and chromatographic properties of the protein component.

Anti-acetylcholinesterase activity: Acetylcholinesterase enzymes activity is inhibited by the methanolic extract of the stem bark of *Ficus religiosa*. These properties of plant justify the popular use of *Ficus religiosa* for the Alzheimer's disease treatment.

Other uses: Fruits and tender leaf buds eaten in times of scarcity. Used for colouration material and fixative, fodder, laxative, sacred, tonic, tree of fertility, burns, snake bite, blisters, constipation, cough disease, match box, packing cases, paralysis, skin affections, small pox, sores complaint, over intoxication by opium, tannings, throat infection, toothache, ulcer, urinary complaint and wounds (Pandit et al 2010, Ambike and Rao 1967).

2. *Ficus bengalensis*:

Anti-stress and Anti-allergic: Extracts of *Ficus bengalensis* bark was screened for its stress potentials and anti-allergic potential in respiratory disorder by milk-induced eosinophilia and milk-induced leucocytosis. The concentration of ethanol and

ethyl acetate extracts showed significant decrease in eosinophil's and leucocytes in the order given while petroleum ether and chloroform extracts were inactive. This shows the application of polar constituents of *F. bengalensis* bark as Antiallergic agents and anti-stress in respiratory disorders (Gopu Kumar and Praseetha 2015).

Anti-oxidant Activity: The extract showed extreme scavenging of hydrogen peroxide (69.23%) along with DPPH radical (96.07%) at 250 µg mL⁻¹ concentration at 1000 µg mL⁻¹ concentration. When compared with other compounds the extract shows good results. This shows that the extract of Ficus extract has scavenging activity.

Anti-tumor Activity: *Ficus bengalensis* fruit extract chloroform shows toxicity in the brine shrimp (*Artemiasalina*) bioassay (LC50<1000µg/ml). In the potato disc bioassay It also possessed anti-tumor activity (% tumor inhibition >20%). The results support the traditional use of these plants in certain skin diseases and folk medicine for respiratory disorders.

Allelopathic Activity: The shoot and root length of *Vigna radiata* enhanced when plants were exposed to 5% and 6% concentration of aqueous leaf extract of *Ficus benghalensis*. Seed germination inhibited by both leaf and bark extracts. *Ficus benghalensis* may have potential allelochemicals which may be developed as natural herbicides (Gopu Kumar and Praseetha 2015).

Wound Healing: In Ayurvedic medicine system, the *Ficus bengalensis* were found to be effective as wound healing property. Some of these plants have been screened scientifically for the evaluation of their wound healing activity in different pharmacological models and patients, but the potential of most remains unexplored. In a few cases, active chemical constituents were identified.

Anti-diarrheal Activity: The ethanol extract of the hanging roots of *Ficus benghalensis* has been evaluated for anti-diarrheal activity against different investigational models of diarrhea in rats. The extract has also been significantly effective in reducing gastrointestinal mobility (extract fed rats: 50.2±2.7%; control 79.412.76%, P< 0.001) in charcoal meal test in rats.

Anti-microbial and Anti-fungal activity: *Ficus benghalensis* has chloroform extract of the fruit show inhibitory effect (0.5 mg/disc) against the bacterium Streptomycin (100 µg/disc) or penicillin (5 µg/disc). *Streptococcus faecalis* and *Streptococcus faecium* were also inhibited by the fruit extract (17-20 mm inhibition zone). Mitosporic fungi and several sterile forms were isolated as endophytes from the leaf tissues and aerial roots of *Ficus benghalensis*.

Other uses: *Ficus benghalensis* used earlier as an edible (fruit, leaf buds, shoots, bark powder), abortion, fodder, bird lime, bleeding and swelling of gums, coarse ropes, cough, conception, pains and bruises, paper-pulp, pregnancy, sexual and skin diseases, wood in tent poles, in religious ceremonies. The seeds are used as cooling and tonic. Its bark with black pepper used in snakebites (Singh et al, 2009)

3. *Ficus racemosa*

Antitussive: The extract of stem bark with methanol was tested against a cough induced model by sulphur dioxide gas in mice as its antitussive potential. The dose of 200 mg/kg observed at 90 min after administration. The extract possesses maximum inhibition of 56.9% from the sample.

Wound healing and Antibacterial activity: The hydro-alcoholic extract of leaves was found effective against *Actinomyces viscosus*. The minimum inhibitory concentration was found to be 0.08mg/ml. Ethanol extract of stem bark showed the antibacterial and wound healing effect in incised and excised wound model in mice population (Prakash et al 2013).

Antipyretic: The stem bark with methanol extract showed significant reduction in normal body temperature based on dose in yeast-induced pyrexia in albino rats up to 5 h after drug administration, at doses of different concentration 100, 200 and 300 mg/kg body wt. p.o. The similar anti-pyretic effect was observed as compared to that of paracetamol (Prakash et al 2013).

Radio protective/antioxidant: The ethanol extract with Ficus significantly exhibited a higher steady state antioxidant activity. In vitro radio protective potential was studied in irradiated Chinese hamster lung fibroblast cells (V79) using micronucleus assay. The Pre-treatment of extract with different doses from 1h prior to 2 Gy γ -radiation resulted in a significant decrease in the percentage of micro nucleated binuclear V79 cells suggesting its role as radio protector. The methanol-stem bark extract has shown potent in vitro antioxidant activity when compared to the methanol-roots extract.

Larvicidal: The larvicidal activity of acetone, ethyl acetate, crude hexane, methanol and petroleum ether extracts of the various part mainly bark and leaf were assayed against toxicity in early fourth-instar larvae of mosquito species (*Culex quinquefasciatus*). The larval mortality was observed with different combination with alcohol after 24-h exposure. All extracts showed moderate larvicidal effects but the highest larval mortality rate was recorded in bark-acetone extract.

Renal anticarcinogenic: The extracts of *Ficus racemosa* with specific dose of 200 mg/kg body weight and 400 mg/kg body weight significantly decreased enzyme activity of γ -glutamyl transpeptidase and xanthine oxidase. It also decreased the lipid peroxidation and hydrogen peroxide concentration. There was significant recovery of renal glutathione content and antioxidant enzymes, decrease in the enhancement of DNA synthesis, renal ornithine decarboxylase activity, nitrogen, serum creatinine 66 and blood urea. Similar results were obtained when Ferric nitrilotriacetate (Fe-NTA) was used as renal carcinogen. These results proved that the extract is a very potent chemo preventive agent.

Other uses: Heals fractured bones and wounds, Improves skin tone and complexion, Relieves burning sensation, as in gastritis, neuropathy, burning sensation in eyes, bark is administered as part of after-delivery care of mother. The bark is astringent and is given to cattle when suffering from rinder-pest. The milky juice is administered in piles and diarrhoea and with sesame oil in cancer (Ahmed and Urooj 2009).

4. *Ficus hispida*:

Antidiabetic: The Bark-Ethanol extract of *Ficus hispida* showed significant decrease in blood glucose concentration both in the diabetic and normal rats. However, the reduction in the blood glucose level was comparatively less than that of glibenclamide which is used as standard drug for diabetics. *Ficus hispida* also enhance the glucose uptake by rat hemi-diaphragm significantly. (Ghosh et al., 2004).

Anti-Tussive: *Ficus hispida* shows anti-tussive activity against sulphur dioxide induced cough in mice. MEFH exerts a significant inhibition of cough reflex (62.3%) at the maximum dose of 500 mg/kg.

Other uses: *Ficus hispida* used as edible fruits, vegetables, jam, astringent, cattle fodder, fibre, tonic, curries, cuts, diarrhoea, earache, easy shedding of placenta, stomach ulcers, ulcers in mouth, purgative, giddiness, preserving foetus in the womb, vegetable (leaves sometimes cooked with pork) and wounds. (Mandal and Kumar, 2002)

5. *Ficus semocordata*

The species is known to be used as for its use as edible (fruits), vegetable, sand paper for bladder complaints, choking in throat, dysentery, as fodder and in jams. *Ficus subincisa* is used as fodder and vegetables.

Medicinal applications of different *Ficus* species mentioned in ayurvedic literature (Kapoor 1990).

Part	Medicinal uses
Fruits	Diabetes, Dysentery, abortifacients, antibacterial activity, anti-implantation, Earache, Eye vision problem, Expectorant, Fever
Leaves	Food, Hemorrhoids, Hepatitis, Inflammation, Intestinal pain, Jaundice Kidney stone, Laxative, Leucoderma, cancer, Wart, Liver diseases, Menstruation pain, and Sedative, Mouth cavity disease Paralysis, Piles and chronic ulcer, Regulates blood stream, Skin disease, Stomach Sunscreen, tanning activator, Antioxidant, hemoptysis, antiseptic, Antimalaria, Antioxidant and radical scavenging action Hypolipidemic, Anticancer, anti-inflammatory, Hypolipidemic
Latex	Heals fractured bones and wounds, Improves skin tone and complexion, Relieves burning sensation, as in gastritis neuropathy, burning sensation in eyes, bark is administered as part of after-delivery care of mother. Astringent and is given to cattle when suffering from rinder-pest.
Bark	Diuretic, Irregular uterus bleeding, anti-fungal activity, emmenagogue, asthma, vermifuge, colic, fever, beriberi, and haemolytic activity, dressing wounds and urinary complaints
Roots	

Conclusion

The genus *Ficus* possesses a unique source of different pharmacological properties as discussed in current paper. Traditional, primitive and rural societies have identified solutions for disease treatment to all their problems & needs from the resources that occur naturally. Hence, in recent years, folk medicinal studies receive little unknown and known attentions toward phytochemical analysis. Quite an explorative biological work done on these phytochemical compounds to explain the extensive role in medicinal system.

REFERENCES

- Ahmed F and Urooj A. 2009. Glucose-lowering, hepatoprotective and hypolipidemic activities of stem bark of *Ficus racemosa* in streptozotocin-induced diabetic rats. *J Young Pharmacists* 1(2): 160-164.
- Ambike S and Rao M. 1967. Studies on a phytosterol from the bark of *Ficus religiosa*, *Indian J Pharm* 29: 91-94.
- Duen M, Perez-Alonso JJ, Santos-Buelga C, Escribano-Bailo T. 2008. Anthocyanin composition in fig (*Ficus carica* L.). *J Food Comp Anal* 21: 107-115.
- El-Shobaki FA, El-Bahay AM and Esmail RSA. 2010. Effect of fig fruit (*Ficus carica* L.) and its leaves on hyperglycemia in alloxandibetic rats. *World J Dairy Food Sci* 5: 47-57.
- Gopu KST and Praseetha PK. 2015. *Ficus bengalensis* Linn- The sacred Indian medicinal tree with potent pharmacological remedies. *Int J Pharm Res* 32(1): 223-27.
- Husain A, Virmani OP, Popli SP, Misra LN, Gupta, Srivastava GN, Abraham Z and Singh AK. 1992. Dictionary of Indian medicinal plants. CIMAP, Lucknow, India pp. 546.
- Kalaichelvan VK. 2009. Antidiabetic potential of alcoholic and aqueous extracts of *Ficus racemosa* Linn. Bark in normal and alloxan induced diabetic rats. *Int J Pharmaceutical Sci Drug Res* 1 (1): 24-27.
- Kapoor LD. 1990. Handbook of ayurvedic medicinal plants. CRC Press, *Ficus carica* Boca Raton pp. 149-150.
- Mandal SC, Kumar CK. 2002. Studies on antidiarrhoeal activity of *Ficus hispida* leaf extract in rats. *Fitoterapia* 73: 663-637.
- Mandal SC, Saraswathi B, Kumar CK, Lakshmi SM and Maiti BC. 2000. Protective effect of leaf extract of *Ficus hispida* Linn. against paracetamol-induced hepatotoxicity in rats. *Phytotherapy Research* 14(6): 457-459.
- Oliveira AP, Silva LR and Andrade PB. 2010. Further insight into the latex metabolite profile of *Ficus carica*. *J Agric Food Chem* 58: 10855-10863.
- Oliveira AP, Valenta OP and Pereira JA. 2009. *Ficus carica* L. metabolic and biological screening. *Food Chem Toxicol* 47: 2841-2846.
- Pandit R, Phadke A and Jagtap A. 2010. Antidiabetic effect of *Ficus religiosa* extract in streptozotocin-induced diabetic rats. *J Ethnopharmacology* 128: 242-466.
- Prakash D, Kaur A, Singh MD, Tahir A and Prashant R. 2013. Pharmacological potential of *Ficus racemosa*-a review. *Int J Pharm Res* 22(1): 29-34.
- Rubnov S, Kashman Y and Rabinowitz R. 2001. Suppressors of cancer cell proliferation from fig (*Ficus carica* L.) resin, isolation and structure elucidation. *J Nat Prod* 64: 993-996.
- Saeed MA and Sabir AW. 2002. Irritant potential of triterpenoids from *Ficus carica* leaves. *Fitoterapia* 73: 417-20
- Singh RK, Mehta S, Jaiswal D, Rai PK and Watal G. 2009. Antidiabetic effect of *Ficus bengalensis* aerial roots in experimental animals. *J Ethnopharmacology* 123 (1): 110-114.
- Solomon A, Golubowicz S and Yablowsky Z. 2010. Protection of fibroblasts (NIH-3T3) against oxidative damage by cyanidin-3-rhamnoglucoside isolated from fig fruits (*Ficus carica* L.). *J Agric Food Chem* 58: 6660-6665.

Solomon S, Golubowicz Z and Yablowicz S .2006. Antioxidant activities and anthocyanin content of fresh fruits of common fig(*Ficus carica* L.). *J Agric Food Chem* 54: 7717-7723.

Subramanian PM, Misra GS .1978. Chemical constituents of *Ficus bengalensis* (part II). *Polish J Pharmacology Pharm* 30(4): 559-562.

Vaya J and Mahmood S. 2006. Flavonoid content in leaf extracts of the fig (*Ficus carica* L.), carob (*Ceratonia siliqua* L.) and pistachio (*Pistacia lentiscus* L.). *Biofactors* 28: 169-175.

YemiSO, Bakkalba SE and Artık N .2012. Changes in pigment profile and surface colour of fig (*Ficus carica* L.) during drying. *Int J Food Sci Tech* 47: 1710-1719.

