

Ethnopharmacological Properties of *Ficus benghalensis* Linn: A Review

Krishna Murti*, Upendra Kumar¹, Vijay Lambole, Vipul Gajera,

Dept. of Pharmacology, Vidyabharti Trust College of Pharmacy (Gujarat)

1. College of Pharmacy, Azamgarh, (u.p)

Name & Correspondence address of Author:

Krishna Murti

A-36, Ami Jadav Bunglows, Near Doodhdhara Dairy,

College Road, Bholav, Bharuch, Gujarat

India,

Contact Number: +91-9328832853

Email ID: krishnamurti74@yahoo.co.in

Summary

Since ancient times, plants have been an exemplary source of medicine. Ayurveda and other Indian literature mention the use of plants in treatment of various human ailments. *Ficus benghalensis* Linn is a large evergreen tree found throughout India. It is popular indigenous system of medicine like Ayurveda, Siddha, Unani and Homeopathy. In traditional system of medicine various plant parts such as stem bark, root bark, vegetative buds, leaves, fruits and latex are used in dysentery, diarrhea, diabetes leucorrhoea, menorrhagia, nervous disorders, tonic and astringent. According to Ayurvedic system of medicine *Ficus benghalensis* Linn (Banyan tree) is well known to be useful in wound healing. The present review is therefore, an effort to give a detailed survey of the literature on its traditional and pharmacological uses.

Keywords: Phytopharmacological wound Healing, Antidiabetic Activity, *Ficus Benghalensis*

Introduction

Medicinal plants are an important therapeutic aid for various ailments. Today, there is widespread interest in drugs derived from plants. This interest primarily stems from the belief that green medicine is safe and dependable, compared with costly synthetic drugs that have adverse effects. Natural antimicrobials can be derived from plants, animal tissues, or microorganisms. The shortcomings of the drugs available today, propel the discovery of new pharmacotherapeutic agents in medicinal plants. To determine the potential and promote the use of herbal medicine, it is essential to intensify the study of medicinal plants that find place in folklore.

The evaluation of these drugs is primarily based on phytochemical, pharmacological and allied approaches including various instrumental techniques such as chromatography, microscopy and others. With the emerging worldwide interest in adopting and studying traditional systems and exploiting their potential based on different health care systems, the evaluation of the rich heritage of traditional medicine is essential. In this regard, one such plant is *Ficus benghalensis* Linn. syn. *Ficus banyana* Oken. (Family-Moraceae). The plant is a large evergreen tree distributed all over India from sub Himalayan region and in the deciduous forest of Deccan and south India. It is a grown in gardens and road sides for shades^[1-2]. It is a member of four sacred trees Nalpamara (Ksirivrkas) meant to be planted around the home and temples. It is found throughout the year, grows in evergreen except in dry localities where it is a leafless for a short time. It is hardy and drought-resistant; it withstands mild frost. It is epiphytic when young. It develops from seeds dropped by birds on old walls or on other trees and is therefore, considered destructive to forest trees, walls and buildings^[1, 3-5]. The tree is commonly found all over India from sea level to an elevation of about 3,000 ft. It is also reported from Sri Lanka, Pakistan now widely cultivated⁶. The group of four *Ficus*, all yielding latex, according to ayurvedic texts, consist of Nyagrodha (*Ficus benghalensis*), udumbara (*Ficus racemosa*), Plaksha (*Ficus lacor/Ficus retusa*) and ashvattha (*Ficus religiosa*) the bark and leaves of this group are used as astringent, haemostatic, anti-inflammatory, anti-septic; prescribed in diarrhoea, dysentery, and in the treatment of skin diseases, ulcers, vaginal disorders, leucorrhoea, menorrhagia, deficient lactation⁶. In the traditional system of medicine, the plant is used for various health problems and diseases⁴⁻⁹. Therefore, the aim of this paper is to present an overview of traditional, phytochemical and pharmacological investigations carried out on the plant. *F. benghalensis* is one of about 60 species of *Ficus* that has been introduced to Hawaii⁶. Moreover the number of clinical studies supporting the use of *Ficus benghalensis* as a wound healing is rather limited: therefore the effectiveness of *Ficus benghalensis* in the treatment of wound healing is still questionable.

TAXONOMY

Family: Moraceae (Mulberry family)⁶

Latin name: *Ficus benghalensis* L.¹⁰

Synonyms: *Ficus indica* L.¹⁰

Common names: Indian banyan tree, banyan tree, East Indian fig tree,^{10,11}

Taxonomic notes: The genus *Ficus* is made up of about 1,000 species from pantropical and subtropical origins⁶. Plants in the genus are all woody, ranging from trees and shrubs to climbers⁹.

Nomenclature: The tree is named for the Hindu traders, called Banyans, who favored the tree¹¹.

BIOLOGY & ECOLOGY

Cultivation: *F. benghalensis* is widely cultivated in the tropics¹⁰. *F. benghalensis* is the world's largest tree in terms of its spread¹² with some old trees covering over an acre of ground. The tree's name "banyan" refers to the merchants who set up shop under the spreading trees¹².

One of the most popular banyan trees, *F. benghalensis*, on Maui, located on Front St. in Lahaina, is a meeting place for tourists, artists, children, and folks selling their goods. In addition to the large spreading growth form, trees also have attractive red fruits and aerial roots which hang from limbs.



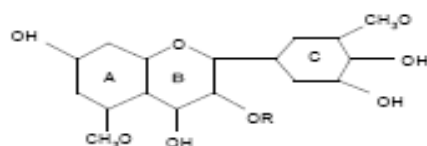
Fig. 1 *Ficus benghalensis*

TRADITIONAL USES

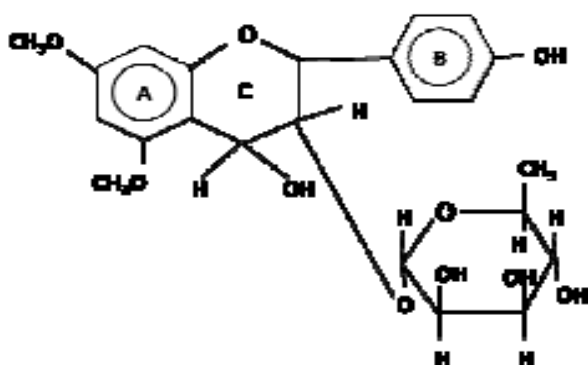
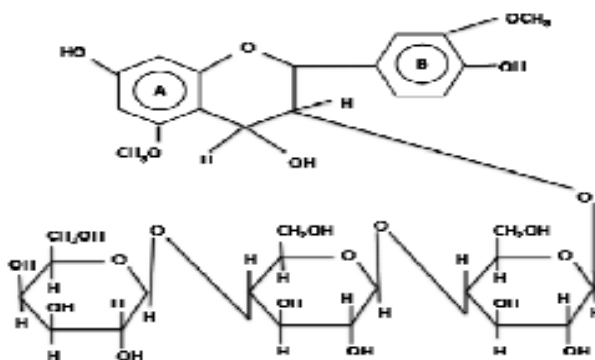
Charaka prescribed aqueous extract of leaf buds of Nyagrodha (*Ficus benghalensis*) mixed with sugar and honey for checking diarrhoea; milk processed with the aerial roots or leaf buds of Nyagrodha in hemorrhages and bleeding piles; a decoction of leaf buds and aerial roots of Nyagrodha, mixed with honey, was given for checking vomiting and thirst; also during fevers with burning sensation (Astaanga Hridaya, Vrindamaadhava, vaidyamanorama)⁶. The aerial roots are useful in obstinate vomiting and leucorrhoea and are said to be used in osteomalacia of the limbs. The bark is useful in burning sensation, haemoptysis, haemorrhages, diarrhoea, dysentery, diabetes, enuresis, ulcers, skin diseases, gonorrhoea, leucorrhoea, and hyperpiesia. The leaves are good for ulcers, leprosy, allergic conditions of skin, burning sensations and abscesses. The buds are useful in diarrhoea and dysentery. The fruits are refrigerant and tonic and are useful in vitiated condition of pitta. The latex is useful in neuralgia, rheumatism and lumbago bruises, nasitis, ulorrhagia, ulitis, odontopathy, hemorrhoids, gonorrhoea, inflammations, cracks of the sole and skin diseases^[21]. Milky juice and seeds are beneficial as local application to sores and ulcers, soles of the feet when cracked or inflamed and in rheumatism. Leaves are heated and applied as a poultice to abscesses; tender leaves pasted with honey beneficial in raktapitta. Tender ends of the hanging (aerial roots) are antiemetic. Seeds are cooling and tonic^{1, 2, 13}. Some important Ayurvedic Marketed formulations are: Nyagrodhaadi churnam (Bhaishajya Ratnavali), Saarivaadyaasava, Chandanaasava, Dineshavalayaadi Taila (Sahasrayoga).

PHYTOCHEMICAL PROPERTIES

Leaves yield quercetin-3-galactoside, rutin, friedelin, taraxosterol, lupeol, β -amyrin along with psoralen, bergapten and β -sisterol¹³. The bark of *Ficus bengalensis* presence of 5, 7 Dimethyl ether of leucopelargonidin-3- α -L rhamnoside and 5, 3 dimethyl ether of leucocyanidin 3- α -D galactosyl cellobioside, glucoside, 20-tetratriacontene-2-one, 6-Heptatriacontene-10-one, pentatriacontan-5-one, beta sitosterol-alpha-Dglucose, and meso-inositol Earlier, glucoside, 20 tetratriacontene-2-one,6- heptatriacontene-10-one, pentatriacontan-5-one, β sitosterol-alpha-Dglucose, and meso-inositol¹⁴⁻¹⁹, Leucodelphinidinderivative²⁰, bengalenoside: Aglucoside²¹, Leucopelargonin derivative^{22,23}, leucocyanidin derivative²⁴, glycoside of leucopelargonidin²⁵ have been isolated from the bark of the *Ficus bengalensis*.



Leucodelphinidin

**5,7 Dimethyl ether of leucopelargonidin, 3-O- α -L-rhamnoside****5,7 dimethyl leucocyanidin, 3 O β galactosyl cellobioside**

PHARMACOLOGICAL ACTIVITIES**Antioxidant**

Ficus compound showed significant antioxidant effects which may be attributed to their polyphenolic nature. The antioxidant effect of aqueous extract of the bark of *Ficus bengalensis* has been evaluated in hypercholesterolemia rabbits. Thus, our results show that the water extract of the bark of *Ficus bengalensis* has significant antioxidant effect. Two flavonoids compounds viz. 5, 7 Dimethyl ether of leucopelargonidin-3-0- α -L rhamnoside and 5, 3 dimethyl ether of leucocynidin 3-0- α -D galactosyl cellobioside, obtained from the bark of *Ficus bengalensis* were evaluated for their antioxidant action in hyperlipidemic rats. Since these effects may be correlated with the presence of antioxidant compounds, methanol and 70% acetone (acetone: water, 70:30) extracts of *Ficus bengalensis* (aerial root) and *Ficus racemosa* (stem bark) were evaluated for their antioxidant activity and radical scavenging capacity in comparison with *Camellia sinensis* (L.) O. Kuntz (green tea)²⁶

Antiatherogenic

One month treatment of alloxan diabetic dogs with glycoside, viz. leucopelargonin derivative (100mg/kg/day) isolated from the bark of *Ficus bengalensis* decreased fasting blood sugar and glycosylated haemoglobin by 34% and 28% respectively. Body weight was maintained in both the treated groups while the same was decreased significantly by 10% in the control group. In cholesterol diet fed rats, as the atherogenic index and the hepatic bile acid level and the faecal excretion of bile acids and neutral sterols increased, the HMGCOA reductase and lipogenic enzyme activities in liver and lipoprotein lipase activity in heart and adipose tissue and plasma LCAT activity and the incorporation of labeled acetate in to free and ester cholesterol in liver decreased significantly²⁷.

Antitumor

Fruit extracts exhibited anti-tumor activity in the potato disc bioassay. None of the tested extracts showed any marked inhibition on the uptake of calcium in to rat pituitary cells GH4C1. The extracts of the four tested *Ficus* species had significant antibacterial activity, but no antifungal activity. The results of this preliminary investigation support the traditional use of these plants in folk medicine for respiratory disorders and certain skin diseases²⁸.

Anthelmintic

The methanolic, chloroform, and pet ether extracts of the roots of *Ficus bengalensis* have potent Anthelmintic activity when compared with conventionally used drug and is equipotent to standard Anthelmintic drug²⁹.

Anti-inflammatory

The anti-inflammatory effect of ethanolic and petroleum ether extracts of the bark of *Ficus bengalensis* were evaluated in experimental animals. We have determined the anti inflammatory activity of ethanolic and petroleum ether extracts of the bark of *Ficus bengalensis* by oral administration of doses of 300 and 600 mg/kg/day of body weight to

healthy animals. The extracts were studied for their anti-inflammatory activity in carrageenan-induced hind paw edema in rats and the paw volume was measured plethysmometrically at 0 to 3h after injection. The present results indicated the ethanolic extract of *Ficus bengalensis* exhibited more significant activity than petroleum ether in the treatment of inflammation compared with the standard drug Indomethacin³⁰.

Antistress and ant allergic

Various extracts of *Ficus bengalensis* bark was screened for its anti allergic and anti stress potential in asthma by milk-induced leucocytosis and milk induced eosinophilia. Aqueous, ethanol, and ethyl acetate extracts showed significant decrease in leucocytes and eosinophils in the order given while petroleum ether and chloroform extracts were inactive. This shows the application of polar constituents of *F. bengalensis* bark as anti stress and anti allergic agents in asthma³¹.

Antidiarrhoeal

Ethanol extract of four different plants of the Khatra region of the Bankura district of West Bengal, India were evaluated for anti-diarrhoeal activity against different experimental models of diarrhoea in rats. The extracts of *Ficus bengalensis* Linn. (Hanging roots), *Eugenia jambolana* Lam. (bark), *Ficus racemosa* Linn. (bark) and *Leucas lavandulaefolia* Rees (aerial parts) showed significant inhibitory activity against castor oil induced diarrhoea and PGE2 induced enter pooling in rats. These extracts also showed a significant reduction in gastrointestinal motility in charcoal meal tests in rats. The results obtained establish the efficacy of all these plant materials as anti-diarrhoeal agents³².

Hypoglycemic

According to Ayurvedic system of medicine *Ficus bengalensis* Linn (Banyan tree) is well known to be useful in diabetes. This attracted the attention of many earlier workers who studied the hypoglycemic effect of extracts from the bark of *Ficus bengalensis* and tried to isolate active compounds. Bark of this plant has antidiabetic properties. The hypoglycemic effect of extract of bark was demonstrated in alloxan diabetic rabbits, rats and in humans. Potent hypoglycemic water insoluble principle was isolated (Patent applied) from the bark in our lab by Babu *et. al.* A water soluble hypoglycemic principle was also isolated from the bark (patent applied) in our lab by Shukla *et. al.* which was effective at a low dose of 10 mg/kg, bw/day. Both the banyan bark principles were effective in mild as well severe alloxan induced diabetes in rabbits, and improved lipid profile. Mechanism of action of water soluble and insoluble hypoglycemic compounds was investigated³³⁻³⁹.

Hypolipidemic

Hypolipidemic effect of the water extract of the bark of *Ficus bengalensis* was investigated in alloxan induced diabetes mellitus in rabbits showing a good glycemic control also corrects the abnormalities in serum lipid profile associated with diabetes mellitus. In view of the ability of the water extract of *Ficus bengalensis* to improve carbohydrate and lipid metabolism⁴⁰.

Dietary fibre content of foods namely, khejri (*Prosopis cineraria*), peepalbanti (*Ficus religiosa*), barbanti (*Ficus bengalensis*), gullar (*Ficus glomerata*) and teent (*Capparis decidua*) varied from 38.5% to 55.7%. Fibre from all these plant foods, fed at the 10% dietary level to rats, induced a greater resistance to hyperlipidemia than cellulose. The dietary fibre influenced total lipids, cholesterol, triglycerides and phospholipids of the liver to varying extents⁴¹.

Immunomodulatory

To evaluate the immunomodulatory activity of the aerial roots of *Ficus bengalensis* (Family Moraceae). The successive methanol and water extracts exhibited a significant increase in the percentage phagocytosis versus the control. In the *in vivo* studies, the successive methanol extract was found to exhibit a dose related increase in the hypersensitivity reaction, to the SRBC antigen, at concentrations of 100 and 200 mg/kg. It also resulted in a significant increase in the antibody titer value, to SRBC, at doses of 100 and 200 mg/kg in animal studies⁴².

Wound healing

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. Some Ayurvedic medicinal plants, namely *Ficus bengalensis*, *Cynodon dactylon*, *Symplocos racemosa*, *Rubia cordifolia*, *Pterocarpus santalinus*, *Ficus racemosa*, *Glycyrrhiza glabra*, *Berberis aristata*, *Curcuma longa*, *Centella asiatica*, *Euphorbia nerifolia*, and *Aloe vera*, were found to be effective in experimental models. This paper presents a limited review of plants used in Ayurvedic medicine⁴³.

Conclusion

In recent years, ethnomedicinal studies received much attention as this brings to light the numerous little known and unknown medicinal virtues especially of plant origin which needs evaluation on modern scientific lines such as phytochemical analysis, pharmacological screening and clinical trials⁴⁴⁻⁴⁶. *Ficus bengalensis* possesses various pharmacological activities as discussed in present paper. However, it is imperative that more clinical and pharmacological studies should be conducted to investigate the unexploited potential of this plant. Therefore, author feels to carry out some potential activities which are still unexplored on the various parts of the plant.

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