



FICUS BENGHALENSIS LINN – THE SACRED INDIAN MEDICINAL TREE WITH POTENT PHARMACOLOGICAL REMEDIES

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ABSTRACT

There are many different kinds of plants and trees that have enormous therapeutic benefits. These plants were used by ancient Indian and other civilizations to treat and cure a wide range of illnesses. The Indian Banyan Tree, or *Ficus benghalensis*, is one such tree with exceptional therapeutic qualities. Its exceptional therapeutic qualities have assisted in the treatment of numerous serious illnesses. This tree was widely used as medicine for a variety of illnesses in ancient medical systems like Ayurveda, Siddha, Unani, and homeopathy. Numerous fatal illnesses, including diarrhoea, diabetes, menorrhoea, leucorrhoea, neurological disorders, and tonic and astringent properties, were treated using different components of these trees. Thus, the goal of this study is to provide a comprehensive overview of the literature on its pharmacological, traditional, phytochemical, and pharmacogenetic applications.

KEYWORDS: *Ficus benghalensis*, Phytochemistry, Anti-tumour, Anti-microbial, Anti-diabetic.

INTRODUCTION

Background of the study

Taxonomical classification

Kingdom Plantae –Plants
Sub kingdom tracheobionta
Super division spermatophyta
Division magnoliophyta
Class magnoliopsida
Subclass hamamelididac
Order urticales
Family moraceae
Genus ficus
Species benghalensis (L)

Plants produce most of the chemical substances that carry out essential biological processes.^[1] One of the most hallowed trees in history, the banyan tree, has rates that can treat some of the deadliest ails.^[2,3] The huge evergreen tree *Ficus benghalensis* is a member of the Moraceae family. It's constantly appertained to as the "Indian Banyan Tree".^[2,4] It's one of the four "Nalpamara" (Ksirivarkas) sacred trees that are supposed to be planted around houses and tabernacles. Their ever-expanding branch is revered because it represents eternal life. There are also many mythological and mystical contexts for the banyan tree.^[5]

Religious background

In addition to being revered by Hindu deities like Vishnu, Brahma, Kali, Lakshmi, and Kubera, the banyan represents Lord Shiva. The Trimurti—Shiva, Brahma, and Vishnu—are represented by the tree. Shiva is thought to represent the branches, Brahma the roots, and Vishnu the bark. In many Indian tribes, it also represents life and fertility, which is why those without children love banyan trees and they are never chopped. Because the entire cosmos is thought to have emerged from Vishnu, just as the enormous Banyan tree grows from a single minute seed, our ancient poets likewise equated him to the Banyan tree's seed.^[5] The banyan tree is so revered that people will only pick its leaves or meddle with it in extreme circumstances. Its ashes are thought to have the ability to purge sin.^[6] In addition to being India's national tree, the banyan tree represents spiritual wisdom. The universal Teacher, Lord Shiva in the guise of Dakshinamurti, sits beneath a Vatavrksha and illuminates the sages' minds who are seated at his feet. As the epitome of wisdom and the ultimate ruler of ignorance, he stands in for Lord Shiva. Only the Lord, manifested as a baby Krishna floating on a banyan leaf (Vatapata rashaayi) and sucking his toe—a common motif in Tanjore paintings—survives the entire creation in the great Cosmic Deluge, Pralaya.^[7] The Indian mythology of Savitri and Sathyavaan states that, as foretold by astrology, Savitri had to deal with the death of her

husband shortly after marriage. After cutting wood for the family fire, Sathyavaan was resting under a banana tree, exhausted and unprotected, when Yama Dharma pulled his spirit away. Savitri trailed behind Yama, impressed him with the strength of her paativratya, and reclaimed her husband from him. A vrata called Vata-Saavithri-Vrata was created in remembrance of the great sati's triumph. The Sumangali fasts and walks around the banyan tree on the Pournima of the month of Jyeshtha, offering prayers for her husband's long life. Interestingly, as Sati Savitri is one of the sat to whom prayers are to be offered daily, the Jains have also incorporated him into their roll-call prayers.^[8] Likewise, a barren woman can transcend her socially ostracizing condition with the help of the Banyan tree's Jeremiah power. Vasuki's theatre is allowed to be the motherland of the banyan tree. One of the nine snake gods, or Navanaagas, is Vasuki. It should be mentioned that the snake is considered a fertility symbol in India. According to legend, Goddess Amba's might bring the tree to earth. For the sake of her mortal seed, Amba asked it to live on Earth. She sought Lord Shiva's help after her fight with Vasuki failed to end in palm, and she was suitable to bring the banyan tree to our earth to insure fertility for her mortal seed. Buddhists also consider the tree to be sacred. Buddha is said to have spent seven days sitting beneath a banyan tree after attaining enlightenment. According to legend, Satyavan accidentally picked his woman Savitri as he was trimming the tree's branches, and she passed away as a result of her injuries. On the fifteenth day of the dark half of the month of Iyesth (May – June), women in the countries of Maharashtra and Gujarat glorify this tree in remembrance of Savitri. Women also relate the Bat- Savitri narrative and perform their puja (Deification) to this tree in Uttar Pradesh and Bihar.

Distribution

The banyan tree is native to South Asia, particularly to Pakistan, India, and Sri Lanka. It is frequently planted near temples and other places of religious significance. Both Buddhists and Hindus regard it as a sacred tree.

In both the New and Old-World tropical regions, banyan trees are commonly grown in urban parks and botanical gardens. It thrives in monsoon, rain forests, tropical, semi-tropical areas, and areas with moderate to abundant rainfall. It thrives in humid air and moist soil, is resilient to drought, and may tolerate light frost.^[9]

Morphology

With branches spanning a large area, the banyan tree can grow to a height of approximately 100 feet and cover many acres with its enormous limbs held up by prop roots. Its wood is soft and porous with milky, sticky latex; its bark is thick, smooth, green when young, grayish white when mature, turning pink when cut, and flaking in sheaths.^[10]

Leaves

The leaves are ovate, mostly obtuse, base cordate or rounded, thickly coriaceous, glossy, leathery, and glabrous when fully grown. The midrib has 4-6 pairs of secondary nerves, the blade is 10-20 cm long, the petiole is 2-5 cm long, the shoot is pubescent, 1.5 to 2 cm in diameter, sessile, scarlet, and red when ripe.^[10]

Flowers

Its male and female flowers are tiny and distinct. Male flowers clustered close to the receptacle's mouth, whereas female flowers with long styles and shorter perianths were present in the same container.^[11]

Fruits

The fruit is globose, sessile in axillary pairs, has a fleshy pericarp with achenes trenching in it, and is 1.5–2.0 cm in diameter. When ripe, it turns scarlet to dark purple, and the seeds are tiny. Although humans cannot eat fruit, birds and monkeys can.^[11]

Chemical constituents

Numerous anthocyanidin derivatives, including methyl ethers of leucodelphinidin-3-O-L-rhamnoside and^[12] leucopelargonidin-3-O-L-rhamnoside, are found in stem bark. In addition to beta-betasitosterol glucoside and mesoinositol, leucocyanidin-3-O-D-galactosylcellobioside^[13] and aliphatic long chain ketones (pentatriacontan-5-one, tetratriacontane -20-en-2-one, and heptatriacont -6-en-10-one).^[14] The bark of *Ficus benghalensis* has yielded the following derivatives:^[15] leucodelphinidin derivative, bengaleno side: aglucoside,^[16-19] leucopelargonin derivative,^[20] leucocynidin derivative, and^[21] glycoside of leucopelargonidin. 9.63% crude protein, 26.84% crude fiber, 2.53% calcium oxalate, and 0.4% phosphorus are all present in the leaves. Sterols, flavonoids, phenol, tannins, and saponins are abundant in the ethanol and aqueous extracts of leaves, according to several qualitative chemical tests, but this plant was completely devoid of volatile oils, gums, mucilage, carbohydrates, triterpenoids, and aromatic acids. The leaves' flavonols have been determined to be rutin and quercetin-3-galactoside. Quercetin-3-galactoside, rutin, friedelin, taraxosterol, lupeol, β -amyrin, psoralen, bergapten, and β -sisterol are all found in leaves.^[23]

Pharmacological activities

Anti-inflammatory activity: -- *Ficus benghalensis* ethanolic (300 mg) and petroleum ether (600 mg/kg/day) extracts significantly reduced ($P < 0.05$) the paw edema caused by carrageenan in rats. When compared to the common medication Indomethacin, the ethanolic and petroleum ether extracts had a stronger anti-inflammatory effect. According to the findings, *Ficus benghalensis* ethanolic extract shown greater efficacy than petroleum ether in the management of inflammation.^[23]

Anti-helminthic activity: -- Ficus benghalensis extracts have the dual effect of killing and paralyzing earthworms. When compared to anti-helminthic medications, the aqueous and methanolic extracts were found to be more effective at killing earthworms.^[24]

Anti-stress and Anti-allergic: --Several Ficus benghalensis bark extracts were tested using milk-induced leucocytosis and milk-induced eosinophilia to determine their anti-allergic and anti-stress potential in asthma. Petroleum ether and chloroform extracts were inactive, while leucocytes and eosinophils significantly decreased in response to aqueous, ethanol, and ethyl acetate extracts in the order specified. This demonstrates how the polar components of F. benghalensis bark can be used as anti-stress and anti-allergic medicines to treat asthma.^[25]

Anti-oxidant activity: -- DPPH radical scavenging activity, hydroxyl radical scavenging activity, reducing capacity, hydrogen peroxide activity, and total phenolic content were used to assess the extract's antioxidant activity using Folin-Ciocalteu's phenolic reagent. At 250 $\mu\text{g mL}^{-1}$, the extract demonstrated high DPPH radical scavenging (96.07%), and at 1000 $\mu\text{g mL}^{-1}$, hydrogen peroxide (69.23%). When compared to other substances, the extract performs well. This demonstrates the extract's scavenging ability.^[26]

Anti-tumour activity: --In the brine shrimp (*Artemiasalina*) bioassay, the chloroform extract of Ficus benghalensis fruit has demonstrated toxicity ($\text{LC}_{50} < 1000\mu\text{g/ml}$). In the potato disc bioassay, it likewise demonstrated anti-tumour action (% tumour inhibition $>20\%$). The other extracts that were evaluated did not significantly decrease the rat pituitary cells GH4C1's ability to absorb calcium. The findings back up the traditional usage of these plants in folk medicine to treat specific skin conditions and respiratory ailments.^[27]

Anti-diarrhoeal activity: --The anti-diarrheal properties of the ethanol extract of Ficus benghalensis' hanging roots have been assessed against several experimental types of rat diarrhoea. The extract (400 mg/kg, orally) demonstrated strong inhibitory activity against PGE2-induced enter pooling (the reported value for extract-fed rat is 1.25 ± 0.15 in terms of intestinal fluid; control 0.78 ± 0.11 , $P < 0.02$) and castor oil-induced diarrhoea (extract-fed rats had 2.21 ± 0.27 defecations per animal in 4 hours; control 4.0010.33, $P < 0.001$). In rats given charcoal meal, the extract also significantly decreased gastrointestinal movement (extract fed animals $50.2 \pm 2.7\%$; control 79.412.76%, $P < 0.001$).^[28]

Anti-microbial activity: --The bacterium *Micrococcus luteus* (18–26 mm diameter inhibition zone) was also inhibited by the chloroform extract of Ficus benghalensis fruit (0.5 mg/disc), even though kanamycin (100 $\mu\text{g/disc}$), streptomycin (100 $\mu\text{g/disc}$), and penicillin (5 $\mu\text{g/disc}$) did not inhibit it. The fruit extract also inhibited

St. Cryptococcus faecalis and *St. Reptococcus faecium* (17–20 mm inhibition zone). *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Bacillus cereus*, *B. megaterium*, *Staphylococcus aureus*, *St. cryptococcus liposis*, and *St. cryptococcus aureus* were among the other bacteria that were inhibited to a lower degree (16–19 mm inhibition zone).^[27]

Anti-fungal activity: --Ficus benghalensis leaf tissues and aerial roots were used to isolate mitosporic fungus and a number of sterile forms as endophytes. The petiole was more heavily colonized by endophytic fungi, despite the fact that the lamina and petiole had a comparable number of endophyte species. Since the roots pulled some endophytes from the soil, the species composition and colonization frequency of the endophytes were higher for aerial roots entering the soil than for those growing in the air. There was minimal overlap between the endophyte assemblages of the leaf and aerial root and the aerial root growing in the soil and air, indicating that the endophyte composition of a host is determined by the environment and the type of host tissue.^[29]

Analgesic and Antipyretic activity: --Ficus benghalensis bark's antipyretic properties were investigated in rats with pyrexia produced by Brewer's yeast. At all doses, the extract and aspirin significantly reduced the analgesic activity for the hot plate and tail immersion methods as well as the antipyretic activity for the Brewer's yeast-induced pyrexia in rats' inflammation in a way that was independent of dosage.

The presence of flavonoids and phenolic chemicals may be the cause of the different extracts' stronger analgesic effects. These findings imply that the various Ficus benghalensis bark extracts have analgesic and antipyretic properties, which may be brought on by the extract's bioactive ingredients.^[30]

Allelopathic activity: --Ficus benghalensis trees that are well-grown produce one or more possible inhibitors of seed germination and seed growth. When plants were subjected to 5% and 6% concentrations of aqueous leaf extract of Ficus benghalensis, the Ficus leaf and bark aqueous extract increased the shoot and root length of *Vigna radiata*. At high concentrations, Ficus benghalensis bark extract reduced the plant's shoot and root lengths. The germination of the seeds was hindered by both the bark and leaf extract. According to the findings, Ficus benghalensis may contain allelochemicals that might be used to create natural herbicides.^[31]

Hypolipidemic activity: --To create hypercholesterolemia, three groups of rabbits were given cholesterol suspended in ground nut oil (100 mg/kg/day); a fourth group was given Ficus benghalensis bark extract at a rate of 50 mg/kg/day.

After receiving bark extract, there was a 59% reduction in serum cholesterol, a 54% reduction in triacylglycerol,

and a drop in lipid peroxidation. significant rise in the antioxidant enzymes glutathione peroxidase, catalase, and superoxide dismutase activity, which were decreased in other groups following cholesterol feeding.

These findings demonstrate the significant hypolipidemic effects of the aqueous extract of *Ficus benghalensis* bark.^[32,33]

Immunomodulatory activity: --*Ficus benghalensis* has aerial roots' immunomodulatory activity was assessed utilizing the in vitro polymorpho nuclear leukocyte (human neutrophils) function test. Rats served as the animal models for the in vivo investigations that assessed the methanol extract's immune-modulatory potential. The extracts were evaluated using sheep red blood cells (SRBC) as the antigen to check for hemagglutination and hypersensitivity reactions. At concentrations of 100 and 200 mg/kg, the subsequent methanol extract was observed to show a dose-related increase in the hypersensitive reaction to the SRBC antigen in the in vivo investigations. In animal experiments, it also led to a notable rise in the antibody titer value to SRBC at dosages of 100 and 200 mg/kg.^[34]

Wound healing: --While some of these plants have undergone scientific screening to assess their ability to heal wounds in various pharmacological models and people, the majority of them still have untapped potential. Active chemical components were found in a few instances. *Ficus benghalensis* has been examined in a number of experimental models and proved to be an efficient wound-healing herb in Ayurvedic medicine.^[35]

CONCLUSION

It is evident from the current study on *Ficus benghalensis* that the majority of the pharmacological activities were assessed in various *Ficus benghalensis* components. However, in comparison to other therapeutic plants, the amount of medication extracted from this plant is somewhat modest.^[36] Given that studies are being conducted on this plant in relation to various conditions like diabetes, cancer, leprosy, etc.^[37] The use and production of medications derived from *Ficus benghalensis* will contribute to the expansion of the medical field.

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