ETHNOBOTANY, PHYTOCHEMICAL PROPERTIES AND PHARMACOLOGICAL REVIEW OF *FICUS BENGHALENSIS* LINN.

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ABSTRACT

Ayurveda and other literature mention the use of plants in treatment of the various human ailments. *Ficus benghalensis* is a large evergreen tree found throughout India. This tree is commonly called as banyan tree and is considered to be sacred in many places. It is used in traditional system of medicines like ayurveda, siddha, unani, and homeopathy. Traditional system of medicine has used different parts of this plants such as stem bark, roots, aerial roots, vegetative buds, leaves, fruits and latex are used in prevention and treatment of various disorders. The roots of *Ficus benghalensis* are given for obstinate vomiting and infusion of its barks is considered as a tonic and astringent and is also used in diarrhea, dysentery and diabetes. The bark of the plant is used in ayurvedic medicine for the treatment of diabetes.

KEYWORDS: *Ficus benghalensis*, ethnobotany, pharmacognosy, phytoconstituent.

INTRODUCTION

India has an ancient heritage of traditional medicine. The materiamedica of India provides a great deal of information on the folklore practices and traditional aspects of therapeutically important natural products. Indian traditional medicines based on various systems including Ayurveda, Siddha, Unani and Homeopathy. 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.\textsuperscript{[1]}

The genus \textit{Ficus} includes some 750 species of plants occurring in most tropical and subtropical forests throughout the world. The genus is remarkable for the large variation in the habits of its species.\textsuperscript{[2]} Many plants of this genus are used in medicine for the treatment of skin diseases, enlargement of liver and spleen, dysentery, diarrhoea, diabetes, leprosy, lung complaints, leucorrhoea, heart diseases, cough, asthma, piles, ulcers, gonorrhea and rheumatism.\textsuperscript{[3-4]} \textit{Ficus bengalensis} (Moraceae) one of the most frequently seen plant in India, is commonly known as Banyan tree or Vata or Vada tree in Ayurveda. There are more than 800 species and 2000 varieties of \textit{Ficus} species, most of which are natives of old world tropics.\textsuperscript{[5]}

\textbf{TAXONOMY}

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnoliopsida
Order : Urticales
Family : Moraceae
Genus : \textit{Ficus}
Species : \textit{F. bengalensis}

\begin{center}
\textbf{Banyan tree (Ficus bengalensis)}
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VERNACULAR NAMES
Sanskrit : Vata
English : Banyan tree
Hindi : Vada
Bengali : Bot
Gujrati : Vad
Marathi : Vad
Telugu : Maricheta
Tamil : Vada
Malayalam : Perala
Canarese : Aladamara
Punjab : Bera

HABIT AND HABITAT
The plant is an evergreen tree distributed all over India from sub Himalayan region to the deciduous forest of Deccan and south India. It is also grown in gardens and road sides for shade.[6] It grows in the low altitudes up to 2000ft (610m) especially in the dry regions. It is native to a wide area of Asia from India through Myanmar (Burma), Thailand, Southeast Asia, Southern China and Malaysia.[7-8]

BOTANICAL DESCRIPTION
they are very large fast growing evergreen tree upto 3 metre with spreading branches and many aerial roots.[9] Leaves broadly ovate, obtuse, the base cordate; lamina 10-30 cm long, 7-20 cm wide, very coriaceous, puberulous beneath; lateral veins 5-7 pairs, the basal pair prominent, reaching 1/3 of lamina length; petiole with a broad smooth greasy gland at the apex compressed, downy; bark smooth light grey white 1.27 cm thick wood moderately hard, grey or grayish white, 5mm wide, stipules thick, 1-1.5 cm long and wide, puberulous. Figs paired sessile, puberulous, depressed-globular, 1.5-2 cm diam., maturing orange to red; ostiole broadly unbonate, enclosed by 3 flat apical bracts; basal bracts 3, foliaceous, obtuse, 3-7 mm long, 10-15 mm wide puberulous, it bears flowers during the summer and fruits in the rainy season. Male flowers pedicellate; tepals 2 or 3. Female flowers sessile; tepals 2 or 4. Gall flower pedicellate; tepals 3 or 4 inch.[10]
ETHNOBOTANY

*Ficus benghalensis* commonly called nyagrodha. Ancient nighanthus and modern pharmacopoeias of Indian Medicine contain much valuable information about the pharmacological properties of various parts of *Ficus benghalensis*. The tree is regarded everywhere, as a symbol of peace and harmony.\(^{[11]}\) According to Ayurveda, *Ficusbengalensis* is astringent to bowels; useful in the treatment of ulcers, vomiting, vaginal complains, fever, different kinds of inflammations, and leprosy. According to Unani system of medicine, the latex of this plant is aphrodisiac, tonic, vulnerary, and a maturant. The latex also lessens the inflammations, hence useful in piles, nose-diseases, gonorrhoea, etc. The aerial root is found to be useful in syphilis, biliousness, dysentery, and in treating the inflammation of liver, etc.\(^{[12]}\) Milky juice is used for targeting pains, rheumatism, lumbago and bruises. For the treatment of spermatorrhea, 2 drops of fresh latex in a lump of sugar are taken once daily on empty stomach early in the morning. Seeds are cooling and tonic in nature.\(^{[1,13,14]}\) The leaf-buds of *Ficus benghalensis* are astringent in nature. Infusion of leaves is given in diarrhoea and dysentery, poultice of hot leaves is applied on abscesses. The bark is astringent and tonic and used in diabetes and leucorrhoea, lumbago, sores, ulcers pains and bruises.\(^{[15]}\) Some important Ayurvedic marketed formulations formulated from Ficusbengalensis are Nyagrodhaadi churnam (*Bhaishajya Rutnavali*), Saarivaadya Chandanaasava, Dineshavalyaadi Taila (*Sahasrayoga*).\(^{[1]}\) 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*).\(^{[16]}\)

PHYTOCHEMICAL PROPERTIES

The bark contains leucopelargonidin-3-0- α-L rhamnoside and leucocynidin 3-0-α-D galactosylcellobioside, glucoside, beta glucoside, pentatriactant-5-one, beta sitosterolalpha-Dglucose.\(^{[17,18]}\) A glycoside of leucopelargonidin was also isolated from the bark and it has antidiabetic effects.\(^{[19]}\) The leaves contain, crude protein, crude fibres, CaO, phosphorous, rutin, friedelin, taraxosterol, lupeol, β-amyrin along with psoralen, bergapten and β-sisterol, quercetin-3-galactoside.\(^{[20]}\) Leucodelphinidin derivative\(^{[21]}\) bengalenoside, Aglucoside\(^{[22]}\), Leucopelargonin and leucocynidin derivatives. The latex contains caoytchoue, resin, albumin, cerin, sugar, and malic acid.\(^{[23,24]}\) Phytochemical investigation of F. bengalensis led
to the exploration of a wide variety of constituents which are responsible for its wide range of pharmacological activities. They include ketones, flavonoids, flavonols, sterols, oenanthacyclictriterpenes and triterpenoids, furocoumarin, tiglic acid ester and some other esters.

**Ketones**

Three ketones 20-tettratriacontene-2-one, 6-heptatriacontene-10-one, pentatriacontan-5-one were isolated from stem bark of *Ficus benghalensis*.[1]

**Flavonols and flavonoids**

Leaves of *Ficus benghalensis* contain flavonols, responsible for the antioxidant effects of the plant. These flavonols include quercetin-3-galactoside and rutin. Stem bark of *F. bengalensis* also contains bengalenosides that is, glycosides or flavonoids, 5, 7 Dimethyl ether of Leucoperalongidin-3-0-α-L-rhamnoside and 5, 3 dimethyl ether of leucocyanidin 3- O-β-Dgalactosylocelllobioside, and 5, 7, 3 trimethoxyleucodelphinidin 3-O-α-L-Rhamnoside. All these flavonoids consist of various sugars attached with OH groups of Leucoperalongidin, Leucodelphinidin and Leucocyanidin.[1]

**Terpenoids**

Pentacyclictriterpenes and triterpenoids for example, friedelain, 3-friedelanol, beta sitosterol, 20-traxasten-3-ol, Lupeol or Betulinic acid and β-amyrin are present in the leaves of *F. Bengalensis*.[1]

**Coumarins**

Coumarins (furocoumarins) have been identified from *Ficus benghalensis* Psoralen (also called psoralene) is a parent compound in the family of natural products which are known as furocoumarins. It is structurally related to coumarin by the addition of a fused furan ring, and can also be considered as a derivative of umbelliferone. Psoralen occurs naturally in the seeds of *F. bengalensis*. It has photosensitizing activity. Bergapten (5-methoxypsoralen) is a psoralen that was also explored *Ficus benghalensis*.[25]

**Esters**

The tiglic acid ester of 7-traxasterol has been isolated from the heartwood of *Ficus benghalensis*. Recently three new esters were isolated and characterized from methanolic extract of the bark of *F. bengalensis* along with linolyglucoside and oleoiglucoside. These esters are Keto-n-cosanyl stearate, Hydroxypentacosanyl palmitate and Phenyl
tetradecanyloleiate. CH₃-(CH₂)₁₆-CO-OCH₂-(CH₂)₁₄-CO-(CH₂)₃-CH₃, Keton- cosanyl stearate, CH₃-(CH₂)₁₄-CO-OCH₂(CH₂)₁₇-C(OH)-(CH₂)₅-CH₃, Hydroxypentacosanoylpalmitate, CH₃-(CH₂)₇-CH=CH-(CH₂)₇-CO-OCH₂(CH₂)₁₃-C₆H₅-OH, Phenyl tetradecanyloleiate.¹²⁶

Carbohydrates
A galactose specific lectin was isolated from the seeds of Ficus benghalensis (Moraceae) fruits and designated as Ficus benghalensis agglutinin (FBA). Purification of this lectin was done by Affinity Repulsion Chromatography (ARC) on fetuin-agarose. It was found to be a monomer of molecular mass 33 kDa. Carbohydrate-binding activity of FBA was independent of any divalent cation, hence FBA did not bind with simple saccharides. However, sugar ligands with aromatic aglycons showed pronounced binding.¹²⁷

PHARMACOLOGICAL REVIEW

Anti-inflammatory activity
The ethanolic (300 mg) and petroleum ether extracts (600 mg/kg/day) of Ficus benghalensis, significantly reduced (P <0.05) carrageenan-induced paw edema in rats. The ethanolic and petroleum ether extracts showed a greater anti-inflammatory effect compared with the standard drug Indomethacin. The results indicated the ethanolic extract of Ficus benghalensis exhibited more significant activity than petroleum ether in the treatment of inflammation.¹²⁸

Anthelminitin Activity
The methanolic, aqueous, chloroform, petroleum ether extracts of FB used studied for paralysis and death of earthworm. All the extracts were found not only to paralyze (Vermifuge) but also to kill the earthworms (Vermicidal). The aqueous and methnolic extract was found to be more effective to execute the earthworm.¹²⁹

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 diseases.¹³⁰
Antidiabetic and ameliorative activity
Oral administration of aqueous extract to fed, fasted and glucose loaded diabetic rats significantly decreased the blood glucose level at 5 hrs and restored the levels of serum electrolytes, glycolytic enzymes and hepatic cytochrome P-450 dependent enzyme systems and decreased the formation of liver and kidney lipid peroxides at the end of 12 weeks. The aqueous extract of Ficus benghalensis at a dose of 500mg/kg/day exhibits significant antidiabetic and ameliorative activity shown by histological studies in normal and streptozotocin induced diabetic rats.[31]

Anti stress and ant allergic
Various extracts of Ficus benghalensis bark was screened for it's ant allergic and antistress 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 Ficus benghalensis bark as antistress and antiallergic agents in asthma.[32]

Antioxidant activity
The extract was investigated for its antioxidant activity by 1,1-diphenyl, 2-picryl hydrazyl (DPPH) radical scavenging activity, hydroxyl radical scavenging activity, reducing capacity, hydrogen peroxide activity, total phenolic content using Folin-Ciocalteu’s phenolic reagent. The extract showed maximum scavenging of DPPH radical (96.07%) at 250 µg mL-1 concentration and hydrogen peroxide (69.23%) at 1000 µg mL-1 concentration. The extract shows good results when compared with other compounds this shows the scavenging activity of the extract.[33]

CONCLUSION
This plant has a great medicinal value as it has been reported to have versatile phytochemical constituents including ketones, flavonols, and flavonoids, terpenoids, coumarins, esters, carbohydrates, serine protease. It has important pharmacological activities such as antidiabetic, hypolipidemic, anthelmintic, antistress and antiallergic, antioxidant, anti-inflammatory, , wound healing and growth promoting. Thus, the plant can be considered as a great herbal asset for human beings.[34] In recent years, ethno medicinal 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 trials.[35,36,37] *Ficus benghalensis* consist of various pharmacological activities as discussed in the paper. However, it is imperative that pharmacological studies should be conducted to investigate the unexploited potential of this plant.

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