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Research Article

Phytochemical Evaluation of *Ficus Benghalensis* Leaves

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ABSTRACT

Ficus benghalensis, commonly known as the Indian Banyan tree, has been widely used in traditional medicine systems such as Ayurveda and Siddha due to its diverse therapeutic properties. The present study was undertaken to evaluate the phytochemical profile of the leaves of Ficus benghalensis to identify the key bioactive constituents responsible for its medicinal effects. Fresh leaves were collected, shade-dried, and subjected to successive extraction using solvents of increasing polarity—namely, chloroform and ethanol. The extracts were then analyzed through preliminary phytochemical screening to detect the presence of major secondary metabolites such as alkaloids, flavonoids, tannins, saponins, phenols, and glycosides. This phytochemical evaluation provides scientific evidence supporting the ethnomedicinal claims associated with Ficus benghalensis leaves and lays a foundation for further pharmacological investigations and standardization of herbal formulations derived from this plant.

INTRODUCTION

Ficus benghalensis has many common names, such as the Indian banyan tree, East Indian fig tree, and vada tree [1,2,3]. *F. benghalensis* is a large evergreen tree throughout India from the sub-Himalaya region in the north to the deciduous forest of Deccan and southern India. It is a hardy and drought-resistant plant; it withstands mild frost and is found throughout the year, from sea level to an elevation of about 3,000 ft [4]. The sweet fruit of the banyan is eaten in India during times of scarcity [5].

Scientific Classification[6]

Botanical Name: *Ficus bengalensis*
Family: Moraceae
Genus: Ficus
Species: bengalensis

Religious Background

The banyan symbolizes Lord Shiva and is even sacred to Hindu Gods like Vishnu, Brahma, Kali,

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Lakshmi, and Kubera[7]. The tree depicts the Trimurti – Vishnu, Brahma, and Shiva. Vishnu is believed to be the bark, Brahma, the roots, and Shiva, the branches. Vishnu is also compared to the seed of the Banyan tree by ancient poets, as the entire universe is said to have emanated from him, just as the gigantic Banyan tree originates from a single minute seed [8].

Plant Morphology[9]

Banyan tree is humongous tree with branches spreading across a wide area. Their massive limbs are supported by prop roots, and spread over an area of several acres. Its bark is smooth, thick, green when young, grayish-white when mature, turning pink when cut, and exfoliating in sheaths; Wood is soft and porous with milky, sticky latex [10].

Leaves

Simple, alternate, 10-20 cm long, 5-12.5 cm broad, oval, ovate or orbicular-ovate to oblong, coriaceous, obtusely cuspidate, quite entire, glabrous or pubescent beneath, base rounded, sub cordate or acute, basal veins strong, lateral veins 7-8 pairs, finely reticulate beneath, petioles 1.2-5 cm long, stipules 1.8-2.5 cm long, coriaceous [11].

Flowers

Minute, unisexual, of 3 kinds, males, females, and imperfect females (gall flowers) crowded along with bracteoles in the inner walls of fleshy receptacles which are sessile, globose, about 1.8 cm diam., puberulous, arising in axillary pairs, basal bracts 3, orbicular, spreading. Male flowers: near the mouth of the receptacle, perianth 4, stamen 1, filament erect. Female flowers perianth as in the male, but shorter, ovary superior, unilocular with a single pendulous ovule, straight or oblique, style excentric, and stigma simple [11].

Chemical Constituents

Tetraxasterol tailgate from heartwood; quercetin-3-galactoside and rutin isolated from leaves. Stem bark contains several anthocyanidin derivatives (methyl ethers of leucodelphinidin-3-O-Lrhamnoside, leucopelargonidin-3-O-L-rhaamnoside, Lecocyanidin- 3-O-D-galactosyl cellobioside) and aliphatic long chain ketones (pentatriacontan-5-one, tetratriacont-20-en-2one, heptatriacont-6-en-10-one), besides-beta-sitosterol glucoside and meso-insitol. The leaves contain 9.63% crude protein, 26.84% crude fibre, 2.53% calcium oxalate, and 0.4% phosphorus [12,13]. β-sitosterol, α-D glucoside and meso-inositol land isolated from stem bark [14].

Medical Usage

The leaves are good for ulcers, aerial roots are useful in gonorrhea, and seeds and fruits are cooling and tonic[15]. The roots of Ficus bengalensis are used to treat obstinate vomiting. Ayurvedic practitioners of India use the milky juice (latex) of the stem bark of *F. bengalensis* to treat rheumatism and other inflammatory diseases. The bark of the plant is used in Ayurvedic medicine to treat diabetes [15,16].

MATERIALS AND METHODS

Collection of Plants

Fresh leaves of *Ficus benghalensis* were collected from G.H. Raisoni University and authenticated by a qualified botanist. The leaves were thoroughly washed, shade-dried for 7–10 days, and then powdered using a mechanical grinder[17].

Fig. 1: Collection of fresh leaves of Ficus benghalensis

Fig. 2: After drying the leaves of *Ficus benghalensis*

Microscopy

Trim a small section of the leaf, approximately 1 cm x 1 cm, using a clean razor blade or sharp scissors. Place the leaf section in a petri dish containing water or a drop of glycerine to prevent dehydration and maintain its natural structure. With the help of a phloroglucinol solution as a clearing agent. The leaf section is removed from the clearing solution and transferred to a microscope slide using fine forceps. Add a drop of water or a mounting medium (e.g., glycerine) to the leaf section on the slide. Carefully place a coverslip over the leaf section, ensuring that no air bubbles are trapped. Press down the leaf gently to flatten the leaf and minimize distortion. Place the prepared slide on the stage of the compound microscope and start with the lowest magnification, 40x or 100x objective lens. Gradually increase the magnification to examine different regions of the leaf[18].

Fig. 3: Microscopic preparation of leaves of *F. benghalensis*

Powder Characteristics:

The visual appearance of leaf powder can vary depending on the processing method and plant material. It can range from fine and smooth to slightly coarse or granular. The colour of the powder of the leaves is greenish brown. The aroma of leaf powders has a pleasant, herbal, or grassy scent. The taste of leaf powders has a mild or slightly bitter taste, while others may have a more pronounced flavour. The texture of leaf powders can vary depending on the plant material and the fineness of the powder. The leaves powder has a smooth and fine texture [19].

Fig. 4: Powder of Dried Leaves of *F. Benghalensis*

Ash Values [19]:

There are three types of ash values:

Total Ash: Take about 2 or 3 g, accurately weighed, of the dry powder of *Ficus benghalensis* leaves in a tarred platinum or silica dish previously ignited and weighed. The ground drug is scattered in a fine, even layer on the bottom of the dish. Incinerate by gradually increasing the heat-not exceeding dull red heat, until free from carbon,

cool, and weigh. If carbon-free ash cannot be obtained in this way, exhaust the charred mass is re-examined with hot water, the residue is collected on an ashless filter paper, the residue is increased, and the filter paper is added to the filtrate, is evaporated to dryness, and the ash is ignited at a low temperature. Calculate the percentage of ash in air-dried drugs.

Acid-Insoluble Ash: Boil the total ash for five minutes with 25 ml of dilute hydrochloric acid, collect the insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water, ignite, and weigh. Calculate the percentage of acid-insoluble ash in air-dried drugs.

Water-Soluble Ash: Boil the total ash for 5 minutes with 25 ml of water; collect the insoluble matter in a Gooch crucible or on an ashless filter paper, wash with hot water, and ignite to constant weight at a low temperature. Subtract the weight of insoluble matter from the weight of the ash; the difference in weight represents the water-soluble ash. Calculate the percentage of water-soluble ash in air-dried drugs.

Extraction Process

The dried powder plant material of *Ficus benghalensis* was weighed at 50 g and extracted using chemical chloroform and ethanol by the Soxhlet extraction method for 72 h. After each extraction, the solvent was distilled off, and the concentrated extract was transferred to the previously weighed petri dish and evaporated to dryness at room temperature, 45°C–50°C, to obtain dried extracts [20].

Fig. 5: Extraction Process by Soxhlet apparatus using chloroform

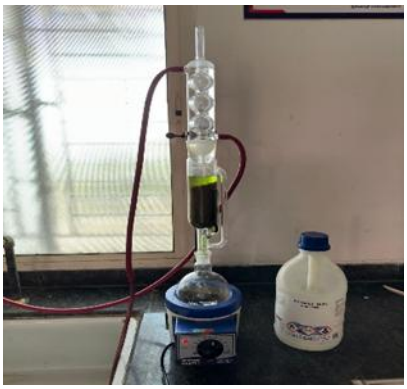

Fig. 6: Extraction Process by Soxhlet apparatus using methanol

2.6 Phytochemical Screening [21,22]:

The different solvent extracts were subjected to standard qualitative phytochemical tests to detect the presence of major classes of bioactive constituents. The tests performed were as follows:

Table 1: Phytochemical screening test

Sr. No.	Constituent	Test Performed
1.	Alkaloids	Mayer's, Dragendorff's, and Wagner's tests
2.	Flavonoids	Shinoda test, alkaline reagent test
3.	Tannins	Ferric chloride test
4.	Saponins	Foam test
5.	Phenols	Lead acetate test
6.	Glycosides	Keller-Killiani test

Phytochemical screening was performed using by given standard procedure.

Shinoda test:

To dry extract (10-20 mg), 5 mL of ethanol (95%), 2-3 drops of hydrochloric acid, and 0.5 g magnesium turnings were added. The change of color of the solution to pink indicated the presence of flavonoids.

Tannins and phenolic compounds:

1 ml of both the extract (carbohydrate and methanol) and 2 ml of water were added to a test tube. Then 2 to 3 drops of diluted ferric chloride ($FeCl_3$) solution were added and observed for green to blue-green (catechin tannins) or a blue-black (gallic tannins) colouration.

Molish test:

In 2 mL of both the extract (carbohydrate and methanol) and 1 mL of Molish reagent were added to a test tube. Then added 2 to 3 drops of conc. H_2SO_4 on the side wall of a test tube and observed a purple and violet colour ring at the junction of the two liquids.

Saponins:

1 ml of both extract (carbohydrate and methanol was added and a few volumes of distilled water were added to a test tube. The solution was shaken vigorously and observed for a stable, persistent froth for 20 min, which indicates the presence of saponin.

Alkaloids:

To the dry extract (10-20 mg), dilute hydrochloric acid (1-2 mL) was added, shaken well, and filtered. With filtrate, the following tests were performed.

Mayer's test:

To 2-3 mL of filtrate, 2-3 drops of Mayer's reagent were added. The appearance of precipitate indicated the presence of alkaloids.

Wagner's test:

To 2-3 mL of filtrate, Wagner's (3-5 drops) reagent was added. The appearance of a reddish-brown precipitate indicated the presence of alkaloids.

Hager's test:

To 2-3 mL of filtrate, 4-5 drops of Hager's reagent were added. The appearance of a yellow precipitate indicated the presence of alkaloids.

Dragendorff's test:

To 2-3 mL of filtrate, 4-5 drops of Dragendorff's reagent were added. The appearance of an orange-brown precipitate indicated the presence of alkaloids.

RESULTS AND DISCUSSION

Microscopic study:

Vascular bundles consist of xylem and phloem tissues responsible for the transport of water, minerals, and sugars within the plant. The lower epidermis forms a protective layer on the lower surface of the leaf. It often contains stomata, which are small openings that regulate gas exchange and transpiration. The spongy mesophyll contains loosely arranged cells separated by air spaces. This region facilitates gas exchange and plays a role in photosynthesis.

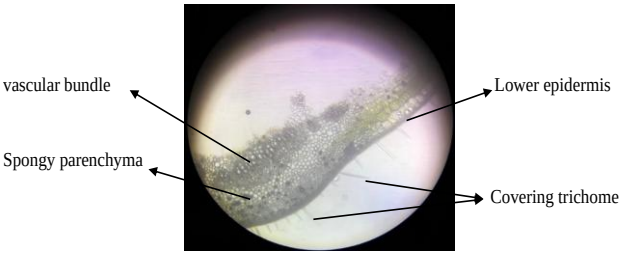

Fig. 7: Result of T.S. of Ficus benghalensis leaf

Extraction

Phytochemical evaluation of the leaf extract of *Ficus benghalensis* is an important step in understanding its the medicinal properties of this plant. The phytochemical constituents of Ficus benghalensis leaves extract were evaluated using standard procedures. After the extraction process using the Soxhlet apparatus and some chemicals (chloroform and methanol), we obtained two aqueous extracts.

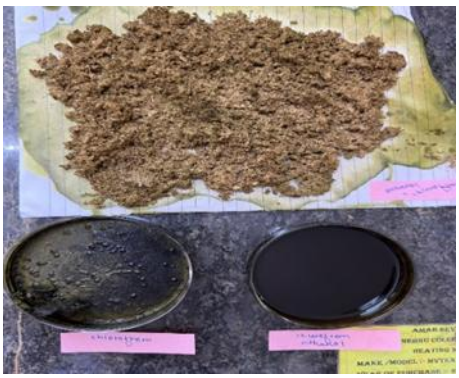

Fig. 8: After extraction of the leaf by the Soxhlet apparatus

Phytochemical screening study:

The result of the phytochemical analysis revealed the presence of various bioactive compounds, including alkaloids, flavonoids, tannins, phenols, and saponins. These compounds have been reported to have various biological activities, including antioxidant, antimicrobial, anti-inflammatory, antidiabetic, and anticancer properties.

Saponins have various biological activities, including antitumor, antimicrobial, and anti-inflammatory properties. These compounds could be responsible for the traditional medicinal uses of *Ficus benghalensis* in the treatment of various diseases.

Table 2: Phytochemical screening

Phytocompounds	***F. benghalensis* leaves extract**	
	Chloroform extract (CE)	Ethanol extract (EE)
Flavonoids	±	++
Alkaloids	+	++
Carbohydrates	-	+
Tannin	-	++
Phenolic compounds	-	++
Saponin	-	±
Glycosides	-	++

The symbol indicates, + = present, ++ =abundant, - = absent, ± = trace.

3.4 Ash value study:

Table 3: Ash value

Ash type	**Percentage of Ash**
Total ash	11.63 % w/w
Acid insoluble ash	4.5 % w/w
Water-soluble ash	7.56 % w/w

Note: w/w denotes weight by weight

CONCLUSION

The present investigation confirms that *Ficus bengalensis*, or the banyan tree, is an iconic and culturally significant tree species with ecological importance. The unique growth patterns, extensive aerial roots, and large canopy make it a remarkable species that provides shade, habitat, and environmental benefits. The banyan tree is a true symbol of strength, wisdom, and natural beauty. In Hindu mythology, the banyan tree is considered sacred and is often associated with longevity and strength. It is also considered a tree of enlightenment by Buddha, as he is believed to

have achieved enlightenment while meditating under a banyan tree.

The phytochemical evaluation of *Ficus benghalensis* leaves revealed its rich chemical composition and potential medicinal properties. The notable flavonoids, tannins, phenolic compounds, saponins, and glycosides are linked to various pharmacological properties. The ethanolic and aqueous extracts were found to be particularly rich in bioactive constituents, aligning with the plant's traditional use in managing wounds, inflammation, and infections. Further studies such as quantitative analysis, bioassay-guided fractionation, and in vivo efficacy testing are recommended to validate and optimise its application in herbal medicine.

Conflict of Interest

The authors declare that they have no conflicts of interest to disclose.

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