International Journal of Medical and Pharmaceutical Research
Website: https://ijmpr.in/ | Print ISSN: 2958-3675 | Online ISSN: 2958-3683
NLM ID: 9918523075206676
Volume: 4 Issue:3 (May-June 2023); Page No: 350-353

Original Article

IJMPR

Medicinal Uses, Phytochemistry, and Pharmacological Actions Ficus Benghalensis and Ficus Religiosa

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ABSTRACT

Ficus is one of the largest genera in the plant kingdom that belongs to the Moraceae family. This review aimed to summarize the medicinal uses, phytochemistry, and pharmacological actions of two major species from this genus, namely Ficus benghalensis and Ficus religiosa. These species can be found abundantly in most Asian countries, including Malaysia. The chemical analysis report has shown that Ficus species contained a wide range of phytoconstituents, including phenols, flavonoids, alkaloids, tannins, saponins, terpenoids, glycosides, sugar, protein, essential and volatile oils, and steroids. Existing studies on the pharmacological functions have revealed that the observed Ficus species possessed a broad range of biological properties, including antioxidants, antidiabetic, anti-inflammatory, anticancer, antitumor and antiproliferative, antimutagenic, antimicrobial, anti-helminthic, hepatoprotective, wound healing, anticoagulant, immunomodulatory activities, antistress, toxicity studies, and mosquitocidal effects. Overall,the review discussion on the importance of Ficus benghalensis as the herbal property in the aspect of the greater therapeutic response, as well as also balancing the oxygen level in the environment.

Key Words: *Ficus benghalensis, Ficus religiosa, Moraceae, medicinal uses, phytochemistry, pharmacological actions*

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INTRODUCTION

Ficus have been known for their vast number of species, consisting of more than 800 species in the form of trees, vines, shrubs, epiphytes, and hemiphytes. Ficus genera belong to the Moraceae family of Urticales order under the classification of Dicotyledone and Spermatophyte phylum of the Plantae kingdom. There are more than 800 species of Ficus that have been discovered. Ficus plants are generally known as figs or fig trees. The genus is distributed in various regions across the tropical and sub-tropical areas, mainly in Asia, America, Australia, and Africa [1]. Ficus benghalensis is a laticiferous, moraceaeous, tremendous evergreen tree which has over 800 species and 2000 sub-varities [2]. Throughout many regions of India, this tree is recognized as sacrilegious [3]. The parts of the tree has been reported to segregate glucoside, 20-tetratriaconthene-2- one, 6-heptatriacontene-10 -one, pentatriacontan-5-one, beta sitosterol-alpha- D-glucose, and meso-inositol [4, 5].

In India, some of the species are considered sacred, especially Ficus benghalensis, which is referred to as India's National Tree that signifies spiritual knowledge and eternal life [6]. Some of the species are edible, while some are used as ornamental plants, especially Ficus lyrata, commonly known as the fiddle-leaf fig [7]. The common fig or Ficus carica Linnaeus is the most popular species of Ficus, known for its remarkable commercial importance, with multiple vernacular names such as Anjir (Hindi, Sanskrit, Malay, etc.), Fagari (Northern India), Thaphan (Burmese), Qua Va (Vietnamese), etc [8].

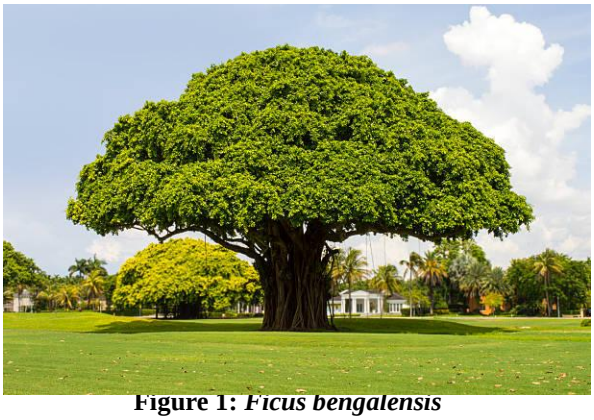

Figure 1: ***Ficus bengalensis***

Scientific Classification:
Kingdom: Planate
Subkingdom: Tracheobinote
Super division: Spermatophyta
Division: Magnoliophyta
Class: Magnoliopsida
Subclass: Hamamelidae
Order: Urticales
Family: Moraceae
Genus: Ficus
Species: Benghalensis, indica [9]

MORPHOLOGY

- Plant F. bengalensis is a laticiferous tree, up to 30 m in height with widely spreading branches bearing many aerial prop roots.
- The bark is greenish white. Leaves are simple, alternate, and arranged often in clusters at the ends of branches.
- They are stipulate, 5-12 cm broad and 10-18 cm long, entire, broadly elliptic to ovate.
- Fruits are achenes, which are small, crustaceous, and enclosed in the common fleshy receptacles, having red outside color.
- The young bark is somewhat smooth having a transverse and longitudinal row of lenticels, while in the older bark, the lenticels are numerous and closely spaced.
- Outer bark flakes off easily.
- The fresh-cut surface of the bark is pink to flesh-colored and exudes plenty of latex. The innermost part of the bark adjoining the wood is nearly white and fibrous.[10]

Phytochemical Constituents:

Plants are the source of various phytochemical constituents that are functional as aremedy for health defects that occur in humans, and the diversity of the plant metabolites benefits humans in treating those conditions [1, 2]. Ficus species is one of the largest genera of the plant kingdom, with promisingphytoconstituents from various classes of compounds, including phenols, flavonoids, sterols, alkaloids, tannins, saponin, terpenoids,etc. Table 1 displays the phytoconstituents of the discussed Ficus species. Table 1. Phytochemical constituents present in Ficus benghalensis plant parts.

Plant Parts	Compound Class	Compounds Identified	References
Leaf	Phenolics	Gallic acid, theaflavin-3,30 -digallate, rutin, quercetin-3-galactoside, leucodelphinidin, gallocatechin, kaempferol, apigenin	[2, 11]
	Terpenoids/ Terpene	Friedelin, lupeol, β-amyrin, 3-friedelanol, betulinic acid, 20-traxasten-3-ol	
	Miscellaneous	Rhein, anthraquinone, taraxosterol, β-sitosterol,bengalenoside, leucocyanidin, psoralen, bergapten	
Fruit	Miscellaneous	hexadecanoic acid, 5-decenedioic acid and methyl esters of 14,17-octadecadienoic acid,	[12]
Bark	Phenolic	Tannins, leucocyanidin-3-O-β-D-glucopyrancoside, leucopelargonidin-3-O-β-D-glucopyranosideleucopelargonidin-3-O-α-L-rhamnopyranoside	[13]

Pharmacological Actions:

All the plant organs, including leaves, stem bark, root, latex, and fruits, were investigated for their potential bioactivities. Some of the bioactivities researched include antioxidants, antidiabetic, anti-inflammatory, anticancer, antitumor and antiproliferative, antimutagenic, antimicrobial, anti-helminthic, hepatoprotective, wound healing, anticoagulant, immunomodulatory activities, antistress, and toxicity studies.The plants are also utilized as insect repellents.

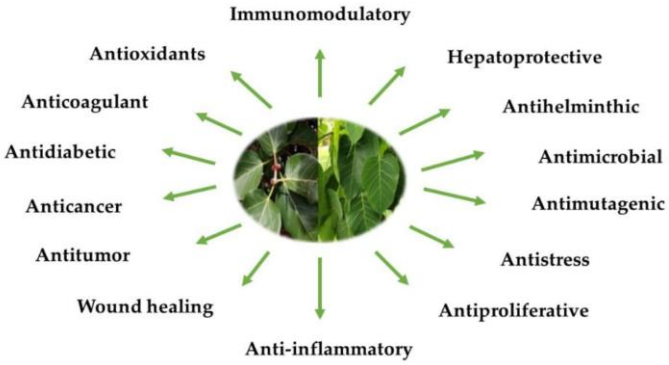

Figure 2: Pharmacological activities of ***Ficus benghalensis***

1. Antioxidant:

Ficus compound shows significant antioxidant effects which may be due to their Polyphenolic content. Antioxidant content and activity were studied by different methods; hydrogen peroxide activity, hydroxyl radical scavenging activity, 1, 1 diphenyl and 2 picryl hydroxyl (DPPH) radical scavenging activity, reducing power and total phenolic content. The aqueous extracts showed maximum scavenging of DPPH radical (96.07%) at the concentration of 250µg/ml. Its activity is higher than hydrogen peroxide which was (69.23%) at the concentration of 1000µg/ml. The extract of banyan showed the best outcomes when compared with another standard compound such as ascorbic acid [14].

2. Antitumor:

In another study, FB fruit extracts exhibited antitumor action. In the Ayurvedic system of medicine, the banyan plant is used as an antitumor agent. The extracts of the four confirmed ficus species (Ficus thonningii, F. saussureana, F. exasperata, and F. sur) have important antibacterial activity, but with no significant antifungal effect. These experiments support the traditional use of these plants in folk medicines as antitumor remedies [14].

3. Anti-inflammatory:

Anti-inflammatory effects of ethanolic and petroleum ether extracts of the bark of banyan were measured in different animals. The animals were given oral doses of 300 and 600 mg/kg/day of body weight to the dietary fiber content of foods namely, khejri (prsopsiscinceria), peepalbanti (Ficus religiosa), banyan (Ficus bengalensis), gular (Ficus glomerata) and tents (Capparis decidua) mottled from 38.5% to 55.7%. Fiber from all these plant foods is fed at the 10% dietary level to rats. Results showed that banyan extract was of high potential anti-inflammatory activity.[14]

4. Immunomodulatory:

The aerial parts of FB showed to have immunomodulatory activity. The immunomodulatory action of the aerial roots has effects on both specific and non-specific immunity. Methanolic extract of the root was found to exhibit a prominent increase in the fraction of phagocytosis. In another study, it was proven that the extract exhibited a significant increase in the percentage of phagocytosis in human neutrophils. It was found that the extract can elevate hypersensitivity reactions in a dose-dependent manner, it also resulted in a connotation elevation in the antibody titer value [14].

5. Wound healing:

The reason for the efficacy of the FB plant to heal wounds remains unknown for a long time. In this case, the chemical components responsible for wound healing were unknown. But later on, after the identification of chemical components responsible for wound healing, it was found that FB also contains chemical constituents and is an effective wound healing agent [14].

6. Antistress and antiallergic:

Different extracts of FB bark were used as an antiallergic and antistress therapy. Theextracts were given to patients with asthma in milk resulting in leucocytosis and eosinophilia. Aqueous and ethanolic extracts revealed that there is a prominent decrease in the number of leucocytes and eosinophils. While petroleum ether and chloroform extracts were proved to be inactive. Hence, bark work as an anti-stress and anti-allergic agent in asthma [14].

7. Hypoglycemia:

In many studies, the hypoglycemic effect of bark which is isolated from FB was evaluated. It was found that bark has anti-diabetic properties. The hypoglycemic consequence of the bark was demonstrated in alloxan diabetic rabbits for the first time and then in human beings [14].

8. Antipyretic Activity:

The antipyretic action of bark from banyan was studied in Brewer's yeast-induced pyrexia in rats. The analgesic effects of different bark extracts of banyan might be due to the flavonoidsand phenolic compounds. It was concluded that the various extracts of the bark of FB show analgesic and antipyretic effects which may due to the presence of bioactive

components in the extract. Furthermore, it was also tested by some research by using the acetic acid-induced twisting model on rats, it showed significant analgesic activity [14].

9. Antidiabetic:

One of the most important medicinal applications of banyan is its antidiabetic activity. Different aerial parts of FB were comparatively used for their activity on blood glucose down-regulation. Fruits lowered the blood glucose concentration more beneficial than the root or bark. The antidiabetic effects of aqueous extract of aerial roots of FB are due to the presence of specific glycemic elements (calcium and magnesium) in high concentrations [14].

10. Antimutagenic:

Mutagenicity is described as the induction of permanent transmissible changes in the structure or quantity of the genetic material of cells or organisms that consequently lead to certain diseases. Antimutagenic agents can prevent this in the first place before the phenomenon could take place by inhibiting and suppressing the known mutagens [15]. Some of the plant metabolites can act as antimutagens that can prevent mutageni city in certain cells and their genetic materials. F. benghalensis aqueous stem bark demonstrated a potential antimutagenic effect on Salmonella typhimurium TA100 strains with the IC50 value of 70.24 mg/mL [16].

CONCLUSION

Plant life has been serving humankind for centuries by providing a good source of medicines. Active constituents from plants are isolated and used for analysis, treatment, mitigation, and inhibition of various diseases, but many crude drugs are also in use. Ficus bengalensis L. is one of the most important plants of traditional medicines and is still in use, to treat various diseases, particularly diabetes, reproductive system disorders, inflammatory conditions, and swellings.

Ficus species plant parts have attracted much attention for their various pharmacological potentials contributed by the phytochemicals present in the plant matrix. The species contain a range of flavonoids, phenolics, terpenes and terpenoids, fatty acids, sterols, organic acids, proteins, and some long-chained hydrocarbon compounds. Some of the distinct compounds present in Ficus species plant parts include bengalenoside, leucodelphinidin, leucoanthocyanin, leucocyanidin, and derivatives. Besides that, the presence of flavonoids and terpenoids is potentially responsible for their pharmacological activities. Overall, the present compilation of chemical constituents with their pharmacological properties will provide prospective information on the existing studies and the research gap or pharmacological aspects that may require further attention and experimental values to be added to this genus. The Ficus species can be utilized as functional foods and pharmaceutical ingredients with respect to its pharmacological potentials and its availability in nature. Pharmacological studies on various parts of the plant have confirmed its use in traditional medicines.

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