



Exploring the Therapeutic Potential of *Ficus racemosa*: A Comprehensive Review

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ABSTRACT

India's traditional medicine system incorporates the use of *Ficus racemosa* Linn., a plant referenced in ancient Ayurveda, Siddha, Unani, and Homeopathy scriptures, for addressing various ailments. The plant's bark, root, leaf, fruits, and latex possess multiple therapeutic properties attributed to its phytochemical compounds. Despite being underutilized due to limited availability, this review focus into the plant's traditional uses, phytochemical constituents, and pharmacological effects. There hasn't been any scientific evidence of its effective application in value added food production. The aim of this review is to explore *F. racemosa*'s configuration, Physical advantages, overall upgraded food, and future outlook for a better grasp of its potential.

Keywords: Phytochemicals, Latex, Traditional, Underutilized, *Ficus racemosa* Linn.

INTRODUCTION

Throughout history, medicinal herbs have been extensively relied upon by civilizations as a fundamental source of healing. Ancient texts like the Vedas and the Bible highlight the use of herbal remedies for healthcare, showcasing the natural medicinal properties of conventional herbs and plants¹. The utilization of medicinal plants in many developing countries as a primary source of maintaining good health is significant². Moreover, the reliance on medicinal shops in industrialized societies has led to the development of various drugs and chemotherapeutics sourced from these plants³. The World Health Organization found that 80% of the global population uses herbal medicine for their healthcare needs⁴. *Ficus*, consisting of 750 species of woody plants in tropical and semi-tropical regions, stands out for its delicious taste and therapeutic benefits due to its biologically active phytochemical components⁵.

F.racemosa Linn., an evergreen tree with unique characteristics, possesses pharmacological significance across all its parts. Traditionally, its leaves, fruits, bark, latex, and root sap have been used to treat various conditions like piles, dysentery, and asthma. Scientific studies have explored their diverse medicinal properties such as hepatoprotective, chemoprotective, antidiabetic, antipyretic, antitussive, and antidiuretic effects⁶. These medicinal attributes are often attributed to the plant's antioxidant properties, which are known to be beneficial for various health conditions. Moreover, the plant has been found to contain phytochemical compounds like sterols, tannins, and flavonoids that offer protection against different pathogens⁷. The presence of compounds like beta-sitosterol in *F.racemosa*'s fruit extracts has shown potential anti-diabetic properties. Additionally, flavonoids, powerful antioxidants, interact with enzymes in the body, showcasing their ability to modulate enzyme activity effectively⁸.

Ficus racemosa has a long history of traditional use in herbal medicine for various ailments. It has been used for the treatment of anaemia, cancer, diabetes, leprosy, liver diseases, paralysis, skin diseases, and ulcers⁹. In addition, it has been used as a healing agent in traditional systems of medicine. The therapeutic potential of *Ficus racemosa* in the field of ethnopsychopharmacology has been explored, and it has been found to show a wide spectrum of biological activities. These include anti-inflammatory, antioxidant, antitumor, antimicrobial, and cytotoxic effects¹⁰. Several parenchyma cells contain distinct polychromatic oxalate crystals that appear demitasse or brownish. The cortex is wide, housing numerous stone and cortical cells filled with a gelatinous mass¹¹. The most significant antinociceptive activity, resulting in a writhing inhibition of 61.38% (P<0.001), was demonstrated by the ethanolic extract of the fruit, while the bark extract exhibited the lowest writhing inhibition at 42.76% (P<0.02). The ethanolic bark extract of *Ficus racemosa* gradually reduced diabetes by 80%, with 60-70% of lipid and lipoprotein levels restored to nearly normal ranges¹². *F.racemosa* also contains phytochemical compounds like sterols, tannins, and flavonoids that offer protection against various microbes¹³. Steroids such as beta sitosterol found in petroleum ether extracts of *F.racemosa* fruits are known to exhibit antidiabetic effects¹⁴. The potent antioxidant flavonoids interact with several biomolecules, modulating the activity of different enzymes¹⁵.

1. Taxonomic position of *F. racemosa*¹⁶

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Order	Urticales
Family	Moraceae
Genus	<i>Ficus</i>
Species	<i>racemosa</i>



2. "Vernacular names of *F. racemosa*"

English: "Cluster fig", "Country fig", "Redwood fig"; Chinese: "Ju Guo Rong"; Burmese: "Jagyadumbar"; Hindi: "Gular"; Urdu: "Dimiri"; Sanskrit: "Udumbara"; Kannada: "Atti"; Bengali: "Dumur"; Tamil: "Atti"¹⁷

4. Distribution

The majority of these non-epiphytic plant species thrive in damp locations such as riverbanks, mountain passes, and rocky slopes. They are primarily found in Myanmar, China, Malaysia, Australia, and India¹⁸. In India, they are widely distributed across the outer Himalayan regions, Punjab, the Khasia Mountains, Chotanagpur, Bihar, Odisha, West Bengal, Rajasthan, the Deccan, and extensively in South India¹⁹.

5. Plant Morphology

The tree, which can grow up to 30 meters and has a thick measuring 8– mm in diameter, has a smooth bark that is somewhat short and fibrous, showcasing a delicate pink color and a milky latex secretion²⁰. When young, the shoots and growths are white and hairy but quickly become rough. The branches, ranging from 1.5 to 3 mm in thickness, are covered with fine hairs²¹. The tree's outer layer is thin at about 72 micrometers, featuring a peelable periderm and phellem that are membranous and easy to remove²².

5.1 Leaves

The leaves have a flat length ranging from 5 to 20 cm and a width of 3 to 7 cm, with a simple shape that is ovate and ovate-lanceolate. They are arranged helically in an alternate pattern, with a plane periphery, pointed tips, rounded acute bases, and a network of veins. The stipule is 2.2 cm long, and the petiole is angular and sanguine brown, measuring between 3.2 to 8 cm. The lamella in the cross-section of the leaves, featuring anomocytic stomata, reveals a hypodermis below the upper epidermis²³.



Figure 1: Leaves of *F. racemosa*

5.2 Bark

The bark, ranging from flat to curved with a thickness of 2 to 3 mm, displays a grayish-brown color on its external surface. This rough surface is characterized by numerous lenticels, while the internal side is rough, fibrous, pale reddish, longitudinally striated, and fibrous upon fracture. The outer bark comprises a narrow, simple periderm zone that originates superficially. The periderm, which is 138 mm thick, consists of a phellem zone with 5–10 layers of

cells forming thin, continuous membranes. The outermost phellem layers are single-cell-thick membranes²⁴.

5.3 Latex

Latex possesses aphrodisiac qualities and is utilized in treating ailments such as diarrhoea, dysentery, haemorrhoids, bellyaches, cholera, and mumps. In Sri Lanka, it is employed for healing cadaverous fractures²⁵. The latex is also recognized for its adhesive properties and is released when leaves, barks, or stems are severed²⁶.

5.4 Flowers

Flowers appear on small branches without leaves, with knobby protrusions on the stem or larger branches producing syconia in a unisexual manner. The blooms are smooth, marked with lenticels and warts, shaped like pears, and varying from sub globose to pyriform. A sturdy peduncle, 3–12 mm in length, is capped by 5–6 bracts at the apex and features a flat or slightly sunken opening²⁷.

The male flowers are sessile and densely clustered, with toothed-lacerated tepals in red, and two projecting stamens with fused filaments. Female flowers have lacerated tepals with articulate lobes, a sessile ovary, and a smooth, simple style ending in a club-shaped stigma. Unisexual flowers are found in a syconia inflorescence, typically sub globose to pyriform, smooth, and marked with lenticels and warts.

The stout peduncle measures 3-12 mm long, with a plane or slightly sunken orifice closed by 5-6 apical bracts²⁸.

5.5 Fruits

The primary stem and main branches yield a bountiful cluster of pear-shaped, 3-6 cms wide fruit clusters that grow in a circular arrangement resembling a rosette like pattern. These fruits, initially green and fig-like, gradually transit to orange, dull red, or dark crimson hues²⁹. *Ficus racemosa's* spherical fruit measures 1.5 to 2 inches long known for its digestive, stomach-soothing and gas-relieving properties, the constrictive fruit can be utilized in the treatment of heavy menstrual bleeding and coughing up blood. There is a belief that leprosy can be remedied by using the fruit and bark for bathing³⁰.



Figure 2: Fruits of *F. racemosa*

5.6 Seeds

The seeds of *Ficus racemosa*, are incredibly small and have a lenticular shape. They are flat and disc-shaped, with two

rounded surfaces. Typically, their diameter measures around 1 millimetre. The seeds enclosed within the syconia (the fig's fruit-like fleshy structure) that emerges from the plant's inverted flower receptacle, are inconspicuous to the naked eye. Birds and other animals that consume the syconia play a crucial role in dispersing these seeds ³¹.

5.7 Root

The *Ficus racemosa*, also known as the Cluster Fig Tree, is a fascinating plant with its intricate network of roots that play a crucial role in its growth and sustainability. These roots not only anchor the tree to the ground but also absorb water and nutrients from the soil, providing it with the essential elements it needs to thrive. They also support the tree's weight and stability, especially in areas prone to strong winds or heavy rainfall. The roots of the *Ficus racemosa* are composed of two types: anchor roots, which grow deep into the soil, and aerial roots, which grow above ground and extend outward from the branches, helping

the tree absorb moisture from the air. These roots have evolved over time to adapt to their surroundings, such as high-water levels near rivers or lakes, and droughts in arid regions. The roots also support a diverse ecosystem, providing habitat for microorganisms and forming symbiotic relationships with insects and animals ³². Wound healing, bone fracture, and inflammatory activity are the traditional advantages. According to Ayurveda, these are used in the treatment of gynaecological disorders ³³.

6. Phytochemistry of *F. racemosa*

It's a branch of pharmacognosy with chemical & natural characters, dealing with chemical structures of secondary metabolites, their metabolism & their distribution & natural function ³⁴. In brief, these are the chemicals that are present naturally in shops. These are deduced from colourful corridor of shops like leaves, flowers, seeds, dinghies, roots & pulps ³⁵.

Table 1: The phytochemistry present in *Ficus racemosa* in its various parts are mentioned.

S.no	Plant parts	Phytoconstituents	References
1.	Leaves	Tannins, Saponins, Flavonoids, Steroids, Glycosides, Terpenoids, Resins, Triterpenoids	36
2.	Fruits	Beta-sitosterols, Stigmasterols, Lipeol acetate, lupeol, Alpha-amyrin, Kaempferol, Ascorbic acid, Gallic acid, Catechin, Tannic acid, Chlorogenic acid, Ferulic acid, Quercetin	31,37
3.	Stem barks	Racemosic acid, Bergenin, Tannin, Kaempferol, Rutin, Bergapten, Psoralenes, Ficusin, Coumarin, Phenolic glycosides	38
4.	Trunk barks	Stigmasterols, Beta- sitosterol, Upenol, Lupeol	39
5.	Root	Carbohydrates, Tannins, Saponins, Alkaloids, Glycosides, Quinones, Phenols, Terpenoids, Steroids	40
6.	Latex	Racemosic acid, Triterpenes, Alpha amyrin, Beta-sitosterol	41

Table 2: Estimation of the concentration (ppm) of mineral elements in *F. racemosa*

Mineral elements	Concentration (ppm)
Calcium	1729.3 ± 13.02
Iron	159.2 ± 2.03
Magnesium	196.2 ± 4.63
Phosphorous	443 ± 8.98
Zinc	0.49
Manganese	1.9 ± 0.14
Chromium	0.38
Copper	5.2 ± 0.15
Lead	0.017 ± 0.003
Sodium	255 ± 42.03
Potassium	11975 ± 537.74
Chloride	7475 ± 263

7. Mineral Profiling of *Ficus racemosa* (dry basis)

Mineral profiling in *F. racemosa* involves analysing the elemental composition of the plant. Such analyses provide insights into the plant's nutritional content & can aid in understanding its ecological role or potential uses ⁴².

8. Nutrient profiling of *F. racemosa* (Nutrients per 100g Fresh fruits)

To profile the nutrition in *F. racemosa*, one would analyse its nutritional composition which involves assessing macronutrients & micronutrients. Understanding the plant's nutritional profile is crucial for evaluating its potential as a food source or for medicinal purposes ⁴³. (Table 3)

9. Traditional uses of *F. racemosa*

The traditional Indian medical system contemplates all parts of this plant, including the leaves, fruits, bark, latex, and sap of the root, to be medicinally important ⁴³.

Table 3: Detailed amount of nutrient constituents in *F. racemosa*

Sl.no.	Nutrient constituents	Amount
1	Moisture content	80.20 %
2	Crude protein	1.475 gm
3	Protein (N x 6.25)	28.125 gm
4	Total lipids	7.58 gm
5	Ascorbic Acid	0.0053 gm
6	Carotenoids	0.2 gm
7	Total Phenols	1.025 gm
8	Anthocyanin	0.6864 gm

9	Lycopene	0.0848 gm
10	Chlorophyll	
	i) Chlorophyll – a	0.00489 gm
	ii) Chlorophyll – b	0.00613 gm
	iii) Total chlorophyll	0.01102 gm
11	Total carbohydrate	15.84 gm
12	Starch	0.146 gm
13	Reducing sugar	14.85 gm
14	Non-reducing sugar	0.099 gm
15	Crude fat	1.079 gm
16	Crude fibre	0.544 gm

Table 4: Detailed traditional utilisation of *F. racemosa*

Sl no	Parts of the Plant	Cure diseases	References
1.	Leaves	Chronic wounds, Cervical adenitis, Hemoptysis Dysentery & Diarrhoea, Glandular swelling, abscesses.	44
2.	Latex	Traumatic pain & Swelling, Toothache, Inflammatory enlargements Haemorrhoids, Diarrhoea, Diabetes, Boils.	45
3.	Bark	Gonorrhoea, Urinary illnesses, Skin problems Impending Abortion, Menorrhagia, leucorrhoea.	46
4.	Fruits	Astringent, Kidney & spleen diseases, Astringent to the bowel, Styptic, Tonic, Leucorrhoea, Stomachic, Refrigerant dry cough, Loss of voice	47
5.	Root sap	Menorrhagia, Haematuria, Smallpox, Mumps, Inflammatory conditions, Diabetes	48
6.	Root	Diabetes, Mumps, Pectoral problems, Inflammatory glandular enlargement hydrophobia, Diarrhoea	49

Traditionally, all organs of this plant can be utilised not only internally but also externally which contain outstanding therapeutical values that can provide benefit to human in numerous ways as follows

Table 5: Detailed traditional curing applications potentials of various plant parts of *F. racemosa* to various diseases

Plant Part	Traditional Disease Curing Applications	References
Leaves	<ul style="list-style-type: none"> A bilious illness can be treated with a mixture of leaves and honey. Dysmenorrhea is treated using a leaf decoction. Hair should be rubbed with leaf juice to avoid splitting. The Usage of leaf helps shield against measles, boils, and blister. 	50, 51
Fruits	<ul style="list-style-type: none"> Fruit serves as a stimulating tonic that supports the stomach's healthy operation Fruit juice is used to treat haemoptysis and menorrhagia. Serve as a treatment for diarrhoea, constipation, diabetes and leprosy curing agent. 	52,53
Bark	<ul style="list-style-type: none"> This is used to treat dysentery, menorrhea, and spongy gum conditions. Bark decoction is applied topically to wounds, burns, asthma and edema Additionally, it is crucial in uropathy to avoid certain urinary tract infection 	52,50,54,55
Latex	<ul style="list-style-type: none"> It is utilized in the production of medications known as aphrodisiacs, which increase fertility. It treats cholera, the mumps, and stomach ailments. It's applied to the management of bone fractures. It serves a variety of uses as adhesive as well. 	56-60
Root	<ul style="list-style-type: none"> The root's sap is used to treat diabetes and gonorrhoea. Additionally, root sap is utilized to stop malaria in cattle as well as chronic wounds, headaches, muscular aches, and heat stroke. 	52, 61

Table 6: Pharmacological features of *F. racemosa*

Plant Part	Phytochemicals	Pharmacological activity	References
Root	Cycloartenol Euphorbol Taraxerone Tinyatoxin Flavonoids Tannins Saponins Alkaloids Steroids	Anti-analgesic Anti-diuretic Anti-hydrophobic Anti-microbial Anti-oxidant Wound healing activity	62-69
Stem	Campesterol Hentriacontan Hentriacontanol Kaempferol Stigmasterol Methyl ellagic acid Lupeolacetate β -Sitosterol α -Amyrin acetate Glauanol acetate	Anti-inflammatory, hypoglycemic, anti-diarrheal, anti-ulcerative, anti-asthmatic, antipyretic wound healing	3, 70-73
Leaves	Tetra triterpene Glauanolacetate Racemosic acid Alkaloids Glycosides Flavonoids Phenolic compound Tannins	Anti fungal Anti bacterial Anti inflammatory Wound healing properties	45,3,50
Fruits	Glauanol Hentriacontane β sitosterol Glauanolacetate Tiglic acid Esters of Taraxasterol Lupeolacetate Friedelin Phytosterol Tannins Steroids Flavonoids Alkaloids	Hypolipidemic Anti diabetic Anti carcinogenic Anti lucorrhic	73,74,3,75
Latex	α -Amyrin β -Sitosterol Cycloartenol Cycloeuphordenol 4-Deoxyphorbol and its esters Euphorbinol Iseuphorbol Palmitic acid Taraxerol Tinyatoxin, Trimethylellagic acid	Anti pyretic Anti inflammatory Anti microbial	3

10. Pharmacological Features of *F. racemosa*

F. racemosa has been studied for its abundant pharmacological potential, revealing various bioactive compounds like flavonoids & saponins found in plant are associated with anti-inflammatory & anti-oxidant properties. Some other studies regarding medicinal properties are notified in table 6.

11. Toxicity Profiling

Cytotoxic effect of ethanol extracts of the bark of *F. racemosa* using ATP-based luminescence assay in human skin fibroblasts, human hepatocytes carcinoma & human promyelocytic leukaemia¹. Traces of aspirin & mercuric chloride found which was significantly in trace amount⁷⁶. Administration of the aqueous extract of *Ficus racemosa* for 3 weeks (subacute) was associated with the liver damage. Histopathological damage to kidney was not marked but there was significant change in serum creatinine and urea⁷⁷.

12. Food and beverage products made from *Ficus racemosa*:



- a. **Biscuits:** Formulated using cluster fig powder, flours made from sprouted wheat, pearl millet, and mung beans, in varying proportions⁷⁸.
- b. **Wine:** Produced by extracting juice from fully ripe *Ficus racemosa* fruit, followed by inoculation and fermentation processes⁷⁹.
- c. **Juice:** Prepared from fully ripe, washed *Ficus racemosa* fruits by blanching, crushing, extracting juice, pasteurizing, and cooling⁷⁹.
- d. **Nutra Tea:**
 - i. **Combination:** A non-alcoholic beverage containing *Ficus racemosa* and Arjuna bark which are good sources of fiber, minerals, and phenolic compounds. Tea prepared with this combination has significantly higher levels of phenolics compared to regular tea⁸⁰.
 - ii. *Ficus racemosa* only: Tea made using *Ficus racemosa* bark powder exhibits a significant increase in phenolic content compared to regular tea⁴².

- e. **Herbal Ointment:** An ethanol extract of *Ficus racemosa* shows antibacterial activity against *Staphylococcus aureus*, with moderate effectiveness against *E. coli* and minimal effect against *Klebsiella* spp., demonstrating its potential for wound healing⁸¹.

13. Utilisation of *F. racemosa* in food industry

Because figs are so sweet, juicy, delicious, and squishy, using their fruit paste as a natural sweetener is a better alternative to sugar or corn syrup. You can turn it into delicious jams. Figs can be prepared in a number of ways, depending on how they are cooked—peeled or not. Figs are a simple ingredient to make puddings, cakes, fig pies, smoothies, milkshakes, custards, and other baked goods. Fig fruits can also be used to frozen dessert concoctions. Home producers can preserve the entire fruit in syrup or process it into fig paste, jam, marmalade, and wheat and maize flour, whey, syrup, oils, and other components. These products are then utilized as enticing fillings for various baked goods⁸².

Because of its high functional compound, fig fruit coproducts are abundant in polyphenolic chemicals that food businesses might utilize to differentiate and create functional foods. There are many consumer and commercial goods that contain dried figs, such as pasta, nuggets, powder, concentrate, and chopped varieties. Dried fig puree is a great topping for cereal, yogurt, ice cream, and desserts. Fig fruit can be used to produce a variety of food dishes, both fermented and unfermented. It can be used to make vinegar and wine in fermented food products, but in non-fermented food products, it is usually used in its raw or dry form⁴.

CONCLUSION

F. racemosa, a versatile medicinal plant, is rich in phytochemicals with numerous biological activities and health benefits. However, its fruits are often neglected due to limited availability and underutilization. The review aims to explore *F. racemosa*'s potential in the food industry and attract processors and researchers for its value addition, potentially enhancing socio-economic status. Traditional medical practitioners use *F. racemosa* parts like root, fruit, leaves, stem, seeds, latex, and whole plant for treating various diseases. The plant's bioactive constituents, such as β -sitosterol and glauanol acetate, have shown therapeutic potential for various ailments. Further clinical and pathological studies are needed to explore the active potentials of bioactive compounds in the plant. The aqueous extract has been marketed, attracting scientists to explore more information about *F. racemosa* for commercial potential.

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