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Review Article

A Systematic Review of Ficus racemosa Linn's Therapeutic Potential

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ABSTRACT

A noteworthy species in the genus Ficus is Ficus racemosa Linn., which is a group of trees with important medicinal qualities. It is a medium-sized tree in the Moraceae family that goes by several names depending on the area. It is commonly referred to as the cluster fig tree. Ficus racemosa is found in many nations, including Australia, Malaysia, South-East Asia, Sri Lanka, Pakistan, China, and the Indian subcontinent. It is usually found growing next to bodies of water, but it can also be grown elsewhere. India's most prized medicinal plant, Ficus racemosa Linn. (Moraceae), has long been used in Ayurvedic medicine to treat a wide range of ailments, such as diabetes, liver problems, diarrhea, inflammation, haemorrhoids, respiratory, and urinary issues. The pharmacological properties of the plant, including as its antimetabolic, antipyretic, anti-inflammatory, antiulcer, cardioprotective, hepatoprotective, and antibacterial properties, have been validated by research. Numerous phytochemical substances from various plant sections have been found and extracted. Alkaloids, tannins, saponins, β-sitosterol, lupeol, and other bioactive substances are among the many phytochemical compounds it contains. Ficus racemosa is still underutilized despite having several medicinal qualities because of its seasonal scarcity and limited availability. This study highlights recent important results and the plant's potential for future medicinal applications while offering a thorough overview of Ficus racemosa's traditional usage, phytochemical ingredients, and pharmacological effects.

INTRODUCTION

In Ayurveda and Rigveda, medicinal plants are a key therapeutic ingredient for removing human health hazards [1]. One medical system that uses the healing qualities of plants is Ayurveda. Traditional Chinese Medicine (TCM) therapies can help prevent and improve diseases. Traditional Chinese medicine is inexpensive, easy to use, and harmless. Treatments from Traditional Chinese Medicine can help with a number of chronic,

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geriatric, and incurable illnesses [2]. A very significant group of trees with a variety of medicinal uses and applications that are found throughout China and other countries is the genus Ficus [3]. The evergreen, lactiferous, deciduous *Ficus racemosa L*. (Moraceae) tree is 15–18 m tall, moderately to large in size, and lacks noticeable aerial roots. The warmer regions of Asia, Africa, America, and Australia are home to more than 700 species of the remarkably large pan-tropical genus Ficus. Udumbara is thought to be afraid of the god Datta guru, while *F. racemosa* is usually referred to as "gular"[4] The entire plant is regarded as medicinally significant in Ayurveda, and it has been extensively utilised to treat inflammatory conditions, diabetes, diarrhoea, jaundice, biliary problems, and dysentery [2]. The astringent bark and fruit are used to treat haemoptysis, menorrhagia, and haematuria. The sap can be utilised to treat gonorrhoea, mumps, and other inflammatory glandular enlargements. You can use the roots to treat tonsillitis [5]. A variety of plant parts, including bark, roots, leaves, fruits, and latex, have anti-dysentery, vermifuge, astringent, and carminative properties. Fruit extract is used to treat diabetes and leukoderma. It is an effective treatment for overeating. It is applied locally to sprains, skin wounds, fibrositis, and lymphadenitis to reduce inflammation [4]. Numerous recent results of significance regarding this plant's morphological characteristics, phytochemical ingredients, medicinal uses, and pharmacological activity are reviewed in this review.

1.1 Taxonomical Classification

Kingdom	Plantae, Planta, Planter, Plants, Vegetal
Sub kingdom	Tracheobionta, Vascular Plants
Division	Magnoliophyta
Supervision	Spermatophyta
Class	Magnoliopsida
Subclass	Hamamelididae
Order	Urticales
Family	Moraceae
Genus	Ficus

Fig:1 Leaves of Ficus Racemosa

Fig:2 Ripe Ficus racemosa fruits

Fig:3 Unripe Ficus Racemosa fruits

Fig:4 Plant of Ficus Racemosa

Synonyms	Local names
Covellia glomerata (Roxb.) Miq., Ficus glomerata Roxb., Ficus vesca F.Muell. ex Miq., and Ficus semicostata	**Indonesia:** Jawa: elo (Jawa Timur), loa, lowa (Sunda); **Malaysia:** ara, ara nasi; **Thailand:** ma der (Phu Thai), duea kliang (Central, Northern), duea nam (Peninsular); **Singapore:** atteeka; **Myanmar:** atti, umbar, **English:** cluster fig, blue fig, figwood, red river fig

1.1 Climate and Soil

It is growing naturally in forests and waste areas. For this to be successfully grown, medium-to-heavy soil that drains effectively is necessary. Additionally, it has been shown to withstand lime sulphates and chlorides, making it suitable for use in planning on industrially polluted areas. It is not, however, resistant to potassium or sodium carbonates. With the exception of clay and waterlogged soils, it can be found in all types of soil[6].

1.2 Habitat

It is grown across India, and it can be found growing wild in many hilly and forested regions. It is typically found around water features like ponds and riverbanks, although it can also be planted outside. The tree is tall and moderate, growing up to 12 meters[2]. The gorgeous green leaves of Ficus racemosa provide adequate shade. The bark is reddish-gray in hue and appears to be fractured[2].

1.3 Morphology

1.3.1 Leaves

The dark green leaves are elliptic or oblong, with petioles 1. 3- 3. 8 cm and entire margins glabrous on both surfaces. The leaves are lanceolate, tapering to a blunt tip at the apex base, which is sharp and rounded with three nerves[7]. In January and April, leaves are shed when the tree is barren for a brief time [8].

1.3.2 Inflorescence

The Inflorescence There are three different kinds of flowers in the hypanthodium's receptacle. The gall flowers create an interior layer, the fertile female flowers create a layer in the container walls, and the male flowers create a zone close to the mouth. When young, the short, warted, leafless branches that emerge from the stem and later branches contracted at the base [7].

1.3.3 Flower

The male flower has sessile basal bracts, three ovate-triangular sepals, four membrane sepals that are inflated and enclose the two elongate ovate anthers, and connate filaments[9]. Sub-sessile, gamophyllous perianths with four or five long, lance-like teeth encasing the tiny, minutely tuberculate achene, style sub-terminal, and stigma clavate are characteristics of fertile female flowers. Gall flowers are pedicellate, with a gamophyllous perianth that is irregularly serrated, lateral elongate, stigma clavate, and only covers the base of the rough spherical style[9].

1.3.4 Fruits (Syconium)

The fruits are sub globose, pyriform, smooth or pubescent, and 1-2 inches in diameter. They are stunning when mature, scarlet, and have a flattened umbilicus. They can be observed grouped on the trunk's leafless branches. Fruits grown with high perfusion often reach complete development between March and July. When fruits are completely mellow, they smell nice, like cider apples. Several tiny male and female flowers are enclosed in syconns, which are formed from a fleshy, hollow pear-shaped container. The fruit is 3 cm in diameter, greenish white when immature, and purple red when ripe[7].

1.3.5 Bark

The reddish brown bark has a solidly smooth and soft surface, and depending on how old the trunk is, its thickness ranges from 0.5-2 cm. It has tiny flakes of whitish tissue that separate it.It has an astringent quality and a uniform leathery texture[9].

1.4. Microscopic characteristics:

1.4.1 Cork (Outer phellum)

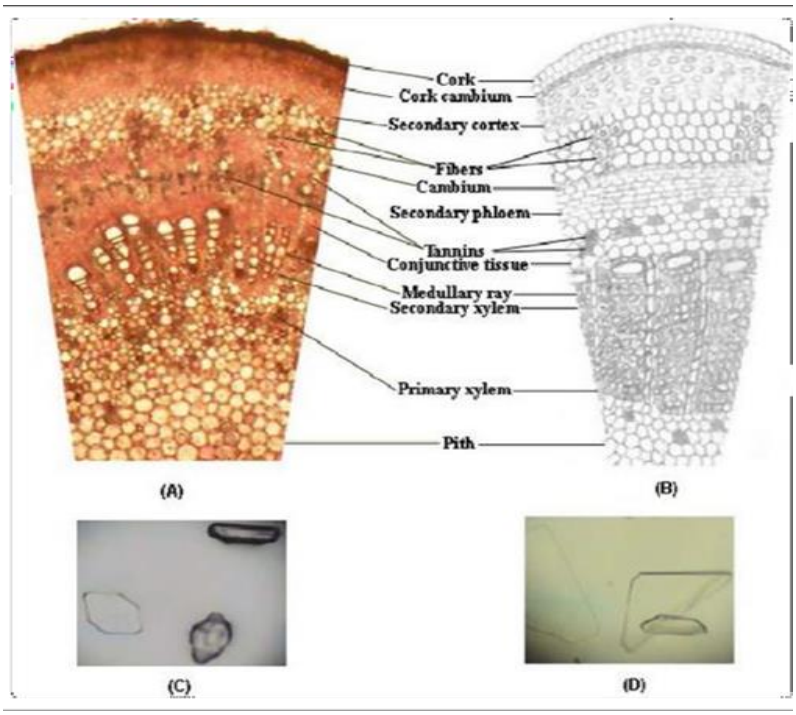
The two layers of densely suberised cells that make up cork are polygonal or rectangular in shape 10].

1.4.2 Phelloderm (Secondary Cortex)

It is composed of small clusters of sclereids or dense tissue of parenchyma cells as well as being lignified with simple pits. A solitary prism with reddish calcium oxalate content in a few parenchymatous cells[10].

1.4.3 Cortex

Several rectangular, isodiametric, pitted, thick-walled sclereids make up this structure, and the cortical cell itself contains a resinous material. Crystals of this type of calcium oxalate are prismatic and found in cells. Phloem components include sclereid phloem fibers, mesh tubes, companion cells, phloem parenchyma, and medullary rays. It is distributed in two to three layers of thin- walled, tangentially elongated cells [11].



(A) T.S. Of The Young Stem Containing the Bark. (B) Schematic Diagram of The T.S. (C) Rhomboidal Crystals. (D) Prismatic Crystals

1.4.1 Phytochemistry

Alkaloids, flavonoids, and tannins are found in the roots, leaves, and fruits of the *ficus racemosa* plant. Taraxerone, cycloartenol, euphorbol, and tinyatoxin are the major compounds found in roots. The phytochemicals glauanolacetate, racemosic acid, glycosides, phenolic compound, and antetra triterpene are all present in leaves. These components can be found in fruits: tiglic acid, phytosterol, β-sitosterol, lupeolacetate, hentriacontane, glauanol, glauanolacetate, friedelin, and esters of taraxasterol. The primary constituents of stem are methyl ellagic acid, kaempferol, lupeolacetate, stigmasterol, α-amyrin acetate, glauanol acetate, hentriacontane, hentriacontanol, campesterol, and β-sitosterol. The components of latex's phytochemistry include α-amyrin, β- sitosterol, cycloartenol, cycloeuphordenol, euphorbinol, isoeuphorbol, palmitic acid, taraxerol, tinyatoxin, trimethylellagic acid, and 4-deoxyphorbol and its esters[12].

1.5 Therapeutic uses

Parts of the plants	Therapeutic uses
Leaves of *Ficus racemosa*	The leaves are used as an ulcer and wound wash and as a douche for dysmenorrhea. Leaves latex is used for boils, blisters, and measles, and their juice is massaged into hair to keep it from breaking.

Fruits of *Ficus racemosa*	When used to treat haemoptysis and menorrhoea, the fruits have carminative, stomachic, and astringent properties. constipation, diarrhoea, and visceral blockage. Leprosy is thought to be cured by taking a bath consisting of fruit and bark. Additionally, it is used to treat diabetes.
Bark of *Ficus racemosa*	The bark is abrasive. Bark is used as a mouthwash to treat diabetes, haemoptysis, menorrhea, dysentery, and spongy gum disease. It's also indicated for uropathy, particularly effective in threatening abortions, and used as a wound wash. Bark decoction is used to treat piles and asthma. The sap taken from the trunk is used to treat diabetes. Stem bark paste is applied to leucorrhea, burns, and swelling.
Latex of *Ficus racemosa*	The aphrodisiac latex is used to treat hemorrhoids, diarrhoea, dysentery, and boils. The latex is also used to treat cholera, mumps, and stomachaches. In Sri Lanka's traditional medical system, latex has been used to cure skeletal fractures and manage acute diarrhoea, especially in youngsters.
Sap of root of *Ficus racemosa*	The root's sap is applied topically to mumps and other inflammatory glandular enlargements, and it is also used to treat diabetes and gonorrhoea. In cattle, root sap is used to treat malaria, chronic wounds, and heat stroke.

2. Pharmacological activity

2.1 Anti-thyroid activity

Based on this study, the author found that hyperthyroid actuated rats showed normal thyroid hormone levels and lipid profiles after receiving three different centralizations of the ethanolic concentrate of Ficus racemosa bark (250, 350, and 450 mg/kg of body weight) for 21 days along with the standard medication methimazole. As compared to the normal treatment, the group that received the most amazing accumulation of plant concentrate showed remarkable results. This indicates that Ficus racemosa bark ethanolic concentration may be able to treat test-rat hyperthyroidism[13].

2.2 Antiulcer Activity

The antiulcer properties of ficus racemosa L. leaves were assessed by Dr. Ankita et.al, using the pyrolous ligation-induced ulcer method. According to the results of this study, methanolic extract at dose levels of 200 mg/kg and 400 mg/kg considerably reduced the ulcer index, as demonstrated by a significant rise in the percentage of ulcer protection at both dose levels. When 200 and 400 mg/kg of ethanol extract of leaves were administered to the treatment groups, the percentage protection against ulcers was 57.97% and 67.70%, respectively. At 20 mg/kg, omeprazole demonstrated an 88.52% protection index[14]. The antiulcer properties of ficus racemosa leaves are examined by the same author using a different technique. In rats in the control group, the administration of ethanol (1 ml/200 gm b.w.) caused ulceration in the stomach mucosa, which was characterized by hemorrhagic gastric lesions. When compared to the control group, the methanolic extract of leaves was found to reduce the severity of these ethanol-induced lesions, as evidenced by a fairly significant decrease in the ulcer index and an increase in the percentage protection of ulcers. When rats were given omeprazole, the preferred standard medication, the severity of these ethanol-induced lesions decreased, as evidenced by a significant decrease in the ulcer index and an increase in the proportion of ulcers protected, in contrast to the control group [14].

2.3 Cardio Protective Activity

It is well known that the cardiotoxic drug doxorubicin raises serum transaminases, LDH, and CK- MB. The presence of troponin I in serum, together with the activity of LDH, CK-MB, AST, and ALT, were identified as indicators of cardiotoxicity. As predicted, the injection of doxorubicin caused considerable cardiac damage because the activities of CK-MB and LDH were found to be much higher than those of the control groups. Their increased activities were considerably reduced by pretreatment with FR250, FR500, and AR100. The percentage decreases in LDH activity caused by FR250, FR500, and AR100 were 38, 68, and 36%, respectively, whereas the corresponding decreases in CK-MB activity were 43, 63, and 38%. Only the control serum had undiscovered troponin I, whereas it was discovered[15].

2.4 Antidiabetic Activity

In a mechanism that is independent of insulin, Ficus racemosa maintains or improves beta-cell and pancreatic health and function, according to Kalpeshkumar et al. Among other possible pathways, it exhibits its antidiabetic benefits through interactions with insulin receptors, significant proliferative and antioxidant effects, activation of the MAPK and P13K pathways, and translocation of glucose transporters. In both extracts, the phytochemical components such as phenolic acids, rosmarinic acid and chlorogenic acid, as well as rutin and isoquercitrin, and the main flavonoid, luteolin, shown anti-diabetic properties[16]. Using alloxan monohydrate, Sadhana et.al, studied the anti-diabetic effects of ficus racemosa leaf extract in rats (120 mg/kg, i.p.). Rats with diabetes had significantly higher fasting blood glucose levels than rats without the disease. After seven days of therapy, the flavonoid and tannin fraction of Ficus racemosa extract exhibit a significant anti-hyperglycemic effect that is dose dependent. It was discovered that Ficus racemosa extract's flavonoid and tannin fractions had less of an anti- hyperglycemic impact than the gold standard, Glibenclamide. Glibenclamide significantly reduced blood glucose levels in comparison to diabetes control[17].

2.5 Antimicrobial Activity

Amit et.al, conducted research on the antimicrobial effects of Ficus racemosa and Ficus benghalensis on harmful viral illnesses. Flavonoids and terpenoids were found in aqueous root extracts of Ficus benghalensis and Ficus racemosa after a phytochemical qualitative investigation. According to research on the impact of aqueous root extract on PBMC proliferation assay (using NDV and IBD), greater doses of aqueous extract significantly inhibited PBMC proliferation assay compared to control. as compared to control. Aqueous root extract at higher doses considerably suppressed the generation of TNF alpha in comparison to control, and the results showed a considerable increase in proliferation as compared to the conventional NDV and IBD. When aqueous root extract was used at greater levels, it dramatically suppressed the CD14 monocyte surface marker, according to research employing NDV and IBD [18].

2.6 Antibacterial and Antifungal Activity

Tanvi Pingale's et.al, research focused on the antifungal and antibacterial properties of ficus racemosa. It was determined that the combined extract's minimum inhibitory concentration in this investigation was 1 mg/ml. According to preliminary phytochemical tests, the antimicrobial activity of Ficus racemosa L. extracts in water, chloroform, ethyl acetate, hexane, and ethanol was most likely caused by a few key secondary metabolites, including glucanol, tiglic acid,

taraxasterol, lupeol acetate, friedelin, hydrocarbon, carbohydrate, and mucilage. As a result, the chemical component of these herbs can be utilised to identify natural bioactive products that may enhance their therapeutic value in the creation of new pharmaceutical research projects and in the pursuit of employing promising antibacterial agents to treat bacterial infections[19].

2.7 Gastro-Intestinal Digestion, And Apoptosis Inducing Activity

Kasipandi et.al. noted that this study examined the polysaccharide content of F. microcarpa and F. racemosa, as well as the inhibition of α-amylase and α-glucosidase during the in vitro simulated digestion. Significant sugar content loss was observed following the digestion of FMP and FRP, which also suggested that isolated polysaccharides might be easily absorbed. The fruit polysaccharides of F. racemosa and F. microcarpa were discovered to be easily absorbed during intestinal digestion, antidiabetic, and potent antioxidants. Furthermore, by inhibiting α-amylase, α-glucosidase, and free radicals, Ficus fruits can be used to create novel dietary nutraceuticals. In vivo bio-availability studies are also a feature that supports the bio-accessibility of F. microcarpa and F. racemosa fruit polysaccharides, and they are essential to our research [20] .

2.8 Hepatoprotective Activity

Faiyaz and Urooj et.al, used hepatotoxic chemicals, such as CCl4, which are known to raise blood transaminases, to study the hepatoprotective potential of ficus racemosa. Significantly raised levels of ALT, AST, ALP, and total bilirubin indicate that CCl4 caused substantial liver damage in this investigation, as was to be expected. The presence of bergenin, an isocoumarin that has been demonstrated to have strong hepatoprotective activity, may be the cause of the substantial decrease in serum transaminase (AST and ALT), alkaline phosphatase, and total bilirubin content activities caused by the FRME pretreatment. In CCl4-intoxicated rats, Liv 52 was shown to have a strong hepatoprotective effect and enhance liver function. According to the findings, F. racemosa exhibits strong hepatoprotective activity against CCl4-induced liver injury in rats; this effect may be mediated by its antioxidative properties. These findings supported the use of F. racemosa as a traditional remedy for jaundice [21].

2.9 Anti-Arthritic Activity

To examine the anti-arthritic properties of ficus racemosa, T. Lakshmi et.al, conducted the Ferric Reducing Antioxidant Power (FRAP) Assay and the [2,2′ -Azino-(bis (3-ethylbenzothiazoline-6-sulphonic acid)] ABTS Assay. Flavonoids and saponins were found in this initial phytochemical investigation. The ABTS test revealed 90.69% inhibition, while the FRAP test revealed 72.24%. One of the primary recognised causes of rheumatoid arthritis is protein denaturation. In contrast to diclofenac, F. racemosa extract inhibits the denaturation of proteins and its effects, making it a potential choice for regulating the synthesis of autoantigen. Several fractions of F. racemosa fruits were tested for in vitro anti-arthritic activity at different concentrations (i.e., 200 µg/ml, 400 µg/ml, 800 µg/ml, and 1000 µg/ml). The percentage of inhibition at 200 µg/ml was 92.88%, 400 µg/ml was 98.68%, 800 µg/ml was 99.94%, and 1000 µg/ml was 99.95%. The fruit of F.racemosa was found to have antiarthritic and free radical scavenging properties. Consequently, due to its strong antioxidant and phytochemical activity, it can be utilised to treat arthritis [22].

2.10 Analgesics and Anti-Inflammatory Activity

To investigate the anti-inflammatory qualities of Ficus racemose, Lakshmi et al. used carrageenan to cause inflammation. When compared to the positive/carrageenan control group, none of the groups demonstrated statistically significant improvements in paw oedema.

Ficus racemosa's analgesic properties were assessed using two techniques. The first approach is the writhing test, and the test's outcome was displayed. Out of all the groups, only the high dose of 1000 mg/kg produced statistically meaningful outcomes. The results of the second approach, the Tail flick test (TFS), were Out of all the groups, only the high dose of 1000 mg/kg produced statistically meaningful results. FR treatment resulted in a dose-dependent improvement in the pain threshold. But it didn't have as much of an effect as aspirin, the gold standard drug[22].

CONCLUSION

This comprehensive review covers the pharmacological characteristics, phytochemicals, and traditional uses of Ficus rasemosa Linn., a plant utilized for thousands of years in Traditional Chinese Medicine (TCM). The plant contains several pharmacologically active compounds, such as gluanol acetate, flavonoids, lupeol, stigmasterol, B-sitosterol, and the tetracyclic triterpene glauanol. These compounds have been shown to have antifungal, hypoglycemic, hypolipidemic, renal anticarcinogenic, memory-enhancing, antiulcer, anti-inflammatory, antimicrobial, and analgesic properties. The phytochemicals responsible for these effects are abundant in the plant's stem bark, fruit, and leaves. Numerous bioactive chemicals that can be utilised to create successful formulations have been found in the plant through phytochemical screening. According to the study, Ficus racemosa may be used to treat several illnesses, such as neurological conditions, wounds, fever, and bacterial and parasite infections. Despite the review's comprehensive proof of the plant's therapeutic benefits, more research is required to identify and describe the active ingredients and their pharmacological actions using animal models. In summary, this review highlights the necessity of additional research to completely investigate this plant's pharmacological potential and create novel medications using its bioactive chemicals for the treatment of diseases and disorders.

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