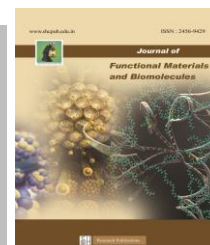




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A REVIEW ON THE BIOMEDICAL POTENTIAL OF *FICUS RACEMOSA*

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Abstract

The cluster fig tree, also known as Gular or *Ficus racemosa* Linn. (Family: Moraceae), is a well-known medicinal plant in India that has been used for a long time in traditional systems of medicine to treat a variety of ailments, including diabetes, liver disorders, diarrhoea, inflammatory conditions, hemorrhoids, respiratory and urinary diseases. The ancient texts of Ayurveda, Siddha, Unani, and homeopathy all mention this herb. As an astringent, carminative, vermifuge, and anti-dysentery, various plant parts including bark, roots, leaves, fruits, and latex are employed. It is an effective treatment for overeating. Fruit extract is used for menorrhagia, diabetes, leucoderma, cooling, anti-asthmatic, hepatoprotective, antioxidant, and other conditions. It is applied locally to treat sprains, fibrositis, lymphadenitis, and skin wound irritation. As a result, the current review attempts to offer an in-depth investigation of pharmacognostic, phytochemical, and pharmacological properties.

Keywords: *Ficus racemosa* Linn., Moraceae, Pharmacognostical, Pharmacological and Phytochemical.

1. Introduction

Throughout the dawn of time, medicinal plants have served as a source of healing for almost all cultures. The prevalence of natural substances with medical characteristics has been linked to the usage of herbal treatments and healthcare preparations, such as those mentioned in ancient books like the Vedas and the Bible and made from widely used traditional herbs and medicinal plants [1]. It has also been extensively noted that most developing nations use traditional medicine and medicinal plants as a normative foundation for the preservation of good health [2]. Furthermore, the extraction and creation of numerous medicines and chemotherapeutics from these plants as well as from conventionally used rural herbal remedies has been linked to an increase in the reliance on the usage of medicinal plants in industrialized cultures [3]. According to the World Health Organization, 80% of people worldwide use botanical medicine for their main healthcare requirements [4].

A 15–18 m tall, lactiferous, evergreen tree of the Moraceae family called *Ficus racemosa* Linn. does not have obvious aerial roots [5]. With over 700 species [6] widely dispersed throughout the warmer regions of Asia, Africa,

America, and Australia, *Ficus* is a remarkably big pantropical genus. Because of its distinctive reproductive system, which includes the synconia fig and specialized pollinator wasps, it is kept as a single, big genus [7]. *F. racemosa*, also referred to as "gular," is a plant that is widely used to treat inflammatory illnesses, biliary problems, jaundice, dysentery, diabetes, and diarrhea [8–10]. All parts of the plant are considered medicinally significant in Ayurveda. In light of the numerous recent results on this plant that are significant, a detailed explanation of the morphology, phytochemical components, traditional usage, and pharmacological Potential are given in this review.

Table 1: Taxonomy of *Ficus racemosa*

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnolipsida
Order	Urticales
Family	Moraceae
Genus	Ficus
Species	racemosa
Synonym	F. glomerata Roxb

Traditional uses

The root is administered for mumps, various inflammatory glandular enlargements, diabetes, diarrhea, pectoral problems, and hydrophobia. The bark is also advised in cases of piles, leprosy, diabetes, hiccup, leprosy, dysentery, sathenia, and impending miscarriage. The leaves make an excellent wash for ulcers and cuts. They are helpful for diarrhea and dysentery. Bark and leaf infusions are also used topically to treat spongy gums, orally to treat menorrhagia, dysentery, and abscesses, and as a treatment

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for cervical adenitis, haemoptysis, and glandular swelling. Sensitive leaves are utilized for bilious affection as well as to lighten skin. Tender fruits are useful in the treatment of leucorrhoea, blood disorders, burning sensation, fatigue, urinary discharges, leprosy, menorrhagic, epistaxis, intestinal worms, and carminative. They are also astringent, stomachic, refrigerant, dry cough, loss of voice, diseases of the kidney and spleen, astringent to bowel, styptic, and tonic. They can help with visceral blockages, excessive thirst, cancer, myalgia, spermatorrhoea, menorrhagia, menorrhagia, epididymitis, haemoptysis, and intrinsic hemorrhage. Latex is used to treat hemorrhoids, diarrhea, diabetes, boils, orchitis, parotitis, traumatic swelling, toothaches, and vaginal diseases [11–20]. It is also an aphrodisiac. Asamgrahaniya kasaya churna, Udumbarasara, Udumbaravaleha, and Udumbramtra are a few significant Ayurveda products that are commercially available.



Figure 1: *Ficus racemosa* Linn

Phytochemical properties

The plant *F. racemosa* has only received a very limited amount of phytochemical research. Two leucoanthocyanins were detected in the stem bark: leucocyanidin-3-O-glucopyranoside, lupeol, its acetate, leucopelarogonidin-3-O-L-rhamnopyranoside, sitosterol, an unidentified long chain ketone, ceryl behenate, and -amyirin acetate. Lupeol, -sitosterol, and stigmasterol were isolated from trunk bark. Fruit contains phytosterols such as glauanol, hentriacontane, -sitosterol, glauanol acetate, glucose, tiglic acid, esters of taraxasterol, lupeol acetate, friedelin, and higher hydrocarbons. From the leaves, researchers recovered a novel tetracyclic triterpene called glauanol acetate, which has the chemical formulas 13H, 14H, 17H, 20H-lanosta-8, 22H-diene-3 acetate, and racemosic acid. From the plant's latex, a peculiar thermostable aspartic protease was identified. Glauanol acetate was present in the stem bark and fruit [21–33].

Antifungal

The plant possess potent inhibitory effect against six types of fungus, viz. *Trichophyton mentagrophytas*, *Trichophyton rubrum*, *Trichophyton soundanense*, *Candida albicans*, *Candida krusei* and *Torulopsis glabrata* [34–35].

Antibacterial

The antibacterial potential of several leaf extracts against *Escherichia coli*, *Bacillus pumitis*, *Bacillus subtilis*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* was examined. The most efficient extract against the tested microorganism out of all those tested was petroleum ether extract [36].

Analgesic Potential

Using hot-plate and tail immersion techniques, the analgesic effects of ethanol extracts of *Ficus racemosa* Lin. bark and leaves were assessed. *Ficus racemosa* Lin. leaf extract significantly raised the latency time at 300 mg/kg, i.p., providing around 40.1% protection; the bark extract greatly enhanced the reaction time at 35% protection. They discovered that the presence of friedelin, behenate, bergenin, lupeol, and lupeol acetate caused an analgesic effect. [37] Similar results were obtained in the hot-plate test, where considerable analgesic efficacy was shown and persisted in mice for three hours after the decoction was administered. The petroleum ether extract significantly reduced the paw edema that carrageenan-induced in mice. [38].

Anti-inflammatory Potential

Ficus racemosa Lin. leaves extract was tested for its ability to reduce inflammation in models of rat hind paw oedema brought on by carrageenin, serotonin, histamine, and dextran. On the evaluated experimental models, the extract was proven to have considerable anti-inflammatory effect at dosages of 200 and 400 mg/kg. Using carrageenin, serotonin, histamine, and dextran-induced rat paw oedema, the extract (400 mg/kg) shown maximum anti-inflammatory efficacy that was 30.4, 32.2, 33.9, and 32.0% at the end of 3 hours, respectively. The extract (400 mg/kg) demonstrated a 41.5% reduction in granuloma weight in a chronic test. The extract's effects were comparable to those of the nonsteroidal anti-inflammatory drug prototype phenylbutazone. [39].

Antipyretic Potential

The methanol extract of *Ficus racemosa* Lin. bark given at a dose of 200 and 300 mg/kg bw showed a significant dose-dependent reduction in body temperature in both normal and yeast-induced pyrexia in albino rats. The antipyretic effect of the extract was comparable to that of paracetamol (150 mg/kg bw) a standard antipyretic drug. [40] The decoction and petroleum ether extract of the leaves manifested a significant antipyretic effect comparable to that of indomethacin against yeast-induced pyrexia in rats. [41]

Anti-tussive Potential

The antitussive Potential of the methanol extract of the stem bark of *Ficus racemosa* Lin. was evaluated using a mouse model of cough induction by sulphur dioxide gas. 90 minutes after treatment, the extract showed minimal inhibition of 56.9% at a dosage of 200 mg/kg. [42]

Hypotensive Potential

The glycoside-rich fraction of the *Ficus racemosa* Lin. leaf extracts showed strong hypotensive and vasodilator effects on sedated dogs as well as direct cardiac depressing Potential on isolated frog and rabbit hearts. Both behavioral Potential and acute toxicity in rats were unaffected by the extract. [43]

Anti-filarial Potential

Alcoholic and aqueous preparations of the fruits of *Ficus racemosa* Lin. prevented whole worms from moving on their own and prevented a preparation of *Setaria cervi* nerve muscles from contracting with greater amplitude and tone. Alcohol extract required concentrations of 250 and 50 g/mL and aqueous extract required concentrations of 350 and 150 g/mL, respectively, to stop the movement of the entire worm and nerve muscle preparation. In vitro, microfilaria were killed by aqueous extracts and alcohol, respectively. [44]

Radio Protective /Antioxidant Potential

Using the micronucleus assay, the radioprotective ability of Chinese hamster lung fibroblast cells was investigated. *Ficus racemosa* Lin, ethanolic water, and pretreatment extract in varying doses The fraction of micronucleated binuclear V79 cells significantly decreased 1h before 2 Gy of -radiation, indicating a potential radioprotective function. [45] *Ficus racemosa* Lin. stem bark methanol extract has demonstrated strong in vitro antioxidant compared to the methanol extract of its roots, Potential. [46] In the DPPH free radical scavenging assay, the ethanol extract of fruits demonstrated strong antioxidant Potential. Significant antioxidant Potential was demonstrated by 3-O-(E)- Caffeoyl Quinate. [47].

Cardioprotective Potential

The ability of a standardized extract of *Ficus racemosa* Lin. stem bark to protect the heart from doxorubicin-induced toxicity. The (TBARS) thiobarbituric acid reactive compounds were dramatically reduced by the extract, and the serum and heart tissue glutathione levels were elevated. [48]

Diabetic Problems

Ficus racemosa Lin. tannin fraction was administered, and it dramatically reduced the serum levels of insulin and high density lipoprotein as well as decreased blood glucose, total cholesterol, triglycerides, and low density lipoprotein. Moreover, tannins greatly improved the Potential of antioxidant enzymes like catalase, superoxide dismutase, and glutathione peroxidase while lowering glutathione peroxidase and glutathione levels, returning the organs' antioxidant state to normal. [49]

Hepatoprotective potential

CCl₄ administration caused a significant decrease in serum total protein, albumin, urea, and significantly increased in total bilirubin along with a marked elevation in the activities of aspartate aminotransferase, alanine ami-

notransferase, and alkaline phosphatase. These effects were due to the hepatoprotective effects of the petroleum ether and methanol extract of *Ficus racemosa* Lin. stem bark. Total protein and albumin levels in rats were significantly restored after pre-treatment with *Ficus racemosa* Lin. petroleum ether extract and *Ficus racemosa* Lin. methanolic extract.

Memory Enhancing Potential

In comparison to the control, the extract of *Ficus racemosa* Lin. at two concentrations of 250 and 500 mg/kg considerably increased Ach levels in the rat hippocampi. Ach levels were found to have increased by 22% or 38%, respectively. Also, the extract significantly decreased transfer latency on the elevated plus-maze, which was utilized as an exteroceptive behavioral model to assess memory in rats, at both dosage levels. It is discovered that *Ficus racemosa* Linn. may be useful in treating Alzheimer's disease.

Protective Renal Oxidative Injury

Rats were given extracts of *Ficus racemosa* Lin. at doses of 200 mg/kg and 400 mg/kg, and these treatments significantly reduced the activities of xanthine oxidase, lipid peroxidation, and gamma glutamyl transpeptidase. As a result, the extract of *Ficus racemosa* Lin. is an effective chemopreventive drug that reduces the nephrotoxicity caused by potassium bromate in rats.

Anti-filaria Potential

Both alcoholic and aqueous extracts of *Ficus racemosa* Lin. inhibited the spontaneous motility of whole worms and a *Setaria cervi* nerve muscle preparation marked by an increase in contraction amplitude and tone. In vitro, both extracts killed microfilaria. Alcoholic extracts' LC₅₀ and LC₉₀ values were 21 and 35 ng/ml and 27 and 42 ng/ml, respectively.

Anthelmintic Potential

Adult earthworms were used to test the crude extracts of *Ficus racemosa* Lin. stem bark for anthelmintic action. They showed a dose-dependent suppression of spontaneous motility and evoked responses to pin-prick, comparable to that of 3% piperazine citrate. Although the worms treated with the aqueous extract showed signs of wormicidal Potential, there was no complete recovery in their instance.

Wound Healing Potential

ethanol-based *Ficus racemosa* extract In rats with excised and incised wound models, Lin. stem bark demonstrated wound healing.

Renal anticarcinogenic Potential

Xanthine oxidase, lipid peroxidation, -glutamyl transpeptidase, and hydrogen peroxide levels were all significantly reduced by *Ficus racemosa* Lin. extract at doses of 200 mg per kilogram of body weight and 400 mg per kilogram of body weight, respectively. Renal glutathione level and antioxidant enzymes significantly recovered, although

DNA synthesis, blood urea nitrogen, serum creatinine, and renal ornithine decarboxylase Potential were reduced. When ferric nitrilotriacetate (Fe-NTA) was utilized as a kidney carcinogen, similar results were found. [50]

Larvicidal Potential

Ficus racemosa Lin. leaf and bark extracts were tested for their larvicidal effectiveness against early fourth-instar *Culex quinquefasciatus* larvae using crude hexane, ethyl acetate, etroleum ether, acetone, and methanol extracts (Diptera: Culicidae). The mortality of the larvae was seen after a 24-hour exposure. Although all extracts had a little larvicidal impact, the acetone extract of bark had the highest larval fatality rate. A tetracyclic triterpenes derivative was separated and identified thanks to the acetone extract's bioassay-guided fractionation. A novel chemical that is effective against mosquito larvae was discovered and named gluanol acetate. When it came to *Aedes aegypti* L. fourth-instar larvae, gluanol acetate was extremely effective. [51–54]

Anti-diarrhoeal Potential

The effectiveness of the *Ficus racemosa* Lin. stem bark ethanol extract as an anti-diarrheal agent has been demonstrated by its significant inhibitory Potential against castor oil-induced diarrhea and PEG2-induced enter pooling in rats. It also demonstrated a significant reduction in gastro intestinal motility in the charcoal meal test in rats. [55-57].

Antidiuretic Potential

Ficus racemosa Lin. bark decoction has an antidiuretic effect when taken in doses of 250, 500, or 1000 mg/kg body weight. It began quickly (within 1 hour), peaked after 3 hours, and persisted throughout the duration of the trial (5 h). Moreover, it decreased the Na⁺ level and Na⁺/K⁺ ratio in the urine and increased the osmolarity, indicating numerous modes of action. [58-59].

Conclusions

The field of pharmacology that encompasses the study of herbal medicine includes the study of "drugs" origin, physical and chemical properties, modes of action, absorption, distribution, biotransformation, excretion, and therapeutic applications. The pharmacological study of herbal medicine is still in its infancy in many ways. There is no question after reading this review that the diverse medicinal herb *F. racemosa* is being studied for a variety of biological functions. The phytochemistry and biological Potential of various components of *F. racemosa* has already been the subject of a sizable amount of research over the past few decades. A special source of several kinds of chemicals with varied chemical structures is *F. racemosa*. The biological Potential has not been the subject of very much study.

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