



Pharmacological Potentials of *Ficus racemosa* - A Review

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ABSTRACT

Ficus racemosa Linn. (Family; Moraceae) popularly known as the cluster fig tree or Gular, is famous medicinal plant in India, which is used in traditional system of medicine for a long time, for the treatment of various disorders like diabetes, liver disorders, diarrhoea, inflammatory conditions, haemorrhoids, respiratory and urinary diseases. This herb is mentioned in all ancient scriptures of Ayurveda, Siddha, Unani and Homeopathy. Various plant parts such as bark, root, leaf, fruits and latex are used as astringent, carminative, vermifuge and anti-dysentery. It is a good remedy for excessive appetite. The extract of fruit is used in diabetes, leucoderma, refrigerant, antiasthmatic, hepatoprotective, antioxidant, antiulcer and menorrhagia. It is used locally to relieve inflammation of skin wounds, lymphadenitis, in sprains and fibrositis. The present review is therefore, an effort to give a detailed study in Pharmacognostical, phytochemical & Pharmacological properties.

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

INTRODUCTION

The genus *Ficus* is an important group of trees which has various chemical constituents of promise medicinal value. It is a sacred tree of Hindus and Buddhists. Four species of this genus constitute the group "Nalpamaram", namely; *F. racemosa*, *F. microcarpa*, *F. benghalensis* and *F. religiosa* (Athi, Ithi, Peral and Arayal respectively)¹.

Ficus racemosa is also known as *F. Glomerata*. *Ficus racemosa* has various synonyms like Udumbara (Udumbara is considered sacred to God Dattaguru), yajnanga, yajniya, yajnyoga, yajnyasara, gular, Cluster Fig tree, Country fig tree etc. It has been used in ritual sacrifice. It is one of the ksiri vriksha – latex oozes out when the leaves are cut or plucked. It is one of the plants from a group, called pancavalkala, meaning the thick bark skins of five herbs, viz. udumbara, vata, asvattha, parisa and plaksa. The decoction of pancavalkala is used internally or for giving enema in bleeding per rectum and vagina (Raja Nighantu). Maharishi Charka has categorized udumbara as mutra sangrahaniya – anti-diuretic herb. Susruta has described the properties of the plant, like astringent, promotes callus healing in fractures (bhagna sandhaniya), alleviates Rakta pitta, burning sensation and obesity, and useful in vaginal disorders.

Habit and Habitat

The plant grows all over India in many forests and hills. It is frequently found around the water streams and is also cultivated. The tree is medium tall, growing 10-16 meters in height. The rich green foliage provides a good shade. The bark is reddish grey and often cracked.



Figure 1: Fruits, leaves, trunk of *Ficus racemosa*

Pharmacognostical characteristics

Macroscopical (Plant description)

Plant is native to Australia, South East Asia and the Indian Subcontinent. The plant grows all over India in many forests and hills². It is frequently found around the water stream and is also cultivated in villages for shade and its edible fruits³. The tree is medium tall (18m) with quite green foliage that provide good shade.

The leaves are dark green, 7.5-10 cm long, ovate or elliptic, in large clusters from old nodes of main trunk. The fruit receptacles are 2-5 cm in diameter, pyriform, in large clusters, arising from main trunk or large branches. The fruits resemble the figs and are green when raw, turning orange, dull reddish or dark crimson on ripening⁴. The seeds are tiny, innumerable, grain-like. The roots are long and brownish in colour. It's having characteristic odour and slightly bitter in taste.

Bark is reddish grey or greyish green, soft surface, uneven and often cracked, 0.5-1.8 cm thick, on rubbing white papery flakes come out from the outer surface, inner surface light brown, fracture fibrous, taste mucilaginous without any characteristic odour. Unlike the banyan, it has no aerial roots^{5,6}.

Taxonomy

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

Microscopical

The cork is made up of polygonal or rectangular cells. The phellogen is made up of 1-2 layers of thin walled cells. Phelloderm is well marked compact tissue consisting mainly of parenchymatous cells with isolated or small groups of sclereids, particularly in inner region. Sclereids are lignified with simple pits. Several parenchymatous cells contain single prism of calcium oxalate or some brownish content. The cortex is wide with numerous sclereids and some cortical cells contain resinous mass. Prismatic crystals of calcium oxalate are present in some of the cells.

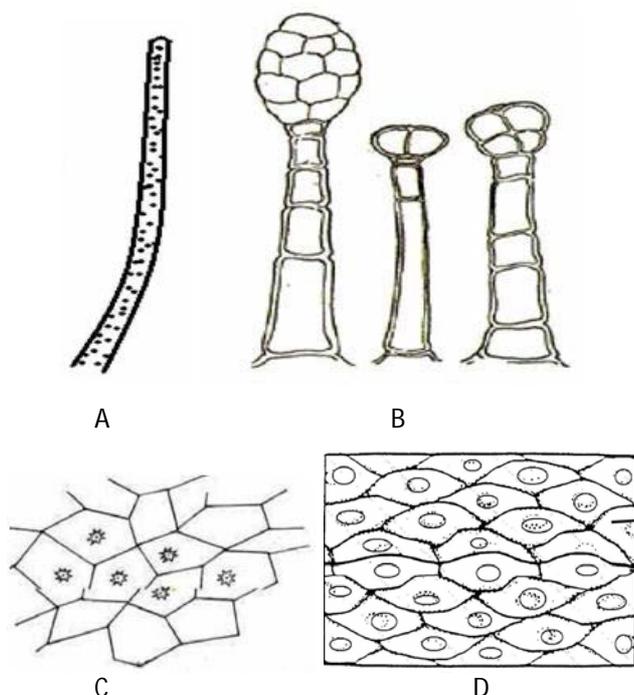


Figure 2: Microscopical character of *F. racemosa* (A- Fiber; B- Glandular Trichoems; C- Calcium Oxalate; D-Stone Cells)

Sclereids are rectangular or isodiametric and pitted thick walled. Phloem consists of sieve tubes, companion cells, phloem parenchyma, sclereids, phloem fibres and medullary rays. Starch grains are ovoid to spherical. Laticiferous vessels with a light brown granular material are present in the phloem region. Cambium is present in 2-3 layered of tangentially elongated thin walled cells. Figs are smooth or rarely covered with minute soft hair⁵⁻⁸.

Physical Constants

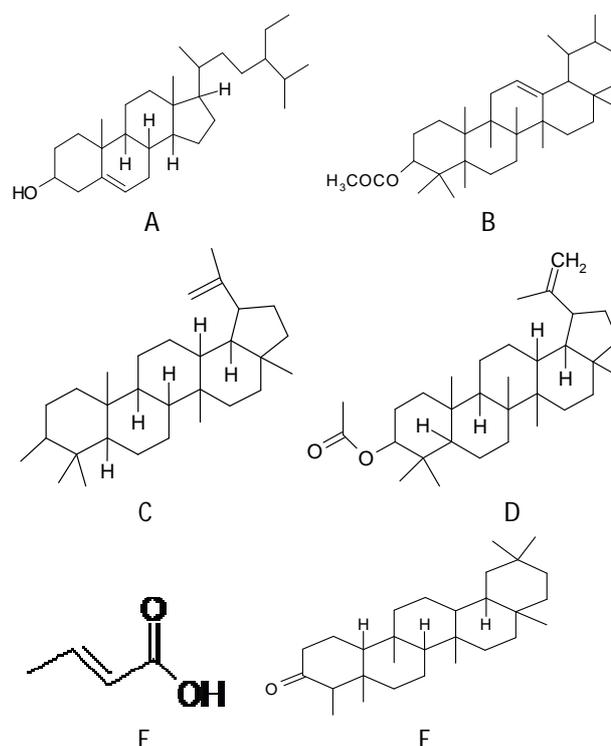
Foreign matter about 2, total ash 14, acid insoluble ash 1, alcohol soluble extractive 7 and water soluble extractive 9%⁹.

Active Principles

The stem bark of *Ficus racemosa* Linn contains tannin, wax, saponin gluanol acetate, β -sitosterol (A), leucocyanidin- 3 - O - β - D - glucopyranoside, leucopelargonidin - 3 - O - β - D - glucopyranoside, leucopelargonidin - 3 - O - α - L - rhamnopyranoside, lupeol (C), ceryl behenate, lupeol acetate, α -amyrin acetate(B), leucoanthocyanidin and leucoanthocyanin from trunk bark lupeol, β -sitosterol and stigmasterol were isolated¹⁰.

Fruit contains gluanol, hentriacontane, β sitosterol, gluanolacetate, glucose, tiglic acid (E), esters of taraxasterol, lupeol acetate (D), friedelin (F), higherhydrocarbons and other phytosterol¹¹.

A new tetracyclic triterpene gluanol acetate which is characterized as 13 α , 14 β , 17 β H, 20 α H-lanosta-8, 22-diene-3 β acetate and racemosic acid were isolated from the leaves. An unusual thermo stable aspartic protease was isolated from latex of the plant¹²⁻²³.



TRADITIONAL USES

Ficus racemosa Linn has been extensively used in traditional medicine for a wide range of ailments. Its bark, fruits, leaves, roots, latex and seeds are medicinally used in different forms, sometimes in combination other herbs²⁴.

Bark Bark is highly efficacious in threatened abortion and also recommended in urological disorders, diabetes, hiccough, leprosy, dysentery and piles^{25, 26-28}.

Leaves The leaves are good wash for wounds and ulcers. They are useful in dysentery and diarrhoea. The infusion of bark and leaves is also employed as mouth wash to spongy gums and internally in dysentery, menorrhagia, effective remedy in glandular swelling, abscess, chronic wounds, cervical adenitis and haemoptysis²⁷⁻²⁹.

Fruits The fruits are astringent, stomachic, refrigerent, dry cough, loss of voice, disease of kidney and spleen, astringent to bowel, styptic, tonic, useful in the treatment of leucorrhoea, blood disorder, burning sensation, fatigue, urinary discharges, leprosy, intestinal worms and carminative. They are useful in miscarriage, menorrhagia, spermatorrhoea, cancer, scabies, haemoptysis and visceral obstructions^{28, 30, 31}.

Roots Roots are used in dysentery, pectoral complaints and diabetes, applied in mumps, other inflammatory glandular enlargements and hydrophobia^{26, 27, 28}.

Latex Latex is aphrodisiac and administered in haemorrhoids, diarrhoea, diabetes, boils, traumatic swelling, toothache and vaginal disorders³².

Root sap is used for treating diabetes³³. The sap of this plant is a popular remedy for mumps and other inflammatory enlargements³⁴⁻³⁶.

PHARMACOLOGICAL ACTIVITIES

Antidiuretic

The decoction of *F. racemosa* bark has shown antidiuretic effect at doses of 250, 500 or 1000 mg/kg body weight. It had a rapid onset (within 1 h), peaked at 3 h and lasted throughout the study period (5 h). It also caused a reduction in urinary Na⁺ level and Na⁺/K⁺ ratio and an increase in urinary osmolarity indicating multiple mechanisms of action³⁷.

Antitussive

The methanol extract of stem bark was tested for its antitussive potential against a cough induced model by sulphur dioxide gas in mice. The extract exhibited maximum inhibition of 56.9% at a dose of 200 mg/kg (p.o.) 90 min after administration³⁸.

Anthelmintic

The crude extracts of bark were evaluated for anthelmintic activity using adult earthworms; they exhibited a dose-dependent inhibition of spontaneous motility (paralysis) and evoked responses to pin-prick,

which was comparable with that of 3% piperazine citrate. However, there was no final recovery in the case of worms treated with aqueous extract suggesting wormicidal activity³⁹.

Antibacterial

The hydro alcoholic extract of leaves was found effective against *Actinomyces viscosus*. The minimum inhibitory concentration was found to be 0.08mg/ml⁴⁰.

Antipyretic

Methanol extract of stem bark showed significant dose-dependent reduction in normal body temperature and in yeast-induced pyrexia in albino rats up to 5 h after drug administration, at doses of 100, 200 and 300 mg/kg body wt. p.o. The anti-pyretic effect was comparable to that of paracetamol⁴¹.

Wound healing

Ethanol extract of stem bark showed wound healing in excised and incised wound model in rats⁴².

Antifilarial

Alcoholic as well as aqueous extracts caused inhibition of spontaneous motility of whole worm and nerve muscle preparation of *Setaria cervi* characterized by increase in amplitude and tone of contractions. Both extracts caused death of microfilariae in vitro. LC50 and LC90 were 21 and 35 ng/ml, respectively for alcoholic, which were 27 and 42 ng/ml for aqueous extracts⁴³.

Antidiarrhoeal

Ethanol extract of stem bark was evaluated for antidiarrhoeal activity against different experimental models of diarrhoea in rats. It showed significant inhibitory activity against castor oil induced diarrhoea and PGE2 induced enteropooling in rats. These extracts also showed a significant reduction in gastrointestinal motility in charcoal meal tests in rats. The results obtained established its efficacy as anti-diarrhoeal agent⁴⁴.

Anti-inflammatory

The anti-inflammatory activity of *F. racemosa* extract was evaluated on carrageenin, serotonin, histamine and dextran-induced rat hind paw edema models. The extract (400 mg/kg) exhibited maximum anti-inflammatory effect of 30.4, 32.2, 33.9 and 32.0% with carrageenin, serotonin, histamine, dextran-induced rat paw oedema, respectively. In a chronic test, the extract (400 mg/kg) showed 41.5% reduction in granuloma weight, which was comparable to that of phenylbutazone⁴⁵.

Bioassay-guided fractionation of the ethanol extract of leaves isolated racemosic acid. It showed potent inhibitory activity against COX-1 and 5-LOX in vitro with IC50 values of 90 and 18 μM, respectively⁴⁶.

Ethanol extract of stem bark also inhibited COX-1 with IC50 value of 100 ng/ml proves that the drug is used in the treatment of inflammatory conditions⁴⁷.



Antiulcer

The 50% ethanol extract of fruits was studied in different gastric ulcer models, viz pylorus ligation, ethanol and cold restraint stress induced ulcers in rats at a dose of 50, 100 and 200 mg/kg body weight p.o. for 5 days twice daily. The extract showed dose dependent inhibition of ulcer index in all three models of ulcer^{48,49}.

Analgesic

The ethanol extract of bark and leaves showed dose dependent analgesic activity when evaluated for analgesic activity by analgesiometer at 100, 300 and 500 mg/kg and was found to possess⁵⁰.

Hepatoprotective

An ethanolic extract of the leaves shown hepatoprotective activity in rats by inducing chronic liver damage by subcutaneous injection of 50% v/v carbon tetrachloride in liquid paraffin at a dose of 3 mL/kg on alternate days for a period of 4 weeks. The biochemical parameters SGOT, SGPT, serum bilirubin and alkaline phosphates were estimated to assess the liver function⁵¹.

In another study, the methanol extract of stem bark at the doses of 250 and 500 mg/kg was evaluated for its hepatoprotective activity in rats against carbon tetrachloride induced liver damage with silymarin as standard. It showed significant reversal of all biochemical parameter towards normal when compared to carbon tetrachloride treated control rats in serum, liver and kidney⁵².

Radio protective/antioxidant

Ethanol extract and water extract were subjected to free radical scavenging both by steady state and time resolved methods. The ethanol extract exhibited significantly higher steady state antioxidant activity. It also exhibited concentration dependent DPPH, ABTS, hydroxyl radical and superoxide radical scavenging and inhibition of lipid peroxidation when tested with standard compounds.

In vitro radio protective potential was studied using micronucleus assay in irradiated Chinese hamster lung fibroblast cells (V79). Pre-treatment with different doses 1h prior to 2 Gy γ -radiation resulted in a significant decrease in the percentage of micro nucleated binuclear V79 cells suggesting its role as radio protector⁵³.

The methanol extract of stem bark has shown potent in vitro antioxidant activity when compared to the methanol extract of its roots⁵².

The ethanol extract of fruits, exhibited significant antioxidant activity in DPPH free radical scavenging assay. 3-O-(E)-Caffeoyl quinate showed significant antioxidant activity⁵⁴.

Antifungal

The plant showed potent inhibitory activity against six species of fungi, viz. *Trichophyton mentagrophytas*, *Trichophyton rubrum*, *Trichophyton soundanense*,

Candida albicans, *Candida krusei* and *Torulopsis glabrata*^{55,56}.

Hypoglycemic

Methanolic extract of the stem bark in dose of 200 and 400 mg/kg p.o. lowered the glucose level in normal and alloxan-induced diabetic rats. The activity was also comparable to that of the effect produced by a standard antidiabetic agent, glibenclamide (10 mg/kg) proving its folklore claim as antidiabetic agent⁵⁷⁻⁵⁹.

The relationship of the post absorptive state to the hypoglycemic studies on *F. racemosa* showed that the absorption of the drug leads to a better hypoglycemic activity⁶⁰.

The ethanolic extract (250 mg/kg/day, p.o.) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming its hypoglycemic activity⁶¹.

β -sitosterol (1) isolated from the stem bark was found to possess potent hypoglycemic activity when compared to other isolated compounds⁶¹.

Methanol extract of powdered fruits at the dose 1, 2, 3, and 4 g/kg reduced the blood glucose level in normal and alloxan induced diabetic rabbits⁶².

Ethanolic extract of leaves at the dose of 100 mg/kg body weight, lowered the blood glucose levels by 18.4 and 17.0% at 5 and 24 h, respectively, in sucrose challenged streptozotocin induced diabetic rat model⁶³.

Hypolipidemic

Pronounced hypocholesterolemic effect was induced when Dietary fibre content of fruits were fed to rats in diet, as it increased fecal excretion of cholesterol as well as bile acids⁶⁴.

Hypolipidemic activities of ethanolic extract of bark were studied at the doses of 100-500 mg/kg body weight to alloxan-induced diabetic rats. Investigation showed that extract had potent antidiabetic and hypolipidemic effects when compared to that of the standard reference drug, glibenclamide⁵⁹.

Larvicidal

The larvicidal activity of crude hexane, ethyl acetate, petroleum ether, acetone and methanol extracts of the leaf and bark were assayed for their toxicity against the early fourth-instar larvae of *Culex quinquefasciatus* (Diptera: Culicidae). The larval mortality was observed after 24-h exposure. All extracts showed moderate larvicidal effects; however, the highest larval mortality was found in acetone extract of bark. The bioassay-guided fractionation of acetone extract led to the separation and identification of a tetracyclic triterpenes derivative. Gluanol acetate was isolated and identified as new mosquito larvicidal compound. Gluanol acetate was quite potent against fourth-instar larvae of *Aedes aegypti* L. (LC (50) 14.55 and LC (90) 64.99 ppm), *Anopheles stephensi*Liston (LC (50) 28.50 and LC (90) 106.50 ppm)



and *C. quinquefasciatus* Say (LC (50) 41.42 and LC (90) 192.77 ppm)⁶⁵.

Renal anticarcinogenic

F. racemosa extract in dose of 200 mg/kg body weight and 400 mg/kg body weight significantly decreased xanthine oxidase, lipid peroxidation, γ -glutamyl transpeptidase and hydrogen peroxide. There was significant recovery of renal glutathione content and antioxidant enzymes, decrease in the enhancement of renal ornithine decarboxylase activity, DNA synthesis, blood urea nitrogen and serum creatinine⁶⁶. Similar results were obtained when Ferric nitrilotriacetate (Fe-NTA) was used as renal carcinogen⁶⁷.

Both the results proved that the extract is a very potent chemopreventive agent.

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