

PHYTOPHARMACOLOGICAL PROPERTIES OF FICCUS RACEMOSA LINN - AN OVERVIEW

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ABSTRACT

Ficus racemosa is a moderate sized avenue tree found throughout India. It is popular in indigenous system of medicine like ayurveda, siddha, unani and homoeopathy. In the traditional system of medicine various plant parts such as bark, root, leaves, fruits and latex are used in dysentery, diarrhoea, diabetes, stomachache, piles and as carminative and astringent and also as antioxidant and anticancer agent. The present review is therefore, an effort to give a detailed survey of the literature on its pharmacological properties.

Keywords: Phytopharmacological, antioxidant, antiseptic, antidiuretic, taraxasterol, piperazine citrate, *Ficus Racemosa*.

INTRODUCTION

Medicinal plants continue to be an important therapeutic aid for alleviating the ailments of human kind. The search for eternal health and longevity and for remedies to relieve pain and discomfort drove early man to explore his immediate natural surroundings and led to the use of many plants, animal products, and minerals, etc. and the development of a variety of therapeutic agents. Today, there is a renewed interest in traditional medicine and an increasing demand for more drugs from plant sources. This revival of interest in plant-derived drugs is mainly due to the current widespread belief that “green medicine” is safe and more dependable than the costly synthetic drugs, many of which have adverse side effects. According to Ventakamaran¹, the taxonomy treatment of the Moraceae family constitutes large taxa of over fifty genera and nearly 1400 species, including some important groups like *Artocarpus*, *Morus* and *Ficus*. Several species belonging to the genera of *Ficus* were reported to contain furanocoumarins which is an important plant phototoxins². Ventakamaran also claimed that Moraceae family contains phytochemistry related to flavonoids, flavonoids with isoprenoid substituents and stilbenes. Antioxidants from figs can protect lipoproteins in plasma from oxidation and produce a significant increase in plasma antioxidant capacity³.

Ficus racemosa Linn (Moraceae) is an evergreen, moderate to large sized spreading, lactiferous, deciduous tree, without much prominent aerial roots found throughout greater part of India in moist localities and is often cultivated in villages for its edible fruit⁴. Different parts of *F. racemosa* are traditionally used as fodder, edible and ceremonial⁵. All parts of this plant (leaves, fruits, bark, latex, and sap of the root) are medicinally important in the traditional system of medicine in India. The leaves powdered and mixed with honey is given in bilious infections⁶. Fruits are a good remedy for visceral obstruction and also useful in regulating diarrhea and constipation⁷. The astringent nature of the bark has been employed as a mouth wash in spongy gum and also internally in dysentery, menorrhagia and haemoptysis⁸. The bark is antiseptic, antipyretic and vermifugal, and the decoction of bark is used in the treatment of various skin

diseases, ulcers and diabetes. It is also used as a poultice in inflammatory swellings/boils and regarded to be effective in the treatment of piles, dysentery, asthma, gonorrhoea, gleet, menorrhagia, leucorrhoea, hemoptysis and urinary diseases⁹. Apart from the usage in traditional medicine, scientific studies indicate *F. racemosa* to possess various biological effects such as hepatoprotective¹⁰, chemopreventive¹¹, antidiabetic¹², anti-inflammatory¹³, antipyretic¹⁴, antitussive¹⁵ and antidiuretic¹⁶. The bark has also been evaluated for cytotoxic effects using 1BR3, Hep G2, HL-60 cell lines and found to be safe and less toxic than aspirin, a commonly consumed anti-inflammatory drug¹⁷.



Ficus Racemosa

Taxonomy

Kingdom : Plantae
Division : Magnoliophyta
Class : Magnolipsida
Order : Urticales
Family : Moraceae
Genus : *Ficus*
Species : *F. racemosa*

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.

MORPHOLOGICAL CHARACTERS

The tree is medium tall with quite rich green foliage that provides good shade. The leaves are dark green, 7.5-10 cm long, ovate or elliptic. The fruit receptacles 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 ripening. The seeds tiny, innumerable, grain-like, the outer surface of the bark consists of easily removable translucent flakes grayish to rusty brown, uniformly hard and non-brittle.

CHEMICAL COMPOSITION

Root: cycloartenol, euphorbol and its hexacosanoate, taraxerone, tinyatoxin; Bark euphorbol and its hexacosanoate, ingenol and its triacetate, taraxerone.

Stem: campesterol, hentriacontane, hentriacontanol, kaempferol, stigmasterol, methyl ellagic acid.

Leaves: Tetra triterpene, glauanol acetate, racemosic acid.

Fruit: glauanol, hentriacontane, β sitosterol, glauanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higher hydrocarbons and other phytosterol.

Latex: a-amyrin, β -sitosterol, cycloartenol, cycloeuophordenol, 4-deoxyphorbol and its esters, euphol, euphorbinol, isoeuphorbol, palmitic acid, taraxerol, tinyatoxin, tirucallol, trimethyl ellagic acid.

Traditional Uses:

The roots, bark-skin, fruits, latex and leaves have great medicinal value. It is one of the herbs mentioned in all ancient scriptures of Ayurveda. Udumbara is considered sacred to God Dattaguru. It is otherwise called Udumbara. Udumbara has various synonyms like yajnanga, yajniya, yajnyoga, yajnyasara etc. suggesting its use in ritual sacrifice. It is one of the ksiri viksa – on cutting or plucking the leaf, latex oozes out. 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-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. The roots, bark-skin, fruits, latex and leaves of udumbara have great medicinal value. Udumbara is used both, internally as well externally, externally; the latex is applied on chronic infected wounds to alleviate edema, pain and to promote the healing. The tender leaf buds are

applied on the skin, in the form of paste, to improve the complexion; the decoction of leaves is salutary in washing the wounds for better cleansing and healing. The decoction of its bark-skin is an effective gargle in stomatitis and sore throat. Application of latex alleviates the edema in adenitis, parotitis, orchitis, traumatic swelling and toothache. Internally, udumbara is used in vast range of maladies. The decoction of bark skin is extremely useful in diarrhea, dysentery and ulcerative colitis. In children, the latex is given along with sugar to combat diarrhea and dysentery. The cold infusion of ripened fruits mixed with sugar, is salutary in Rakta pitta is effectively controlled with the decoction of bark-skin. In diabetes, the ripe fruits or bark-skin decoction is beneficial, as it works well as anti-diuretic. The decoction of leaves is an effective remedy in glandular swelling, abscess, chronic wounds, cervical adenitis etc. In uterine bleeding, abortion, leucorrhoea and vaginal bleeding the decoction of its bark-skin is given orally, as well as in a form of basti (enema). The latex mixed with sugar is benevolent in sexual debility in males. The juice of its fruit is a panacea for hiccup. The powder of the bark-skin works well as an anorexiant, hence, beneficial in gyperphagia-bhasmaka. According to Ayurveda, roots are useful in hydrophobia whereas bark is acrid, cooling, galactagogue and good for gynaecological disorders. Fruits are astringent to bowels, styptic, tonic and useful in the treatment of leucorrhoea, blood disorders, burning sensation, fatigue, urinary discharges, leprosy, menorrhagia, epistaxis and intestinal worms. According to Unani system of medicine, leaves are astringent to bowels and good in case of bronchitis whereas fruits are useful in treatment of dry cough, loss of voice, diseases of kidney and spleen. Bark is useful in Asthma and piles. Latex is applied externally on chronic infected wounds to alleviate edema, pain and to promote the healing. The tender leaf buds are applied on the skin, in the form of paste, to improve the complexion^{18,19}.

PHYTOCHEMICAL PROPERTIES

The stem bark of *Ficus racemosa* contains tannin, wax, saponin glauanol acetate, β -sitosterol, leucocyanidin- 3 – O – β – D – glucopyranoside, leucopelargonidin – 3 – O – β – D – glucopyranoside, leucopelargonidin – 3 – O – α – L – rhamnopyranoside, lupeol, ceryl behenate, lupeol acetate, α -amyrin acetate, leucoanthocyanidin, and leucoanthocyanin from trunk bark, lupeol, β -sitosterol and stigmasterol were isolated²⁰. Fruit contains glauanol, hentriacontane, β sitosterol, glauanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higherhydrocarbons and other phytosterol²¹. A new tetra triterpene glauanol 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 thermostable aspartic protease was isolated from latex of the plant. The stem bark and fruit showed the presence of glauanol acetate²².

PHARMACOLOGICAL PROPERTIES**Hypoglycemic activity:**

The ethanol extract (250mg/kg/day) lowered blood glucose level within 2 weeks in the alloxan diabetic albino

rats confirming its hypoglycemic activity²³. β -sitosterol isolated from the stem bark was found to possess potent hypoglycemic activity when compared to other isolated compound²

Hypolipidemic activity:

Fruits when fed to rats in diet induced hypocholesterolemic effect, as it increased faecal excretion of cholesterol²⁵.

Renal anti carcinogenic:

Ficus racemosa extract at a dose of 200 and 400 mg/kg when given orally a significant decrease in lipid peroxidation, xanthine oxidase, γ -glutamyl transpeptidase and hydrogen peroxide (H₂O₂) generation with reduction in renal glutathione content and antioxidant enzymes generated by Potassium bromate (KBrO₃), a potent nephrotoxic agent that induces renal carcinogenesis in rats. There was significant recovery of renal glutathione content and antioxidant enzymes. There was also reversal in the enhancement of renal ornithine decarboxylase activity, DNA synthesis, blood urea nitrogen and serum creatinine²⁶. This result suggests that *Ficus racemosa* extract is a potent chemopreventive agent and suppresses KBrO₃-mediated nephrotoxicity in rats.

Wound healing:

Ethanol extracts of stem bark show a potent wound healing in excised and incised wound model in rat²⁷.

Antioxidant and a probable radioprotector:

Ethanol extract (FRE) and water extract (FRW) of *Ficus racemosa* were subjected to free radical scavenging both by steady state and time resolved methods such as nanosecond pulse radiolysis and stopped-flow spectrophotometric analyses. FRE exhibited significantly higher steady state antioxidant activity than FRW. FRE exhibited concentration dependent DPPH, ABTS, hydroxyl radical and superoxide radical scavenging and inhibition of lipid peroxidation with IC₅₀ comparable with tested standard compounds. *In vitro* radioprotective potential of FRE was studied using micronucleus assay in irradiated Chinese hamster lung fibroblast cells (V79). Maximum radioprotection was observed at 20 μ g/ml of FRE. The cytokinesis-block proliferative index indicated that FRE does not alter radiation induced cell cycle delay. Based on these results it is evident that the ethanol extracts of *F. racemosa* acts as a potent antioxidant and a probable radioprotector²⁸.

Hepato protective:

Methanol extract of *Ficus racemosa* stem bark were studied using the model of hepatotoxicity induced by carbon tetrachloride (CCl₄) in rats. CCl₄ administration induced a significant increase in total bilirubin associated with a marked elevation in the activities of aspartate aminotransferase (AST), alanine aminotransferase (ALT) and alkaline phosphatase (ALP) as compared to control rats. Pretreatment with methanol extract resulted in significant decreases in the activities of AST, ALT and ALP, compared to CCl₄-treated rats. The results indicate

that *F. racemosa* possesses potent hepatoprotective effects against CCl₄-induced hepatic damage in rats²⁹.

Anti bacterial activity:

Different extracts of leaves were tested for antibacterial potential against *Escherichia coli*, *Bacillus pumitis*, *Bacillus subtilis*, *Pseudomonas aureus*. Out of all extracts tested, petroleum ether extract was the most effective extract against the tested microorganism³⁰.

Antifungal activity of Ficus racemosa:

The 50% methylene chloride in hexane flash column fraction of the extract of the leaves of *Ficus racemosa* was found to have antifungal activity. The extract inhibited the growth of several plant pathogens (*Curvularia* sp, *Colletotrichum gloeosporioides*, *Alternaria* sp, *Corynespora cassiicola* and *Fusarium* sp). Psoralen was identified as the active compound and was shown to be biodegradable, having the potential to be developed as a fungicide against pathogens causing diseases on crops of economic importance³¹.

Antidiarrhoeal:

Ethanol extract of stem bark has shown significant inhibitory activity against castor oil induced diarrhea and PEG2 induced enteropooling in rats and also showed a significant reduction in gastro intestinal motility in charcoal meal test in rats which proves its efficacy as antidiarrhoeal agent³².

Anthelmintic:

The bark extract were evaluated for anthelmintic activity using adult earthworms, which exhibited a spontaneous motility (paralysis) With 50 mg/mL of aqueous extract the effects were compared with 3% piperazine citrate. There was no final recovery in the case of worms treated with aqueous extract in contrast to piperazine citrate, the worms recovered completely within 5 h. This result shows the anthelmintic nature of the extract³³.

Antidiuretic:

The decoction (D) of the bark of *Ficus racemosa* at a dose of 250, 500 or 1000 mg/kg induced antidiuresis, had a rapid onset (within 1 h), peaked at 3 h and lasted throughout the study period (5 h). However, antidiuretic potential of D was about 50% lower than that of ADH. The D was well tolerated even with subchronic administration. The D caused a reduction in urinary Na⁺ level and Na⁺/K⁺ ratio, and an increase in urinary osmolarity indicating multiple mechanisms of action. This proves its efficacy as antidiuretic agent¹⁶.

Antialgestic:

The ethanol extract of bark and leaves evaluated for analgesic activity by analgesimeter at 100, 300 and 500mg/kg was found to possess dose dependent analgesic activity³⁴.

CONCLUSION

The present study shows the pharmacological properties of various bioactive compounds present in the plant. The stem bark and fruits are used in India for the treatment of various diseases. Methanol extracts of *Ficus racemosa* contained relatively higher levels of total phenolics than the other extract. Antioxidants from figs can protect lipoproteins in plasma from oxidation and produce a significant increase in plasma antioxidant capacity. The antioxidant potential of the extracts can be assessed by employing different in vitro assays. The ethanolic extract showed a greater effect against pathogens, worms and renal carcinoma in rat compared with the standard drugs. *Ficus racemosa* possesses various phytochemical and pharmacological properties as discussed in present paper. However, more Clinical and Pathological studies should be conducted to investigate the active potentials of bioactive compounds present in this plant.

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