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Ficus racemosa linn:A boon for ailments of human kind

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ABSTRACT

The medicinal plants are widely used by the traditional medical practitioners for curing various diseases in their day to day practice. In traditional systems of medicine, different parts (leaves, stem, root, fruit, seeds, latex and even whole plant) of *Ficus Racemosa Linn* (commonly known in all over India as udumbara, gular fig.) have been recommended for the treatment of diarrhea, diabetes, hypertension, gastric ulcer, wound healing etc. *Ficus Racemosa Linn.* Showed a wide range of pharmacological actions like hypoglycemic, hypolipidemic, renal anti-carcinogenic, anti-diuretic, anti-tussive, hepatoprotective, radioprotective, anti-ulcer, anti-inflammatory, anti-diarrhoel and anti-fungal. β-sitosterol, glauanol acetate, the active constituent present in *Ficus Racemosa L.*, has been found to be largely responsible for the therapeutic potentials of gular. Although because of its great therapeutic potentials and wide occurrence in India the practitioners of traditional systems of medicine have been using *Ficus Racemosa L.* for curing various ailments, a rational approach to this traditional medical practice with modern system of medicine is, however, not much available. In order to establish the therapeutic uses of *Ficus Racemosa L.* in modern medicine, in last few decades several Indian scientists and researchers have studied the pharmacological effects of ethanolic, methanolic & aqueous extracts of various parts of gular plant. These pharmacological studies have established a scientific basis for therapeutic uses of this plant. Thereby, the objective of this review is an attempt to provide a detailed survey of literature on traditional uses and pharmacological properties of the plant as a boon for ailments of human kind.

Keywords: *Ficus Racemosa Linn*, anti-convulsant, radio protective/anti-oxidant, anti-diarrhoeal.

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INTRODUCTION

Plants are one of the most important sources of medicines. Today the large numbers of drugs in use are derived from plants, like morphine from *Papaver somniferum*, Aswagandha from *Withania somnifera*, Ephedrine from *Ephedra vulgaris*, Atropine from *Atropa belladonna*, Reserpine from *Roulphia serpentina* etc. The medicinal plants are rich in secondary metabolites (which are potential sources of drugs) and essential oils of therapeutic importance. The important advantages claimed for therapeutic uses of medicinal plants in various ailments are their safety besides being economical, effective and their easy availability[1, 2].

Medicinal plants continue to be an important therapeutic aid for alleviating the ailments of human kind. With a view to increasing the wide range of medicinal usages, the present day entails new drugs with more potent and desired activity with less or no side effects against particular disease[3]. According to Ventakamaran, 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. *F. racemosa, F. bengalensis and F. deltoidea* are some of the commonly occurring trees of this genus belonging to the family Moraceae[4]. *Ficus Racemosa Linn* commonly known as gular is the most popular member of the genus Ficus. *Ficus Racemosa Linn* is a one of the herbs mentioned in all ancient scriptures of Ayurveda. Udumbara is considered scared to god Dattaguru. All ficus species possess latex-like material within their vasculatatures that provide protection and self healing from physical assaults[5]. Various studies indicates that *Ficus Racemosa Linn* have great medicinal uses in the management of various types of diseases like diabetes, and fungal infections.

Among various pharmacological properties, *Ficus Racemosa Linn* imparts an important role as anti-oxidant and a probable radio protector. Herbal radio protectors have been gaining prime importance in radio protective drug discovery due to lesser side effects as reviewed extensively by many authors[6, 7]. Such free radical scavengers exert a key role in radio protection; because radiation induced cytotoxicity is mediated mainly through generation of free radicals in the biological system[8]. Reactive oxygen species (ROS) interact with some biological cellular macromolecules such as proteins, lipids, DNA, which leads to functional changes. The damage to DNA and membrane lipids are critical factors in radiation induced cellular damage and reproductive cell death[8]. Another study which also provides the evidence of drug in anti-cancer activity indicates that the extract of *Ficus Racemosa Linn* is a potent chemo-preventive agent and suppresses Potassium bromate ($KBrO_3$) - mediated nephrotoxicity in rats[9]. *Ficus Racemosa Linn*

possesses potent hepatoprotective effects against Carbon tetra chloride (CCl_4) - induced hepatic damage in rats[10]. Taken all together *Ficus Racemosa Linn* possesses great therapeutic potential.

Phytochemical Properties

The stem bark of *Ficus Racemosa Linn* contains tannin, wax, saponin gluanol acetate, β-sitosterol, leucocyanidin- 3 – O – β – D - glucopyrancoside, 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 isolated[11]. Fruit contains glauanol, hentriacontane,β sitosterol, glauanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higherhydrocarbons and other phytosterol[12]. A new tetra triterpene glauanol acetate which is characterized as 13α, 14β, 17βH, 20 α H-lanosta-8, 22-diene-3βacetate and racemosic acid were isolated from the leaves. An unusual thermo stable aspartic protease was isolated from latex of the plant. The stem bark and fruit showed the presence of glauanol acetate[13].

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 herbs[14].

Bark

Bark is reddish grey or grayish 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[15, 16]. It is highly efficacious in threatened abortion and also recommended in urological disorders, diabetes, hiccough, leprosy, dysentery and piles[17, 19, 20, 21].

Leaves

Leaves are dark green, 7.5-10 cm long, glabrous; receptacles small subglobose or piriform, in large clusters from old nodes of main trunks. The leaves are good wash for wounds and ulcers. They are useful in dysentery and diarrhea. 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 haemoptysis[18, 19, 20, 21].

Fruits

The fruits 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 ripening. The fruit of F. Racemosa is ¾ inch to 2 inches long, circular and grows directly on the trunk. Tender fruits are astringent, stomachic, refrigent, 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[21, 22, 23].

Roots

The roots of *Ficus Racemosa Linn* are long and brownish in colour. It's having characteristic odour and slightly bitter in taste. Roots are used in dysentery, pectoral complaints, and diabetes, applied in mumps, other inflammatory glandular enlargements and hydrophobia[19, 20, 21].

Latex

Latex is aphrodisiac and administered in hemorrhoids, diarrhea, diabetes, boils, traumatic swelling, toothache and vaginal disorders[24].

Fruit, Bark, and Leaves of Ficus Racemosa has been shown in Figure. 1

Figure1:Fruit, Bark, and Leaves of Ficus Racemosa

MARKETED FORMULATIONS

Currently available marked formulations are Asamgrahaniya kasaya churna, Udumbarasara, Udumbaravaleha, Udumbramtra, and Diabet Guard.

PHARMACOLOGICAL ACTIVITIES

The whole parts of the plant exhibit wide spectrum of pharmacological activities and used such as hypoglycemic, hypolipidemic, renal anti-carcinogenic, anti-diuretic, anti-tussive, hepatoprotective, radioprotective, anti-ulcer, antiinflammatory, antidiarrhoeal and antifungal etc.

Hypoglycemic:

There are more than one type of hypoglycemic principles, both organic and inorganic, in *Ficus Racemosa Linn* fruits which produce a significant fall in blood glucose levels in normal and alloxan-diabetic rabbits by producing an organotropic effect on the B-cells which results in an increased release of insulin from the pancreatic beta cells. *Ficus Racemosa Linn* fruits pulp may, in the long run after more detailed studies, prove to be a more valuable anti-diabetic agent as in addition to its insulin releasing and insulin-like activities. Methanol extract of powered fruits at the dose 1, 2, 3, and 4 g/kg reduced the blood glucose level in normal and alloxan induced diabetic rabbits[25].

On the other hand the glucose-lowering efficacy of methanol extract of the stem bark was evaluated both in normal and alloxan-induced diabetic rats at the doses of 200 and 400 mg/kg p.o. 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 anti-diabetic agent[26-28].

The ethanol extract (250 mg/kg/day, *p.o.*) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming its hypoglycemic activity[29]. β-sitosterol isolated from the stem bark was found to possess potent hypoglycemic activity when compared to other isolated compounds[29].

Ethanolic extract of leaves lowered the blood glucose levels by 18.4 and 17.0% at 5 and 24 hr, respectively, in sucrose challenged streptozotocin induced diabetic rat model at the dose of 100 mg/kg body weight[30].

Hypolipidemic:

Dietary fiber content of fruits when fed to rats in diet induced pronounced hypocholesterolemic effect, as it increased fecal excretion of cholesterol as well as bile acids[31].

Hypolipidemic activities of ethanolic extract of bark were studied at the doses of 100-500 mg/kg b.w to alloxan-induced diabetic rats. Investigation showed that extract had potent anti-diabetic and hypolipidemic effects when compared to that of the standard reference drug, glibenclamide[28].

Anti-oxidant and a probable radio-protector:

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 of *Ficus Racemosa* Extract (FRE) was studied

using micronucleus assay in irradiated Chinese hamster lung fibroblast cells (V79). Pretreatment with different doses of FRE 1hr 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 protector[32].

The methanol extract of stem bark has shown potent *in vitro* antioxidant activity when compared to the methanol extract of its roots[33].

The fruit ethanol extract exhibited significant antioxidant activity in DPPH free radical scavenging assay. 3-*O*-(*E*)-Caffeoyl quinate showed significant antioxidant activity[34].

Anti-diuretic:

The decoction of the bark of *Ficus Racemosa Linn* is claimed as an anti-diuretic and its potential is evaluated in rats using three doses (250, 500 or 1000 mg/kg). It had a rapid onset (within 1 hr), peaked at 3 hr and lasted throughout the study period (5 hr). It also caused a reduction in urinary Na+ level and Na+/K+ ratio, and an increase in urinary osmolarity indicating multiple mechanisms of action[35].

Renal anti carcinogenic:

Ficus Racemosa Linn 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 (H_2O_2) generation with reduction in renal glutathione content and antioxidant enzymes generated by $KBrO_3$, 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, and blood urea nitrogen and serum creatinine[9]. This result suggests that *Ficus Racemosa Linn* extract is a potent chemo-preventive agent and suppresses $KBrO_3$-mediated nephrotoxicity in rats.

Antifungal:

The 50% methylene chloride in hexane flash column fraction of the extract of the leaves of *Ficus Racemosa Linn* 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 importance[36].

Hepatoprotective:

Methanol extract of *Ficus Racemosa Linn* stem bark were studied using the model of hepatotoxicity induced by CCl_4 in rats. CCl_4 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 CCl_4-treated rats. The results indicate that *Ficus Racemosa Linn* possesses potent hepatoprotective effects against CCl_4-induced hepatic damage in rats[37].

Anti-tussive:

The methanol extract of stem bark was tested for its Anti-tussive 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 administration[38].

Antibacterial:

The hydro alcoholic extract of leaves was found effective against Actinomyces vicosus. The minimum inhibitory concentration was found to be 0.08mg/ml[39].

Anti-diarrhoeal:

Ethanol extract of stem bark has shown significant inhibitory activity against castor oil induced diarrhea and PEG_2 induced enter pooling in rats and also showed a significant reduction in gastro intestinal motility in charcoal meal test in rats which proves its efficacy as anti-diarrheal agent[40].

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 hr. This result shows the anthelmintic nature of the extract[41].

Anti-pyretic:

Methanol extract of stem bark was evaluated on normal body temperature and yeast-induced pyrexia in albino rats, at doses of 100, 200 and 300 mg/kg b.w *p.o.* It showed significant dose dependent reduction in normal body temperature and yeast-provoked elevated temperature which extended up to 5 hr after drug administration. The anti-pyretic effect was comparable to that of paracetamol[42].

Anti-filarial:

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 microfilaria in vitro. LC_{50} and LC_{90} were 21 and 35 ng/ml respectively for alcoholic, which were 27 and 42 ng/ml for aqueous extracts[43].

Anti-analgesic:

The ethanol extract of bark and leaves evaluated for analgesic activity by analgesio-meter at 100, 300 and 500mg/kg was found to posse's dose dependent analgesic activity[44].

Anti-inflammatory:

The anti-inflammatory activity of *Ficus Racemosa Linn* 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 phenylbutazone[45].

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 IC 50 values of 90 and 18 μm, respectively[46].

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 conditions[47].

Wound healing:

Ethanol extracts of stem bark show a potent wound healing in excised and incised wound model in rat[48].

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 hr 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) [49].

Anti-ulcer/Gastro-protective:

Gastro-protective effect of 50% ethanolic extract of *Ficus Racemosa Linn* known as *F. glomerata* fruit (FGE) was studied in different gastric ulcer models in rats. FGE prevents the oxidative damage of gastric mucosa by blocking lipid peroxidation and by significant decrease in superoxide dismutase, H^+K^+ATPase and increase in catalase activity. The H^+K^+ATPase are the

dimeric enzyme responsible for H^+ secretion by the gastric parietal cells. H^+K^+ATPase are selectively blocked by the action of ranitidine, an acid blocker used to treat gastric ulcers[50, 51].

The therapeutic potentials of *Ficus Racemosa Linn* have been depicted in Figure. 2

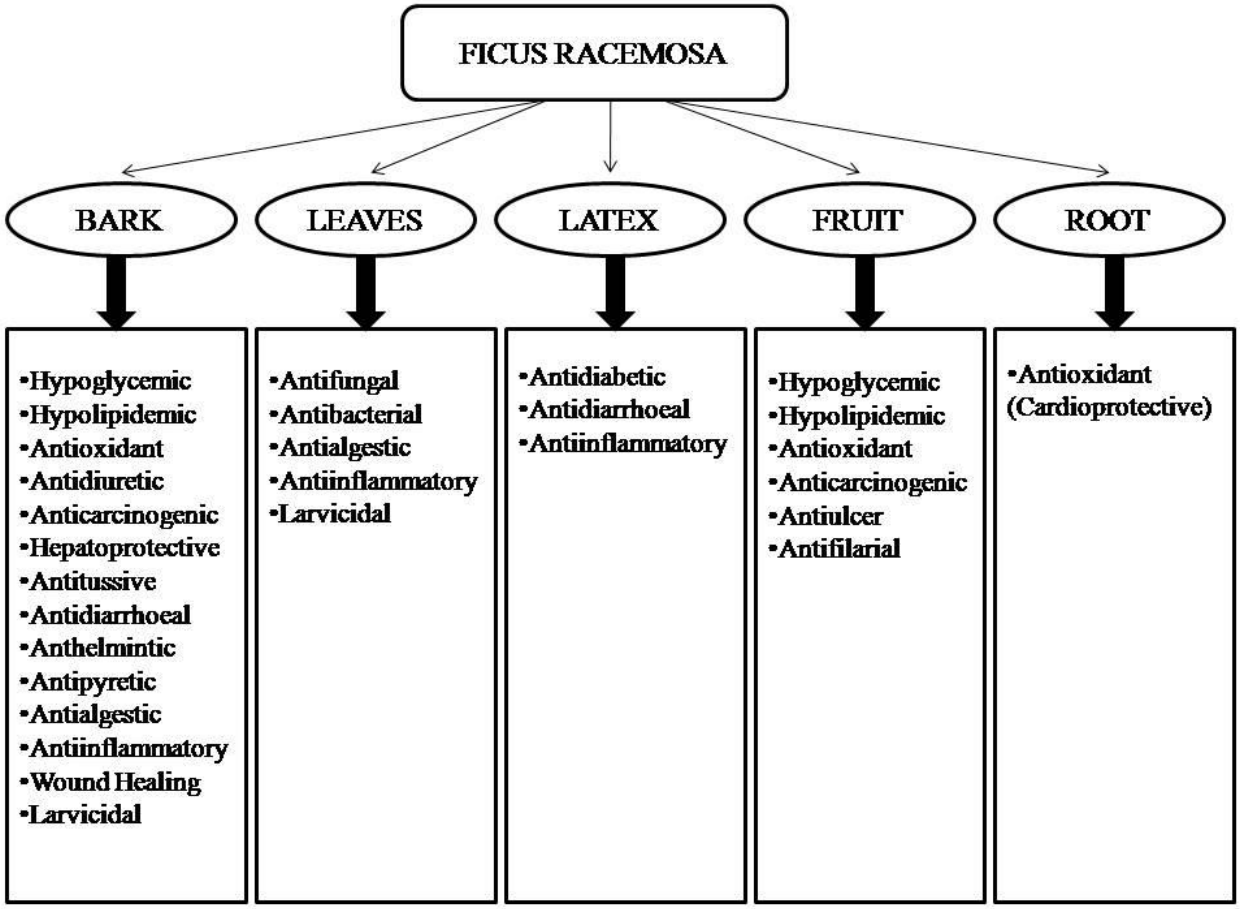

Figure 2:Therapeutic Potential of different parts of *Ficus Racemosa Linn.*

CONCLUSION

The present study shows the pharmacological properties and therapeutic potential of various bioactive compounds present in the plant. On the bases of its pharmacological properties it may be concluded that the present single herbal intervention proven itself a magical remedy for various disorders and it's worthwhile to mention that the *Ficus Racemosa Linn* on the basis of its antioxidant and hypolipidemic activities may be explored for the various chronic vascular complications. However, further clinical studies are needed to evaluate the therapeutic potential of this plant in clinical practice.

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