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Pharmaceutical Potential of Ficus Racemosa Linn-A Review

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ABSTRACT: Ficus racemosa Linn, commonly known as udumber is a plant which available easily in every region of our country. People use traditionally its various plant parts such as bark, root, leaves, fruits and latex in treatment of dysentery, diarrhoea, diabetes, stomach-ache, piles, skin diseases and as carminative and astringent. It is largely use in ayurveda, siddha, unani, homoeopathy medicine system as an anti-oxidant, anti cancer, anti-diuretic, anti bacterial, anti-inflammatory, memory enhancing and gastro-protective agent. In this review, emphasis is lead upon research opportunity on Ficus racemosa Linn for its huge pharmaceutical potential.

KEYWORDS: Ficus racemosa Linn., Udumber, Gular, anti-diuretic, gastro-protective.

I. INTRODUCTION

The plant Ficus racemosa Linn (Udumbara) has several therapeutic uses in the traditional system. All parts of the plant are involved in medicinal cure. Leaves tend to cure bilious infection. Fruits are known to counter constipation and diarrhea. Bark of the plant cures dysentery, spongy gums, ulcers, diabetes, asthama, leucorrhoea and urinary problems. With its traditional uses, udumbara has many biological properties like antitussive, chemo preventive, hepatoprotective, anti-inflammatory, anti-diuretic, and antipyretics. All parts of the plant contain number of phytochemicals which are responsible for fighting with aliments. [1]

Udumbara is one of the few widely described plants in the Vedic literature. It is very useful material for yogna (rituals) or homa. The twigs of plant are used as both brushes. It is the member of the four sacred trees Nalpamara (ksirivrkas) meant to be planted around the home and temples.

Ficus racemosa Linn (moraceae) is an evergreen moderate to large sized spreading, lactiferous, deciduous tree, found throughout greater part of India. It is foundin evergreen forests, deciduous forests and moist localities up to 1800 m above the sea level. It is cultivated over outer Himalayan ranges, Khasia mountain, Punjab, Rajasthan, Chota Nagpur, Odisha, Karnataka, Kerala, and Deccan plateau. It is deciduous tree can grow up to medium level up to a height of 10 to 16 meters. It is frequently available around the water streams and is also cultivated. The leaves of the plant are ovate or elliptical shape. These are 7 to 10 cm long and has green colour. The leaves wither in December and flourish during January to April. Flowers of the plant are sheathed within the fruits as these are not visible differently. The fruits are edible and of pear shape. They grow in clusters arising from the main branch. These are 2 to 5 cm in diameter. The colour of the raw fruit is green and become orange or dark crimson on ripening. Ripe fruit has a scented smell. The seeds are so small, grain like and plenty in number. Bark is of greyish brown color 0.5 to 1.8 cm thick uneven with soft surface and cracked. The inner surface of the bark is of light brown color with fibers. It tastes like mucilage without any particular smell. The plant can be grown by vegetative as well as sexual propagation (using seeds). In India the tree and it's fruits are called "gular" in the north and "atti" in the south. This plant is universally used in traditional system of medicine for the treatment of numerous disorders. It is good medication for excessive appetite. [2-6]

II. TAXONOMY [7]

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta

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Division	Magnoliophyta
Class	Magnolipsida
Subclass	Hamamelididae
Order	Urticales
Family	Moraceae
Genus	Ficus
Species	F . Racemosa

III. VERNACULAR NAME OF FICUS RACEMOSA

Language	Name
Sanskrit	Jantu phala, Jantukaphala, Hemadugdha, Yajnayoga
Hindi	Gular, Dumar, Umari, Pani bhuj, Udumbara.
English	Gular fig, Cluster fig, Count fig, Redwood fig.
Odia	Dimri, Dumbri or Dumber.
Bengali	Udumbara, Dumur.
Telgu	Brahmamamidi, Atti, Bodda, Medi pandu.
Gujarati	Goolar, Umbaro.
Manipuri	Heibong.
Marathi	Umbar, Udumbara.
Urdu	Dumar
Konkani	Rhumbud
Kannada	Atti, Atti mara
Irula	Athi
Tamil	Malaiyin munivan
Nepalese	Dumrii
Thai	Ma-duer uthumphon
Sinhalese	Attikka
Vietramese	Sung.

IV. CHEMICAL CONSTITUENTS

The racemosa Linn species contains primary and secondary metabolites like carbohydrates, mucilage, alkaloids, flavonoids, steroids, tannins, terpinoids, phenolic substance, glycosides, saponins, coumarins, triterpenoids, alpha-phenolics, bergapten, bergaptol, lanosterol, stigmasterol, lupen-3-one, beta-sitosterol-d-glucoside, and vitamin K, alpha-hydroxyl ursolic acid, proto catechuic acid, oleanolic acid, rusolic acid, maslinic acid also used for treating many diseases.

Leaves: The non-enzymatic constituents like phenoli components flavonoids, vitamin C and the enzymatic constituents like ascorbate oxidase, ascorbate peroxidase, catalase peroxidase, quercitin-3-glucoside, rutin and methyl esters of leucoanthocyanins.

Root: Cycloarterol, euphorbul and it's hexacosanoate, traxerone, tinyatoxin, bark euphorbol and it's hexacosanoate, ingenol and it's triacetate.

Stem: Campesterol, hentracontane, hentria contanol, kaempferol, stigmasterol, methyl ellagic acid.

Leaves: Tetra triterpene, glauanol acetate, racemosic acid.

Fruits: Glauanol, hentriacontane, beta-sitosterol, glaunanolacetate, glucose, tiglic acid, esters of taraxasterol, lupeolacetate, friedelin, higher hydrocarbons and other phytosterol.

Latex: a-amyrin, beta-sitosterol, cycloartenol, cycloeuphordenol, isoeuphorbol, palmitic acid, taraxerol, tinyatoxin, tirucallol, trimethyl ellagic acid.

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V. PHYTOCONSTITUENTS

Leaf	Sterols, tannins and flavonoids, triterpenoids (lanosterol) and alkaloids. A new tetracyclic triterpene glauanol acetate which is characterised as 13alpha, 14beta, 17betaH, 20alphaH, 20alphaH-lanosta-8, 22-diene-3 beta-acetate and racemosic acid were isolated from the leaves.[8]
Stem-Bark	Tannin, wax, saponin glauanol acetate, beta-sitosterol, leucocyanidin-3-0-beta-D-glucopyrancoside, leucopelargonidin-3-0-beta-D-glucopyranoside, lupeol, ceryl behenate, lupeolacetate, alpha-amyrin acetate, leucoanthocyanidin, and leucoanthocyanin from trunk bark, leuanol acetate, leupeol, beta-sitosterol and stigmasterol were isolated from stem bark.[9]
Trunk-Bark	Upenol, beta-sitosterol and stigmasterol.[9]
Fruit	Glauanol, glauanol acetate, hentriacontane, beta-sitosterol, glaunanolacetate, glucose, tiglic acid, esters of taraxasterol and other phytosterol.[10]
Root	Cycloartenal, euphorbi and it's hexacosanoate, taraxerone, tinyatoxin, bark euphorbol and it's hexacosanoate, ingenol and it's triacetate, taraxerone.[11]
Latex	a-amyrin, beta-sitosterol, cycloartenol, cycloartenol, cycloeuphordenol, 4-deoxyphorbol and it's esters, euphol, euphorbinol, isoeuphorbol, palmitic acid, taraxeros, tinyatoxin, tirucallol, trimethyl ellagic acid. [12]

VI. PHARMACOLOGICAL PROFILE

Hypoglycemic Activity:- The ethanol extract (250mg/kg/day) lowered blood glucose level within 2 weeks in the alloxan diabetic albino rats confirming it's hypoglycemic activity. Beta-sitosterol isolated from the stem bark was found posses potent hypoglycemic activity when compared to other isolated compound. [13]

Anti-oxident Activity: 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. [14]

Hepato Protective Activity: 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 a sparatate amino transferase (AST), alanine amino transferase (ALT) and alkaline phosphate (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 hepato Protective effects against CCl4- induced hepatic damage in rats. [15]

Anti-tussive Activity: 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 200mg/kg 90 min after administration. [16]

Anti-ulcer/Gastro-protective Activity: 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 considerable 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. [17]

Wound Healing: Ethanol extract of stem bark showed wound healing in excised and incised wound model in rats. [18]

Anthelmintic Activity: 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 respones 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 activity. [19]

Anti-diuretic Activity: 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 1hr) peaked at 3h and lasted throughout the study period (5h). However, anti-diuretic potential of D was well tolerated even with subchronic administration. The D caused a reduction in urinary

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Na+ level and Na+/K+ ratio, and an increase in urinary osmolarity indicating multiple mechanisms of action. This proves it's efficacy as anti-diuretic agent. [20]

Antidiarrheal Activity: Ethanol extract of stem bark has shown significant inhibitory activity against castor oil induced diarrhoea and PEG_2 induced enteropooling in rats and also showed a significant reduction in gastro intestinal motility in charcoal meal test in rats which proves it's efficacy as antidiarrheal agent. [21]

Chemo-preventive Activity: (Ahmed et al., 2009) The is treatment given orally to the rats by two methods, incidence tumors in ferric nitrilotriacetate (fe-NTA) it induced chemotoxicity in rats and potassium bromate induced nephrotoxicity in rats. Ficus racemosa extract (PM Paarakh, 2009) was given at 200 and 400 mg/kg BW it results in decrease of xanthin oxidase, gama-glutamyl tranpeptidase, lipid peroxidation and H_2O_2. It also shows recovery in blood urea nitrogen, serum creatinine, renal OCD activity and DNA synthesis by evaluating decrease in all this parameters it shows chemo-preventive Activity.

Anticancer Activity: ficus racemosa extract at a dose of 200 and 400 mg kg-1 when given orally a considerable decrease in lipid peroxidation, xanthin oxidase, gama-glutamyl tranpeptidase and hydrogen peroxide (H_2O_2) generation with decrease in renal glutathione content and antioxidant enzymes generated by potassium bromate ($KBrO_3$), a nephrotoxic agent that induces renal carcinoma in rats. There was considerable recovery of renal glutathione content and antioxidant enzymes. These results recommended that ficus racemosa extract is a potent chemopreventive agent and supress $KBrO_3$ mediated nephrotoxicity in rats. [22]

Antibacterial Activity: The hydroalcoholic extract of leaves was effective against actinomyces viscous. The minimum inhibitory concentration was found to be 0.08 mg/ml. [23]

Anti-inflammatory Activity: The anti-inflammatory activity of f. racemosa extract was evaluated on carrageenin, serotonin, histamine, and dextran induced rat hind paw edema models. The extract (400mg/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 chromic test, the extract (400 mg/kg) showed 41.5% reduction in granuloma weight, which was comparable to that of phenylbutazone. 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 18um, respectively. 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. [24]

Memory Enhancing Activity: Alzheimer disease (AD) is a progressive neurodegenerative disorder resulting in dementia and enhancement of acetylcholine (Ach) levels in brain using acetyl cholinesterase inhibitors is one of the most important approaches for the treatment of AD. Aqueous extract ficus racemosa Linn (moraceae) bark having anti-inflammatory, antioxidant and anticholinesterase activity was evaluated for it's ability to enhance Ach levels, and to acertain it's antidementia activity in rats. This work was carried out under the assumption that the f. racemosa extract may show combination of action which could be beneficial in the treatment of AD. Such as neuro protection, attributed to antioxident and anti-inflammatory property and may elevate levels of Ach levels and improved memory in rats. The collective pharmacological action attributed by f. racemosa extract may serve as beneficial and supporting agent in the treatment of AD. [25]

Hypolipidemic Activity: Fruits when fed to rats in diet induced hypocholesterolemic effect, as it increased faecal excretion of cholesterol. [26]

Renal Anticarcinogenic Activity: Ficus racemosa extract a dose of 200 and 400 mg/kg when given orally a significant decrease in lipid peroxidation, xanthin oxidase, gama-glutamyl tranpeptidase and hydrogen peroxide (H_2O_2) generation with reduction in renal glutathione content and antioxidant enzymes generated by potassium bromate ($KBrO_3$), 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, blood urea nitrogen and serum creatinine, this result suggest that ficus racemosa extract is potent chemopreventive agent and supress $KBrO_3$ mediated nephrotoxicity in rats. [27]

Antifungal Activity: The plant showed potent inhibitory activity against six species of fungi, viz Trichophyton metagrophytas, Trichophyton rubrum, Trichophyton soundanense, Candida albicans, Candida krusei and Torulopsis glabrata. [28]

Antipyretic Activity: Methanol extract of stem bark showed significant dose-dependent reduction in normal body temperature and In yeast induced pyrexia in albino rats up to 5hr after drug

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administration at doses of 100, 200, and 300 mg/kg body wt, the antipyretic effect was comparable to that of paracetamol. [29]

Antifilarial Activity: Alcoholic as well as aqueous extract inhibition of spontaneous motility of whole worm and nerve muscle preparation of setaria cevi characterised 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-1 for aqueous extracts. [30]

Larvicidal Activity: The larvicidal activity of crude hexane, ethyl acetate, petroleum ether, acetone, and methanol extract 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 24hr exposure. All extract showed moderate larvicidal effect, however, the highest larval mortality was found in actone 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 stephensiliston (LC (50) 28.50 and LC (90) 106.50 ppm) and C. quinquefasciatus say (LC (50) 41.42 and LC (90) 192.77 ppm). [31]

Antifertility Activity: (Dheeraj et al, 2011). The extract shows antifertility about 70% reduction in sperm count, motility, viability and abnormal morphology was determined reduction in weight of reproductive organ and the level of sialic acid in epididymis and fructose in seminal vesicle the bark extract shows 80% of vaginal contraception.

Angiotensin Converting Enzyme Inhibitor Activity: (Ahmed et al; 2010) Cold aqueous extract (FRC) and hat aqueous extract (FRH) given close dependently and shows inhibition activi against porcine kidney and rabbit lung ACE. As compare to cold aqueous extract hat aqueous extract shows higher angiotensin activity both extract shows higher inhibition on porcine kidney and rabbit lung ACE. FRH lower IC50 values at concentration 1.36 and 1.91 ug/ml for porcine kidney and rabbit lung ACE when compared with FRC at concentration 128 and 291 ug/ml. Angiotensin Converting Enzyme Inhibition studied by radial scavenging activity. The both extract was given dose dependently it shows maximum inhibition about 87% and 75% for extract FRC and FRH at concentration 25 ug/ml FRH at 10.8 ug/ml shows lower IC50 value compared with 15.8 ug/ml and 16.5 ug/ml concentration of FRC and BHT (butylated hydroxytoluene).

Cardioprotective Activity: (Voumik et al, 2010) Acetone extract of f. racemosa Linn bark it shows cardio Protective Activity against doxorubicin-induced cardio toxicity in rats the cardio Protective Activity was evaluated by biochemical parameters are CK-MB, AST, LDH, ALT, troponin, thiobarbituric acid and glutathione.

Analgestic Activity: The ethanol extract of bark and leaves evaluated for analgestic activity by analgesiometer at 100, 300 and 500 mg/kg was found to posses dose dependent analgestic activity. [32]

VII. SIDE EFFECTS

1. f. racemosa is coolant tree, precaution is taken while using kapha dominant person with recurrent allergic rhinitis, caugh and cold.
2. Ripe fruit avoided in use of culinary it causes or worsen the intestinal worm infestation.
3. Safety is taken during pregnancy.

VIII. TRADITIONAL USES

Ficus racemosa Linn has been extensively used in traditional medicine for a wide range of ailments. It's bark, fruits, leaves, roots, latex, and seeds are medicinally used in different forms, sometimes in combination other herbs. [33]

Bark:- Bark is highly efficacious in threatened abortion and also recommended in arological disorders, diabetes, hiccough, leprosy, dysentery and piles. [34]

Leaves:- The Leaves are good wash for wound 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 haemoptysis. [35]

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 obstruction.

Roots:- Roots are used in dysentery, pectoral complaints and diabetes, applied in mumps, other inflammatory glandular enlargements and hydrophobia.

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Latex:- Latex is aphrodisiac and administration in haemorrhoids, diarrhoea, diabetes, boils, traumatic swelling, toothache and vaginal disorders.
Root Sap:- Root sap is used for treating diabetes. The Sap of this plant is a popular remedy for mumps and other inflammatory enlargements. [36]

IX. CONCLUSION

In our country there are 400 different tribal and ethnic groups are present. They occupy 7.5 % of total population. These groups have discovered different traditional medicines for various diseases from natural sources around them to fulfill their needs. Ficus racemosa is a such traditional medicine which gives a huge benefits to that community. Now it receive attention for research and evaluation on modern scientific lines such as Phytochemical analysis, Pharmacological screening and Clinical trials. Ficus racemosa contains a number potential active constituents which able to possesses various pharmacological activity as discuss in this article. It will be helpful enormously for more clinical and pharmacological studies to find out the unexploited potential of this plant.

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