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Pharmacognostic and phytochemical properties of Ficus carica Linn –An overview

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Abstract: *Ficus carica* grows in tropical and subtropical regions of India, it is used in indigenious system of medicine like ayurveda, siddha, unani and homoeopathy. Different biologically active compounds were isolated form this plant. The barks, leaves,fruits are considered to be very effective in various treatments, such as diabetes, skin diseases, ulcers, dysentry, diarrohoea, stomachache, piles . Latex is widely used for warts, skin ulcers and sores, and taken as a purgative and vermifuge. The present review is therefore, an effort to give a detailed survey of the literature on its Pharamacognosy, phytochemistry, and traditional properties.
Key words: pharmacognosy , antioxidant, hypoglycemic, anaemic , fucosterol, flavonoids, Ficus carica.

Introduction:

Ficus constituted one of the largest genera of medicinal plants with about 750 species of woody plants, trees, and shrubs primarily occurring in subtropical and tropical regions through out the world. The genus is remarkable for the large variation in the habits of its species[1]. In India, the most important species of *Ficus* are *F. bengalensis, F. carica, Ficus racemosa and F. elastica*. *Ficus carica* is commonly referred as " Fig". Various parts of the plant like bark, leaves, tender shoots, fruits, seeds, and latex are medicinally important. The fig is a very nourishing food and used in industrial products. It is rich in vitamins, mineral elements, water, and fats. Figs are one of the highest plant sources of calcium and fiber. According to USDA data for the Mission variety, dried figs are richest in fiber, copper, manganese, magnesium, potassium, calcium, and vitamin K, relative to human needs. They have smaller amounts of many other nutrients. Figs have a laxative effect and contain many antioxidants. They are good source of flavonoids and polyphenols[2]. and some bioactive compounds such as arabinose, β-amyrins, β- carotines, glycosides, β-setosterols and xanthotoxol [3-5]. The dried figs produced a significant increase in plasma antioxidant capacity[6] and also used in various disorders such as gastrointestinal respiratory, inflammatory ,cardiovascular disorders, ulcerative diseases, and cancers[7-10]. In traditional medicine the roots are used in treatment of leucoderma and ringworms and its fruits which are sweet, have antipyretic, purgative, aphrodisiac properties and have shown to be useful in inflammations and paralysis[11,12]. *F. carica* has been reported to include antioxidant, antiviral, antibacterial, hypoglycemic, cancer suppressive, hypotriglyceridaemic, and anthelmintic effects [13-15]. This study was aimed to present an overview of traditional, phytochemical and pharmacological investigations of bioactive compounds present in this plant.

Taxonomy:

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

Ficus carica

Habit and habitat:

The fig grows well in mediterranean and dryer warm-temperate climates. The fig is a deciduous tree, to 50 ft tall, but more typically to a height of 10 - 30 ft. The large, wavy-margined leaves are usually 5 lobed but may have only 4 or 3 lobes. The leaves are conspicuously palmately veined. Their branches are muscular and twisting, spreading wider than they are tall. Fig wood is weak and decays rapidly. The trunk often bears large nodal tumors, where branches have been shed or removed. The twigs are terete and pithy rather than woody. The sap contains copious milky latex.

Morphological characters:

Bark: The bark is a smooth and silvery gray.
Leaves : Fig leaves are bright green, single, alternate and large (to 1 ft length). They are more or less deeply lobed with 1 - 5 sinuses, rough hairy on the upper surface and soft hairy on the underside.
Flowers: The tiny flowers of the fig are out of sight, clustered inside the green "fruits", technically a synconium. Pollinating insects gain access to the flowers through an opening at the apex of the synconium.
Fruits: The matured "fruit" has a tough peel (pure green, green suffused with brown, brown or purple), often cracking upon ripeness, and exposing the pulp beneath. The interior is a white inner rind containing a seed mass bound with jelly-like flesh.
Seeds: Seeds may be large, medium, small or minute and range in number from 30 to 1,600 per fruit. The edible seeds are numerous and generally hollow, unless pollinated. Pollinated seeds provide the characteristic nutty taste of dried figs.

Chemical composition:

Stem: campesterol, hentriacontanol, , stigmasterol, euphorbol and its hexacosanate, ingenol and taraxerone.
Leaves: moisture, 67.6%; protein, 4.3%; fat, 1.7%; crude fiber, 4.7%; ash, 5.3%; N-free extract, 16.4%; pentosans, 3.6%; carotene , bergaptene, stigmasterol, sitosterol, and tyrosine. Ficusin, taraxasterol, beta-sitosterol, rutin ,sapogenin, Calotropenyl acetate, lepeolacetate and oleanolic
Latex: caoutchouc (2.4%), resin, albumin, cerin, sugar and malic acid, rennin, proteolytic enzymes, diastase, esterase, lipase, catalase, and peroxidase.
Seed: Dried seeds contain 30% of a fixed oil containing the fatty acids: oleic, 18.99%; linoleic, 33.72%; linolenic, 32.95%; palmitic, 5.23%; stearic, 2.1 8%; arachidic, 1.05%. It is an edible oil and can be used as a lubricant.

Traditional uses:

The fig is one of the earliest fruit trees cultivated by primitive man. Figs are having a definite laxative effect and a high alkalinity of ash. The laxative effect is probably due to the bulk of seeds and fibre combined with some specific solvent present in the juice. In Mediterranean countries, the fig is so widely used both fresh and dried that it is called ‘the poor man’s food’ Sushruta included the fruit in a medicated clarified better for internal use in fever, consumption , asthmaand epilepsy. The fruit juice with honey is used to check haemorrhagia. In unani medicine anjeer is used as a mild laxative, expectorant and diuretic. Anjeer is used for the diseases in liver and spleen. The dry fruits of anjeer is a supplement food for diabetics. Sweets in the markets with sugar free for diabetics contain ficus carica . the paste of fruit is applied in swellings, tumours and inflammation for relieving pain. Figs provide minerals , calcium and phosphorus; dried figs are also high in iron. The figs are astrigent and carminative; the dried figs are given in doses of 150 gram with honey in menorrhagia, hepatitis and dysentery; the figs are very useful in diabetes; A decoction of dried figs is an excellent mouthwash for sore throat and aphthous complaints of the mouth. Boil figs in water to get a decoction and used twice a day to set right urinary disorders and to melt small stones. Boil the bark of fig in water along with neem, mango and peepal barks, this decoction is very useful to wash and soothe ulcers caused by burns. Intaking dry fig fruit everyday to build body resistance and for natural daily requirement of vitamins. Due to the iron-rich content of fig, it is ideal to include it in one's diet in anaemic condition. The burnt ash of the fig fruit is highly basic in nature and can be consumed a tsp before meals to counter hyperacidity. The enzyme ficin present in the fig latex is responsible for its

anthelmintic activity and can be given with great benefit in worm infestations especially ascaris and tricharus types. Figs are a good source of potassium, a mineral that helps to control blood pressure.The fig leaves are added to boiling water and used as a steam bath for painful or swollen piles.The leaf decoction is taken as a remedy for diabetes and calcifications in the kidneys and liver.The milky juice of the freshly-broken stalk of a fig has been found to remove warts on the body.

Phytochemical properties:

F. carica have numerous bioactive compounds such as Mucilages, flavinoids, vitamins, enzymes, nicotinic acid, and tyrosin. Ficusin, bergaptene, stigmasterol, psoralen, taraxasterol, beta-sitosterol, rutin ,sapogenin, Calotropenyl acetate, lepeolacetate and oleanolic acid sistosterol are present in the leaf. The plant also contains arabinose, β-amyrins, β- carotines, glycosides, β-setosterols and xanthotoxol[16-18]. Umbelliferone[19,20], campesterol, , fucosterol, fatty acids[21], 6-(2- methoxy-Z-vinyl)-7-methyl-pyranocoumarin and 9,19-cycloarlane triterpenoid as an anticancer[22] and 6-O-acyl-*β*-Dglucosyl -*β*-sitosterol [23], calotropenyl acetate, and lupeol acetate [24]as an antiproliferative agent.

Phytopharmacological properties[25-33]:

Hepatoprotective activity:

Significant reversal of biochemical, histological and functional changes where induced by petroleum ether extract treatment in rifampicin treated rats, indicating promising hepatoprotective activity .

Hypoglycemic activity:

The leaf extract induced a significant hypoglycaemic effect in oral or intraperitoneal administration in streptozotocin- diabetic rats . Weight loss was prevented in treated diabetic rats and the survival index was significantly altered by plasma insulin levels. Results show that *Ficus carica* aqueous extract has a clear hypoglycemic activity.

Hypolipedimic activity:

Livers from 8-week-old roosters (n = 24) with high abdominal fat pad ratios were extracted, sliced, and cultured with increasing concentrations of leaf extract , insulin and both of them. While insulin significantly increased TG secretion (0.190 ± 0.013 mmol/l), TG content (0.523 ± 0.093 mmol/l) and TC secretion (1.727 ± 0.412 mmol/l) above the basal level ($P < 0.001$), when leaf extract was added these effects were drastically reduced to the basal level in a concentration dependent manner ($P < 0.001$). These results suggest that Ficus carica leaf extract could be a beneficial supplement to modulate TG and TC secretion in poultry liver.

Anticancer activity:

Bio active compounds like 6-*O*-acyl-β-d-glucosyl-β-sitosterols, the acyl moeity being primarily palmitoyl and linoleyl with minor amounts of stearyl and oleyl, has been isolated as a potent cytotoxic agent from fig (*Ficus carica*) latex. Both the natural and the synthetic compounds showed in vitro inhibitory effects on proliferation of various cancer cell lines.

Antioxidant activity:

The potential health-promoting constituents of fig fruits were studied with six commercial fig varieties differing in color (black, red, yellow, and green) were analyzed for total polyphenols, total flavonoids, antioxidant capacity, and profile of anthocyanins. In the dark-colored mission and the red Brown-Turkey varieties, the anthocyanin fraction contributed 36 and 28% of the total antioxidant capacity, C3R (cyanidin-3-*O*-rutinoside) contributed 92% of the total antioxidant capacity of the anthocyanin fraction. Fruits of the mission variety contained the highest levels of polyphenols, flavonoids, and anthocyanins and exhibited the highest antioxidant capacity.

Scavenging activity and immune response:

The water extract (WE) and crude hot-water soluble polysaccharide (PS) from *Ficus carica* L. fruit were investigated for scavenging abilities on DPPH, superoxide and hydroxyl radicals and reducing power. The immune activities of PS were evaluated using the carbon clearance test and serum hemolysin analysis in mice. Both WE and PS have scavenging activities on DPPH with the EC_{50} (0.72, 0.61) mg/ml, respectively. The PS showed higher scavenging activity than WE on superoxide radical (EC_{50}, 0.95 mg/ml) and hydroxyl anion radical (scavenging rate 43.4% at 4 mg/ml). The PS (500 mg/kg) also has a significant increase in the clearance rate of carbon particles and serum hemolysin level of normal mice. This indicates the scavenging activity and immune responses of the extract.

Anti-pyretic activity:

The ethanol extract of *Ficus carica*, at doses of 100, 200 and 300 mg/kg showed significant dose-dependent reduction in normal body temperature and yeast-provoked elevated temperature. The effect extended up to five hours after drug administration when compared to that of Paracetamol (150 mg/kg.), a standard anti-pyretic agent. This shows the anti pyretic effect of ethanol extract:

Antibacterial activity:
The methanol extract of (MICs, 0.156 to 5 mg/ml; MBCs, 0.313 to 5 mg/ml) showed a strong antibacterial activity against oral bacteria. The combination effects of methanol extract with ampicillin or gentamicin were synergistic against oral bacteria. It is proved that figs could act as a natural antibacterial agent .

Anti fungal activity:
Methanolic, hexanoïc, chloroformic and ethyl acetate extracts of *Ficus carica* latex were investigated for their invitro antimicrobial proprieties against five bacterial species and seven strains of fungi. The antimicrobial activity of the extracts was evaluated and based respectively on the inhibition zone using the disc – diffusion assay, minimal inhibition concentration (MIC) for bacterial testing and the method by calculating inhibition percentage (I%) for fungi inhibiting activities.The methanolic fraction had a total inhibition against *Candida albicans* (100%) at a concentration of 500µg/ml and a negative effect against *Cryptococcus neoformans*. *Microsporum canis* was strongly inhibited with methanolic extract (75%) and totally with ethyl acetate extract at a concentration of 750µg/ml.

Conclusion:
The present study shows the pharmacognostic and phytochemical properties of various bioactive compounds present in this plant. The antimicrobial activity of the extracts was evaluated based on the inhibition zone using the disc – diffusion assay. Among the various extracts the methanolic fraction had a total inhibition against various microorganisms. The ethanol extract also showed significant dose-dependent reduction in normal body temperature when compared to that of a standard anti-pyretic agent. Further more Clinical and Pathological studies should be conducted to isolate and characterize the bioactive components present in this plant.

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