Novel Therapeutic Activity and its Medicinal Uses of *Ficus Carica Linn*

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ABSTRACT

Ficus carica (Moraceae) is a deciduous tree, which grows in tropical and subtropical regien of India, commonly known as fig tree. Dried figs are nutritionally rich fruits. Ficus carica Linn. (Moraceae) is commonly known as Angir is a middle sized laticiferous deciduous tree, widelydistributed in all tropical and sub-tropical countries. The fruit extracts possessed activity in anaemia, latex as anthelmintic (due to ficin) andanticarcinogenic. Traditionally, the plant is being used as purgative, aphrodisiac, anti-inflammatory,expectorant, diuretic, anti- anxiety (mild sedative). Pharmacological studies carried out on the fresh plant materials, crude extracts, and isolated components of Ficus carica provide an experimental support for its numerous traditional uses. However, the potent bioactive secondary metabolite for anticancer, haemostatic effect, antifungal activity, scavenging effect, and irritant potential is described by earlier researchers of this field. The present review is therefore, an effort to give a detailedsurvey of the literature on its pharmacognosy, phytochemistry, and pharmacological properties. Figs are one of the highest sourse of calcium, copper, magnesium. The seeds are real fruit in figs. In traditional medicine the roots are used in the treatment of leucoderma and ringworms. Fruits have antipyretic aphrodiasic property. Many biologically active compounds were isolated from figs. The barks, leaves are used in the treatment of diabetes, skin, diarrhea, and ulcer. Sushrusha included the fruits for use in fever, consumption, asthma, epilepsy and insanity. The present review in therefore, and effort to give a detailed survey of literature on its pharmacognostic, traditional and pharmacological uses.

***KEYWORDS**: Ficus Carica Linn., Pharmacognosy, Phytochemistry, Pharmacological properties.*

INTRODUCTION

Ficus (Moraceae) comprises one of the largest genera of angiosperms with more than 800 species of trees, shrubs, hemiepiphytes, climbers, and creepers in the tropics and subtropics worldwide [1]. This genus is an important genetic resource due to its high economic and nutritional values and also an important part of the biodiversity in the rainforest ecosystem. It is also a good source of food for fruit-eating animals in tropical areas [2].The genus is divided into six subgenera based on preliminary morphology. The monoecious subgenus Urostigma is the largest with about 280 species all inclusive, and most of them display distinctive hemiepiphytic habits. Ficus includes 23 species of hemiepiphytes and lithophytes which produce aerial and creeping root systems [3]. F. carica L. is an important member of the genus Ficus. It is ordinarily deciduous and commonly referred to as "fig". The common fig is a tree native to southwest Asia and the eastern Mediterranean, and it is one of the first plants that were cultivated by humans.

The fig is an important harvest worldwide for its dry and fresh consumption. Its common edible part is the fruit which is fleshy, hollow, and receptacle [4]. The dried fruits of F. carica have been reported as an important source of vitamins, minerals, carbohydrates, sugars, organic acids, and phenolic compounds [5–7]. The fresh and dried figs also contain high amounts of fiber and polyphenols [8, 9]. Figs are an excellent source of phenolic compounds, such as proanthocyanidins, whereas red wine and tea, which are two good sources of phenolic compounds, contain phenols lower than those in fig [10-14]. Its fruit, root, and leaves are used in traditional medicine to treat various ailments such as gastrointestinal (colic, indigestion, loss of appetite, and diarrhea), respiratory (sore throats, coughs, and bronchial problems), and cardiovascular disorders and as anti-inflammatory and antispasmodic remedy[15-17].

Scientific Classification

Kingdom : Plantae
Clade : Tracheophytes
Clade : Angiosperms
Clade : Eudicots
Clade : Rosids
Order : Rosales
Family : Moraceae
Genus : Ficus
Subgenus : F. subg. Ficus
Species : F. carica

Vernacular Names

Vernacular names are as in english- common fig tree, hindi- angir, sanskrit- angira, bengali- angir. kannadanjura, tamil- tenatti, telgu- anjuru, marathi- anjra, punjabi-fagari.

Disribution

Fig is distributed in Southwest Asia and the Eastern Mediterranean region, from the Turkey in the East to Spain and Portugal in the West; it is also grown commercially in parts of U.S.A. and Chile and to small extent, in Arabia, Persia, India, China and Japan[18-21]. It is cultivated in India commercially few centres near Pune (Maharastra) and Bellary and Anantpur districts (South India). In Punjab, Uttar Pradesh and Mysore, it is mostly grown scattered in gardens or in homeyards[22-24].

PHYTOCHEMICAL PROPERTIES

Phytochemicals are the chemicals produced by plants. Literature survey indicated the presence of coumarins, flavonoids, sterols, triterpenoids, anthocyanins etc, in various parts of the plant. Dried seeds contain fixed oil containing the fatty acids viz oleic acid, linoleic acid, linolenic acid, palmitic acid, stearic acid, arachidic acid. Leaves contain bergapten, 4′,5′-dihydropsoralen, rutin, 24-methylenecycloartanol umbelliferone, marmesin, stigmasterol, β-sitosterol, ficusogenin, lupeol, psoralen ψ-taraxasterol ester and tyrosine moisture, protein, fat, crude fiber, ash, N-free extract, pentosans, carotene on a dry weight basis[25-27]. The latex contains 6-O-linoleyl-β-D-glucosyl-β-sitosterol, 6-O-Oleyl-β-D-glucosyl-β-sitosterol, 6-O-palmitoyl-β-D- glucosyl-βsitosterol, caoutchouc, resin, albumin, cerin, sugar and malic acid, rennin, proteolytic enzymes, diastase, esterase, lipase, catalase, and peroxidase. Fruits contain cyanidin-3-O-glucoside, cyanidin-3-Orhamnoglucoside, saturated fat, cholesterol, sodium, insoluble sugars, protein, vitamin A, vitamin C, calcium, iron[28-30].

TRADITIONAL USES

The plant, Ficus carica Linn. possesses many therapeutic uses. Extracts of the plant were traditionally for internal as well as external use. Ficus carica Linn. is one of the important ingredient of ‘Asoka cordial’, the well accepted utero-tonic for mild to moderate type of uterine bleeding through the effective mode of action of its active ingredients viz. Fig, Asoka, Lodhra, Satawar etc[31-33]. Traditional uses of figs are considered, including how figs or fig tree parts were processed as poultices from fresh or dried figs, poultices from fig leaves, fig wines, lye from fig tree bark, latex from stems and leaves. The juice of the fruit with honey was prescribed for checking haemorrhage (Vrindamaadhava).

Ficus carica Linn. and Juglans regia (Akharot) from a good aphrodisiac tonic in unani medicine. Angir as a dry fruit is also considered a good nutritional support for diabetics. These compounds bring styptic effect through its astringent action in controlling menorrhagia[34]. Ficus carica Linn. Is also used in the formulation of ‘Stone crush’, as a daily health supplement by keeping the urinary tract flushed, urolithiasis, crystal urea, burning following lithotripsy and urinary tract infections. Stone crush prevents recurrence after surgical removal of calculi, arrest formation of urinary calculi. Fruits of Ficus carica Linn. Are used in leprosy, nose bleeding, antipyretic, aphrodisiac, lithontriptic, hair-nutritive, emollient, demulcent, laxative and in treatment of various inflammations, paralysis, liver diseases, chest pain, piles. Roots are used as tonic, leucoderma and ringworm infection[35-37].

PHARMACOLOGICAL REPORTS

Antipyretic Activity

The significant antipyretic effect of an ethanol extract of Ficus carica was demonstrated in a study, where this extract was effective at dose of 100, 200, and 300 mg/kg in reducing normal body temperature. Furthermore, the effect extended up to 5 h after drug administration when compared with that of paracetamol (150 mg/kg.), a standard antipyretic agent[38-40].

Anti-inflammatory Activity

The probable anti-inflammatory effect of petroleum ether (PEE), chloroform (CE) and ethanol (EE) extracts obtained from the leaves of Ficus carica Linn.. Antiinflammatory activity was studied by carrageenan-induced rat paw edema and cotton pellet granuloma methods[41-42]. The ethanolic extract 600 mg/Kg exhibited maximum anti-inflammatory effect, which is 75.90% in acute inflammation and in chronic studies showed 71.66% reduction in granuloma weight. The petroleum ether (PEE), chloroform (CE) and ethanol (EE) extracts significantly reduced carrageenan-induced paw edema and cotton pellet granuloma in rats. These extracts showed a greater anti-inflammatory effect comparative to standard drug Indomethacin[43-45].

Antispasmodic and antiplatelet Activity

The aqueous ethanol extract (AEE) of Ficus carica fruit was studied for antispasmodic effect on rabbit jejunum preparations and for antiplatelet effect using ex vivo model of human platelets. When AEE is tested in isolated rabbit jejunum, it produced relaxation in a spontaneous way. AEE also inhibits the adenosine 5′-diphosphate and adrenaline-induced human platelet aggregation. This study exhibits the remarkable spasmolytic property in the ripe dried fruit of Ficus carica along with antiplatelet activity that provides sound pharmacological basis for its medicinal use in the gut motility and inflammatory disorders[46-48].

Antihelmintic Activity

As per WHO, only a few drugs are frequently used in the treatment of helminthes in human beings. Antihelmintics from the natural sources may play a key role in the treatment of parasite infections. Antihelmintic activity of aqueous, petroleum ether, chloroform, and methanol extract of leaves of Ficus carica was investigated against Pheritima posthuma in comparison with mebebdazole as a standard drug. This type of activity is also reported in different members of Ficus, i.e., Ficus benghalensis Linn and Ficus racemosa Linn[49-51].

Hepatoprotective Activity

The methanol extract of the leaves of Ficus carica was evaluated for hepatoprotective activity in CCl_4-induced liver damage in a rat model. The extract of 500 mg/kg (oral dose) exhibited a significant protective effect reflected by lowering the serum levels of aspartate aminotransferase (AST), alanine aminotransferase (ALT), total serum bilirubin, and malondialdehyde equivalent, an index of lipid peroxidation of the liver Significant reversal of biochemical, histological, and functional changes was induced by petroleum ether extract treatment in rifampicin-treated rats, indicating promising hepatoprotective activity.

Hepatoprotective activity was also reported in the leaf extracts of Ficus racemosa Linn and Ficus hispida Linn. possess significant hepatoprotective activity against carbon tetrachloride- and paracetamol-induced hepatotoxicity in rats, respectively[52-54].

Hypoglycemic Activity

The hypoglycemic effect of an aqueous extract of leaves has been demonstrated in streptozotocin-induced diabetic rats, where weight loss was prevented in these animals. Additionally, treatment resulted in an increase in the survival index that correlated with increased plasma insulin levels. A similar activity has also been reported for the fruit of Ficus carica[55-57]**.**

Hypocholesterolemic Activity

The leaves of fig have hypocholesterolemic activity. Chloroform extract is prepared from the aqueous decoction of fig leaves. It causes decline in the levels of total cholesterol and decrease in the total cholesterol/HDL cholesterol ratio, together with a reduction of the hyperglycemia. In addition to this, the cell content of cholesterol in HepG2 cells appreciates the reduction of blood cholesterol level in streptozocin-induced diabetic rats[58-60].

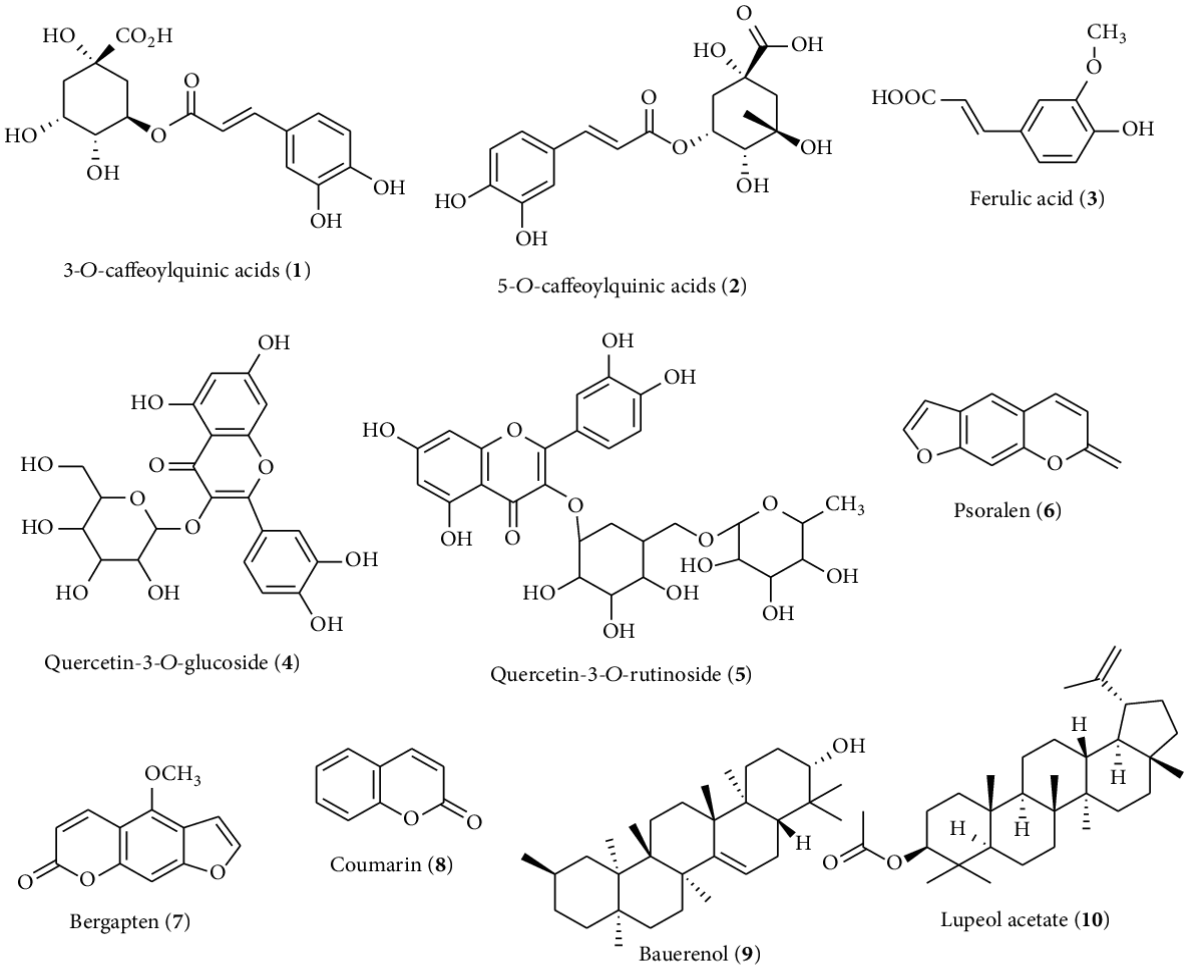

Figure 1. Active Chemical Constituents of *Ficus Carica*

Anticancer activity

Anticancer activity reported a mixture of 6-O-acyl-β-D-glucosyl-β-sitosterols (where acyl moiety being primarily palmitoyl and linoleyl with minor amount of stearyl and oleyl) found in Ficus carica Linn. resin as potent cytotoxic agents. Both the natural and the synthetic compounds showed in vitro inhibitory effects on proliferation of various cancer cell lines[61-64].

Antimicrobial Activity

The antimicrobial activity of methanol (MeOH) extract of figs against oral bacteria. The MeOH extract (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 MeOH extract with ampicillin or gentamicin were synergistic against oral bacteria[65-68].

Cytotoxicity Activity

The cytotoxicity of fruit and leaf extracts as well as latex of Ficus carica was evaluated using HeLa cell lines. Plant latex and different extracts (ethanol, ethyl acetate, and dichloromethane) could reduce the viability of HeLa cell lines at low concentrations. The approximate IC_{50} values of ethanol, ethyl acetate, and dichloromethane extracts of the leaves and fruits are 10, 13, 12 μg/ml and 12, 12, 11.5 μg/ml, respectively, and for latex 17 μg/ml. Thus, fig containing active principles may be responsible for cytotoxicity[69-72].

Antimutagenic Activity

Antimutagenic action of plant extracts of Armoracia rusticana, Ficus carica, Zea mays and their mixture on environmental xenobiotics has been investigated. The plant extracts and their mixture decreased the level of mutations induced by N-metil-N′-nitro-N-nitrozoguanidin (MNNG) in Vicia faba cells, chlorophyll mutations in Arabidopsis thaliana, and NaF-induced mutability in rat marrow cells. The plant extracts and their mixture demonstrate the ability to decrease the genotoxicity of environmental mutagens[73-75].

Anti-angiogenic activity

The anti-angiogenic and anti-proliferative potentials of Ficus carica latex extract using human umbilical vein endothelial cells (HUVECs)[76-78]. The results clearly indicated that latex extracts of Ficus carica contain strong anti-angiogenic and anti-proliferative activities. Therefore, latex extract could be an ideal candidate as a potential agent for the prevention of angiogenesis in cancer and other chronic disorders[79-80].

Antioxidant activity

Phytochemical analysis reported significant antioxidant activity in dried fruits of Ficus carica. Dried figs are in vitro antioxidants after human consumption. These findings suggest that dried fruits should be a greater part of the diet as they are dense in phenol antioxidants and nutrients most probably fiber[81-83].

Free radical scavenging Activity

The method to study the ultrasonic assisted extraction of total flavonoids from the fruit of Ficus carica and their scavenging activities against hydroxyl and superoxide anion free radicals[84]. The optimum conditions for extracting total flavonoids from the leaves of Ficus carica were found to be the following: ethanol concentration 40%, material-to-liquid ratio 1:60 (g/ml), extraction temperature 60°C, and length of ultrasonic treatment of 50 min. Under these optimum conditions, the extraction efficiency of total flavonoids reached as high as 25.04 mg/g. The total flavonoid extract from the leaves had marked scavenging effects on both hydroxyl and superoxide anion free radicals in a concentration-dependent fashion[85-86].

CONCLUSION

The majority of the pharmacological studies that have been carried out on Ficus carica were conducted using crude extracts. Thus, it is difficult to reproduce the outcomes of these studies and to locate the precise bioactive metabolite. Hence, there is a need for phytochemical standardization and identification of potent bioactive candidates. Phytochemical research carried out on Ficus carica has led to the isolation of few classes of plant metabolites. However, the vast traditional use and proven pharmacological activities of Ficus carica indicate that an immense scope still exists for its phytochemical exploration. An extensive literature survey revealed that Ficus carica is a sacred and important medicinal plant used for the ethnomedicinal treatment of anemia, bronchitis, constipation, diabetes, fever (jaundice), hemorrhoids, inflammation, liver disorders, infectious diseases, and many more throughout the world. Pharmacological studies carried out on the fresh plant materials, crude extracts, and isolated components of Ficus carica provide an experimental support for its numerous traditional uses. However, the potent bioactive secondary metabolite for anticancer, haemostatic effect, antifungal activity, scavenging effect, and irritant potential is described by earlier researchers of this field. There are a number of research papers appeared in the literature indicating relevant chemical characterization of flavonoids, phytosterols, anthocyanins, phenolic compounds, sterols, and volatile compounds. They failed to recognize the referred biological activities. Therefore, there is a vast scope for establishing a relation between given phytoconstituents and biological activities. The outcome of the future research in the above-mentioned areas will provide a convincing support for the future clinical uses of Ficus carica in modern medicine.

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