



Phytochemical and therapeutic properties of *Ficus carica* Linn. : An overview

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Abstract

Ficus carica is one of the largest genera of medicinal plants, grows in tropical and subtropical regions of India. It is an important genetic resource with high economical, nutritional and historical value. It is used in indigenous system of medicine like Ayurveda, Siddha, Unani and Homoeopathy. From the different parts of this plant like Leaves, Fruits, Barks various types of biologically active compounds were isolated which shows much effective in various treatments such as liver diseases, skin diseases, stomachache, dysentery, ulcers, diabetes, kidney diseases and anticancer etc. Therefore the present review is based on the data collected from the various resources on its phytochemistry, isolated compounds, traditional uses and its therapeutic values.

Keywords: active compounds, therapeutic, inflammatory, hepatoprotectivity, memory enhancing, *Ficus carica*.

Introduction

The genus *Ficus* (Moraceae) constitutes one of the largest genera of angiosperms with more than 800 species of trees, epiphytes, and shrubs in the tropical and sub-tropical regions worldwide [1]. In the family Moraceae, *Ficus* L. is quite distinct from other groups and hence placed in its own tribe Ficeae. In molecular phylogenetic study of Moraceae based on *ndhF* sequences, the tribe Castilleae has been shown closest to *Ficus* [2]. Recently, the genus has been classified into six subgenera, 19 sections and 27 subsections based on morphological features and distributional pattern [3]. The genus *Ficus* L. (Moraceae) was first published in *Systema Naturae* by Carolus Linnaeus in 1735. *Ficus* is one of the largest genus among angiosperms. Among the genera of seed plants it ranked as the twenty-first [4]. In India, 115 species are distributed throughout the country with the maximum diversity of the species lies in the North-East region having about 43 species in Meghalaya alone and may be considered as the hotspot region in India [5]. Although 7,000 different medicinal herbs and 95 species estimated 2,50,000 flowering plants and their parts are utilized in western medicines. Chinese medicines used 5,000 different plants in their healing system. Several Indian traditional system used in the medicine or herbals formulation for prevent and management liver disorders. The Indian Traditional Medicine like Ayurveda, Siddha and Unani are predominantly based on the use of plant materials. The association of medical plants with other plants in their habitat also influences their medicinal values in some cases [6].

Medicinal plants play an important role in the lives of rural people by curing common ailments especially in developing countries of the world. A large world population uses alternative medicines for their daily healthcare needs. More than 80% of the world population in developing countries uses plant medicines and about half of the population in

industrialized countries also using traditional medicines as first line therapy [7]. About 70% of the world population also practices traditional medicines to meet their healthcare needs [8].

Taxonomy:

Kingdom	:	Plantae
Division	:	Magnoliophyta
Class	:	Magnoliopsida
Order	:	Rosales
Family	:	Moraceae
Genus	:	<i>Ficus</i>
Species	:	<i>F. carica</i>



Fig 1: shows plant of *Ficus carica* Linn.

Table 1: showing *Ficus carica* with their Traditional and Contemporary applications [9, 47].

S.no.			
1	Abdominal pain	Decoction with dried fruits and unpeeled almond. Fruits are used a tonic.	Abruzzo, Italy. Gilgit, Pakistan.
2	Antihelmentic	Latex	Peshawar, Pakistan
3	Antiseptic for urinary tract	Decoction made with 0.5 l water, 5 dried fruits, 4 Laurus nobilis leaves and a peeled apple	Abruzzo, Italy
4	Anemia	Fruit	Khuzestan, Iran
5	Bee sting	Latex soothes the bee sting by simply rubbing on the skin	Buner, Pakistan
6	Blood deficiency	Leaves	South-eastern Nigeria
7	Bone treatment	Bark	India
8	Bronchitis	Aqueous infusion of fresh leaf tender is taken orally as a drink	Eucador
9	Burn and Emollient	Fruit and latex	Nablus, Palestine
10	Cardiac troubles	Fruits are used a tonic	Gilgit, Pakistan
11	Corns	Latex	Istanbul, Turkey
12	Constipation	Juice extracted from fruit is taken orally	Jodhpur, India
13	Cough	Decoction of fruit with honey. Decoction of boiled fruits is taken orally.	Abruzzo, Italy. Northern and central Oman.
14	Diabetes	Decoction of leaves	Islamabad, Pakistan
15	Drink (Tea)	Dry fruit powder is used in tea recipes, as nutritional one	Turkey
16	Eye vision problem	Powder of dry fruits and sugar is taken orally with water twice a day	Abbottabad, Pakistan
17	Fever	Dried fruits	Bangladesh
18	Food	Fruit. The unripe fruit and young growth are cooked and eaten as vegetable.	Shangla, Pakistan. Rawalpindi, Pakistan.
19	Hemorrhoids	Leaves	Istanbul, Turkey
20	Hepatitis	Decoction of fruit	Istanbul, Turkey
21	Inflammation	Bark	Khuzestan, Iran
22	Intestinal pain	Bark	Pakistan
23	Jaundice	20 ml of leaf juice mixed with a cup of goat milk is administered early in the morning one a day for 3 days.	Andhra Pradesh, India
24	Kidney stone	Fruit and latex. Bark and leaves.	Nablus, Palestine. Pakistan.
25	Liver diseases	Fruit	Northern Pakistan
26	Menstruation pain and Sedative	Aqueous infusion of fresh leaf tender is taken orally as a drink	Eucador
27	Mouth cavity diseases	Dried fruits	Abbottabad, Pakistan
28	Piles and chronic ulcer	Fruit juice and latex	Rawalpindi, Pakistan
29	Skin disease	Fruit and latex.	Nablus, Palestine
30	Stomach cancer	Leafy latex	Sari, Iran
31	Warts	Milky latex is applied externally. Fruit juice.	Alasehir, Turkey. Izmir, Turkey. Kashmir, Pakistan.
32	Weakness	Single dry fruit in the water for a night. This fruit is consumed at morning for 15 days.	Maharashtra, India.
33	Wounds	Fruit and latex	Nablus, Palestine

Medicinal Properties of *Ficus carica* [48].**Internal use preparations with figs**

Laxative: Against constipation, decoction of raw dry figs. Boil 3 dry figs in water for a quarter of an hour. Leave to rest and drink the liquid and eat the figs the following morning.

Mouth cleaner

When having mouth disorders, inflammation, wounds, mouth ulcers etc. the same preparation which is mentioned above can be useful.

Bronchitis

Having a cold or a pain in the breast, figs show emollient properties to soften chest mucus, a quarter of a liter of boiled milk with 12 dry figs for 1/4 of an hour. Drink the liquid once strained and sweetened.

Cough

They are very useful to relieve cough, a quarter of a liter of boiled milk with 12 dry figs for 1/4 of an hour. Drink the liquid once strained and sweetened.

Pancreatitis

Proteolytic enzymes provided by some fruits, such as ficin from figs, are very useful to treat pancreatitis, since they help the pancreas to disaggregate food proteins into peptides which are transformed into amino acids. People affected with pancreatitis are not able to produce the necessary enzymes for digestion so ficin can be very helpful in this case.

External use remedies with figs an latex of fig tree

These are very aggressive treatments by the abrasive nature of the components used. It is important to apply the treatments

only on the affected area, protecting the rest of the healthy skin.

Once a treatment it is applied, it should be covered with gauze and plaster preventing its contents to reach the healthy parts surrounding the affected area.

These treatments should not be used with children or people with sensitive skin to those they can easily produce skin ulcerations.

Warts

To remove warts, the liquid or latex dripping when cutting a branch or a leaf. Soak the wart with it several times daily.

Corns

To get rid of calluses, apply the milky white juice of the

leaves to the corn.

Insect bites or stings

Apply the milky juice of the leaves.

Other uses of fig tree

Skin sagging

To reaffirm the face skin one can make a mask with black fig pulp, to which add a few drops of lemon, apply to face for 30 minutes and wash it with cold water.

Curd

Latex from leaves can be used as "curd" for milk.

Historical uses of *Ficus carica* Linn. Leaf Remedies for internal and external applications

Table 2

Remedies	Applications
Poultice made of fresh leaves.	For scrofulous sores; removes warts, against the bile of a rabid dog.
Poultice made of leaves and unripe fruit.	For Struma.
Poultice made of Fig leaves and branches.	For rubbing coarse and itching eyelids; For vitiligo also.
Poultice made of fresh leaves used with the green Figs or shoots, the milky juice of Fig tree and wine.	For scorpion stings; shoots or the green Figs are taken internally in wine, the milky juice is poured into the wounds and the leaves are applied to it.
Mixed with wine.	Externally for gangrenous ulcers.
Mixed with Honey.	Externally for dog bites and Favus.
Mixed with leaves of poppy.	Externally for extracting splinters of broken bones.
Mixed with chick-pea flour and wine.	Against poison of marine animals.
Boiled until soft with marshmallow (<i>Althaea</i>) roots.	As a poultice for scrofula and tumors.

Table 2: showing Nutritional value of *Ficus carica* Linn^[49].

Nutritional value per 100 g		
Energy	310 kJ (74 kcal)	
Carbohydrates	19.18 g	
Sugars	16.26 g	
Dietary fibers	2.9 g	
Fat	0.30 g	
Protein	0.75 g	
Vitamins		
Thiamine (B1)	0.060 mg	5%
Riboflavin (B2)	0.050 mg	4%
Niacin (B3)	0.400 mg	3%
Pantothenic acid (B ⁵)	0.300 mg	6%
Vitamin B6	0.113 mg	9%
Folate (B9)	6 µg	2%
Choline	4.7 mg	1%
Vitamin C	2.0 mg	2%
Vitamin K	4.7 µg	4%
Minerals		
Calcium	35 mg	4%
Iron	0.37 mg	3%
Magnesium	17 mg	5%
Manganese	0.128 mg	6%
Phosphorus	14 mg	2%
Potassium	242 mg	5%
Sodium	1 mg	0%
Zinc	0.15 mg	2%

Phytochemistry

The leaves of *F. carica* consist of various volatile compounds which are identified and distributed by distinct chemical

classes, such as aldehydes: methylbutanal, 2-methylbutanal, (E)-2-pentanol, hexanol, and (E)-2-hexanol, alcohols: 1-penten-3-ol, 3-methyl-1-butanol, 2-methylbutanol, heptanol,

benzyl alcohol, (E)-2-nonen-1-ol, and phenylethyl alcohol, ketone: 3-pentanone, esters: methyl butanoate, methyl hexanoate, hexyl acetate, ethyl benzoate, and methyl salicylate, monoterpenes: limonene and menthol, sesquiterpenes: α -cubenene, α -guaiene, α -ylangene, copaene, β -bourbonene, β -elemene, α -gurjunene, β -caryophyllene, β -cubebene, aromadendrene, α -caryophyllene, τ -muurolene, τ -cadinene, α -muurolene, germacrene D, and (+)-ledene,

norisoprenoid: β -cyclocitral, and miscellaneous compounds: psoralen^[50].

Phenolic acids such as 3-O- and 5-O-caffeoylquinic acids, ferulic acid, quercetin-3-O-glucoside, quercetin-3-O-rutinoside, psoralen, bergapten, and organic acids (oxalic, citric, malic, quinic, shikimic, and fumaric acids) have been isolated from the water extract of the leaves of *F. carica* L.^[51].

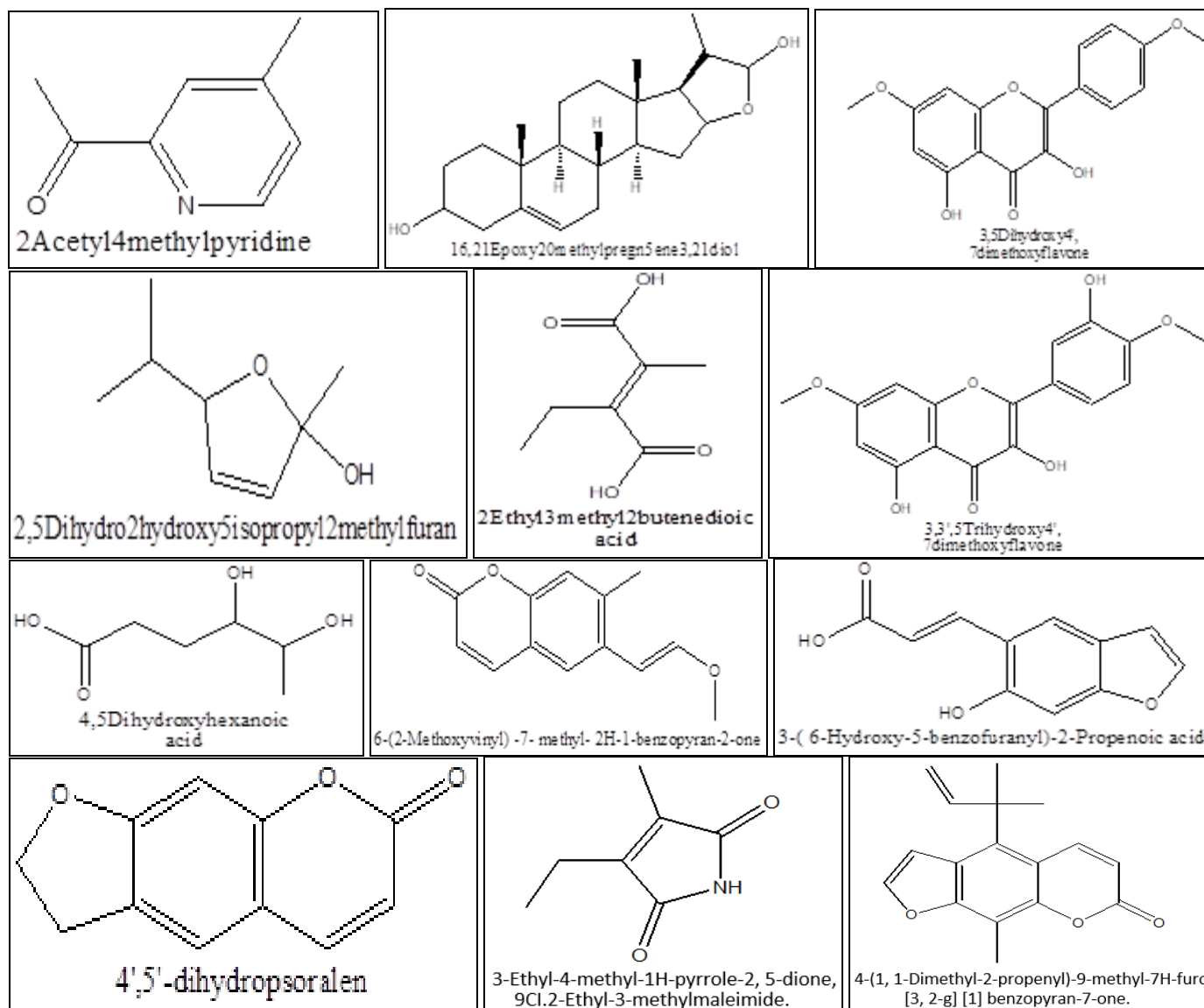


Fig 1: Isolated compounds from *Ficus carica* Linn.^[52]

Therapeutic properties^[53, 71];

Memory Enhancing activity

Hexane extracts of leaves of *Ficus carica* (dosed at 100 and 200mg/kg each) were administered to adult Swiss albino Wistar mice and the acquisition, retention and retrieval of spatial recognition memory was determined, by using Y-maze and rectangular maze models (interoceptive behavioral models). Bacopa monniera extract was used as the standard drug while scopolamine hydrobromide as the amnesic agent. The higher doses of the plant extract, exhibited a more promising nootropic potential. Maximum response was

observed in the 200mg/kg dose of extract, which closely approximated the results for the standard drug Brahmi. The higher dose elicited greater responses in both the models studied and where comparable to that achieved with the standard drug^[1]. The fruit extract of *F. carica* enhanced learning and memory activity by decreased TL, TRC and SL in comparison to scopolamine treated rats^[12].

Anti-Parasitic activity

Different extracts of leaves of *Ficus carica* Linn. Against *Pheritima posthuma* in in-vitro anthelmintic were studied and

each extract was studied at 20 mg/ml in the bioassay, which involved determination of time of paralysis and time of death of the worms. Mebendazole (20 mg/ml) included in the assay as standard reference drug. The methanol and aqueous extracts of *Ficus carica* were showed significant anthelmintic activity and thus *Ficus carica* Linn. Would be useful as an anthelmintic [13].

Anti-Pyretic activity

The anti-pyretic effect of an ethanolic extract of leaves of *Ficus carica* Linn. At normal body temperature and yeast-induced pyrexia, in albino rats was studied. A yeast suspension (10 ml/kg body wt.) increased rectal temperature 19 hours after the subcutaneous injection. The ethanol extract of *Ficus carica*, at doses of 100, 200 and 300 mg/kg body wt. p.o., showed significant dose-dependent reduction in normal body temperature and yeast-provoked elevated temperature. The effect extended up to five hours after drug administration. The anti-pyretic effect of the ethanol extract of *Ficus carica* was comparable to that of Paracetamol (150 mg/kg body wt., p.o.), a standard anti-pyretic agent which shows the promising effect [14].

Anti-Bacterial activity

The activity of methanol (MeOH) extract of fig leaves against methicillin-resistant *Staphylococcus aureus* (MRSA) was studied. The MeOH extract (MICs, 2.5 to 20 mg/mL; MBCs, 5 to 20mg/mL) was demonstrated as antibacterial activity in isolates MRSA 1-20. The administration of the MeOH extract in combination with oxacillin or ampicillin induced a reduction of ≥ 4 -8-fold in all tested bacteria, which was considered to be synergistic based on a FICI of ≤ 0.375 -0.5. Furthermore, time-kill study was found that a combination of MeOH extract with oxacillin or ampicillin produced a more rapid decrease in the concentration of bacteria CFU/mL than MeOH extract alone [15]. In-vitro anti-microbial activity of the methanol extract of *Ficus carica* L. was determined by disc diffusion and broth dilution technique against three gram positive (*Bacillus subtilis*, *Staphylococcus aureus*, and *Bacillus megaterium*) and three gram negative bacterial strains (*Pseudomonas aeruginosa*, *Escherichia coli* and *Proteus vulgaris*). The methanol extract of *Ficus carica* L. is a known antioxidant and can be used as an effective herbal protectant against different pathogenic bacteria [16].

Anti- Diarrhoeal activity

The latex of the *Ficus carica* exhibited significant inhibitory activity against castor oil induced diarrhoea and enteropooling in latex treated rats. It also exhibited significant reduction in gastrointestinal motility following charcoal meal in rats. There has been a statistically significant reduction in the incidence and severity of diarrhoea produced in experimental animal model ($p < 0.01$). *Ficus carica* latex like the standard antidiarrhoeal agent, diphenoxylate, inhibited significantly ($p < 0.01$) the frequency of defecation, wetness of fecal droppings when compared with untreated control rats. This justify the traditional application of the latex as an antidiarrhoeal agent [17]. Ethanolic extract of leaf and bark of *F. carica* Linn showed significant ($p \leq 0.05$) decrease in the severity of diarrhoea, in a dose dependent manner, in castor

oil induced diarrhoea test. Prostaglandin E2 induced intestinal fluid accumulation test (enteropooling) gave significant results ($P \leq 0.05$), indicating possible antidiarrhoeal action. The *Ficus carica* Linn. Extract produced significant ($P \leq 0.05$) reduction of intestinal transit in gastrointestinal motility test with barium sulfate milk in healthy rats. It is evident that extract have significant antidiarrhoeal activity and may be a good source of antidiarrhoeal agents [18].

Hepatoprotective activity

The methanol extract of the leaves of *Ficus carica* Linn. Was evaluated for hepatoprotective activity in rats with liver damage induced by carbon tetrachloride. The extract at an oral dose of 500 mg/kg exhibited a significant protective effect by lowering the serum levels of aspartate aminotransferase, alanine aminotransferase, total serum bilirubin, and malondialdehyde equivalent, an index of lipid peroxidation of the liver. These biochemical observations were supplemented by histopathological examination of liver sections. The activity of extract was also comparable to that of Silymarin, a known hepatoprotective [19].

Anti-Inflammatory activity

The extracts obtained from the leaves of *Ficus carica* Linn. Were studied to their anti-inflammatory activity through carrageenan-induced rat paw edema and cotton pellet granuloma methods. The extracts were administered orally in doses of 300 and 600 mg/kg/day of body weight to healthy animals. The ethanolic extract (EEFC-II) 600 mg/kg exhibited maximum anti-inflammatory effect, which is 75.90% in acute inflammation and in chronic study 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 method in rats. These extracts showed a greater anti-inflammatory effect comparative to standard drug Indomethacin [20].

In vitro cytotoxic and antiviral activities

Five extracts (methanolic, hexanic, ethyl acetate, hexane-ethyl acetate (v/v) and chloroformic) of this species were investigated in vitro for their antiviral potential activity against herpes simplex type 1 (HSV-1), echovirus type 11 (ECV-11) and adenovirus (ADV). To evaluate the capacity of the extracts to inhibit the replication of viruses, the following assays were performed: adsorption and penetration, intracellular inhibition and veridical activity. Observation of cytopathic effects was used to determine the antiviral action. The hexanic and hexane-ethyl acetate (v/v) extracts inhibited multiplication of viruses by tested techniques at concentrations of $78 \mu\text{g mL}^{-1}$. These two extracts were possible candidates as herbal medicines for herpes virus, echovirus and adenovirus infectious diseases. All extracts had no cytotoxic effect on Vero cells at all tested concentrations [21].

Anticancer activity

The in vitro effect of different doses of fig tree latex on stomach cancer cell line and the peripheral blood mononuclear cells was evaluated after 72 hours. Fig tree latex could inhibit

the proliferation of cancer cell line without any cytotoxic effect on human normal cells. Five mg/ml was the optimum concentration in inhibition of cell line growth^[22]. The in vitro effect of different doses of fig tree latex including 2.5 mg/ml, 5 mg/ml, and 10 mg/ml on esophageal cancer cell line was evaluated after 72 hours by MTT assay. There was a significant change in 10 mg/ml treatment of latex after 72 hours on esophageal cancer line (P; 0.025). 10 mg/ml was the optimum concentration in the inhibition of cell line growth^[23].

Hypotriglyceridaemic activity

Pérez *et al.*, 1999^[66] investigated the hypolipidaemic effect of an intraperitoneal (i./p.) administration of a *Ficus carica* leaf decoction. The plasma total cholesterol levels, which were not modified, showed no significant differences in relation to baseline levels in the presence or absence of *Ficus carica* treatment either. The clearly positive results indicated the presence in the fig leaf decoction of a compound or compounds that influence lipid catabolism^[24].

Antiplatelet activity

Richter *et al.* 2002^[67] reported the antiplatelet activity of *Ficus carica* Linn. Which was studied by taking the blood from normal human volunteers reported to be free of medications for 1 week. Platelet aggregation was induced with the agonists (adrenaline and ADP). The observed inhibitory effect of *Ficus carica* Linn. On adrenaline and ADP induced platelet aggregation at relatively lower doses (0.6 and 1.2 mg/ml. An active principal (ficin) from this plant was shown to possess hemostatic effect through activation of factor X^[25].

Hypocholesterolemic activity

Canal *et al.* 2002^[68] reported that the chloroform extract of *Ficus carica* Linn. leaves extracts on the secretion and cell content of cholesterol in HepG2 cells appreciately reduced the blood cholesterol level in streptozocin induced diabetic rats^[26].

Free Radical Scavenging Activity

Yang *et al.*, 2010 designed the method to study the ultrasonic-assisted extraction of total flavonoids from the leaves of *Ficus carica* Linn. And their scavenging activities against hydroxyl and superoxide anion free radicals. The optimum conditions for extracting total flavonoids from the leaves of *Ficus carica* Linn. Were found to be: 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 flavonoids extract from the leaves had marked scavenging effects on both hydroxyl and superoxide anion free radicals in a concentration-dependent fashion^[27].

Irritant Potential Activity

The methanol extract and isolated triterpenoids from the leaves of *F. carica* were tested for irritant activity. They exhibited irritant potential on mice ears, and calotropenyl acetate, methyl maslinate, and lupeol acetate were the most potent and importunate irritant is which were less than those of euphorbium and close to psoralen. Irritant potential was

evaluated by open mouse ear assay^[28].

Anti-HSV Activity

The water extract of the leaves of *Ficus carica* has been studied on anti-HSV effect and observed on Hep-2, BHK21, and PRK cells. The water extract possessed low toxicity and directly killing-virus effect on HSV. The MTC was 0.5 mg/mL, TDO was 15 mg/mL, and TI was 30.0 mg/mL

Conclusion

From the thorough study of *Ficus carica* plant, it has a novel class of properties in Historical, Nutritional and Economical values. There are various class of compounds present in the *Ficus carica* which have been isolated and interpreted. The overall study of this plant shows that it has various phytochemical and therapeutic properties. The different extracts of the plant shows the various types of properties which includes Memory Enhancing, Antiplatelet, Hepatoprotective, Anticancer, Anti-Pyretic, Anti-Inflammatory, Free Radical Scavenging, Anti- Diarrhoeal, *In vitro* cytotoxic and antiviral activities etc. There should be more investigation on the chemical compounds present in the plant and their different activities.

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