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RESEARCH ARTICLE

A COMPREHENSIVE REVIEW ON FICUS CARICA L. - AN UNEXPLORED MEDICINAL PLANT

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Abstract

Fig is one of the earliest cultivated fruit in human history and an important crop worldwide which can be consumed in both fresh and dry form. The genus *Ficus* belongs to the Moraceae family and there are thousands of species in the genus *Ficus*. They are mostly found in tropical and subtropical regions. Figs are extremely nutritious and contain a large amount of minerals, vitamins, dietary fibre, carbohydrates, amino acids and other phytochemicals. *F. carica* was used as a cure-all in systems of medicine such as Ayurveda, Unani, Siddha, and Homeopathy. Studies revealed that *F. carica* has antioxidant, antimicrobial, anticancer, anti-mutagenic, anti-angiogenic, anti-inflammatory, antidepressant, antiplatelet, antipyretic, immunological, dermatological, hepatoprotective, antidiabetic, hypolipidemic, nootropic, antispasmodic, antidiarrheal, nephroprotective and laxative effects. Fruit juice of *F. carica* mixed with honey is used to treat haemorrhage. Thus the review attempts to shed light on all the available literature on the *Ficus carica* L. with reference to its traditional uses, chemical and phytoconstituents, physicochemical properties, and summing up of its various nutritional and therapeutic benefits.

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Introduction:-

Ficus belongs to one of the largest angiosperms genera ("groups of plants"), that have more than 800 plant species, many of which are epiphytes or shrubs that grow in the tropical and subtropical regions of the world¹. It is one of the world's oldest recognised fruit trees. There are around 750 species in the genus *Ficus*. The most suitable climate for the cultivation of fig is a Mediterranean climate, but figs can be grown in tropics and subtropics with a humid climate. 26% of the world's total figs are grown in Turkey and around 70% of the world's total fig is produced together by Egypt, Iran, Morocco, Algeria, and Greece². The most significant species of figs found in India includes *F. bengalensis*, *F. carica*, *F. racemosa*, and *F. elastica*. In India, common Fig or Anjir (Hindi) belongs mainly to the genus *F. carica* of the Moraceae family³. Fig cultivation in India mostly confined in western parts of Maharashtra (Pune) and Gujarat, Uttar Pradesh (Lucknow and Saharanpur), Karnataka (Bellary, Chitradurga, Srirangapatna) and Tamil Nadu (Coimbatore)⁴. In India, around 115 species of *Ficus* are distributed throughout the country and most variety of species is found in the North-East regions, among them Meghalaya has the highest number of species and may be considered as hotspot region in India⁵. Fig can tolerate extreme environmental conditions like drought, but once established regular irrigation is needed to get a higher yield⁴. Various sections of fig plant, such as bark, seed, leaves, latex, and fruits, have different medical uses. The fruit is rich in various nutrients⁶. They can be eaten as fresh, dried or canned and are often used in the preparation of jam⁴.

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Taxonomy⁷:

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

Nutritive Value:

Figs are rich sources of carbohydrates, lipids, minerals, phenolics and enzymes. Figs contain high carbohydrates and they are a good source of food fibre. Dry as well as fresh figs have a good amount of fibre and polyphenols. Glucose, fructose and sucrose constitute 92% of the carbohydrates in dried figs. The rest is dietary fibre, insoluble cellulose in the skin, soluble pectin in the fruit. Figs are an excellent source of minerals and vitamins. They contain high concentrations of amino acids and are free of fat and cholesterol. Figs contain sugar and organic acids like any other fruit that affect their quality. Mineral content of fig has been reported to be similar to that of human milk. Iron is the most abundantly found mineral in fig which is also said to be 50% as much as that of beef liver. Calcium and potassium are also present. Figs contain a relatively high amount of Strontium that helps to maintain good bone health.

There are more than 100 bioactive compounds have been isolated from fig-like arabinose, glycosides, beta-carotene, beta-amyrins, beta-sitosterol and xanthotoxol. The most important among them are triterpenoids which are identified in latex, leaves and roots. Various volatile compounds with various chemical groups viz. aldehydes, ketones, alcohols, esters and other miscellaneous compounds have been distributed in the leaves of *F.carica*. Water extracts of leaves contain phenolic and organic acids. Different lipid compounds were isolated from *F.carica* fruit. Linoleic acid, linolenic acid, myristic, oleic and stearic acid are the most common fatty acids found in fig. Fig is a very good source of phenolic compounds with rutin being the most important followed by catechin, epicatechin, gallic acid, chlorogenic acid and syringic acid. Several important enzymes such as proteolytic, lipolytic enzymes, catalase and peroxidase have been extracted from the fig tree for commercial use. The stem latex of *F.carica* contains enzymes namely, ficin, proteases, amylase, lipodiastases etc. On the other hand, the skin of fig contains tyrosin, lipase and cravin⁸⁻⁹.

Table 1:- Nutritional Composition of Fig (per 100 grams of edible portion).

Moisture (g)	88.1
Protein (g)	1.3
Fat (g)	0.2
Minerals (g)	0.6
Crude Fibre (g)	2.2
Carbohydrates (g)	7.6
Energy (Kcal)	37
Calcium (mg)	80
Phosphorus (mg)	30
Iron (mg)	1.0

Source: Nutritive Value of Indian Foods (ICMR, 2012)¹⁰

Traditional Uses:

Figs were used as medicine in the ancient medicinal system such as Ayurvedic, Unani, Siddha, and Homeopathy. Various sections of fig tree are commonly used in different countries to treat various illnesses.

Latex of the tree is used as antihelminthic, soothes bee sting and corns, piles and chronic ulcer, skin disease and the leafy latex is used to treat stomach cancer.

Leaves are used in anaemia, bronchitis, diabetes, haemorrhoids, sedative and relieve menstrual pain. Leaf juice mixed with goat milk is used for treating jaundice.

Fruits have a large number of medicinal benefits. It is used in the treatment of cardiac troubles, constipation, eye vision problem, hepatitis and other liver diseases, mouth cavity diseases, weakness. The decoction of fruit with honey is used to treat cough and abdominal pain. **Dried fruits** are used in fever. Dried fruit powder is also mixed with tea for its nutritional benefits. Unripe fruits are eaten as vegetables.

Bark of Fig tree is used in bone treatment, inflammation, and intestinal pain.

Roots are used as a tonic for leucoderma and ringworm.

Therapeutic Properties of Different Parts of the Plant:**Anticancer Activity:**

In addition to polyphenols, figs also contain benzaldehyde and coumarin compounds that have anticancer activity. Research showed that benzaldehyde was successfully used to treat human carcinomas in the last stage. Benzaldehyde can convert the cancer cells into keratinized, normal squamous cells. Coumarins have also been used to treat prostate cancer. In vivo studies of extracts of fig have been shown highest anti-tumour activities. The proliferation of different cancer cell lines was found to be prevented by an acyl moiety with very small quantities of steryl and oleyl, isolated from *F.carica* latex¹³.

Antioxidant Activity:

The presence of several phenolic compounds in *F. Carica* has multiple physiological functions. Some effects of these compounds on human health are advantageous because they act as antioxidant in a number of ways: reducing agents, hydrogen donors, free radical scavengers, singlet oxygen quenchers and many more. For total phenolics, complete flavonoids, anti-oxidant potential and anthocyanin profile, six variations of commercial figs (*F.carica*) with various skin colours (Black, Red, Yellow and Green) were examined. In fruits with the highest polyphenol, flavonoid and anthocyanin content, antioxidant potential was found to be the highest¹⁴⁻¹⁷.

Hepatoprotective Activity:

F.carica shade dried leaves petroleum ether extract in rats treated with Rifampicin at the 50 mg/kg dose has been tested for hepatoprotective activity. A substantial reversal in biochemical, histological and functional changes in rats was observed, suggesting possible hepatoprotective activity of *F. carica* over Rifampicin treatment¹⁷⁻¹⁸.

Antidiabetic Activity:

Studies showed that of *F.carica* leaf extract has a significant hypoglycaemic effect on Streptozotocin (oral and intraperitoneal) induced diabetic rats. The extract also prevents weight loss in diabetic rats and maintains insulin level in blood, which greatly alters the index of survival. Therefore, *F.carica* leaf extract can be used in the treatment of hyperglycaemia¹⁹⁻²⁰.

Hypolipidemic Activity:

The *F.carica* leaf extract lowers the overall cholesterol and total cholesterol/HDL ratio²¹.

Antipyretic Activity:

Ethanol extract of *F.carica* is responsible for a significant dose-dependent decline in body temperature and yeast provoked high body temperature at a dose of 100,200 and 300 mg/kg. Compared to the standard antipyretic agent, Paracetamol (150 mg/kg body weight, p.o), and the effect of *F.carica* extract can be extended up to 5 hours after drug administration²².

Antifungal Activity:

Studies showed that figs possess antifungal activities. A low molecular weight protein isolated from the freshly collected latex of *F.carica* is responsible for its antifungal activity.²³

Antibacterial Activity:

The antibacterial effect of aqueous extract of fig was tested in both in vivo and in vitro. It showed that damage (incidence and severity of diseases) caused by pathogenic bacteria was reduced by fig extract. The extract was effective in in vitro antibacterial activity, against all strains of bacteria used at different concentrations (106-108 cfu mL⁻¹). In vivo tests carried out on aqueous fig extract showed anti-microbial activity on *Pseudomonas*²⁴.

Antiviral activity:

The in vivo studies conducted on fig leaf extract were evaluated in Hep-2, BHK21 and CEF human cell lines, showed significant inhibitory activity with MTC value 0.5 mg/mL, against Newcastle disease virus (NDV). The extract from fig leaves had significant activity against NDV and may have applications in drug preparation. The water extract of fig leaves possesses distinct anti-HSV-1 effect, low toxicity and directly killing-virus effect on HSV-1. Based on this, its application in the area of medicine, food, and drugs has a potential future²⁵⁻²⁶.

Anti-mutagenic Activity:

Investigation was done on the anti-mutagenic activity of *F.carica* plant extract on environmental xenobiotics. Plant extract showed a decrease in the mutation levels by N-metil-N"-nitro-N-nitrosoguanidine (MNNG) in *Nicia faba* cells, mutation of chlorophyll in *Arabidopsis thaliana* and NAF induced mutability in rat marrow cells. The extract decreases the xenotoxicity of environmental mutagens²⁷⁻²⁸.

Antispasmodic activity:

The antispasmodic effect was investigated using the aqueous-ethanolic extract of *F.carica*. Studies showed the presence of spasmolytic activity in the ripe dried fruit possibly mediated through the activation of K⁺ ATP channels²⁹.

Anti-inflammatory effect:

Inflammation can be defined as a natural response of the body against microorganisms and toxic materials. Different types of fig branches were taken for examining their ability to remove free radicals and hinder inflammatory reactions. Investigation revealed that the highest amount of phenolic content was present in the ethyl acetate fraction which has highest free radical scavenging activity. Another study was carried using different types of leaf extract for checking the anti-inflammatory effect and the study demonstrated that ethanolic extract of the leaves has maximum anti-inflammatory activity¹⁷⁻¹⁸.

Effect on sperm parameters:

Leaf extracts of *F.carica* were taken to investigate their effect on sperm parameters and testis intoxicated and the results showed that the leaf extracts can improve the sperm count, non-progressive motility of spermatozoa, and gonadosomatic index in treated testes³⁰.

Diuretic Activity:

Ficus carica L. ethanolic extract (100 and 200mg/kg of body weight) cause a rise in urine volume, cation and anion excretion. The reference diuretic used was Furosemide. Based aforementioned observations, it was concluded that a marked diuresis occurs when rats were acutely treated with *F.carica*³¹.

Promoter of Bone Density:

Figs are rich in calcium, a mineral that helps keep bones strong and safe. Moreover, potassium in fig will overcome the increased urinary calcium loss induced by a high salt diet so that bones do no longer weaken rapidly and preventing thinning of bones at a fast rate³².

Immunomodulatory effect:

The immunomodulatory effect was evaluated and the study results indicated that extract administration of *F.carica* significantly improved the response of both cellular and humoral antibody responses³³.

Effect on Alzheimer's disease:

Experiments were performed to assess the effect of dietary supplementation with figs on memory, anxiety, and learning ability, and study results showed that the mice fed with control diet without figs with substantial memory deficits, increased anxiety-related activity, and motor coordination compared to the wild-type control mice fed the same diet, and the mice fed on 4% fig diet supplement³⁴⁻³⁵.

Scope for Future Research:

Many important biological activities of *F.carica* have been documented, which can be further studied as a treatment for the future. During phytochemical assessment of *F.carica*, several plant metabolites have been isolated. But most of the research on phytochemicals was carried out with leaves and fruits of fig tree while the phenolic profile of stem and root remains neglected. The vast use of *F.carica* as traditional medicine and investigated pharmacological activities indicated that there is a huge scope for further estimation of phytochemicals. Future research in the above areas will contribute to the creation of clinical applications for *F. carica* in some contemporary remedies.

Conclusion:-

Fig has been used as a traditional remedy for treating various ailments from prehistoric times. Different parts of the plant have been used as medicine in different countries. Fig provides nutritional and other health benefits along with antioxidant, antibacterial and other therapeutic properties. *F.carica* contains several bioactive compounds among them flavonoids are of major importance. In vitro experimentation with *F.carica* extracts also indicated its health benefits and the power to fight with various diseases. There is no evidence of plant toxicity which makes the plant useful as a therapeutic agent. Thus there is a vast possibility for further pharmacological experimentation and its use as nutraceutical.

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