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Therapeutic Effects of Ficus Carica Leaves: A Brief Review

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ABSTRACT

Ficus Carica would be the first grown tree in food history. The fig is one of the first fruits to be dried and preserved by humans. Different parts of Ficus Carica including its leaves have been used in some traditional medicine systems to treat various ailments. The aim of this review is to go through the current research on the pharmacological effects of fig leaves.

Keywords: *Ficus Carica, Fig leaves, Common fig.*

1. INTRODUCTION

The fig is a tree from the Moraceae family, order of Urticales. It is a deciduous tree, growing 50 ft high, but more typically to a height of 10 - 30 ft (Joseph & Raj, 2011). The leaves of the plant are broad, oval or nearly, 3-5 lobes, rough above and pubescent below. The fruits are axillary, usually pear shaped, variable in size and color. Although considered as a fruit, the fig is actually a self inverted flower (Chawla, Kaur, & Sharma, 2012).

Ficus Carica is a characteristic species of the Mediterranean areas where its culture and its use constitute an ancient tradition (Institut National de la Recherche Agronomique, 2005). It is also grown commercially in parts of U.S.A. and Chile and to a small extent, in India, China and Japan (Chawla, Kaur, & Sharma, 2012).

The bark, leaves, and fruits are used in traditional medicine to treat different disorders such as gastrointestinal (colic, indigestion, loss of appetite and diarrhea), respiratory (sore throats, coughs and bronchial problems), diabetes, skin diseases, ulcers, dysentery, hemorrhoids (Patil, Bhangale, & Patil, 2010; Joseph & Raj, 2011).

1.1 Antioxidant Activity

The antioxidant activity of figs (the fruits) has been studied by many research teams (Vinson, 1999; Solomon, et al., 2006; Çalişkan & Aytekin Polat, 2011; Bijayakumari, Hiranmai Yadav, & Parimaladevi, 2012). That of fig leaves has been much less. Only a few works have been dedicated to it these recent years. In 2009, Oliveira et al. evaluated the antioxidant potential of various parts of fig: leaves, pulp and peel. They showed that all these parts had an inhibition activity on DPPH and nitric oxide radicals depending on the concentration. In both cases, leaves were the most effective part with a percentage of inhibition reaching 70% for DPPH and 50% for nitric oxide at a concentration of 170 and 500µg/ml respectively. In what concerns the superoxide anion, leaves were the only material displaying a protective effect (Oliveira, Valentão, Pereira, Silva, Tavares, & Andrade, 2009).

These results differ from those recently obtained by another research team. Although proportional to the concentration, the maximum percentage of inhibition achieved for the DPPH was 10.22% at a concentration of 250µg/ml. At the same concentration, ascorbic acid has a percentage of inhibition of 60.4%. The lack of hydrogen donor bioactive constituents in the extract, the slow rate of the reaction between DPPH and the substrate molecules might probably explain the low DPPH antioxidant activity of the F. Carica leaves extract (Ahmad, Khan, Khan, & Iqbal, 2013).

This low activity was also noticed by Allahyari et al. (2014). They compared the concentration of 70% methanolic extract of Ficus Carica leaves that caused a 50% reduction in absorbance (RC50) to that of a standard antioxidant Quercetine. The RC50 of 70% methanolic extract of Ficus Carica leaves was 0.06666 mg/ml, while the RC50 of Quercetine is 0.0039 mg/ml (Allahyari, Delazar, & Najafi, 2014).

Pande and Akoh also evaluated the antioxidant activity of fig peel and pulp, and that of leaves by ferric-reducing antioxidant power (FRAP) and trolox-equivalent antioxidant capacity (TEAC) tests. In both cases, the leaves had the best activity, either for lipophilic or hydrophilic fraction (Pande & Akoh, 2010).

1.2 Anti-inflammatory Activity

In traditional medicine, F. Carica leaves are used to relieve various inflammatory ailments such as hemorrhoids, insect stings and bites. Patil and Patil (2011) studied this anti-inflammatory effect by carrageenan-induced rat paw oedema and cotton pellet granuloma method. The ethanolic extract at 600 mg / kg/day of body weight exhibited the best anti-inflammatory effect of 75.90% in acute inflammation and in chronic inflammation,71.66% reduction in granuloma weight. All extracts showed a greater anti-inflammatory effect than that of indomethacin which is a standard drug (Patil & Patil, 2011).

This anti-inflammatory activity could be related to the antiradical activity of the extracts and by extension, to their chemical composition (Ali, Mujeeb, Aeri, Mir, Faiyazuddin, & Shakeel, 2012).

1.3 Gastric Activity

The methanolic extract of Ficus Carica leaves has been evaluated for hepatoprotective activity in rats with liver damage induced by carbon tetrachloride. At an

oral dose of 500 mg/kg, the extract exhibited a significant protective effect by lowering the serum levels of aspartate aminotransferase, alanine aminotransferase, total serum bilirubin, and malonedialdehyde equivalent, an index of lipid peroxidation of the liver. This activity was comparable to that of silymarin, a known hepatoprotective (Mohan, Pallavi, Kumar, Ramesh, & Venkatesh, 2007). Mujeeb et al. (2011) too obtained such significant results (Mujeeb, Khan, Aeri, & Ali, 2011).

Similar results were also observed in mice intoxicated with carbon tetrachloride and treated with methanol extract of F. Carica leaves at a dose of 200 mg/kg (Aghel, Kalantari, & Rezazadeh, 2011).

1.4 Antimicrobial and Antiparasitic Activity

Antimicrobial activity of methanol extract from Ficus Carica leaves against oral bacteria was studied. It showed strong antibacterial activity, at minimum inhibitory concentrations of 0.156 to 5 mg/ml and minimum bactericidal concentrations of 0.313 to 5mg/ml. In addition, the combination of F. Carica leaves methanol extract with ampicillin or gentamicin gave a synergistic effect against oral bacteria (Jeong, Kim, & Cha, 2009). This synergistic effect was also observed when the methanol extract of F. Carica was combined with oxacillin or ampicillin against methicillin-resistant Staphylococcus aureus (Lee & Cha, 2010).

This antibacterial effect was directed against both the pathogenic and non-pathogenic bacteria. The significant effect in inhibiting the growth of Gram-positive and Gram- negative bacteria has also been noticed (Ahmad, Khan, Khan, & Iqbal, 2013).

Al Askari et al. showed that the aqueous extract of F. Carica leaves was more active against Gram-positive bacteria than Gram-negative bacteria. Rashid et al. found the same results with ethanolic extract of F. Carica leaves (Rashid, Mohammd Mahdi, Alwan, & Burhan Khalid, 2014). Al Askari et al. also showed that ethanolic extract had a strong antimicrobial activity, with a maximum zone of inhibition noted against Staphylococcus epidermidis (21mm) with MIC 25µg/ml (Al Askari, et al., 2013). Ethanolic extracts also showed a strong activity against fungi strains (Rashid, Mohammd Mahdi, Alwan, & Burhan Khalid, 2014).

In addition to the antibacterial effect, extract of Ficus Carica leaves have an antiparasitic effect. The aqueous and methanolic extracts for example were shown to be active against the earthworms Pheretima posthuma (Patil A. P., Patil, Patil, & Chaudhary, 2010; Chandra & Kashyap, 2011), leading to their paralysis and their death. The extract of F. Carica leaves also have a strong nematocidal activity against Bursaphelenchus xylophilus, Panagrellus redivivus and Caenorhabditis elegans, causing 74.3%, 96.2% and 98.4% mortality respectively, within 72 hours at a 5mg/ml concentration (Liu, Yang, Zheng, Luo, Zhang, & Li, 2011).

1.5 Hypoglycemic Activity

The effect of a decoction of fig leaves (Ficus Carica), as a supplement to breakfast, on diabetes control was studied in insulin-dependent diabetes mellitus patients. The results showed that supplementation with Ficus Carica reduced the postprandial glycemia and by 12% the mean insulin dose (Serraclara, Hawkins, Pérez, Domínguez, Campillo, & Torres, 1998).

Pérez et al. (2000) realized a similar study on rats. During 3 weeks, a decoction of F. Carica leaves was administered to normal and diabetic rats in lieu of potable water. The extract showed a clear hypoglycemic effect. In fact, the extract decreased the plasma glucose in diabetic rats, as well as the plasmatic levels of insulin in normal rats (Pérez, Domínguez, Canal, Campillo, & Torres, 2000).

Rashidi and Noureddini for their part showed that the decrease in blood glucose level following the oral consumption of aromatic water leaves of Ficus Carica was notable in both normal and diabetic rats (Rashidi & Noureddini, 2011).
Similar results have been obtained by other research teams (El-Shobaki, El-Bahay, Esmail, Abd El Megeid, & Esmail, 2010; Stalin, Dineshkumar, & Nithiyananthan, 2012).

1.6 Other Studied Activities

Orally administered to healthy albinos rats, the extract of Ficus Carica leaves significantly increased the hemoglobin concentration, hematocrit and red blood cell count. However, it also decreased the total white blood cell count, as well as the percentage of neutrophils, when compared with the control group (Nebedum, Udeafor, & Okeke, 2010).

The effect of three extracts of Ficus Carica leaves on the total cholesterol levels in serum and liver were investigated in experimentally-induced hyperlipidemic rats. The rats were treated daily by intraperitoneal administration of an aqueous methanolic extract and its aqueous fractions, for eight days. All the extracts of Ficus Carica leaves resulted in a decrease of serum and liver cholesterol levels. The hydromethanolic extract would be more effective on liver cholesterol level, and this effect is dose-dependent (Rassouli, FatemiArdestani, Asadi, & Salehi, 2010).

Saxena et al. showed that the hexane extract of F. Carica afforded mild memory enhancing effects, the higher dose evoking pronounced alteration of behavior and better learning assessments (Saxena, Ahmad, & Gupta, 2013).

The F. Carica leaves extracts could also have insecticide effect (Kim, Park, Kim, Kuk, Jang, & Kim, 2005), immunostimulant properties (Patil, Bhangale, & Patil, 2010), and even antiscalent (Abdel-Gaber, Abd-El-Nabey, Khamis, & Abd-El-Khalek, 2008).

1.7 Chemical composition

The chemical but also nutritional (
) and mineral (Table 2) composition of fig leaves is rich and has been determined by many research teams.

Table 1: Chemical and nutritional composition of Ficus Carica L. leaves (%) (El-Shobaki, El-Bahay, Esmail, Abd El Megeid, & Esmail, 2010)

Moisture	65.90
Ash	**5.30**
Proteins	**5.90**
Lipids	**0.81**
Fiber	**4.50**
Carbohydrates	**17.50**

Table 2: Mineral composition of Ficus Carica leaves (Khan, et al., 2012)

Element	Concentration (mg/g)
Sodium, Na	**10.63**
Potassium, K	11.32
Zinc, Zn	**0.002**
Iron, Fe	1.35
Chromium, Cr	**0.055**
Cobalt, Co	0.017
Copper, Cu	**0.01**
Nickel, Ni	0.001
Lead, Pb	**0.05**
Manganese, Mn	0.002
Calcium, Ca	**9.73**
Magnesium, Mg	6.97
Cadmium, Cd	**0.002**

Ficus Carica leaves content vitamin C and E (Ghazi, Rahmat, Yassin, Ramli, & Buslima, 2012). They are rich in phenolic compounds. The total phenols content is about 907.02 ± 33.24mg GAE/100g (Ghazi, Rahmat, Yassin, Ramli, & Buslima, 2012).

The chemical compounds identified in F. Carica leaves extracts belong to various classes: phenols, sesquiterpenes, flavonoids, tannins, organic acids (Oliveira, et al., 2010) ; but also coumarins, sterols, glycosides, alkaloids, saponins (Nebedum, Udeafor, & Okeke, 2010).

The compounds found in various extracts are quercetin (Pande & Akoh, 2010; Khan, et al., 2012), luteoline (Vaya & Mahmood, 2006), rutin, carotene (Chawla, Kaur, & Sharma, 2012), psoralen and bergapten (Chunyan, Ping, Jingmei & ito, 2009). These compounds would be responsible for the various properties mentioned above.

2. CONCLUSION

Ficus Carica fruits are widely consumed in mediterranean countries. Even if they have had a certain interest in traditional medicine, its leaves are not well known. These last years, some studies have been focusing on some of their effects. This review shows us that they may be beneficial in drug development. Indeed, for now only a small number of the active compounds have been studied.

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