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Pharmaceutical properties of Indian species of *Ficus* Linn.

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Abstract

The paper deals with the review of pharmaceutical properties of species of *Ficus* L. occurring in India.Key-Words: Pharmaceutical, *Ficus*, Extract.

Introduction

Intuition and the empirical knowledge of the beneficial and harmful qualities of many plants have been employed for thousands of years to heal diseases using plants. In India, the Charak Samhita and Sushrut Samhita documented the therapeutic characteristics of 500 and 700 plants respectively under 37 groups or "Ganas" (Saxena, 2003). In the nearly 8000-year-old Rig Veda, we find the first documentation of the therapeutic use of plants. The ancient Indian academics who wrote Atharva Veda presented a great account of the Indian medicinal herbs. Ayurveda is a medical system that uses natural remedies to cure illness. It was first discussed in the Upaveda, a text written in India circa 2500 B.C. From Vedas it is discovered that Indo-Aryans employed the 'Soma' (a plant product) as a rejuvenating agent, which demonstrates an outstanding stimulating effect (Satyavati et al., 1976). Ayurveda, Siddha, Unani, and Homoeopathy (AYUSH) formulations, which represent the Indian medical traditions, comprise over ninety percent plant-based raw ingredients (Anonymous, 2008).

In Systema Naturae, Carolus Linnaeus originally introduced the genus Ficus L. (Moraceae). Among flowering plants, Ficus is among the top five biggest genera. It was classified as the 21st most common genus of flowering plants that produce seeds (Frodin, 2004). It consists of over 800 different species found in warm climates all over the globe (Adebayo et al., 2009). The North-East area of India, with around 43 species in Meghalaya alone, may be regarded the hotspot region in India, but the whole nation is home to 115 different species (Chaudhary et al., 2012).

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Members of the genus have been used as food, fodder, medicine, as source of rubber and several other uses. Studies on pharmaceutical activities of *Ficus* have been carried out by several workers (Sehgal, 2003; Patil & Patil, 2010; Lalla, 2005; Joseph & Raj, 2011; Mousa *et al.,* 1994; Zahra *et al.,* 2009; Khan *et al.,* 2007; Shukla *et al.,* 2004; Vohra & Parasar, 1970; Singh *et al.,* 2009; Aref *et al.,* 2010; Kuete *et al.,* 2011; Shukla, 1995; Daniel *et al*, 2003; Morton & McManus, 1986; Aswar *et al.,* 2008; Mahalingam,2008; Sharma *et al.,* 2010; Gabhe, 2006; Abdulla *et al.,* 2010; Mukherjee *et al.,*1998; Taur, 2007 and several others). These works have provided information on medicinal properties of several members of *Ficus.*

Pharmaceutical activities of *Ficus* species

Analgesic (pain reliever): Analgesic activity of the leaf extract of *Ficus glomerata* Roxb. and stem bark of *Ficus bengalensis* Linn. have been confirmed respectively by Sehgal (2003) and Patil & Patil (2010).Kumar *et al.* (2012) also published a review paper on analgesic property of *Ficus carica* Linn.

Treatment of cancer: Medicinal plant products exhibiting anticancer activity continue to be the subject of extensive research aimed at the development of new or alternative drugs for the treatment of different human tumors. Lalla (2005) reported *F. glomerata* and *F. racemosa* Linn. for the treatment of skin cancer. Both the natural and compounds synthesised from *F. carica* showed in vitro inhibitory effects on proliferation of various cancer cell lines (Joseph & Raj,2011)**.** Fruit extracts of *F. benjamina* Linn., *F. bengalensis* , *F. religiosa* Linn. and *Ficus sycomorus* n., an African species, exhibited anti-tumor activity in the potato disc bioassay (Mousa *et al.,* 1994).

Treatment against ulcer: The healing activity of whole plant extract of *F. deltoidea* Jack. was studied ingastric ulcer induced by ethanol in rats, the extract promoted ulcer protection as ascertained by the comparative significant decreases in ulcer areas and inhibition of sub mucosal edema and leucocytesinfiltration of sub mucosal layer (Zahra *et al.,* 2009). Sivaraman & Muralidharan (2010) reported *F. hispida* as a potent anti-ulcerogenic as well as ulcerhealingproperties and could act as a potent therapeutic agent against peptic ulcer disease. Anti-ulcerogenic potential of *F. bengalensis* is also reported by Kulshreshtha *et al.* (2011).

Antiageing agent / antioxidant: Cell membranes are especially vulnerable to the aggression of free radicals. When the nucleus is damaged, the cell loses its ability to replicate itself. The impaired cell replication results in the weakened immune system, skin ageing and manyage related disorders. Various antioxidants deactivate the free radicals and prevent oxidation on a cellular level. Some commonly used plants as antiageing agentsincludes *F. bengalensis* (Khan *et al.,* 2007; Patil & Patil, 2010). The antioxident effect of species of *Ficus* may be attributed to the polyphenolic compounds they posses. The antioxidant effect of aqueous extract of the bark of *F. bengalensis* has been evaluated in hypercholesterolemia rabbits by Shukla *et al.* (2004) and confirmed its significant antioxidant effect. The potential health-promoting constituents of fig fruits were studied with six commercial fig varieties differingin color (black, red, yellow and green) 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 (Joseph & Raj, 2011).

Anti diabetic: Diabetes mellitus is the most common endocrine disorder that impairs glucose homeostasis resulting in severe diabetic complications including retinopathy, angiopathy, nephropathy, neuropathy and causing neurological disorders due to perturbation in utilization of glucose. According to Ayurvedic system of medicine *F. bengalensis* is well known in the treatment of diabetes (Rashid, 2008). This attracted the attention of many earlier workers who studied the hypoglycemic effect of extracts from its bark and tried to isolate active compounds. Bark of this plant has anti-diabetic properties. The hypoglycemic effect of extract of bark was demonstrated in alloxan diabetic rabbits, rats and in humans. Potent hypoglycemic water insoluble principle was isolated from the bark and a water soluble hypoglycemic principle was also isolatedfrom the bark which was effective at a low dose of 10 mg/kg, bw/day (Patil & Patil, 2010). Both the banyan bark principles were effective in mild as well as severe alloxan induced diabetes in rabbits, and improved lipid profile (Vohra & Parasar, 1970)**.** The aqueous leaf extract of *F. carica* induced a significant hypoglycemic

effect in oral or intraperitoneal administration in streptozotocin - diabetic rats. Weight loss was prevented in treated diabetic rats and the survival indexwas significantly altered by plasma insulin levels (Joseph and Raj, 2011). Singh *et al.* (2009) reported that *F. bengalensis, F. carica* and *F. glomerata* are effective in the treatment of diabetes. The hypoglycemic activity of ethanol extracts of leaves of *F.glomerata* has significant antihyperglycemic effect in experimental albino rat model of diabetes mellitus (Sharma *et al.,* 2010). Hypolipidemic effect of the water extract of the bark of *F. bengalensis* was investigated in alloxan induced diabetes mellitus in rabbits showing a good glycemic control also corrects the abnormalities in serum lipid profile associated with diabetes mellitus in view of the ability of the water extract of *F. bengalensis* to improve carbohydrate and lipid metabolism (Shukla, 1995). The fruits of *F. glomerata*, locally known as Gular have been used since ancient times in the ethno-medicine including as a remedy of diabetes mellitus (Chopra *et al.*,1976). The aqueous extract of *F. bengalensis* at a dose of 500mg/kg/day exhibits significant antidiabetic and amelioferative activity as evidenced by histological studies in normal and *F. bengalensis* treatedstreptozotocin induced diabetic rats. On the basis of the findings, it could be used as an Antidiabetic and Ameliorative agent for better management of diabetes mellitus (Mahalingam,2008). *F. exasperate* Vahl and *F. arnottiana* Miq. are also reported to have anti-diabetic activity by Sonibare *et al.* (2006) and Mazumdar *et al.* (2009) respectively.

Anti fungal activity: Methanolic extracts of *F. carica* latex had a total inhibition against *Candida albicans* (100%) at a concentration of 500µg/ml and a negative effect against *Cryptococcus neoformans* whereas *Microsporum canis* was strongly inhibited (75%) and totally with ethyl acetate extract at a concentration of 750µg/ml (Joseph & Raj, 2011). Aref *et al*. (2010) also reported that the methanolic, hexanoïc, chloroformic and ethyl acetate extracts of *F. carica* latex posseses anti-fungal activity. Antifungal activities have also been reported for *F. exasperate* (Sonibare *et al*., 2006). **Anti bacterial activity:** The methanol extract of *F. carica* showed a strong antibacterial activity against oral bacteria while the combined effects of methanol extract with ampicillin or gentamicin were synergistic against oral bacteria (Joseph & Raj, 2011). The fruit extracts of *F. sycomorus*, an African species, *F. benjamina*, *F. bengalensis* and *F. religiosa* had significant antibacterial activity (Mousa *et al.*, 1994). Aref *et al*. (2010) also reported that the methanolic, hexanoïc, chloroformic and ethyl acetate extracts of *F. carica* latex posseses anti-bacterial activity. *F. exasperata* leaf, stem bark and root contained bioactivesubstances with the highest inhibitory activities against some human bacterial pathogenic organisms (Adebayo *et al*., 2009).

Anti pyretic: The ethanol extract of *F. carica*, at dosesof 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 administrationwhen compared to that of Paracetamol (150 mg/kg.), a standard antipyretic agent. This shows the anti pyretic effect of ethanol extract of *F. carica* (Joseph and Raj, 2011). *F. bengalensis* also shows antipyretic activity (Patil & Patil, 2010).

Scavenging & immune response: The water extract (WE) and crude hot-water soluble polysaccharide (PS) from *F. carica* 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 EC50 (0.72, 0.61) mg/ml, respectively. The PS showed higher scavenging activity than WE on superoxide radical (EC50, 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 andimmune responses of the extract (Joseph and Raj, 2011)

Hepatoprotective: Shade dried leaves of *Ficus carica* were extracted using petroleum ether (60-80°) and tested for antihepatotoxic activity on rats treated with
50 mg/kg of rifampicin orally. The result indicated promising hepatoprotective activity (Gond and Khadabadi, 2008**).** The ethanolic extract of *F. benjamina* possesses hepatoprotective activity against CCl4 induced hepatotoxicity in rats (Kanaujia *et al*., 2011)

Antiatherogenic: One month treatment of alloxan diabetic dogs with glycoside, viz. leucopelargonin derivative (100mg/kg/day) isolated from the bark of *F. bengalensis* decreased fasting blood sugar and *F. benghalensis* glycosylated haemoglobin by 34% and
In each case, 28%. In contrast to the 10% weight loss seen by the control group, both treatment groups maintained their body weights. Liver

HMGCOA reductase and lipogenic enzyme activities, as well as lipoprotein lipase activities in heart and adipose tissue, plasma LCAT activity, and the incorporation of labeled acetate into free and ester cholesterol in liver, all decreased significantly in rats fed a cholesterol-rich diet (Daniel et al., 2003).

Clinical testing has shown that F. glabrata latex is an effective and safe anthelmintic/vermifuge (Morton and McManus, 1986). Aswar et al. (2008) found that the methanolic, chloroform, and pet ether extracts of F. bengalensis roots show anthelmintic activity that is equivalent to that of standard anthelmintic medication. F. racemosa's aqueous extract may be utilized as an anthelmintic due to its wormicidal properties (Chandrashekhar et al., 2008).Carrageenan-induced paw edema in rats was examined plethysmometrically from 0 to 3 hours after injection to determine the anti-inflammatory activity of ethanolic and petroleum ether extracts of the bark of F. bengalensis. According to the findings, an ethanolic extractWhen compared to the gold standard medicine Indomethacin, F. bengalensis showed much higher action than petroleum ether in the treatment of inflammation (Patil et al., 2009). Kumar et al. (2012) have released a review study on anti-inflammatory effects of F. carica. Immunomodulatory: Gabhe (2006) analyzed the efficacy of F. bengalensis aerial roots as an immunomodulatory agent. Phagocytosis was much higher in the methanol and water extracts after each other than in the control. Results from in vivo tests showed that the hypersensitive response to the SRBC antigen increased proportionally with increasing doses of the consecutive methanol extract. It also resulted in a considerable rise in the antibody titer value to SRBC.The Ayurvedic practice of using F. racemosa Linn. to treat wounds dates back to 2003 (Biswas & Mukherjee). The rate of wound healing enclosure and the histology of healed wounds in rats were evaluated using an aqueous extract of the whole plant of F. deltoidea by Abdulla et al. (2010), and the results strongly document the beneficial and significant effects to speed up the rate of wound healing enclosure in the experimentally-induced wounds in rats. **Antidiarrhoeal**: Mukherjee *et al*. (1998) evaluated ethanol extracts of *F. bengalensis* (hanging roots), *Eugenia jambolana* Lam. (bark), *F. racemosa* (bark) and *Leucas lavandulaefolia* Rees (aerial parts) and showed significant inhibitory activity against castor oil induced diarrhoea and PGE2 induced enter pooling in rats. These extracts also showed a significant reduction in gastro-intestinal motility in charcoal meal tests in rats. The results obtained establish the efficacy of all these plant materials as anti-diarrhoeal agents. Mandal & Kumar (2002) reported *F. hispida* Linn. leaf extract as an anti-diarrheal agent.

Anti-stress and anti-allergic: Extracts of *F. bengalensis* bark was screened for its antiallergic and antistress potential in asthma by milk-induced leucocytosis and milkinduced eosinophilia. Aqueous, ethanol, and ethyl acetate extracts showed significant decrease in leucocytes and eosinophils in the order given while petroleum ether and chloroform extracts were inactive. This shows the application of polar constituents of *F. bengalensis* bark as antis tress andant allergic agents in asthma (Taur, 2007).
F. religiosa is also used for the treatment of Bronchial Asthma. Malhotra *et al.* (1960) was the first who investigated the antiasthmatic potential of the alcoholic bark extract of the *F.religiosa*. The exract showed inhibitory effect on both acetylcholine-induced and histamine-induced experimental asthma (Malhotra *etal.,* 1960).

Conclusion

Review of literature suggests that out of roughly 115 species of Ficus occurrence in India, 11 species have medicinal use. It has been discovered that F. bengalensis, of the Indian species of Ficus, has been reported to be beneficial in the treatment of the greatest number of diseases (pain reliever, cancer, anti-ulcerogenic, aging, diabetes, fever, antherogenesis, helminthes infections, inflammation, Immune system, diarrhoea, allergy, and stress). Pharmaceutical capabilities for the treatment of various ailments have also been attributed to the species F. racemosa (syn. F. glomerata), F. deltoidea, F. hispida, F. benjamina, F. exasperate, F. religiosa, F. arnottiana, and F. glabrata.

References

1. Abdulla M.A., Ahmed K.A., Abu-Luhoom

F.M. and Muhanid M.. (2010). Role of *Ficus deltoidea* extract in the enhancement of wound healing in experimental rats, *Biomedical Research*, 21 :(3): 241-245.

2. Adebayo E.A., Ishola O.R., Taiwo O.S., Majolagbe O.N.and Adekeye B.T. (2009). Evaluations of the methanol extract of *Ficus exasperate* stem bark, leaf and root for phytochemical analysis and antimicrobial activities, *African Journal of Plant Science.*, 3 :(12):283-287.
3. Anonymous. (2008). Agro-techniques of medicinal plants. National Medicinal Plant Board, Deptt. of AYUSH, Ministry of health and Family Welfare, Govt. of India. TERI Press, New Delhi, 1: xiii.
4. Aref H. L., Salah K. B. H., Chaumont J. P., Fekih A. W., Aouni M., Said K. (2010). In vitro antimicrobial activity of four *Ficus carica*latex fractions against resistant human pathogens (antimicrobial activity of *Ficus carica* latex), *Pak. J. Pharm. Sci*, 23 :(1):53-58.
5. Aswar M., Aswar U., Watkar B., Vyas M., Wagh A. and Gujar K.N. (2008). Anthelmintic activity of *Ficus bengalensis*, *International J Green Pharmacy*, 2 :(3):170-172.
6. Biswas T.K. and Mukherjee B. (2003). Plant medicines of Indian origin for wound healing activity: a review, *Int J Low Extreme Wounds*, 2:(1):25-39.
7. Chandrashekhar C.H., Latha K.P., Vagdevi H.M. and Vaidya V.P. (2008). Anthemintic activity of the crude extracts of *Ficus racemosa, International Journal of Green Pharmacy,* April-June: 100-103.
8. Chaudhary L.B., Sudhakar J.V., Kumar A., Bajpai O., Tiwari R. and Murthy G. V. S. (2012). Synopsis of the Genus *Ficus* L. (Moraceae) in India, *Taiwania*, 57 :(2):193-216.
9. Daniel R.S., Devi K.S., Augusti K.T. and Nair C.R. (2003). Mechanism of action of Antiatherogenic and related effects of *Ficus bengalensis* Linn flavonoids in experimental animals, *Indian J Exp. Biol,* 41:296- 303.
10. Frodin D.G. (2004). History and Concept of Big Plant Genera, *Taxon*, 53:753-776.
11. Gabhe S.Y., Tatke P.A. and Khan T.A. (2006). Evaluation of the Immunomodulatory activity of the methanol extract of *Ficus bengalensis* roots in rats, *Indian J Pharmacol*, 38: (4):271- 275.
12. Gond N.Y. and Khadabadi S.S. (2008). Hepatoprotective Activity of *Ficus carica* Leaf Extract on Rifampicin-Induced Hepatic Damage in Rats, *Indian J Pharm Sci*, 70 :(3): 364–366.