



Ficus: A Magical Plant

Ramica Sharma¹, Amita Mahajan², Gurfateh Singh³

1.Ph. D Scholar, University School Of Pharmaceutical Sciences, Rayat Bahra University, Mohali

2.Head, University School of Agriculture Sciences, Rayat Bahra University, Mohali

3.Professor, University Institute of Pharmaceutical Sciences, Chandigarh University

Abstract

Medicinal plants have been used as traditional medicines for centuries. Empirical knowledge of their benefits has been passed down through generations. Plants with medicinal properties are first mentioned in the "Rig-Veda", the oldest source of human knowledge. Indian medicine considers the Ficus to be one of the primary medicinal plants that belongs to Moraceae family. The conventional medication system utilizes plant parts such as leaves, stem bark, aerial roots, fruit, buds, and latex to treat a wide range of illnesses in humans. This review has been designed to summarize the Pharmacological properties of Various species of Ficus such as *Ficus benghalensis*, and *Ficus carica*.

Keywords: Pharmacological Action, Rig-Veda, Medicinal Plants

1. Introduction

India has a rich history of using medicinal plants as part of traditional medicine systems like Unani, Ayurveda, and Siddha. The World Health Organization (WHO) has too developed the guidelines for assessing herbal medicines. From ages i.e Vedic era the medicinal plants have been in use to treat or to prevent numerous diseases¹. Every portion of the plant has its own medicinal value. Different types of secondary metabolites found in the medicinal plants which play an important role in many kinds of diseases and also has potential application in pharmaceutical product development². Ficus is regarded as the largest and most abundant genera in the Plant Kingdom that has been reported to possess thousands

of phytoconstituents that are responsible for the therapeutic activities [3]. Ficus contains phytoconstituents such as monoterpenes, diterpenes, sesquiterpene, triterpenes, alkaloids, and flavonoids [4]. These isolated compounds or phytoconstituents has been found to possess Antioxidant, Hypoglycaemic, Hepatoprotective anti-microbial and anti-viral activities, wound healing activity, anti-oxidant, anti-convulsant activity, immunomodulatory activity, anti-ulcer activity, anti-cancer activity, anti-inflammatory and analgesic activities, anti-asthmatic activity, anti-acetylcholinesterase activity [5-6]. As already discussed, that Ficus is the largest species so in this review, an update about the pharmacological profile of *Ficus benghalensis* and *Ficus carica*, is discussed that are abundantly found in Asia. We had discussed all the therapeutic benefits of Ficus so that further studies can be carried out preclinically and clinically in order to fill all the research gaps.

2. Ficus carica (Fig)

In traditional medicine, *Ficus carica* has been used for treating a variety of ailments, including anemia, cancer, diabetes, leprosy, liver diseases, paralysis, skin diseases, and ulcers [7]. Pharmaceutical biology considers it as a promising candidate for developing/formulating new drugs and using them clinically in the future. Phytochemical studies on fruits and leaves of fig plant have been carried out and it has been documented that they are rich in phenolics, organic acids and volatile compounds which in return are responsible for the various biological activities such as antioxidant, anti-inflammatory, antibacterial, anticancer, hepatoprotective, antidiabetic, antifungal, antiviral, antimutagenic, antipyretic, antituberculosis, anti-angiogenic, antiparasitic, hematostasis, anticonstipation and antiwarts activities [8].



Fig 1: Fruit of *Ficus carica* (*Anjeer*)

Not only this, *Ficus carica* latex is used in milk clotting in cheese production, meat tenderization, bioactive peptides production, and natural rubber production [9]. Oral administration of *Ficus carica* bud and leaf extracts at a dose of 200mg/kg in rats can help in the treatment of alloxan- induced diabetes and Gentamicin induced nephrotoxicity [10-11]. Further, the ethanolic extract of *Ficus carica* has potential to inhibit the carbohydrate and lipid metabolism that are elicited to play a pivotal role in pathogenesis of Obesity and Diabetes. Mopuri and Islam in 2016 whereas Ghanbari and co-workers in 2019 suggested that the Fig latex downregulated the expression level of HPV oncoproteins, E6 and E7 as well as p16 (marker for HPV infection) and elevate the expression of P53 and Rb genes on the cervical cancer cell [12-13]. The findings reveal the cytotoxic potential of Fig Latex in cervical cancer [13]. *F.carica* fruit has been found beneficial in the management of various cardiovascular diseases (CVD), as they are rich source of polyunsaturated fatty acids (PUFA) and omega -6 fatty acid [14]. Despite of the pharmacological role, *Ficus carica* mediated silver nanoparticles have been used for fresh apple slice preservation [15]. Recently the role of Cyanidin-3-rhamnoglucoside common constituent in Fig been elicited in the management of CPVID-19 [16]. Table 1 indicated the therapeutic Potential of Fig.

Fig Latex	Cytotoxic Potential by downregulating the expression level of HPV oncoproteins, E6 and E7 as well as p16 (marker for HPV infection) and elevate the expression of P53 and Rb genes on the cervical cancer cell [13]
Ethanolic Extract of Ficus	Antiobesity and Antidiabetic Potential by inhibiting Carbohydrate digesting enzyme [17]
<i>Ficus carica</i> bud and leaf extracts	Oral administration at a dose of 200mg/kg Attenuates alloxan- induced diabetes and Genbtamicin induced nephrotoxicity [11]
Aqueous Leaf extract of Ficus	Hypoglycemic effect in Streptozotocin (STZ)-induced Diabetes [18]

Petroleum ether extract from leaves of <i>F. carica</i>	Hepatoprotective activity was elucidated on rats administered 50 mg/kg of rifampicin orally [18]
---	--

Table 1: *Therapeutic Roles of Ficus Carica in the Management of Various Disorders*

3. Ficus Benghalensis

F. benghalensis commonly called as Banyan tree, Indian fig, and Sacred Fig is the species of *Ficus* that belongs to *Urostigma* subgenus [19]. A young tree is epiphytic, with petioles of 1.25 to 5 cm in length, ovate sessile lamina, and reddish hypanthodia. Female flowers are small, elongated, and pedicellate. The same stalk, however, lacks male flowers [20].

Fig 2: *Ficus benghalensis* (Sacred Banyan tree)

The Literature Review indicates that the leaves and bark of *F. benghalensis* are rich in flavonoids, phenols, terpenoids, and terpenes whereas leaves contain quinone rhein, psoralen, and bergapten. The root extract has sterols, organic and fatty acids, while the fruit was reported to be rich in fatty acids. *Ficus* tree extracts have shown to have antioxidant, antidiabetic, hypolipidemic, anthelmintic, antihyperglycemic, immunomodulatory, antihyperlipidemic, hypocholesterolemic, anti-inflammatory, analgesic, antimicrobial, larvicidal, anti-diarrhoeal, antimutagenic, hepatoprotective, anti-arthritic, antiallergic, and immunostimulatory effects [21-24]. Various researchers have elucidated the effect of Ethanolic extract of *Ficus benghalensis* on 2,4,6-trinitrobenzenesulfonic acid (TNBS administrated once) induced IBD in rats for 21 days [25]. Not only this Aqueous extracts of *Ficus benghalensis* when used at a concentration of 20 mg/ml concentration showed significant paralysis of worms at 3.44 min and death at 4.34 min, whereas methanolic extract shows paralysis at

3.02 min and death at 4.36 min. Results indicated that both these two extracts possess anthelmintic activity [26]. Evidences indicated that the hydroalcoholic extract of bark of *F. benghalensis* have antidiabetic potential by ameliorating the process of glycolysis and attenuating gluconeogenesis via PI3K/Akt signalling pathway and downregulating the function of protein tyrosine phosphatase 1b [27]. Recently investigators predicted that petroleum, ethanolic and aqueous extracts of *F. benghalensis* leaves possess significant wound-healing activity by significantly decreasing the process of epithelization and increase in the wound contraction rate [28]. In the year 2022 Protective Effects of *Ficus benghalensis* was investigated in Streptozotocin (STZ)-Induced Diabetic Zebrafish (*Danio rerio*) Model. The finding of this study suggested that hydroethanolic extract of *F. benghalensis* as a promising candidate for treating diabetes [29]. Recently, antimicrobial activity of leaves and fruit of *F. benghalensis* was elucidated by evaluating Zone of Inhibition (ZOI) and Minimum Inhibitory Concentration (MIC) against gram-positive (*Bacillus subtilis* and *Staphylococcus aureus*) and gram-negative (*Salmonella typhi* and *Escherichia coli*) bacteria; and fungal strains (*Aspergillus niger*, *Fusarium oxysporum*, and *Rhizopus oryzae*). Methanolic extracts was found to possess higher antimicrobial activity [30]. *Ficus benghalensis* leaf extract is found to be beneficial in stimulating hair follicle maturation by inhibiting the action of enzyme 5 α -reductase II. Hence, they may be employed in *de novo* drug designing to manage alopecia [31]. In 2023, *in vitro* and *in-silico* study was performed to evaluate the glucose uptake and elucidate the phytoconstituents, A total of 17 phytoconstituents from *F. benghalensis* were identified to possess the anti-diabetic effects [32].

Conclusion

In the current review article, we have only focused on the pharmacological properties of two species of *Ficus*. Researchers from various regions too have explored that *Ficus* as an alternative therapy to current medication for the management of various disorders. *In vitro*, *in vivo* and various clinical studies have been carried out to find their efficacy and mechanism of action. Concluding the current literature-based review, it is noted that *Ficus carica* and *Ficus benghalensis* have a series of benefits in all the pathological conditions. Hence, this review open vista to explore more pharmacological interventions by using *In-silico* models and clinical studies.

REFERENCES

1. Bamola, N. Verma, P. Negi, C. 2018. A review on some traditional medicinal plants. International Journal of Life-Sciences Scientific Research., 1:4(1):1550-6.
2. Kaushik, B. Sharma, J. Kumar, P. Shourie, A. 2021. Phytochemical properties and pharmacological role of plants: secondary metabolites. Biosciences Biotechnology Research Asia, 1:18(1):23
3. Salehi, B. Prakash Mishra, A. Nigam, M. Karazhan, N. Shukla, I. Kiełtyka-Dadasiewicz, A. Sawicka, B. Głowacka, A. Abu-Darwish, MS. Hussein Tarawneh, A. Gadetskaya, AV. 2021. Ficus plants: state of the art from a phytochemical, pharmacological, and toxicological perspective. Phytotherapy Research, 35(3):1187-217.
4. Singh, B. Sharma, RA. 2023. Updated review on Indian Ficus species. Arabian Journal of Chemistry, 8:104976
5. Gupta, AK. Gupta, S. Bansal, C. 2021. A Critical Review on Ashvattha Leaves (*Ficus Religiosa* Linn.): An Ayurvedic Perspective and Current Practice. International Journal of Ayurveda and Pharma Research, 4:62-8.
6. Murugesu, S. Selamat, J. Perumal, V. 2021. Phytochemistry, pharmacological properties, and recent applications of *Ficus benghalensis* and *Ficus religiosa*. Plants, 10(12):2749.
7. Badgujar, SB. Patel, VV. Bandivdekar, AH. Mahajan, RT. 2014. Traditional uses, phytochemistry and pharmacology of *Ficus carica*: A Review. Pharm Biol, 52(11):1487-1503. doi:10.3109/13880209.2014.8925
8. Hajam, TA. Saleem, H. 2022. Phytochemistry, biological activities, industrial and traditional uses of fig (*Ficus carica*): A review. Chemico-Biological Interactions :110237.
9. Hegazy, MM. Mekky, RH. Afifi, WM. Mostafa, AE. Abbass, HS. 2023. Composition and Biological Activities of *Ficus carica* Latex. In Fig (*Ficus carica*): Production, Processing, and Properties, 597-641.
10. Ghafoor, A. Tahir, M. Lone, KP. Faisal, B. Latif, W. 2015. The effect of *Ficus carica* l. (Anjir) leaf extract on gentamicin induced nephrotoxicity in adult male albino mice. Journal of Ayub Medical College, 20:27(2):398-401.
11. El Ghouizi, A. Ousaaïd, D. Laaroussi, H. Bakour, M. Aboulghazi, A. Soutien, RS. Hano, C. Lyoussi, B. 2023. *Ficus Carica* (Linn.) Leaf and Bud Extracts and Their Combination Attenuates Type-1 Diabetes and Its Complications via the Inhibition of Oxidative Stress, 9:12(4):759.

12. Mopuri, R. Islam, MS. 2016. Antidiabetic and anti-obesity activity of *Ficus carica*: In vitro experimental studies. *Diabetes & Metabolism*, 42(4):300.
13. Ghanbari, A. Le Gresley, A. Naughton, D. Kuhnert, N. Sirbu, D. Ashrafi, GH. 2019. Biological activities of *Ficus carica* latex for potential therapeutics in Human Papillomavirus (HPV) related cervical cancers. *Scientific reports*, 31;9(1):1013
14. Rasool, IF. Aziz A, Khalid W, Koraqi H, Siddiqui SA, Al-Farga A, Lai WF, Ali A. 2023. Industrial application and health prospective of fig (*Ficus carica*) by-products. *Molecules*, 18;28(3):960.
15. Mouzahim, ME. Eddarai, EM. Eladaoui, S. Guenbour, A. Bellaouchou, A. Zarrouk, A. Boussen, R. 2023. Effect of Kaolin clay and *Ficus carica* mediated silver nanoparticles on chitosan food packaging film for fresh apple slice preservation. *Food Chemistry*, 1;410:135470.
16. Abu Bakar, U. Subramaniam, P. Kamar Bashah, NA. Kamalrudin, A. Kamaruzaman, KA. Jasamai, M. Aizat, WM. Shahinuzzaman, M. 2020. Sperm proteomics analysis of diabetic induced male rats as influenced by *Ficus carica* leaf extract. *Processes*, 28;8(4):395.
17. Hamed, M. Khalifa, M. El Hassab, MA. Abourehab, MAS. Al Kamaly, O. Alanazi, AS. Eldehna, WM. Mansour, FR. 2023. The Potential Roles of *Ficus carica* Extract in the Management of COVID-19 Viral Infections: A Computer-Aided Drug Design Study. *Curr Comput Aided Drug Des*, doi: 10.2174/1573409920666230818092445.
18. Shukranul, M. Khairana, H. Ibrahim, J. 2013. *Ficus carica* L (Moraceae): phytochemistry, traditional uses and biological activities. *Evidence-Based Complementary and Alternative Medicine*. 2013:974256.
19. Pierantoni, M. Tenne, R, Rephael, B. Brumfeld, V. van Casteren, A. Kupczik, K. Oron, D. Addadi, L. Weiner, S. 2018. Mineral deposits in ficus leaves: Morphologies and locations in relation to function. *Plant Physiol*, 176:1751–1763. doi: 10.1104/pp.17.01516).
20. Parameswari, SA. Saleem, TS. Chandrasekar, KB. Chetty, CM. 2012. Protective role of *Ficus benghalensis* against isoniazid-rifampicin induced oxidative liver injury in rat. *Revista Brasileira de Farmacognosia*, 22:604-10.
21. Ahmad, S. Rao, H. Akhtar, M, Ahmad, I. Munawar, M. 2011. Phytochemical composition and pharmacological prospectus of *Ficus bengalensis* Linn.(Moraceae)-A Review. *Journal of medicinal plants research*, 5(28):6393-6400

22. Khanal, P. Patil, BM. 2020. Integration of in silico, in vitro and ex vivo pharmacology to decode the anti-diabetic action of *Ficus benghalensis* L. bark. *Journal of Diabetes & Metabolic Disorders*, 19:1325-37.
23. Taur, DJ. Nirmal, SA. Patil, RY. Kharya, MD. 2007. Antistress and antiallergic effects of *Ficus benghalensis* bark in asthma. *Natural product research*, 1;21(14):1266-70.
24. Singh, P. Dhankhar, J. Kapoor, RK. Kumar, D. Bhatia, S. Al-Harrasi, A. Sharma. 2023. A. *Ficus benghalensis*—A comprehensive review on pharmacological research, nanotechnological applications, and patents. *Journal of Applied Pharmaceutical Science*, 2023 Jun 16.
25. Patel, MA. Patel, PK. Patel, MB. 2010. Effects of ethanol extract of *Ficus benghalensis* (bark) on inflammatory bowel disease. *Indian J Pharmacol*, 42(4):214-218.
26. Aswar, M. Aswar, U. Watkar, B. Vyas, M. Wagh, A. Gujar, KN. 2008. Anthelmintic activity of *Ficus benghalensis*. *International Journal of Green Pharmacy (IJGP)*: 2(3).
27. Khanal, P. Patil, BM. 2021. Consolidation of network and experimental pharmacology to divulge the antidiabetic action of *Ficus benghalensis* L.bark. *Biotech*, 11(5):238.
28. Imran, M. Sharma, JN. Kamal, M. Asif, M. 2021. Standardization and wound-healing activity of petroleum, ethanolic and aqueous extracts of *Ficus benghalensis* leaves. *Pharmaceutical Chemistry Journal*, 54:1057-62.
29. Sabi, EM. Mujamammi, AH. Althafar, ZM. Al-Shouli, ST. Bin Dahman, LS. Sumaily, KM. 2022. Protective Effects of *Ficus benghalensis* in Streptozotocin (STZ) Induced Diabetic Zebrafish (*Danio rerio*) Model. *Indian Journal of Pharmaceutical Education & Research*, 1;56(3).
30. Singh, P. Dhankhar, J. Kapoor, RK, Sharma, A. 2023. A comparative study on GC-MS analysis and antimicrobial activity of bioactive compounds presents in aerial parts (leaf and fruit) of *Ficus benghalensis* L. *Journal of Applied and Natural Science*, 20;15(2):870-83.
31. Iltaf, J. Noreen, S. Rehman, MF. Ghumman, SA. Batool, F. Mehdi, M. Hasan, S. Ijaz, B. Akram, MS. Butt, H. 2021. *Ficus benghalensis* as Potential Inhibitor of 5 α -Reductase for Hair Growth Promotion: In Vitro, In Silico, and In Vivo Evaluation. *Frontiers in Pharmacology*, 7;12:774583.
32. Madiwalar, VS. Dwivedi, PSR. Patil, A. Gaonkar, SMN. Kumbhar, VJ. Khanal, P. Patil, BM. 2022. *Ficus benghalensis* promotes the glucose uptake- Evidence with *in silico* and *in vitro*. *J Diabetes Metab Disord*, 15;21(1):429-438.