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REVIEW ARTICLE

Comprehensive Review on Phytochemistry and Ethnomedicinal uses of *Ficus auriculata* Lour. Medicinal plant species

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ABSTRACT
Ficus auriculata, or Roxburgh fig, is a plant with a wide range of pharmacological qualities that makes it a plant of great therapeutic importance originating from the Moraceae family, Reviewing the literature on Ficus auriculata, this paper highlights the plant's pharmacological diversity and medicinal potency. The plant has a long history of use in traditional medicine; many cultures have used it to treat a wide range of illnesses. Ficus auriculata contains bioactive substances, such as flavonoids, tannins, terpenoids, and alkaloids, according to phytochemical study. These substances support the plant's medicinal properties, which include analgesic, antibacterial, antioxidant, and anti-inflammatory, anti-arthritic properties. These pharmacological characteristics make Ficus auriculata an attractive option for more research in complementary medicine and medication development. The plant's potential effectiveness in treating a variety of health concerns, from skin illnesses to metabolic diseases, is revealed by research into the pharmacological diversity of the plant. Even with the encouraging results, Ficus auriculata's medicinal value needs to be confirmed and enhanced through standardization of extraction techniques and additional clinical research. Ultimately, this research offers a thorough analysis of Ficus auriculata, highlighting its traditional applications, phytochemical composition, and its medicinal advantages. Ficus auriculata is a particularly interesting option for more study and advancement in the field of botanical medicine, especially given the growing interest in natural medicines.
Keywords: *Ficus auriculata*, medicinal uses, pharmacological activity,

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INTRODUCTION

Since ancient times, people have used plants for medicinal purposes. A little over 60% of people on Earth and 80% of people living in underdeveloped nations rely on traditional medicinal plants since they are more cost-effective, safe, and easily accessible. By providing its elements and components, this medicinal plant also significantly contributes to the creation of new drugs in the pharmaceutical industry. Every plant has a variety of active pharmacological compounds that can be used to create different types of medications. Plants have long been recognized as vital resources for the treatment and prevention of a wide range of illnesses [1]. India ranks among the world's top producers of therapeutic plants. Drugs generated from plants are used as a prototype for safer and more potent medications. One possible explanation for the therapeutic effects of medicinal plants could be their diverse secondary metabolites, which include phenols, alkaloids, flavonoids, saponins, sterols, and others. The relationship between a medicinal plant's phytochemicals and pharmacological action is receiving more and more attention [2]. India has long used herbal remedies in officially alternative medical systems like homoeopathy, naturopathy, Ayurveda, Unani, and Sidha. Over 2500 different plant species are now employed as herbal medicines in India. Herbal remedies have been used for more than 3,000 years, either directly as traditional medicine or indirectly in the development of modern pharmaceuticals [3]. Large deciduous plants are found across India, apart from the outer Himalayan mountains, Punjab, Bihar, Orissa, West Bengal, Rajasthan, and common areas in South India. The Moraceae family is classified as a huge

taxonomic category that includes more than fifty genera and about 1400 species, according to Ventakamaran. This includes several significant groups including Artocarpus, Morus, and Ficus. It has been observed that a few species in the Ficus genus contain furanocoumarins, a significant class of plant phototoxins. Additionally, according to Ventakamaran, the Moraceae family has phytochemistry linked to stilbenes, flavonoids with isoprenoid substituents, and flavonoids. Fig antioxidants can prevent lipoproteins in plasma from oxidising and significantly boost the antioxidant capacity of plasma [4].

Botanical Name: *Ficus auriculata* Lour

Family: Moraceae

Common Name: Timla, Roxburgh fig, Elephant ear fig tree, Giant Indian fig

Part Used: Leaves, Fruit, Bark, Root

The large, rounded leaves of the *Ficus auriculata* (Moraceae) or Roxburgh fig, are a common sight throughout Asia. It prefers bright sunlight, yet it has the least resistance to fire. The insect that aids in pollinating this plant is *Ceratosolen emarginatus*. This big spreading evergreen to semi-deciduous shrub or small tree can grow up to 25 feet tall and the same width. In Auriculata is Latin for "ear-like." In the Xishuangbanna rainforests, *Ficus auriculata* is the fig tree with the biggest leaves. When they grow to their final size of up to 50 cm in length, the young evergreen leaves begin as vividly scarlet and gradually turn greener. In addition, trimming it is a simple process that results in the plant producing more leaves and shoots on a thicker stem. Rich red is the new growth. On the trunk and larger branches, figs grow in bunches. Of all the figs, the coconut strawberry fig *(Ficus auriculata*) is one of the tastiest. The little green figs are rounded and within. Mid-spring is when the pink blooms first appear [5].

Morphology

Ficus auriculata Lour. is an evergreen tree with an extended and wide crown that can grow to a height of 4–10 metres. Bark is tough and greyish brown. In the centre of the stem are reddish-brown, 1-1.5 cm thick, and leafless branchlets. The leaves are broadly ovate-cordate, alternating, and have an obtuse-mucronate apex with a shallowly dentate whole edge. Figs are pear-shaped fruits (Syconus), with 8–12 prominent longitudinal ridges. The tiny, sessile male flowers have an ovoid anther, lengthy filaments, two stamens, a translucent, spatulate, thinly membranous calyx, and three lobes. The tiny, sessile or pedicellate female flowers have an oval ovary and three lobes on the calyx. *Ficus auriculata* Lour. is an evergreen tree with an extended and wide crown that can grow to a height of 4–10 metres. Bark is tough and greyish brown. In the centre of the stem are reddish-brown, 1-1.5 cm thick, and leafless branchlets [6].

Traditional uses:

F. auriculata leaves are crushed, and the resulting paste is administered to the wounds. Additionally, they are useful for dysentery and diarrhea. Its stem bark juice is useful for treating diarrhoea and cuts. For dysentery and diarrhoea, roasted figs are consumed. Root latex is used to treat cholera, the mumps, vomiting, and diarrhoea. When someone has jaundice, a mixture of *Oroxylum indicum* bark and *F. auriculata* root powder is consumed. Thirteen. In the Kharagchari Hill District, ethnic groups use *F. auriculata* as a food source and medicinal herb [7].

India grows the massive tropical, evergreen, deciduous *Ficus auriculata* tree for its tasty fruits. Many parts of this plant, including the bark, root, leaves, fruit seed, and latex, are commonly used to cure a variety of maladies. In particular, the fruit of this plant has been used by Malayali tribal people in the Yercaud Hills to treat diabetes, asthma, and infertility in both males and females [8].

Phytochemistry [9], [10]

Ficus auriculata leaves showed presence of phenols, flavonoids, glycosides, resin, tannis, triterpenes, polyphenol, alkaloid, sterol, coumarins.

The contents of flavonols (myricetin, quercetin, and kaempeferol) were determined. Furthermore, from the petroleum ether, $CHCl_3$, and EtOAc fractions of the alcoholic extracts of the leaves and fruits, betulinic acid, lupeol, stigma sterol, bergapten, scopoletin, ß-sitosterol-3-O-ß-D-glucopyranoside, myricetin, and quercetin-3-O-ß-D-glucopyranoside were identified.

One flavonoid is quercetin, which has anti-inflammatory and antioxidant properties. By blocking the production of inflammatory cytokines, lowering lipopolysaccharide-induced cyclooxygenase (COX-2) levels, and inhibiting nuclear factor-kappa β (NF-kβ) and AP-1 activity, quercetin reduces the clinical symptoms of arthritis. It inhibits the growth of synoviocytes and the recruitment of neutrophils and macrophages. [11, 12,13]

PHARMACOLOGICAL ACTIVITY:

Antibacterial activity:

Plant extracts' antibacterial activity was assessed using the conventional disc diffusion method. To create stock solutions of 80 mg/mL w/v, DMSO was used to dissolve the crude extracts of methanol and

chloroform. Method of disc diffusion the standard methodology CLSI M7-A7 was used to prepare the bacterial inoculums, and the turbidity of the inoculums was compared to the 0.5 McFarland standard, which contained 1-2 x 108 CFU/mL. Hinton Mueller After preparing agar plates, 100 µl of bacterial inoculums were applied to them. The aseptic discs were put on agar plates with 400, 550, 700, and 850 µg/mL w/v of leaf extract. The positive control in this experiment was ampicillin, while the negative control was DMSO. For 24 hours, the plates were incubated at 37ºC [14].

Antioxidant Activity: Using the 2,2-diphenyl-1-picrylhydrazyl radical (DPPH) method, the antioxidant activity was assessed. 0.3 mL of the extract was combined with 2.7 mL of DPPH (40 µg·mL 1) methanolic solution, and the mixture was incubated at 25°C for one hour without light. In duplicate, the absorbance was measured at 517 nm following 1, 5, and 10 min, and then for each of the extracts every 10 min to 60 min. Methanol alone was added to the plant extracts at the same sample quantities as reference standards (blank). The sample's antioxidant activity increases with increased DPPH consumption over time. To determine the inhibitory concentration, or IC_{50}, 5 mL of a DPPH solution (in methanol) was mixed with 50 µL of different extract concentrations. After 30 minutes of incubation at room temperature, an absorbance measurement was made at 517 nm and compared to a blank [15].

Anti – inflammatory Activity: Carrageenan in distilled water was subcutaneously injected into the footpads of all rats to cause edema in the left hind paw, and this model was used to test the extracts' ability to reduce inflammation. When it came to the studied experimental model, *F. auriculata* extracts were found to have potent anti-inflammatory properties [16].

Anti-Fungal Activity: The disc diffusion method was used to test the antifungal activity. For every fungal strain, the Sabouraud dextrose agar plates were seeded in the same manner. The sterile Sabouraud dextran agar was seeded at 45°C using the 24-hour culture of each bacterium and the 7-day inoculated fungal culture. The fungal plates were then cultured at 25–28°C for 7 days, following which the diameter of the inhibitory zones was determined. Every disc contains extract [17].

Hepatoprotective Activity: Carbon tetrachloride was used to induce hepatotoxicity in mice at a dose of 0.2 ml/kg, p.o. The 20–25g b. wt. mice were split up into four groups of five mice apiece. Carbon tetrachloride was given to group one (positive group). Group 2 (the solvent of CCl4 as the negative group) was given simply olive oil. Groups three and four, designated as test groups, were given carbon tetrachloride an hour after receiving rough extracts of leaves and fruits at a concentration of 800 mg/kg, respectively. P.O. administered each dose in a volume of 0.2 millilitres. After that, on day six, the animals were killed, blood was drawn, and serum was collected to measure the levels of the enzymes aspartate aminotransferase (AST) and alanine aminotransferase (ALT). These biochemical parameters were measured using spectrophotometry with assay kits that are sold commercially. After being removed right away, the livers were weighed, preserved in a 10% formalin solution, gradually dehydrated in ethanol (50–100Ï), cleaned in xylene, and embedded in paraffin. Hematoxylin and eosin (H&E) dye was used to generate sections that were 4-5 µm thick for photomicroscopic studies [18].

Anti-microbial Activity: The agar plate punch assay was used to assess the isolates' antibacterial activity . *Micrococcus tetragenus, Bacillus cereus, Bacillus subtilis, Staphylococcus aureus*, and *Sarcina lutea* were the pathogenic bacteria found on land that were employed. In summary, DMSO was used to dissolve each chemical at a 500 µg/mL concentration. Subsequently, a well measuring 6 mm in diameter was punched in the suitable agar growth medium and coated with a suspension of the test organism (1.5 × 109 cfu/mL; cfu, unit that forms colonies). Every active substance has an inhibition diameter bigger than 10 mm underwent testing for lowest inhibitory concentration. A two-fold dilution approach was used to identify the minimum inhibitory concentrations (MICs) of compounds 1-4 against five terrestrial pathogenic bacteria [14]. After diluting the compounds twice in MH broth and putting 100 µL of the mixture into each well of 96-well microtiter plates, an aliquot of 5 × 105 cfu/mL of bacterial culture was added to each well to reach final concentrations ranging from 0.39 to 50.0 µg/mL. MIC value was determined by measuring the lowest concentration that did not result in colony development after 18 hours of incubation at 37°C. The obtained values were contrasted with the range of 0.01–25.0 µg/mL for a positive control, vancomycin hydrochloride, using the same circumstances [19].

Antihyperglycemic and Antihyperlipidemic Activity: In Swiss albino mice, streptozotocin (70 mg/kg, i.p.) was used to cause diabetes. Albino mice, both normal and diabetic, were split into six groups (n = 6) and given three different treatments: glibenclamide (10 mg/kg b.w.), methanol extract (300 and 600 mg/kg b.w.), and vehicle (control). On the 0th, 5th, 10th, and 15th days, blood samples were taken from the tail for blood glucose measurement. On the 15th day, the animals were slaughtered, and blood samples were taken via heart puncture and analysed for lipid profile. Studies on the histology of the liver and pancreas were conducted, respectively [20].

Anti cancerous Activity: The methanol and chloroform extracts of *F. auriculata* and *O. wightiana* were tested for their anti-cancerous properties using the MTT cytotoxicity assay. The 96-well plate was seeded with 1 x 10^4 lung cancer A549 cells, which were then grown at 37°C in 5% CO2 for an entire night. Following treatment, cells were exposed to 100 µg/mL w/v of several plant extracts (P1C, P1M, P2C, and P2M) and were then incubated for 24 hours at 37°C in a 5% CO_2 environment. The positive and negative controls employed in this study were vincristine sulphate and DMSO, respectively. Each well received 10 µl MTT (5 mg/mL) to produce Formosan, and the cells were then incubated for 4 hrs. at 37°C in a humidified environment with 5% CO_2 [14].

CONCLUSION

In conclusion, the review of *Ficus auriculata* underscores its remarkable medicinal potency and pharmacological diversity, positioning it as a valuable resource in traditional medicine and a promising candidate for further scientific exploration. The plant's extensive traditional use across diverse cultures is substantiated by the presence of various bioactive compounds, including flavonoids, tannins, terpenoids, and alkaloids, contributing to its broad spectrum of pharmacological activities. The documented anti-inflammatory, antioxidant, antimicrobial, and analgesic properties of *Ficus auriculata* suggest its potential as a therapeutic agent for various health conditions. Moreover, the plant exhibits promise in addressing specific ailments such as diabetes, cardiovascular disorders, and skin diseases, expanding its potential applications in modern healthcare. However, to fully harness the medicinal benefits of *Ficus auriculata*, it is imperative to address gaps in knowledge, standardize extraction methods, conduct rigorous bioassay-guided fractionation, and undertake clinical trials. These steps are crucial for validating traditional uses, optimizing dosage regimens, and ensuring the safety and efficacy of *Ficus auriculata*-based interventions. As interest in natural remedies continues to grow, *Ficus auriculata* emerges as a focal point for sustainable healthcare alternatives. Future research efforts should focus on elucidating the molecular mechanisms behind its therapeutic effects and exploring potential synergies with conventional medicines. The holistic understanding of *Ficus auriculata's* medicinal properties presented in this review contributes to the ongoing dialogue surrounding ethnopharmacology and provides a foundation for the development of novel pharmaceuticals derived from this botanical source.

REFERENCES

1. Negi, D., Singh, B., Kondrapu, P., Kanthal, L. K., Kumare, M. M., Khan, M. R., ... & Pattanayak, S. (2023). In Vitro Pharmacological Evaluation of Anti Ulcer And Anti Arthritic Activity Of Aqueous Root Extract Of *Syzygium Samarangense*. *Latin American Journal of Pharmacy*, *42*(3), 885-907.
2. Arya, D., Meena, M., Grover, N., & Patni, V. (2014). In vitro anti-inflammatory and anti-arthritic activity in methanolic extract of Cocculus hirsutus (L.) Diels. in vivo and in vitro. *International Journal of Pharmaceutical Sciences and Research*, *5*(5), 1957.
3. Choudhary, M., Kumar, V., Malhotra, H., & Singh, S. (2015). Medicinal plants with potential anti-arthritic activity. *Journal of intercultural ethnopharmacology*, *4*(2), 147.
4. Murti, K., Kumar, U., Lambole, V., PB, S., & AP, M. (2010). Pharmacological properties of Ficus racemosa-a review. *Pharmacologyonline*, *2*, 802-807.
5. Chandran K, Ravikumar K. (2017) *Ficus auriculata* (elephant ear fig): A phytochemical and pharmacological review. World Journal Pharmacy and Pharmaceutical Science. 6:274-83.
6. El-Fishawy, A. (2012). Botanical Study of *Ficus auriculata* Lour. *Al-Azhar Journal of Pharmaceutical Sciences*, *46*(2), 10-24.
7. Mehra, N., & Tandon, S. (2021). Traditional uses, phytochemical and pharmacological properties of *Ficus auriculata*: A review. *Journal of Drug Delivery and Therapeutics*, *11*(3), 163-169.
8. Raja, R., Kumar, N., & Duraisamy, M. (2021). Evaluation of phytochemical screening and antibacterial activity of *Ficus auriculata* lour.(moraceae)–an traditional medicinal plant. *Kongunadu Research Journal*, *8*(1), 22-29.
9. George, M., Joseph, L., & Paul, M. N. (2016). *Ficus auriculata*; a pharmacological update. *Int J Curr Res Acad. Rev*, *4*, 26-31.
10. Nawaz H, Waheed R, Nawaz M. (2020) Phytochemical composition, antioxidant potential, and medicinal significance of Ficus. Modern Fruit Industry. 4; 1:20.
11. El-Said, K. S., Atta, A., Mobasher, M. A., Germoush, M. O., Mohamed, T. M., & Salem, M. M. (2022). Quercetin mitigates rheumatoid arthritis by inhibiting adenosine deaminase in rats. *Molecular Medicine*, *28*(1), 24.
12. Gardi, C., Bauerova, K., Stringa, B., Kuncirova, V., Slovak, L., Ponist, S., ... & Russo, G. L. (2015). Quercetin reduced inflammation and increased antioxidant defense in rat adjuvant arthritis. *Archives of biochemistry and biophysics*, *583*, 150-157.
13. Le Rossignol, S., Ketheesan, N., & Haleagrahara, N. (2018). Redox-sensitive transcription factors play a significant role in the development of rheumatoid arthritis. *International reviews of immunology*, *37*(3), 129-143.

14. Kumari, A., Verma, R., Sharma, M., Chauhan, P., & Kumar, A. (2018). Evaluation of phytochemical, antioxidant, antibacterial and anti-cancerous activity of *Ficus auriculata* Lour. and Osyris wightiana Wall. ex Wight. *Bull. Environ. Pharmacol. Life Sci*, *7*, 64-70.
15. Bertoletti LL, Skoronski E, Moroni LS, Kempka AP. (2020) Extracts of branches and fruits of *Ficus auriculata* Lour: antioxidant, antimicrobial and phytotoxic activities. Agriculturae Conspectus Scientificus, 85(4):303-10.
16. Singh, N., Verma, R., Verma, D., Kala, A., & Bhakta, A. A review of the medicinally important plant species from Uttarakhand, *Ficus auriculata* and Ficus palmata, and their prospective uses.
17. Saklani, S., & Chandra, S. (2012). In vitro antimicrobial activity, nutritional profile and phytochemical screening of wild edible fruit of Garhwal Himalaya (*Ficus auriculata*). *Int J Pharm Sci Rev Res*, *12*(2), 61-64.
18. El-Fishawy A, Zayed R, Afifi S. (2011). Phytochemical and pharmacological studies of *Ficus auriculata* Lour. Journal of Natural Products, 4:184-95.
19. Qi, C. C., Fu, Y. H., Chen, W. H., Chen, G. Y., Dai, C. Y., Song, X. P., & Han, C. R. (2018). A new isoflavone from the roots of *Ficus auriculata*. *Natural product research*, *32*(1), 43-47.
20. Rosalind T, Dutta BK, Paul SB. (2014). Antihyperglycemic and antihyperlipidemic activity of *Ficus auriculata* Lour. leaf extract in streptozotocin induced diabetic mice. World Journal of Pharmacy and Pharmaceutical Sciences (WJPPS), 3(1):412-27.