

CHAPTER 6

Exploring pharmacological properties of bark of *Ficus drupacea* Thunb.: - a phytochemical investigation

Saraswati Majhi[1], Prasanta Kumar Samantray[1], Sanjeet Kumar[2] and Sugimani Marndi[2]

[1]Department of Botany, Shailabala Women's Autonomous College, Cuttack affiliated to Rama Devi women's University, Bhubaneswar

[2]Ambika Prasad Research Foundation, Odisha, India

*Email-Id: sugimani2marndi@gmail.com



Licensed under a Creative Commons Attribution 4.0 International License

Abstract: *Ficus drupacea* (Moraceae) is widely recognized for its medicinal value in some ethnomedicinal aspects. Despite its traditional uses, a comprehensive understanding of the pharmacological potential of its bark and the underlying phytochemical constituents remains largely underexplored. Present study aims to conduct a systematic phytochemical analysis of *Ficus drupacea* bark to identify and characterize its secondary metabolites, thereby laying the groundwork for future pharmacological evaluations. The results from this phytochemical analysis are likely to show a variety of active compounds that may explain the traditional medicinal uses of *F. drupacea* bark. This chapter highlights the need for phytochemical profiling, which will serve as a foundational step towards understanding the bark's pharmacological properties and identifying lead compounds for drug discovery and development.

Keywords: Ethnomedicinal, ecological, pharmacological, phytochemical



INTRODUCTION

The *Ficus* species is well known for its large tree species, mostly the climbers, shrubs, creepers, and trees. The *Ficus* species is one of the oldest tree species in human history. It holds a significant value in highly religious value for both Hindus and Buddhists and is deemed sacred. In many temples, many *Ficus* species are planted, which makes it a way to reach deforestation. Due to its huge forage character, it has mostly lived for thousands of years. Various plant parts of *Ficus* species, such as leaves, bark, roots, branches, and fruits serve as a component in traditional value for local and tribals communities. The fig trees have enormous uses based on its traditional values. It is retained as a single, large genus because it is well defined by its unique reproductive systems involving syconia – figs and specialized pollinator wasps **(Yuan et al., 2024)**. Fruits of *Ficus* species are termed as nourishing, energizing, and healthy and have ethnomedicinal benefits. Some Ficus species are also host plants for orchids **(Darshani et al., 2023)**.

Among the genus *Ficus drupacea,* thumb has been selected as a subject of interest for the current chapter according to its phytochemical and pharmacological analysis. *Ficus drupacea* belongs to the family Moraceae, which holds enormous value in various fields. It is distributed throughout Southeast Asia and Northeast Australia. *F. drupaceae,* also known as the brown- woolly fig or Mysore fig. *Ficus drupacea* has several synonyms, including *Ficus aurantiicarpa*, *Ficus chrysochlamys*, *Ficus chrysocoma*, *Ficus citrifolia*, *Ficus gonia*, *Ficus mysorensis*, *Ficus payapa*, *Ficus pilosa*, *Ficus subrepanda*, *Ficus vidaliana*, *Urostigma dasycarpum* & *Urostigma mysorense*. Additionally, various varieties and forms like *Ficus drupacea* var. *glabrata*, *Ficus drupacea* var. *pedicellate*, *Ficus drupacea* var. *pubescenes*, *Ficus drupacea* var. *subrepanda*, *Ficus mysorensis* var. *dasycarpa*, *Ficus mysorensis* var. *parvifolia* & *Ficus mysorensis* var. *subrepanda* are also considered synonyms **(POWO, 2025)**. Some researchers reported the stem and bark identified several phytochemicals, including β -amyrin, β-sitosterol-3-O-β-D-glucopyranoside, 5-O-methyllatifolin, oleanolic acid, epifriedelanol, friedelin, and epilupeol acetate. Latex possesses a cysteine protease called Drupin, which exhibited hemostatic characteristics. Isolation, structural elucidation, and evaluation of α-glucosidase inhibitory activity of one new megastigmane, 4'-dihydrophaseate sodium, one new benzene diol glucoside, 1,4-di-O-β-glucopyranosyl-2-(1,1-dimethyl-propenyl) benzene,



along with nine known compounds from the leaves **(Kiem et al., 2013; Yessoufou et al., 2015; Murthy et al., 2024)**. In 2024, Bakry et al. reported 90 metabolites were annotated, including phenolic acids, flavonoids, furanocoumarins, fatty acids and terpenoids. It also reported that 66 structures of chemical constituents, 47 of them are tentatively recognized compounds and 19 were identified as isolated metabolites. Flavonoids-C-glycosides, flavonoids-O-glycosides and isoflavonoids were present in leaves. Fruit contains significant proportions of essential fatty acids such as linoleic acid, oleic acid, palmitic acid, etc **(Kansal et al., 2024)**. *Ficus drupacea* is an ornamental medicinal tree distributed in temperate areas and used for the treatment of paragonimiasis, malaria, anasarca, nasosinusitis and sinusitis, but also in the pharmaceutical industry as a source of α-glucosidase inhibitors **(Kiam et al., 2013).**

As per research done by other researchers, it revealed that a small number of *Ficus* species are used as traditional medicines, and their pharmacological activities, most of which are about some species, have not undergone any pharmacological activity. Some Ficus species remain underexplored compared to other medicinal plants. This chapter gives a baseline or a preliminary stage of bark.

MORPHOLOGY

It is a large tree with few aerial roots; occasionally epiphytic. A strangling fig. Lenticels tend to be in horizontal lines. A hard brown horny layer normally visible in the outer blaze. Exudate rapid and copious. Leaves ovate to ovate-elliptic, 11-22.5 x 7-16.8 cm, shortly acuminate, glabrescent, glandless, 3-6-ribbed, primary nerves 10-13, very prominent below, regular, parallel, base rounded or cordate. Both surfaces of young leaf blades densely clothed in rusty hairs. Oil dots sometimes visible on the underside of the blade with the aid of a lens. Tepals glabrous. Male flowers scattered at random among the fruitlets in the ripe fig. Bracts at the base of the fig. No lateral bracts on the outside of the fig body. Figs sessile, in axillary pairs, oblong to obovate, ca. 3cm long, nearly glabrous, orange- red when ripe **(Saxena and Brahmam, 1995; Figure 1-2)**.



Figure 1: Leaves of *F. drupacea*

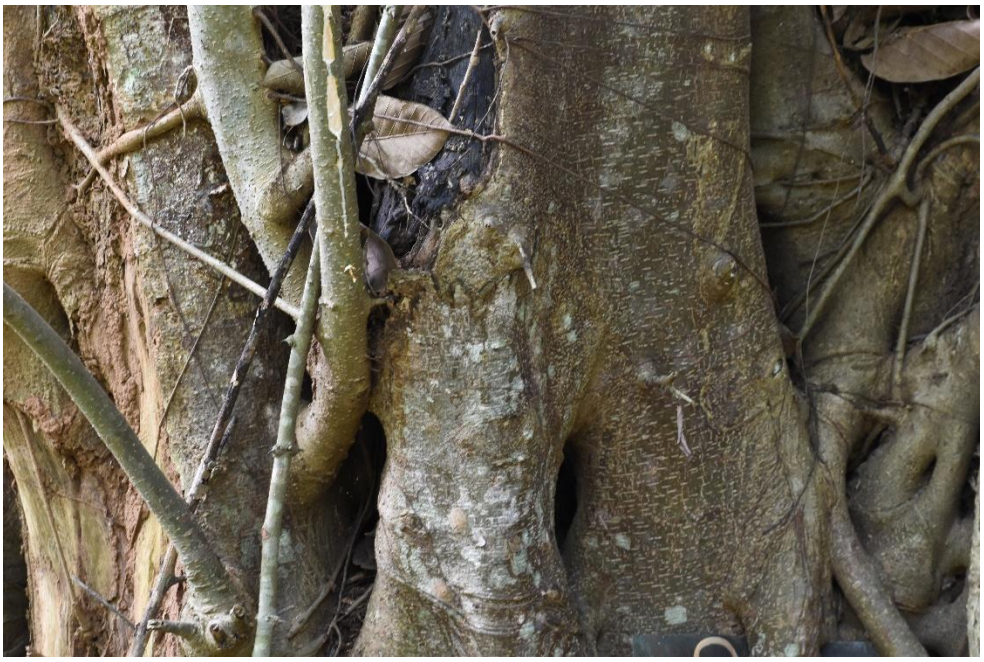


Figure 2: Bark of *F. drupacea*



METHODOLOGY

The bark of *F. drupacea* was collected from the State Botanical Garden, Odisha, India. The plant species was identified by the authors. The Soxhlet extraction method was adopted using N- hexane, ethanolic, and methanolic extracts for phytochemical analysis **(Marndi et al., 2024; Figure 3-5).** Detection of nine secondary metabolites was conducted using standard methods **(Kumar et al., 2013; Marndi et al., 2024)**.

Qualitative phytochemical analysis **(Marndi et al., 2024)**

Test for tannin: About 1 ml of the bark extract was taken. Three to five drops of 10% lead acetate solution were added. The gelatinous precipitate formation confirmed the presence of tannin.

Test for saponin: About 1 ml of the bark extract was taken and 1 ml of distilled water was added and shaken well. The formation of persistent froth was observed confirming the presence of saponin.

Test for flavonoids: About 1 ml of the bark extract was taken. Two ml of 2% NaOH solution and 3 to 4 drops of dilute HCl were added. The colour initially turned to an intense yellow colour with NaOH solution and later became colourless. This colour changes in appearance confirmed the presence of flavonoids.

Test for terpenoids: About 1 ml of the bark extract was added with 5-6 drops of chloroform and placed in the water bath for a few minutes. Then 5-6 drops of concentrated sulphuric acid were added. The reddish-brown interface confirmed the presence of terpenoids.

Test for phenolic groups: About 1 ml of the bark extract was taken. A few drops of 5% ferric chloride solution were added. The dark bluish-black appearance confirmed the presence of phenolic compounds.

Test for reducing sugars: About 1 ml of the bark extract was taken and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept in the water bath for some time. The presence of red-orange precipitate confirmed the presence of reducing sugar.

Test for steroids: About 1 ml of the bark extract was taken. 1 ml of chloroform and 1 ml of concentrated sulphuric acid was added to it. The

appearance of upper red and lower yellow color with green fluorescence provided the presence of steroids.

Test for alkaloids: About 1 ml of the bark extract was taken and 3 to 4 drops of Dragendroff's reagent were added. The formation of a reddish-brown precipitate confirmed the presence of alkaloids.

Test for carbonyl compounds: About 1 ml of the bark extract was taken and 3 to 4 drops of 2,4- Dinitrophenylhydrazine (DNPH) reagent was added. The formation of yellow crystals confirmed the presence of carbonyl compounds.

RESULTS AND DISCUSSION

The phytochemical analysis concludes that bark of *F. drupacea* revealed the availability of tannins, saponin, reducing sugars, and alkaloids and many other compounds through literature aspects. According to table 1, it revealed that tannins, saponin, and alkaloids are present in ethanolic and methanolic extract. Reducing sugars are present in all three extracts. According to researchers, it revealed that leaves often used to treat malaria, skin infection, paragonimiasis, nasosinusitis, sinusitis and anasarca **(Kiem et al., 2013)**. While specific documentation through literature survey it reveals that bark of *F. drupacea* has less documentation as compared to others plants parts. Many researchers have worked on *Ficus* species, but the ethnomedicinal and pharmacological values are still not documented in a proper way. Therefore, through this the phytochemical screening it will aid in for more exploratory cum laboratory work in future works.



Figure 3: Bark sample for phytochemical analysis of *F. drupaceae*

Table 1: Phytochemical screening of *F. drupacea* bark

Bioactive compounds	N-hexane	Ethanol	Methanol
Tannin	-	+	+
Saponin	-	+	+
Flavonoid	-	-	-
Terpenoids	-	-	-
Phenolic compounds	-	-	-
Reducing sugars	+	+	+
Steroids	-	-	-
Alkaloids	-	+	+
Carbonyl compounds	-	-	-

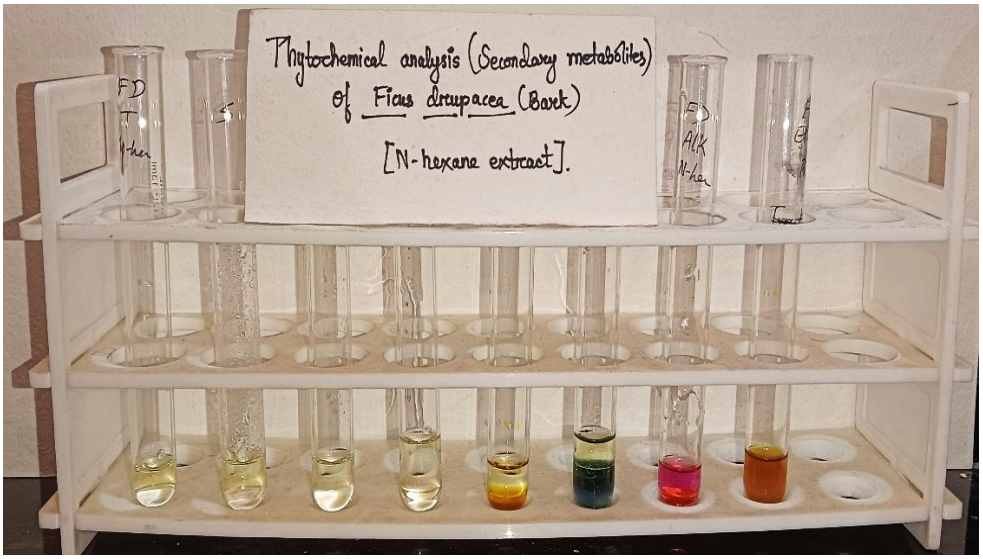


Figure 3: Phytochemical analysis (Secondary metabolites) of *F. drupacea* (Bark) of n- hexane extract

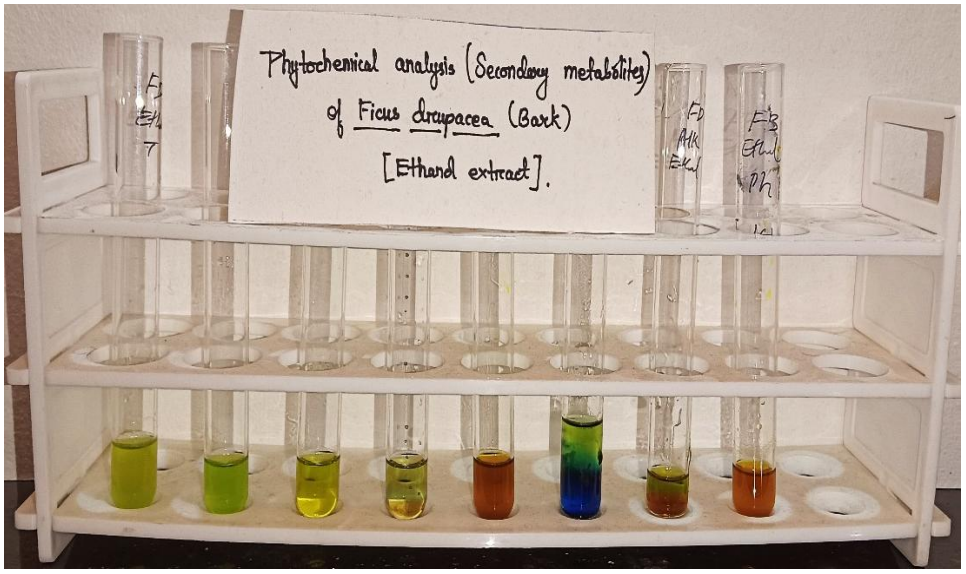


Figure 4: Phytochemical analysis (Secondary metabolites) of *F. drupacea* (Bark) of ethanol extract

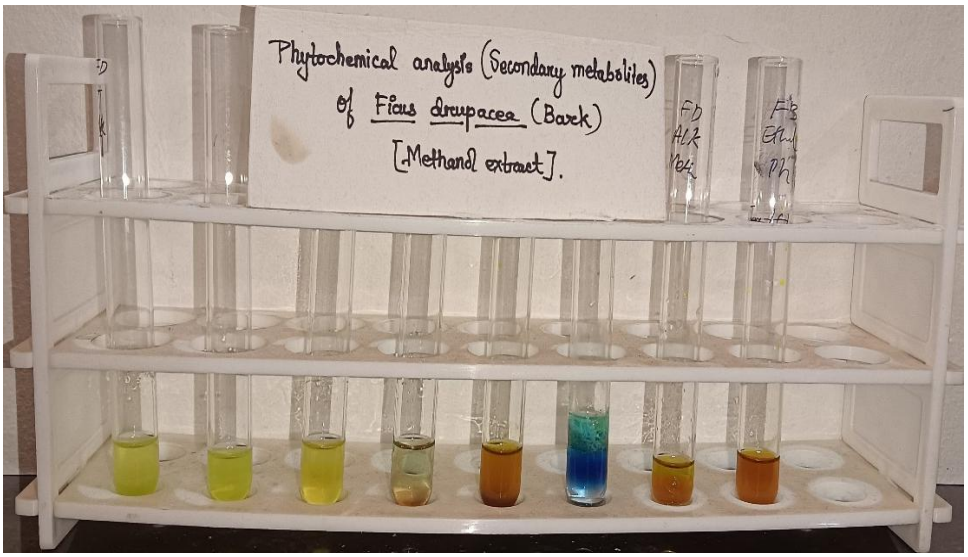


Figure 5: Phytochemical analysis (Secondary metabolites) of *F. drupacea* (Bark) of methanol extract

ETHNOMEDICINAL USES

Various parts of the plant, including roots, leaves, fruits and bark are employed to treat a range of ailments. According to table 2, it concludes that



plants parts such as leaves, latex and root treat various ailments. Mostly leaves are used for ethnomedicinal uses to cure certain diseases malaria, diabetes, gastric ulcers and parasitic lung infection. Copiously, mode of uses mostly decoction and paste of intake plants parts. Apparently, through various literature survey it concludes that less work carried out in aspects of ethnomedicinal values of *F. drupacea*.

Table 2: Ethnomedicinal uses of *F. drupacea*

Plants parts	Mode of uses	Medicinal uses	Sources
Latex	Paste	Wounds	Kansal and Shukla, (2025)
Leaves	Decoction	Malaria	Andalil et al., (2023)
Leaves	Decoction	Diabetes	Kansal and Shukla, (2025); Kiam et al., (2013)
Leaves	Decoction	Gastric ulcers	Bakry et al., (2023)
Leaves	Decoction	Parasitic lung infection	Shukla and Kansal, (2024); Kiam et al., (2013); Bakry et al., (2023)
Root	Paste	Skin infections	Shukla and Kansal, (2024)

PHARMACOLOGICAL ASPECTS

According to Table 3, it concludes that stem bark and leaves and fruits possess antifungal, antibacterial, anticancer, antidiabetic, anti-inflammatory,



antioxidant, antiulcerogenic, wound healing, and anti-hyperlipidemic properties.

Table 3: Pharmacological aspects of *F. drupacea*

Plants parts	Pharmacological activities	Sources
Fruits	Antioxidant	Murthy et al., (2024)
Leaves	Antidiabetic	Kansal and Shukla, (2025)
Leaves	Anti-inflammatory	Kansal and Shukla, (2025)
Leaves	Antiulcerogenic	Bakry et al., (2024)
Leaves	Wound healing	Bakry et al., (2024)
Leaves	Anti-hyperlipidemic	Bakry et al., (2024)
Stem bark	Antifungal, antibacterial and anticancer	Yessoufou et al., (2015)

CONCLUSION

As per a survey conducted through literature, survey there is comparatively less detailed documentation specifically on the ethnomedicinal uses of the bark of *Ficus drupacea* when compared to its leaves, roots and latex. However, some information regarding the general references to Ficus species often mentions the bark as having medicinal properties, and *F. drupacea* is part of that genus; specific and detailed traditional applications of its bark are



less frequently documented as available in literature. Keeping this in mind, an attempt has been made to summarizes the phytochemical, ethnomedicinal, pharmacological activities.

ACKNOWLEDGEMENT

Authors are thankful to the Director & Deputy Director, Nandankanan Zoological Park, Odisha, India.

REFERENCES

Andalil R, Mattumal R, Narayana SKK. (2023). Anatomical profile of six different species of *Ficus* occurring in South India. Journal of Research in Siddha Medicine. 6: 58-67.

Bakry SM, Naser AFA, Negoumy SIE, Kaseem MES, Sattar EA, Meselhy MR. (2023). Phenolic acids- rich fraction from *Ficus drupacea* leaves for the prevention and treatment of ethanol-induced gastric mucosal injury in rats. Inflammopharmacology. 31(3): 1423-1436.

Barky SM, Abulnaser A, Negomy SIE, Kaseem M, Abdelsattar E, Meselhy MR. (2024). Phytochemical constituents and biological effects of *Ficus drupacea* Thunb (Moracea): a mini review. Egyptian Journal of Chemistry. 67(6): 345-351.

Darshani P, Lal S, Manjula S, Marndi S, and Kumar S. (2023). *Vanda tessellata* (roxb.) Hook. Ex G. Don: a common orchid of India. Orchids of India, Food, Medicinal and Ecological Aspects. APRF Publishers. 20-26.

Kansal P and Shukla A. (2025). Anti-diabetic and anti-inflammatory activities of various green solvent extracts of *Ficus drupacea* leaves. Research Journal of Pharmacy and Technology. 18(2): 619-4.

Kiem PV, Minh CV, Nhiem NX, Yen PH, Anh HLT, Cuong NX, Tai BH, Quang TH, Hai TN, Kim SH, Kwon SU, Lee YM, and Kim YH. (2013). Chemical constituents of *Ficus drupacea* leaves and their α-Glucosidase inhibitory activities. Bulletin of the Korean Chemical Society. 34(1): 263-266.

Kumar S, Behera SP and Jena PK. (2013). Validation of tribal claims on *Dioscorea pentaphylla* through phytochemical screening an



evaluation of antibacterial activity. Plant Science Research. 35: 55-61.

Marndi S, Barik M, and Kumar S. (2024). Phytochemical and cytotoxicity analysis of *Eulophia explanata* Lindl. (Tuber extracts). African Journal of Biological Sciences. 6(Si4): 2756-6.

Murthy HN, Yadav GG, Joseph KS, Khan SHS, Magi SM, Dewir YH, and Drienyovszki NM. (2024). Nutritional value, fatty acid and phytochemical composition, and antioxidants properties of Mysore fig (*Ficus drupacea* Thunb.) fruits. Foods.13: 2845.

POWO (2025). Plants of the World Online. Facilitated by the Royal Botanic Gardens, Kew.

Saxena HO and Brahmam M. (1995). The Flora of Orissa. Orissa Forest Department Corporation Ltd., Bhubaneswar & Regional Research Laboratory, Bhubaneswar, Odisha.

Shukla A and Kansal P. (2024). Traditional uses, medicinal properties and phytoconstituents of some Indian Ficus species: a review. International Journal of Biology, Pharmacy and Allied Sciences. 13(12): 6267-6281.

Yessoufou K, Elansary HO, Mahmoud EA, Wozniak KS. (2015). Antifungal, antibacterial and anticancer of *Ficus drupacea* L. stem bark extract and biologically active isolated compounds. Industrial Crops and Products. 74: 752-758.

Yuan S, Yin T, He h, Liu X, Long X, Dong P, Zhu Z. (2024). Phenotypic, metabolic and genetic adaptations of the Ficus species to abiotic stress response: a comprehensive review. International Journal of Molecular Sciences. 25(17): 9520.