



CHAPTER 8

The medicinal and ecological value of *Ficus concinna*: - a comprehensive analysis of its ethnobotany, pharmacology, and phytochemistry

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Abstract: *Ficus concinna*, a graceful fig species native to various regions of Asia, possesses notable yet largely underexplored nutritional, medicinal, and ecological value. This comprehensive chapter brings together current knowledge on its ethnobotanical applications, pharmacological activities, and phytochemical composition, aiming to underscore its potential and guide future research efforts. Traditional medicinal systems have used *F. concinna* to address a range of health issues. Although pharmacological studies remain limited. Preliminary phytochemical analyses indicate the presence of bioactive compounds present in bark, including saponin, tannin, terpenoids, and alkaloides, which are likely responsible for its observed therapeutic potential. This chapter underscores the need for further systematic research to fully elucidate the therapeutic mechanisms and isolate novel bioactive compounds of *F. concinna* bark, thereby unlocking its full potential for both human well-being and ecological conservation.

Keywords: Ethnomedicinal, ecological, pharmacological, phytochemical



INTRODUCTION

The plant kingdom has long served as an invaluable source of both ecological stability and medicinal compounds, offering solutions to a myriad of environmental challenges and human health concerns. Within this vast kingdom, the genus *Ficus* (family Moraceae) stands as a particularly remarkable and diverse group, comprising over 880 species distributed predominantly across tropical and subtropical regions worldwide (Chaudhary et al., 2012; Sasidharan et al., 2023; Hossain et al., 2025). Figs hold both cultural significance and critical ecological importance. They are often regarded as "keystone species" because their asynchronous fruiting provides a reliable year-round food source for a diverse range of frugivores, thereby supporting and maintaining biodiversity within their ecosystems. Their complex mutualistic relationship with fig wasps for pollination further underscores their distinctive evolutionary and ecological significance (Mackay et al., 2018).

Among the many species within this ecologically important genus, *Ficus concinna* (Miq.) Miq. which is commonly known as the Red Leaf Fig or Drooping Fig, stands out as a notable tree native to a wide geographical area, extending from India and Bangladesh to southern China, Myanmar, Thailand, Vietnam, and Borneo. In India, *F. concinna* is found across several regions, including the Andaman Islands, Assam, Bihar, Jharkhand, Madhya Pradesh, Meghalaya, Odisha, Sikkim, and West Bengal (Karthigeyan and Jayanthi, 2016). *F. concinna* has synonyms *Ficus glabella* var. *concinna* (Miq.) King and *Urostigma concinnum* Miq. (POWO, 2025). In India, it is distributed across various states, with significant diversity found in the North-East and Peninsular regions (Chaudhary et al., 2012). *F. concinna* is characterized by its distinctive aerial roots and often cultivated as an ornamental tree in urban landscapes, demonstrating its adaptability to various environmental conditions, including those influenced by climate change and urbanization (Hayat et al., 2022). It is predominantly found in semi-evergreen forests, particularly along stream banks. Its capacity to sustain high transpiration rates even under relatively dry conditions highlights its potential in mitigating urban heat island effects. In addition to its ecological value, *F. concinna* has been traditionally used in folk medicine by various indigenous communities throughout its native range, albeit to a lesser extent than some other species. Ethnobotanical records document the use of different parts of



the plant including the leaves, bark, roots, and stems for treating a wide range of ailments. These include inflammatory conditions, gastrointestinal issues such as diarrhea and dysentery, skin infections, and its use as a general health tonic. It has also been employed in the traditional management of diabetes, arthritis, and urinary tract infections (**Dapar et al., 2020**). In the Philippines, the Manobo tribe traditionally uses decoctions made from the leaves, bark, and roots of *F. concinna* as potential anticancer remedies (**Cabanlit et al., 2025**). As per the literature, it revealed that less documentation was carried out on medicinal values. Despite its widespread traditional use, the scientific validation of these claims and a comprehensive understanding of the underlying pharmacological mechanisms remain relatively underexplored for *F. concinna* specifically. Preliminary phytochemical screenings of *Ficus* species, in general, suggest the presence of a wide array of bioactive compounds, including flavonoids, terpenoids, phenolic acids, alkaloids, saponins, and steroids (**Murugesu et al., 2021; Chandra et al., 2023**). In some parts of the world the tender leaves serve as a source of edible vegetables (**Mon et al., 2020; Zhang and Hou, 2022**). These secondary metabolites are often associated with the observed medicinal properties in plants. The wood of *F. concinna* is used as fuelwood (**Lepcha and Sharma, 2021**). However, comprehensive phytochemical profiling of *F. concinna* and the identification of specific compounds or extracts linked to particular pharmacological effects remains in its early stages. Considering the species' important ecological role and its widespread, yet scientifically underexplored, use in traditional medicine, a thorough review of its ethnobotanical applications, pharmacological properties, and phytochemical composition is essential. Such a review would not only integrate the currently scattered body of knowledge but also identify critical research gaps, thereby guiding future scientific inquiry. This chapter aims to provide a holistic analysis of *F. concinna*, emphasizing its multifaceted value and underscoring its potential as a source of novel therapeutic agents and as a species vital for ecosystem health and biodiversity conservation. Ultimately, this comprehensive synthesis seeks to stimulate further scientific inquiry into *F. concinna*, contributing to its sustainable utilization and conservation in the face of ongoing environmental and health challenges.



Figure 1: Leaves of *F. conccina*

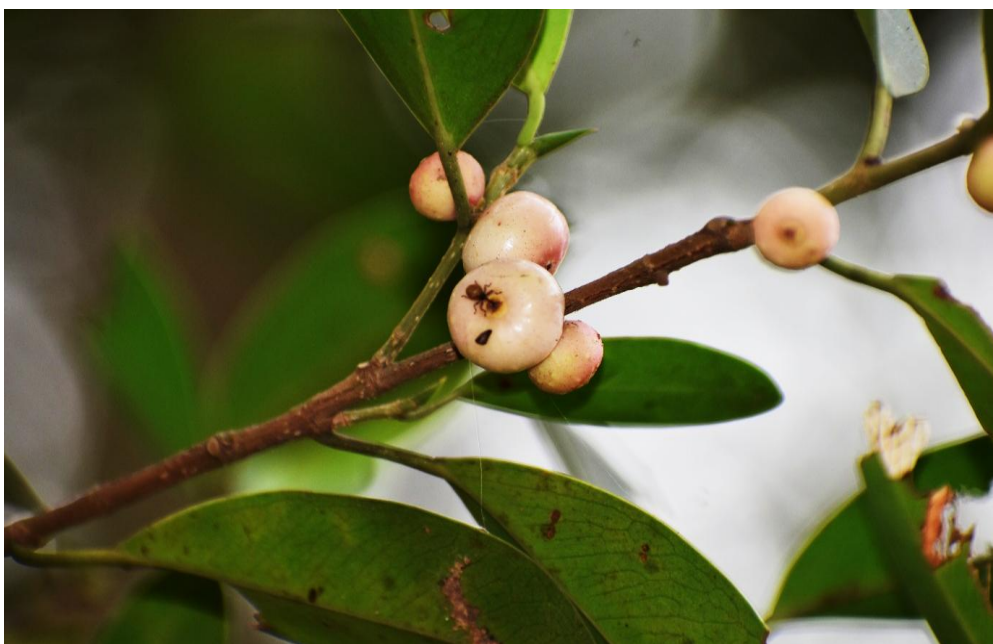


Figure 2: Figs of *F. conccina*



Figure 3: Bark of *F. conccina*



Figure 4: Bark sample for phytochemical analysis



MORPHOLOGY

It is a tall tree upto 25-30 m high. The branchlets are terete, smooth, and hairless (glabrous), with sparse lenticels. The leaves are simple and arranged alternately. They are narrowly elliptic to oblong-elliptic or ovate in shape, with bases that range from rounded to wedge-shaped (cuneate). The leaf margins are entire (smooth, without teeth), dark green and glossy on the upper surface, and pale on the underside. Both surfaces are glabrous and coriaceous. There are 9-10 pairs of lateral veins, and the midrib is canaliculate on the upper side. The petiole is glabrous and measures 1-2.1 cm in length and 2.1-2.4 mm in width. The stipules are ovate, 7-9 mm long and 3-5 mm wide, tapering to a long point (long acuminate), hairless, and fall off early (caducous). The hypanthodium is sessile, occurring singly or in pairs, sub-globose in shape, and dark orange, turning scarlet red upon maturity, with a few pale yellowish spots. It is glabrous throughout. The basal bracts are persistent, ovate, and glabrous. The ostioles are prominent, located at the ostiolar region, and are minutely ovate in shape. The interfloral bracts are lanceolate and glabrous. Male flowers are few in number, located near the ostiole, and are minutely pedicellate. They have three united tepals, and the anthers are broadly ovoid in shape. Gall flowers are pedicellate. Female flowers are also pedicellate, measuring 2.6-3 mm in length. They have three glabrous tepals, each 1-1.4 mm long. The ovary is ovoid or nearly spherical (sub-globose), with a style 1-1.5 mm long and a bifid stigma (Karthigeyan and Jayanthi, 2016; Figure 1-3).

METHODOLOGY

The bark of *F. concinna* was collected from the State Botanical Garden, Odisha, India. The plant species was identified by the authors. The Soxhlet extraction method was adopted using three solvents (N-hexane, ethanolic, and methanolic) for phytochemical analysis. 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 change 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 Dragendorff'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

A thorough scrutiny of the literature survey revealed that some plant parts of *F. concinna* have less documentation on medicinal properties. Researchers often prioritize documentation on the species with a long history of



widespread traditional uses, leading to more accumulated data for the species of *F. concinna*. Preliminary phytochemical analysis revealed that tannin and alkaloids are present in methanolic and ethanolic extracts. Saponin and terpenoids are present in the methanolic extract. Reducing sugars are present in all the extract (**Table 1; Figure 5-7**).

Table 1: Phytochemical analysis using different extracts of *F. concinna*

Bioactive compounds	N-hexane extract	Ethanolic extract	Methanolic extract
Tannin	-	+	+
Saponin	-	-	+
Flavonoids	-	-	-
Terpenoids	-	-	+
Phenolic compounds	-	-	-
Reducing sugars	+	+	+
Steroids	-	-	-
Alkaloids	-	+	+
Carbonyl compounds	-	-	-

(‘+’ve – Positive; ‘-’ ve – Negative)

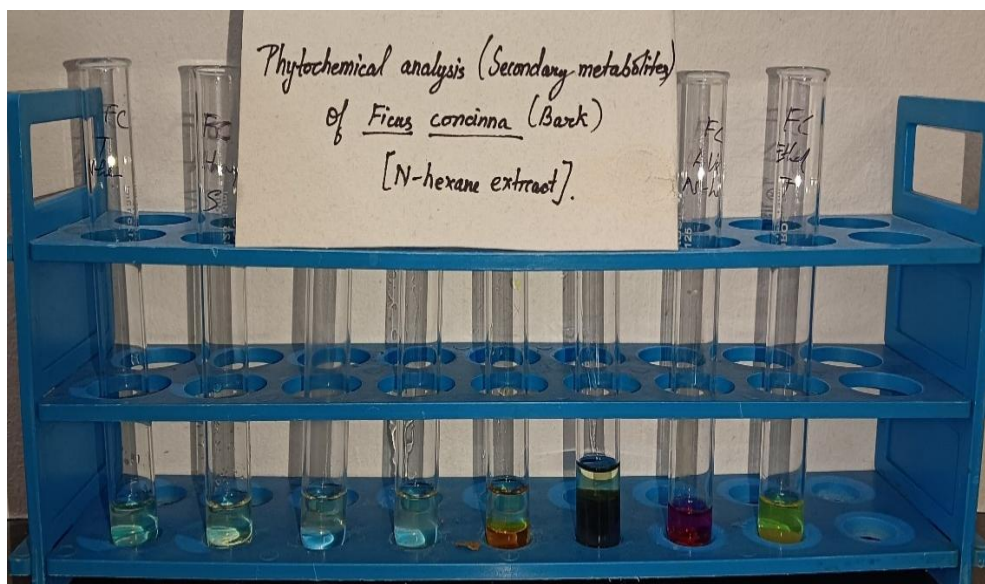


Figure 5: Phytochemical analysis (Secondary metabolites) of *F. concinna* (Bark) of n-hexane extract

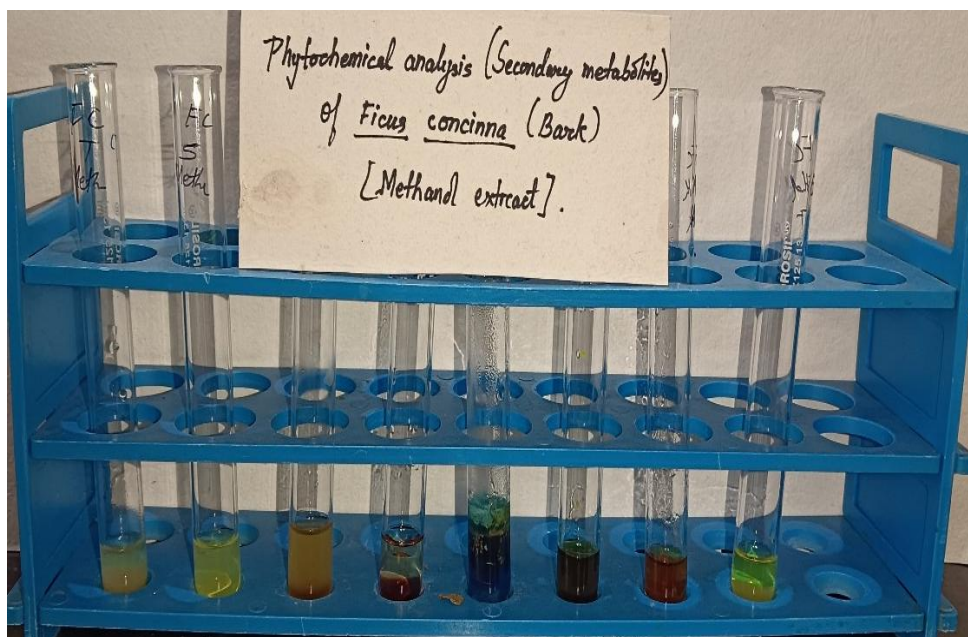


Figure 6: Phytochemical analysis (Secondary metabolites) of *F. concinna* (Bark) of methanolic extract

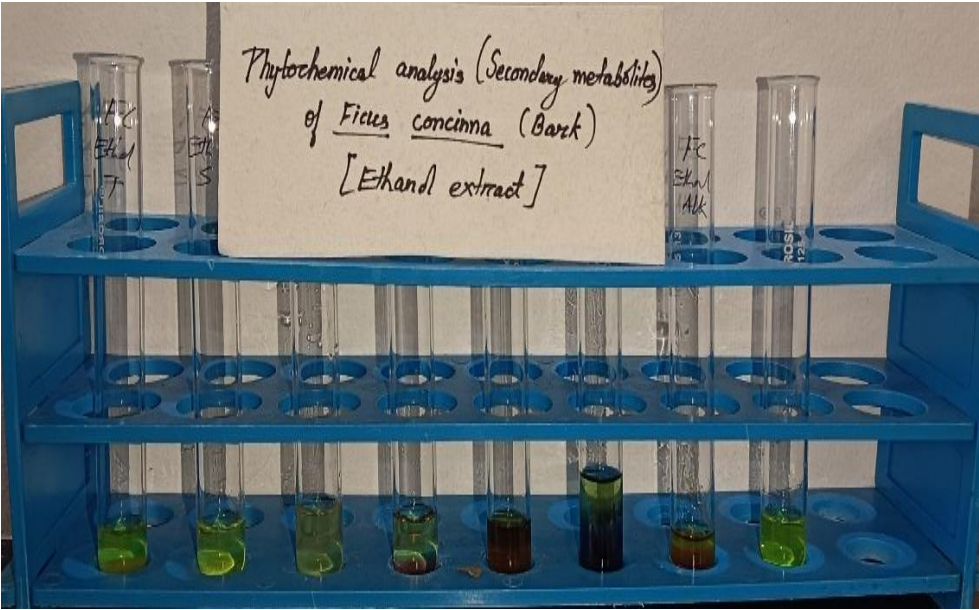


Figure 7: Phytochemical analysis (Secondary metabolites) of *F. concinna* (Bark) of ethanolic extract

There might be a lack of comprehensive ethnomedicinal surveys focusing specifically on *F. concinna* in all regions where it grows. This could lead to traditional knowledge not being systematically recorded and therefore have less scientific literature available. According to Table 2, only a few researchers have recorded the use of leaves and stems, primarily for treating cancer, cuts, and wounds, while little to no research has been conducted on the bark, roots, and fruits. This gap presents an opportunity for future researchers to explore and contribute to this under-studied area.

Table 2: Ethnomedicinal uses of all parts of *F. concinna*

Plant parts	Mode of uses	Diseases	Sources
Leaves	Paste	Cuts and wounds	Dapar et al., (2020)
Leaves, bark, and roots	Decoction	Cancer	Cabanlit et al., (2025)
Stem	Raw	Toothache	Devi et al., (2022)



The *Ficus* genus is known for its diverse array of phytochemicals associated with ethnomedicinal values, except some of the *Ficus* species are unexplored or might be overlooked. Less work is carried out on pharmacological values because maybe the particular species isn't seen as having immediate high potential or widespread traditional values; it might receive less attention and resources for in-depth studies. According to the present phytochemical analysis carried out in Table 1, on that basis their probable utilization is listed in **Table 3**.

Table 3: Some bioactive compounds from the *F. conccina* (bark) and their probable utilization

Bioactive compounds	Pharmacological values	Sources
Alkaloids	They are well known for their analgesic and anti-inflammatory	Jiang et al., (2022)
Flavonoids	Anti-cancer	Cabanlit et al., (2025)
Saponin	It contributes significantly to anti-inflammatory and antioxidant activity	Jang et al., (2013)
Tannin	It possesses astringent properties which are beneficial for wound healing, treating skin infections, anti-diarrhoeal	Dufourc, (2021); Xu et al., (2023)
Terpenoids	Anti-cancer, anti-inflammatory, antimicrobial activity	Thoppil and Bishayee (2011)

ECOLOGICAL SIGNIFICANCE

Many *Ficus* species are well known for their ecological significance. As a keystone species in many ecosystems, it provides essential resources for a



wide range of fauna, contributing significantly to biodiversity. Its ability to thrive in various environments and its role in ecological succession further emphasize its importance in maintaining ecosystem health and resilience. Ecologically, *Ficus concinna* functions as a keystone species, contributing significantly to biodiversity and ecosystem health through its role as a food source for various fauna and its adaptability to diverse environmental conditions (Kumar et al., 2022). During the field survey it was revealed that figs of *F. concinna* are consumed by many avian species, such as the red whiskered bulbul and orange-headed thrush.



Figure 8: Red whiskered bulbul (*Pycnonotus jocosus*) consuming figs of *F. concinna*



Figure 9: Orange-headed thrush (*Geokichla citrina*) consuming figs of *F. conccina*

CONCLUSION

The comprehensive analysis of *Ficus concinna* revealed a species of significant, yet underexplored, medicinal and ecological value. According to the literature study, it concluded that the traditional knowledge base serves as a crucial basis for further scientific investigation, bridging the gap between ancestral wisdom and modern pharmacological understanding. The isolation of bioactive compounds such as tannins, saponins, terpenoids, reducing sugars and alkaloids underscores the plant's complex chemical profile and its potential as a source of novel drug leads. Beyond its less data on medicinal attributes, *F. concinna* plays a vital ecological role. Its ecological significance further solidifies its position as a species worthy of conservation and continued scientific inquiry. Future research should focus on detailed ethnomedicinal studies to elucidate the precise modes of action of its active compounds, to validate its efficacy and safety in humans, and explore sustainable cultivation practices to ensure its availability for both medicinal uses and ecological preservation.



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