CHAPTER 5

Phytochemical screening of fruits of *Tiliacora acuminata* (Lam.) Miers (Menispermaceae)

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Abstract

Tiliacora acuminata, a plant species used in traditional medicine, was investigated for its phytochemical constituents. The fruits of *T. acuminata* were extracted using aqueous, ethanol, and methanol solvents, and the resulting extracts were screened for the presence of various bioactive compounds. The phytochemical analysis revealed the presence of tannins, saponins, reducing sugars, phenolic compounds, alkaloids, steroids, and terpenoids in the extracts. The results suggest that *T. acuminata* fruits are a rich source of bioactive compounds, which may contribute to their potential medicinal and therapeutic properties. The study provides a comprehensive understanding of the phytochemical constituents of *T. acuminata* fruits and highlights their potential for further research and development into natural health products.

Keywords: Bioactive compounds, medicinal plants, extraction, phytochemical analysis

Introduction

Traditional medicine has been an integral part of human healthcare for centuries (Devi et al., 2022; Nayak and Kumar, 2023; Devi et al., 2024), with many plant species being used to treat various ailments (Kumar and Jena, 2014). In recent years, there has been a growing interest in the phytochemical analysis of medicinal plants (Das et al., 2022; Mishra et al., 2022; Saha et al., 2022), as they are a rich

source of bioactive compounds with potential therapeutic properties (Sahoo et al., 2021; Kumar et al., 2021; Agarwal et al., 2023; Sahu et al., 2024).



Figure 1: Vegetative parts of *Tiliacora acuminata*



Figure 2: Habitat of *Tiliacora acuminata*

Tiliacora acuminata (Figures 1-2), a plant species native to the tropical regions of Asia, has been used in traditional medicine for its various health benefits (Das et al., 2020; Tripathi et al., 2024). Phytochemical screening is a crucial step in the discovery of new drugs from plant sources (Aradhana et al., 2022). It involves the identification and quantification of bioactive compounds present in plant extracts (Singh et al., 2022). The phytochemical analysis of *Tiliacora acuminata* fruits can provide valuable information on their potential medicinal properties and can pave the way for further research into their therapeutic applications. *Tiliacora acuminata* is a member of the Menispermaceae family, which is known for its diverse range of bioactive compounds. The plant has been traditionally used to treat various ailments, including fever, rheumatism, and digestive disorders (Tripathi et al., 2024). However, there is limited scientific evidence to support its traditional uses, highlighting the need for further research into its phytochemical constituents and therapeutic properties.



Figure 3: Fruits of *Tiliacora acuminata*

The aim of the present study is to investigate the phytochemical constituents of *Tiliacora acuminata* fruits using various solvents, including aqueous, ethanol, and

methanol. The study will provide a comprehensive understanding of the bioactive compounds present in *T. acuminata* fruits and their potential therapeutic applications.

Materials and methods

The fruits of *Tiliacora acuminata* were collected from the bank of Mahanadi River areas, Cuttack, in October 2024. Authors have identified the plant specimen. Aqueous, ethanol and methanol extracts of fruits were obtained and nine different bioactive compounds were detected using standard methods (Devi et al., 2023; Marndi et al., 2024).

Qualitative phytochemical analysis for secondary metabolites

Test for tannin

2-5 drops of 0.1 % lead acetate solution were added to 1 ml of the filtrate of the leaf extract. The white gelatinous precipitate provided a positive result for the presence of tannins.

Test for saponin

1 ml of distilled water was added to 1 ml of the filtrate of the leaf extract and shaken vigorously. The persistent froth formation after shaking indicated the presence of saponin.

Test for flavonoids

2 ml of 2 % NaOH solution and 3 drops of dilute HCl were added to 1 ml of the filtrate of the leaf extract. The colour of the filtrate initially turned to an intense yellow colour with NaOH solution and later turned colourless. This colour change confirmed the presence of flavonoids.

Test for terpenoids

1 ml of the filtrate of leaf extract was added with 6 drops of chloroform and placed in the water bath for a few minutes. Then 6 drops of concentrated H_2SO_4 were added. The reddish-brown interface confirmed the positive result for the presence of terpenoids.

Test for phenolic compounds

1 ml of the filtrate of leaf extract was taken and a few drops of 5 % Ferric chloride solution were added. The bluish-black colour provided the positive result of the phenolic compounds.

Test for reducing sugars

1 ml of the filtrate of leaf 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 a few minutes. The presence of red-orange precipitate confirmed the presence of reducing sugars.

Test for steroids

1 ml of the filtrate of the leaf extract was added with 1 ml of chloroform and 1 ml of concentrated H_2SO_4 were added to it. The appearance of upper red and lower yellow with green fluorescence provided the positive result of the test for steroids.

Test for alkaloids

1 ml of the filtrate of the leaf extract was taken and 3-4 drops of Dragendroff's reagent was added to it. The formation of a reddish-brown precipitate confirmed the presence of alkaloids.

Test for carbonyl compounds

1 ml of the filtrate of the leaf extract was taken and 3-4 drops of 2,4-Di-nitrophenylhydrazine reagent was added to it. The formation of yellow crystals confirmed the presence of carbonyl compounds.

Results and discussion

The phytochemical analysis of *Tiliacora acuminata* fruits revealed the presence of several bioactive compounds. Tannins, saponins, reducing sugars, and phenolic compounds were detected in all three extracts (aqueous, ethanol, and methanol). These compounds are known for their antioxidant, anti-inflammatory, and antimicrobial properties (Kumar et al., 2013). The analysis also detected the

presence of terpenoids in the ethanol extract, while steroids were detected only in the methanol extract. Alkaloids were detected in both ethanol and methanol extracts. Flavonoids, carbonyl compounds were not detected in any of the extracts (Table 1). The presence of these bioactive compounds suggests that *Tiliacora acuminata* fruits may have potential medicinal and therapeutic applications. The results of this study provide a comprehensive understanding of the phytochemical constituents of *Tiliacora acuminata* fruits. The presence of a range of bioactive compounds, including tannins, saponins, reducing sugars, phenolic compounds, terpenoids, steroids, and alkaloids, suggests that the fruits may have potential antioxidant, anti-inflammatory, antimicrobial, and other medicinal properties (Palei et al., 2024). Nishanthini et al., (2014) documented the phytochemicals from stem and leaf of *T. acuminata.* Uthirapathi et al., (2020) reported the phytochemicals of *T. acuminata*. Simon et al., (2016) documented the antimicrobial activity of *T. acuminata*. Tripathi et al., (2024) documented the bioactive compounds of flowers of *T. acuminata*.

Table 1: Phytochemical analysis of *T. acuminata* fruits

Bioactive compounds	Aqueous	Ethanol	Methanol
Tannin	+ve	+ve	+ve
Saponin	+ve	+ve	+ve
Flavonoids	-ve	-ve	-ve
Terpenoids	-ve	+ve	-ve
Reducing sugar	+ve	+ve	+ve
Phenolic compounds	+ve	+ve	+ve
Steroids	-ve	-ve	+ve
Alkaloids	-ve	+ve	+ve
Carbonyl compounds	-ve	-ve	-ve

(+ve: present; -ve: absent)

Conclusion

The phytochemical analysis of *Tiliacora acuminata* fruits revealed a diverse range of bioactive compounds, including tannins, saponins, reducing sugars, phenolic compounds, terpenoids, steroids, and alkaloids. The presence of these compounds suggests that the fruits may possess antioxidant, anti-inflammatory, antimicrobial,

and other medicinal properties, supporting their traditional use in folk medicine. Further studies are warranted to explore the therapeutic potential of *T. acuminata* fruits and to isolate and characterize the bioactive compounds responsible for their medicinal properties.

References

Agarwal B, Rathore S, Krishnan R, Jaiswal A, Panda A, Hegde L and Kumar S. (2023). A check list on wild nutraceutical tuberous plants of India. Indian Forester. 149(5): 587-590.

Aradhana S, Manjula BL and Kumar S. (2022). Scientific validation of tribal claims on the plants used in diabetes by Santhal community, Mayurbhanj, Odisha, India. Medicinal Plants. 14(4): 513-517.

Das L, Mishra S, Das A, Dimri R and Kumar S. (2022). Some common flora of temple city of Odisha, India: source for ethno-medico-cultural values. Indian Forester. 148(2): 207-212.

Das MK, Das PK, Kumar S and Singh NR. (2020). Flora of Khandagiri & Udayagiri, an urban heritage of Odisha. Indian Forester. 146(6): 509-518.

Devi RS, Satapathy KB and Kumar S. (2022). Ethnomedicinal plants of Phumdi, Loktak lake, Manipur, India. Asian Pacific Journal of Health Sciences. 9(4): 77-80.

Devi RS, Satapathy KB and Kumar S. (2023). Validation of tribal claims for formulation of future drugs through evaluation of ethno-pharmacological values of *Ludwigia adscendens*. Medicinal Plants. 15(4): 691-697.

Devi RS, Satapathy KB and Kumar S. (2024). Loktak Lake of the state Manipur: A review to educate the intellectuals and awareness on its biowealth. Educational Administration: Theory and Practice, 30(5), 6936–6947. https://doi.org/10.53555/kuey.v30i5.4064

Kumar S and Jena PK. (2014). Chromatographic, antibacterial, and FT-IR analysis of *Dioscorea pentaphylla* L. tuber extracts. Plant Science Research. 36 (1&2): 83-90.

Kumar S, Behera SP and Jena PK. (2013). Validation of tribal claims on *Dioscorea pentaphylla* through phytochemical screening and evaluation of antibacterial activity. Plant Science Research. 35: 55-61.

Kumar SN, Mishra S and Kumar S. (2021). Documentation of Indigenous Traditional Knowledge (ITK) on Commonly Available Plants in Koira Range, Bonai Forest Division, Sundargarh, Odisha, India. Asian Plant Research Journal. 8(4): 83-95.

Marndi S, Barik M and Kumar S. (2024). Phytochemical and cytotoxicity analysis of *Eulophia explanata* Lindl. (Tuber extracts). Afr. J. Biol. Sci. 6(4): 2751-2756. DOI: 10.48047/AFJBS.6.Si4.2024.2751-2756.

Mishra S, Agrawal B, Rathore S, Mishra AK and Kumar S. (2022). Medicinal grasses of Eastern Ghats of Odisha, India. Indian Forester. 148(11): 1172-1174.

Nayak S and Kumar S. (2023). Medicinal plants used by tribals of Odisha. APRF & SMPB, Odisha; APRF Publishers, India. ISBN: 978-81-958404-9-6. Pp 1-665.

Nishanthini A, Mohan VR and Jeeva S. (2014). Phytochemical. FT-IR and GC-MS analysis of stem and leaf of *Tiliacora acuminata* (Lan.) Hook. f. & Thomas (Menispermiaceae). International Journal of Pharmaceutical Sciences and Research. 5(9): 3977-3986.

Palei S, Dagwal MJ, Choudhari SS, Raut ST, Parmeela HC, Sharma BP and Kumar S. (2024). Ethno-Pharmacological values of *Drosera Indica* L.: A Carnivorous Plant of India. African Journal of Biological Sciences. 6(Si4): 4908-4913; DOI: 0.48047/AFJBS.6.Si4.2024.4908-4913

Saha M, Roy AB, Kumar S and Datta BK. (2022). Ethnobotanical diversity of some wetland plants of North-East India: implications for conservation. Indian Forester. 148(11): 1149-1154.

Sahoo A, Choudhury R, Devi RS, Kumar S, Pradhan S, Biswal SK and Kumar S. (2021). Evaluation of medicinal potential and antibacterial activity of selected plants against *Streptococcus mutans*. Acta Fytotechnica et Zootechnica. 24(1): 9-15.

Sahu LM, Das K, Sahu JK, Das A, Behera B and Kumar S. (2024). Eco-social Services of Native Tree species: A Conservation Approach. Indian Forester. 150(7): 630-634.

Simon L, Nanthakumar R and Arumugasamy K. (2016). Phytochemical analysis and antimicrobial activity of *Tiliacora acuminata* (Lam.) f. Thoms. (Menispermaceae). Journal of Medicinal Plants Studies. 4(6): 18-22.

Singh A, Lama R, Panda A, Marndi S, Devi RS and Kumar S. (2022). Phytochemical and Anti-bacterial Activity of *Toddalia asiatica*: A Wild Nutraceutical. Asian Pacific Journal of Health Sciences.9(2):235-239.

Tripathi G, Sharma N, Kapil MJ, Singh G, Lal S and Marndi S. (2024). Phytochemical screening of the flowers of *Tiliacora acuminata* (Lam.) Miers: a climber of India. In: Alam SKS, Basole S and Kakkalameli S. Ethnopharmacology, Volume 2, APRF Publishers, India.

Uthirapathi M, Manohar K and Nalliah N. (2020). Comparative investigation on antimicrobial and phytochemical profiling of *Cyclea peltata* and *Tiliocora acuminata*. Journal of Applied Biology & Biotechnology. 8(3): 57-63.