CHAPTER 5

Phytochemical screening of the flowers of *Tiliacora acuminata* (Lam.) Miers: a climber of India

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Abstract

The ethnomedicinal, phytochemical, and pharmacological aspects of the *Tiliacora acuminata* flower are provided here by the authors, along with photos for easy identification. Biological characteristics, including habitat and habit are also provided. The chapters present the *Tiliacora acuminata* flower's significance in a scientific way.

Keywords: Climber, ethnomedicinal uses, phytochemical analysis, pharmacological

Introduction

Climbers play a significant role in forests due to their ability to shade the forest. It is also one reason faunal species travel from one place to another, like monkeys and giant squirrels. Climbers include a total of 2,608 species, representing 585 genera and 104 spermatophyte plant families (Pandi and Babu, 2022). Climbers are categorized into herbaceous (vines) and woody climbers (Lianas) and subdivided into twiners, tendril climbers, root climbers, hook climbers, and scramblers based on their climbing strategies (Sethi et al., 2023). Families included in climbers are Convolvulaceae, Cucurbitaceae, Asclepiadaceae, Vitaceae, Ranunculaceae, Apocynaceae, Dioscoreaceae, Fabaceae, and Menispermaceae (Deepa et al., 2020). Several climbers are medicinal, ecologically, and economically important and

used as herbal remedies in traditional knowledge. The Menispermaceae family consists of 526 species and 72 genera (Meenu and Radhakrishnan 2020; Boxi et al. 2024). It is traditionally known as the moonseed family; it possesses pharmacological activities that include anticancer, antioxidant, anti-inflammatory, hyperglycemia, and cardiopathy (Boxi et al., 2024). *Tiliacora acuminata* is one of the species in the Menispermacae family. It is a small climbing vine. It is mostly found in wet tropical biomes, such as moist deciduous forests. The flowering period is April–JJune and the fruiting period is June–December. It can be easily observed by the fragrant yellow flower along with a long-stemmed, woody vine. The flower of *T. acuminata* possesses antimicrobial, antidiarrheal, antioxidant, and antibacterial properties (Kumar et al., 2023; Ben et al., 2013; Nishanthini et al., 2016). It is abundantly available all over the world despite the factors of its medicinal uses, economic value, and ecological potential. Therefore, an attempt has been made to document the phytochemical and pharmacological value of the flower of *Tiliacora acuminata*.

Morphology

It is a small, climbing vine with slender, twining olive-green to brownish stems. Leaves large, ovate to lance-shaped, smooth, or slightly wavy along the margin, pointed at the apex; glossy green; alternate on the stems. Small greenish or yellowish flowers are borne in clusters, fragrant flowers. Fruits are small, rounded, and usually dark at maturity (Saxena and Brahmam, 1995; Kumar et al., 2020).

Methodology

Collection of plant material

The flowers of *Tiliacora acuminata* were collected from the State Botanical Garden, Odisha, India in August 2024. The species was identified by the senior author. The Soxhlet extraction method was adopted using different solvents for phytochemical analysis (Dwibedy et al., 2015). Nine secondary metabolites were detected using standard methods (Kumar et al., 2013; Marndi et al., 2024; Jena et al., 2024).

Qualitative phytochemical analysis

Detection of nine secondary metabolites were conducted using standard methods (Kumar et al., 2013).

Test for tannin

About 1 ml of the filtrate of flower extract was taken. Added about 3-5 drops of 0.1 % lead acetate solution into it. The gelatinous precipitate formation confirms the presence of tannin.

Test for saponin

About 1 ml of the filtrate of flower extract was taken and mixed with 1 ml of distilled water and allowed to shake it vigorously. The persistent froth formation after shaking confirmed the presence of saponin.

Test for flavonoids

About 1 ml of the filtrate of flower extract was taken and added 2 ml of 2 % NaOH solution, followed by H_2SO_4 into it. The color initially turned to an intense yellow color with the addition of NaOH solution and later became colorless with sulphuric acid. This color change confirmed the presence of flavonoids.

Test for terpenoids

About 2ml of the filtrate of flower extract was added with 6 drops of chloroform and placed it in the water bath for few minutes. Then 6 drops of concentrated H_2SO_4 were added. The appearance of reddish – brown interface confirmed the presence of terpenoids.

Test for phenolic compounds

About 1 ml of the filtrate of flower extract was taken. A few drops of 5 % Ferric chloride solution were added to the filtrate extract. The appearance of a bluish-black color provides a positive result for the phenolic compounds.

Test for reducing sugar

About 1ml of the filtrate of flower extract was taken and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept it in a water bath for a few minutes. The presence of red-orange precipitate confirmed the positive result of the test for reducing sugars.

Test for steroids

About 1 ml of the filtrate of flower extract was taken. 1 ml of chloroform and 1 ml of concentrated sulphuric acid was added into it. The appearance of upper red and lower yellow with green fluorescence provides a positive result for the presence of steroids.



Figure 1: Morphology of *Tiliacora acuminata*

Test for alkaloids

About 1 ml of the filtrate of flower extract was taken and added 3 to 4 drops of Dragendroff's reagent. The formation of reddish–brown precipitate confirmed the presence of alkaloids.

Test of carbonyl compounds

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

Results and discussion

The phytochemical screening result revealed that tannin, saponin, phenolic compounds, and reducing sugars are present in aqueous, ethanol, and methanol. Terpenoid, steroid, and alkaloids are detected in aqueous. Tannin has antiviral, antibacterial, antiparasitic effects, anti-inflammatory, antiulcer, and antioxidant properties. Phenolics have antioxidative, antidiabetic, anticarcinogenic, antimicrobial, antiallergic, antimutagenic, and anti-inflammatory.

Table 1: Phytochemical screening (Secondary metabolites) using different extracts of *T. acuminata* flower

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

(+ve: Positive; -ve: Negative)

In 2013, Ben et al. reported the antimicrobial efficacy of *Tiliacora acuminata*. In 2014, Manda et al. reported hypoglycaemic and wound-healing activities of *Tiliacora acuminata*. In 2014, Sagayaraj et al. reported antimicrobial studies and phytochemical screening of the leaves of *Tiliacora acuminata*. In 2016, Nishanthini et al. reported phytochemical, in vitro antioxidant, and antibacterial activity of the flower of *Tiliacora acuminata*. In 2016, Simon et al. reported the phytochemical and antimicrobial activity of *Tiliacora acuminata*. In 2020, Rodrigues et al. reported the in vitro cytotoxicity and in silico molecular docking of alkaloids from *Tiliacora acuminata*.

Conclusion

The current study concludes that the flower of *T. acuminata* contains tannin, saponin, terpenoids, phenolic compounds, reducing sugars, steroids, and alkaloids. Therefore, the flower of T. acuminata could be used for further pharmacological studies to cure different ailments.

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