

Chapter 4

Qualitative phytochemical analysis of *Cascabela thevetia* fruits

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Abstract

Cascabela thevetia is a very common plant on the premises of temples in India. Flowers are used for worship and other rituals. It is thought that fruits are very toxic throughout the country. Toxicity also indicates the medicinal potential of a plant. Keeping this in mind, an attempt has been made to document the bioactive compounds available in fruits. Fruits were collected, and phytochemical analysis was carried out. Results revealed that tannin, saponin, alkaloids, and flavonoids are detected in the aqueous extract of the fruits of *C. thevetia*. The presence of saponins and alkaloids might be responsible for toxicity, and these bioactive compounds could be responsible for curing bacterial and fungal skin infections.

Keywords: Apocynaceae, temple, bioactive compounds

Introduction

India is a home of temples, sacred groves, and religious premises (Das *et al.*, 2020). In every village of India, can be observed at least one sacred groves or religious place. They are unique and holy for local communities. Many such places have specific restriction and rules. They are place of different types of plants related to their believes (Das *et al.*, 2022). The locals never harm such plants and they come under fruiting plants, medicinal plants, plants used in rituals and threatened plants. They also play an important role in balancing the ecosystem of the locality and maintaining the environment (Nayak and Kumar, 2023). Among the plants observed in religious places, *Cascabela thevetia* is very common and commonly known as yellow oleander. Its flowers are offered to the deities and use it for ornamental purposes. The plant parts of this species are also used to cure many health problems. During field survey in different biodiversity works, it was noticed that fruits are very toxic. Keeping this in view, an attempt has been made to carry out the

qualitative phytochemical analysis of fruits using three extracts (aqueous, methanol and ethanol). The present study highlights the medicinal potential of *Cascabela thevetia* fruits.

Methodology

Collection of plant sample and preparation of extracts

The fruits of *C. thevetia* were collected from the bank of Mahanadi River area in Naraj, Cuttack district of Odisha state in June 2024 (Figures 1-2). The plant was identified by the senior author. The Soxhlet method of extraction was adopted using different solvents for phytochemical analysis (Devi *et al.*, 2023). Detection of nine secondary metabolites was carried out using standard methods (Hebbbar *et al.*, 2024; Mahendru *et al.*, 2024; Mety *et al.*, 2024).

Qualitative phytochemical analysis

Test for tannin

About 1 ml of the filtrate of fruit extract was taken. Added about 3-5 drops of 0.1% lead acetate solution into it. The gelatinous precipitate formation confirmed the presence of tannin (Kumar *et al.*, 2013).

Test for saponin

About 1 ml of the filtrate of fruit 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 (Kumar and Jena, 2014).

Test for flavonoids

About 1 ml of the filtrate of fruit extract was taken and added 2 ml of 2 % NaOH solution followed by H₂SO₄ into it. The colour initially turned to an intense yellow colour with the addition of NaOH solution and later become colourless with sulphuric acid. This change in colour confirmed the presence of flavonoids.

Test for terpenoids

About 2 ml of the filtrate of fruit extract was added with 6 drops of chloroform and place it in the water bath for few minutes. Then 6 drops of concentrated H₂SO₄ were added. The appearance of reddish-brown interface confirmed the presence of terpenoids (Sahoo *et al.*, 2021).

Test for phenolic compounds

About 1 ml of the filtrate of fruit extract was taken. Few drops of 5% Ferric chloride solution were added into the filtrate extract. The appearance of bluish black colour provides the positive result of the phenolic compounds (Kumar *et al.*, 2012).



Figure 1: Collection of *C. thevetia* fruits



Figure 2: Flower and leaves of *C. thevetia*

Test for reducing sugar

About 1 ml of the filtrate of fruit extract was taken and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept it in water bath for few minutes. The presence of red orange precipitate confirmed the positive result of the test for reducing sugar ([Mohanty *et al.*, 2021](#)).

Test for steroids

About 1 ml of the filtrate of fruit 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 provide the positive result for the presence of steroids ([Swain *et al.*, 2020](#)).

Test for alkaloids

About 1 ml of the filtrate of fruit extract was taken and added 3 to 4 drops of Dragendroff's reagent. The formation of reddish-brown precipitate confirmed the presence of alkaloids (Kumar *et al.*, 2017).

Test for carbonyl compounds

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

Results and discussion

During field survey, it was noticed that fishing communities of Mahanadi River areas use fruit paste to treat fungal skin infections. Therefore, phytochemical screening was carried out and found that tannin, saponin, flavonoids and alkaloids are present in aqueous extract (Table 1; Figure 3). In methanol extract, tannin and saponin are detected (Table 1; Figure 4). Tannin, saponin and reducing sugar are observed in ethanol extract (Table 1; Figure 5). The detected compounds like saponin and alkaloids might be responsible for the toxicity of fruits. Presence of tannin in all extracts of fruits might be responsible to treat fungal infections. It is also used in the treatment of external wounds, infected area, ring worms and tumours in traditional system of medicine (Rahman *et al.*, 2017).

Table 1: Phytochemical screening using different extracts of *C. thevetia* fruit

Bioactive compounds	Aqueous	Methanol	Ethanol
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

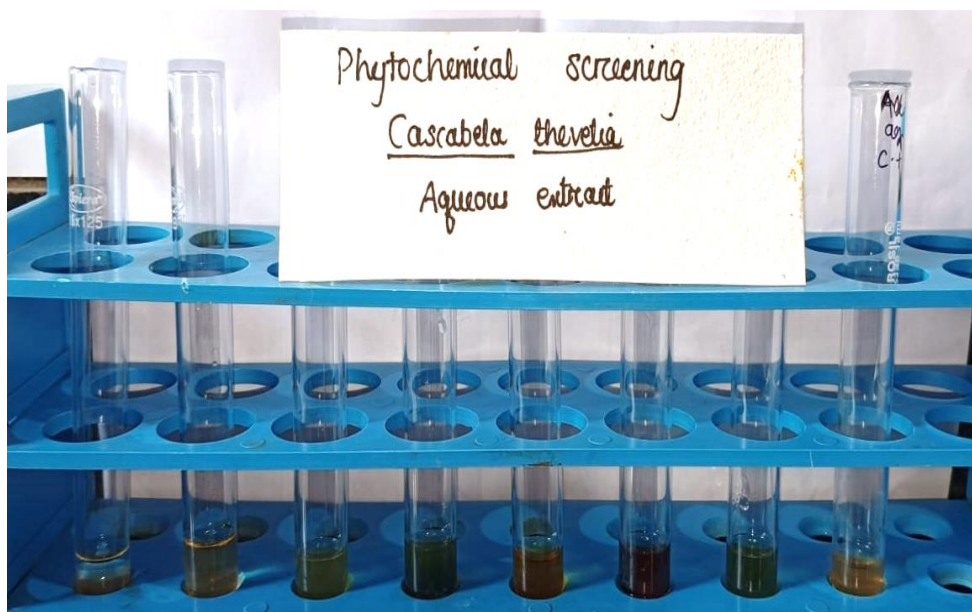


Figure 3: Detection of secondary metabolites using aqueous extract of *C. thevetia* fruit

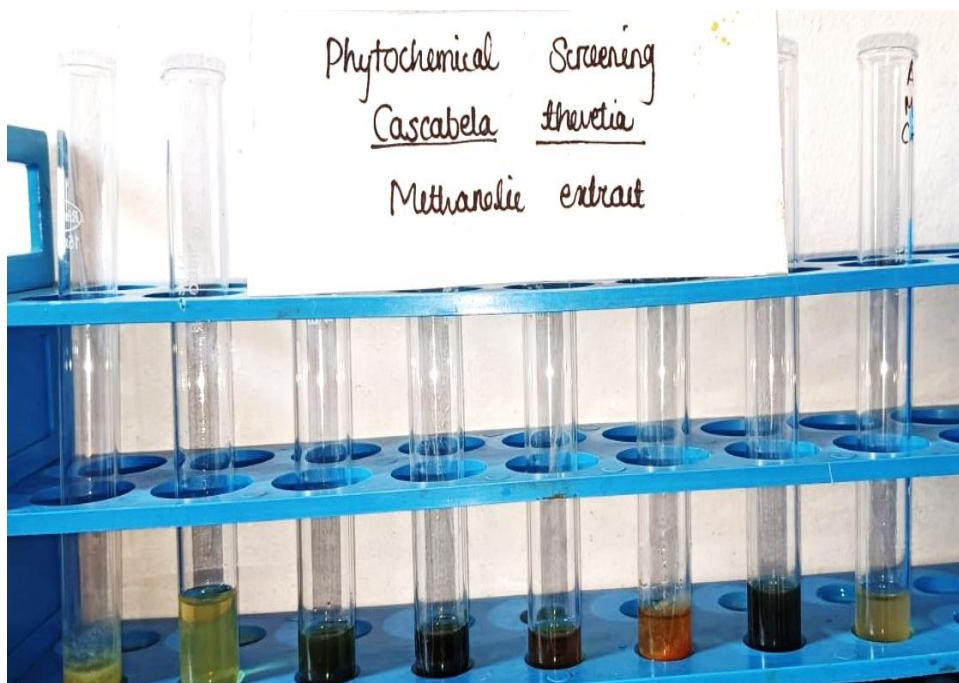


Figure 4: Detection of secondary metabolites using methanolic extract of *C. thevetia* fruit

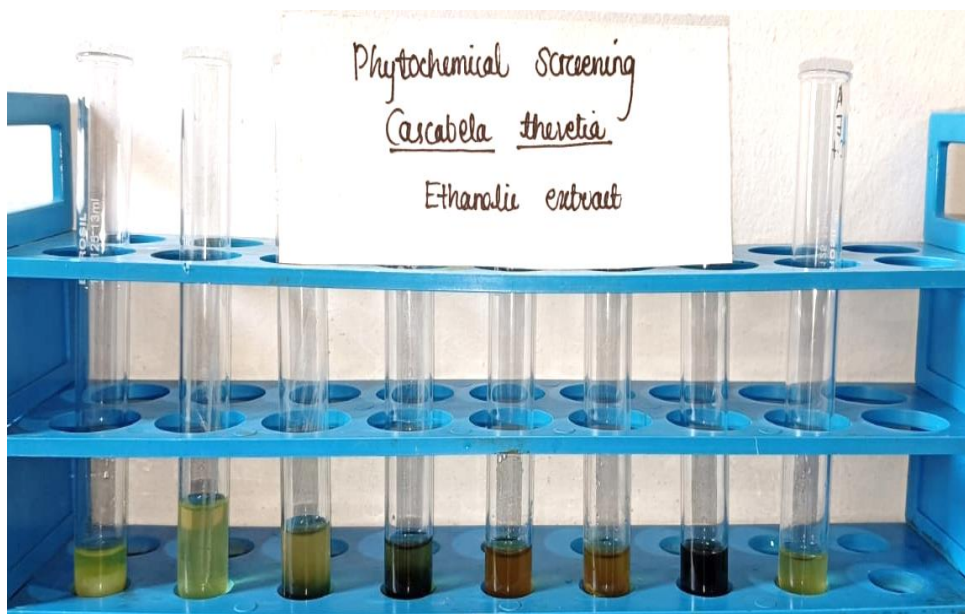


Figure 5: Detection of secondary metabolites using ethanolic extract of *C. thevetia* fruit

Antifungal efficacy of leaf extract against *Alternaria solani* and characterization of novel inhibitory compounds by Gas Chromatography-Mass Spectrometry analysis is also documented (Meena *et al.*, 2021) which reflects and validate our claims. Other pharmacological activities like anticancer (Ramos-Silva *et al.*, 2017), anti-rodenticide (Ndung'u *et al.*, 2024) etc are reported.

Conclusion

Field observations conclude that fruits are toxic in nature, and phytochemical screening revealed that detected compounds might be responsible. They may also be responsible for curing ethnomedicinal claims. Other reports have also validated the medicinal potentials, but a lack of work is observed in the literature. Therefore, an extensive survey is required to design advanced experimental work on bioactivity.

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