

Chapter 6

Phytochemical analysis and TLC profiling of the flowers of *Wendlandia tinctoria* (Roxb.) DC.

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ABSTRACT

The present study examines the phytochemical composition of *Wendlandia tinctoria* flowers using qualitative screening and Thin-layer chromatography (TLC) analysis. The findings revealed the presence of several bioactive compounds, including tannins, saponins, phenols, and reducing sugars, in the three selected extracts. The TLC analysis with multiple mobile phases validates the presence of these compounds, indicating potential therapeutic uses of *W. tinctoria* flowers.

Keywords: Bioactive compounds, flowers, trees

INTRODUCTION

Tree species have been a vital source of bioactive compounds, with many being used to develop new medicines (Lama *et al.*, 2022). The importance of tree species in the search for bioactive compounds lies in their diverse phytochemical composition (Dziedziński *et al.*, 2021). The study of tree species has led to the discovery of many life-saving medicines, and continued research has the potential to uncover new compounds with therapeutic applications (Satapathy *et al.*, 2021). Many tree species

have been used in traditional medicine for centuries, providing a wealth of knowledge and experience that can inform modern drug development (Devi *et al.*, 2018). Trees can provide a sustainable source of medicines, reducing the need for synthetic production and minimizing environmental impact. Additionally, the preservation of tree species can have a positive impact on both human health and the environment (Kumar *et al.*, 2022a; Sahu *et al.*, 2024). As a result, the search for bioactive compounds in tree species is an important area of research with potential benefits for human health and the environment. Therefore, keeping the importance of trees and the need to screen plant sources for documenting the availability of bioactive compounds, *Wendlandia tinctoria* is selected for the present study (Figure 1). It is a tree species belonging to Rubiaceae. It has ethnomedicinal uses.



Figure 1: Flowers of *W. tinctoria*

METHODOLOGY

The flowers of *W. tinctoria* were collected from the Sundargarh district of Odisha, India (Figure 2). The plant species was identified by the authors (Kumar *et al.*,

2022b). The Soxhlet method of extraction was adopted using three different extracts for phytochemical analysis. The detection of secondary metabolites was conducted using standard methods (Devi *et al.*, 2023; Marndi *et al.*, 2024; Patra *et al.*, 2025; Roy *et al.*, 2025). TLC plates were prepared on 6 cm glass slides using silica gel powder. Slides were washed with clinical laboratory detergent and dried. Clean and dried slides were wiped with ethyl acetate for removing surface adherents. 3 g of silica was taken in 20 ml of distilled water, and slurry was prepared by constant stirring, and was finally poured over the slides, and slides were left undisturbed till the drying of the silica layer. Then, the slides were activated at 50° C for 15-20 minutes before running the TLC. Methanol: chloroform (1:1), ethyl acetate: chloroform (1:9), and ethyl acetate: distilled water: acetic acid (8:1:1) were used as mobile phases. Then spots were marked, the RF (Retention Factor) values were recorded and visualized under the UV chamber (Kumar and Jena, 2014; Mishra and Bhatnagar, 2024).

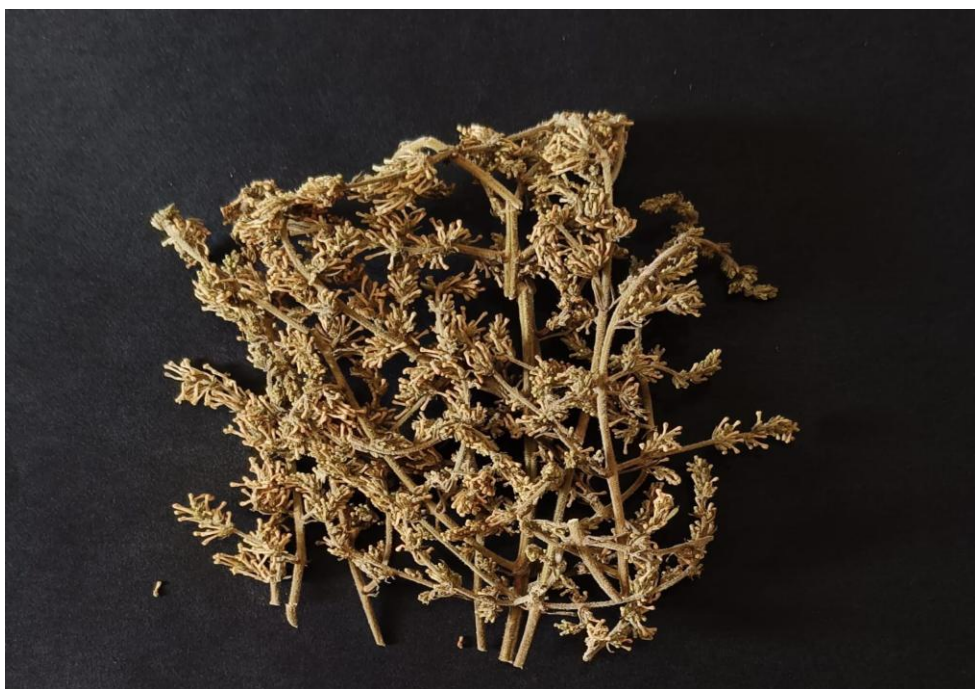


Figure 2: Collected *W. tinctoria* flowers for experimental work

RESULTS AND DISCUSSION

The phytochemical screening of *W. tinctoria* flowers revealed the presence of various bioactive compounds, including tannins, saponins, phenols, and reducing sugars (Table 1). These compounds were detected in different extracts, with saponins and phenols being present in all three extracts (n-hexane, ethanol, and aqueous). The presence of these bioactive compounds suggests that *W. tinctoria* flowers may have potential therapeutic applications.

Table 1: Qualitative phytochemical screening of *Wendlandia tinctoria* flowers using different extracts

Bioactive compounds	Extracts		
	n-Hexane	Ethanol	Aqueous
Tannin	Not detected	Detected	Detected
Saponin	Detected	Detected	Detected
Flavonoids	Not detected	Not detected	Not detected
Terpenoids	Not detected	Not detected	Not detected
Phenols	Detected	Detected	Detected
Reducing sugar	Detected	Detected	Detected
Steroid	Not detected	Not detected	Not detected
Alkaloid	Not detected	Not detected	Detected
Carbonyl compound	Not detected	Not detected	Not detected

Table 2: TLC analysis of *Wendlandia tinctoria* flowers using different mobile phases

Mobile phases	Extracts	Rf values of spots	
		S ₁	S ₂
Chloroform: Methanol	Acetone	0.88	Nil
	Hydroethanolic	0.87	Nil

(1:1)			
Ethyl acetate: chloroform (1:9)	Acetone	0.77	0.84
	Hydroethanolic	0.91	Nil
Ethyl acetate: water: acetic acid (8:1:1)	Acetone	0.83	0.88
	Hydroethanolic	0.81	0.85

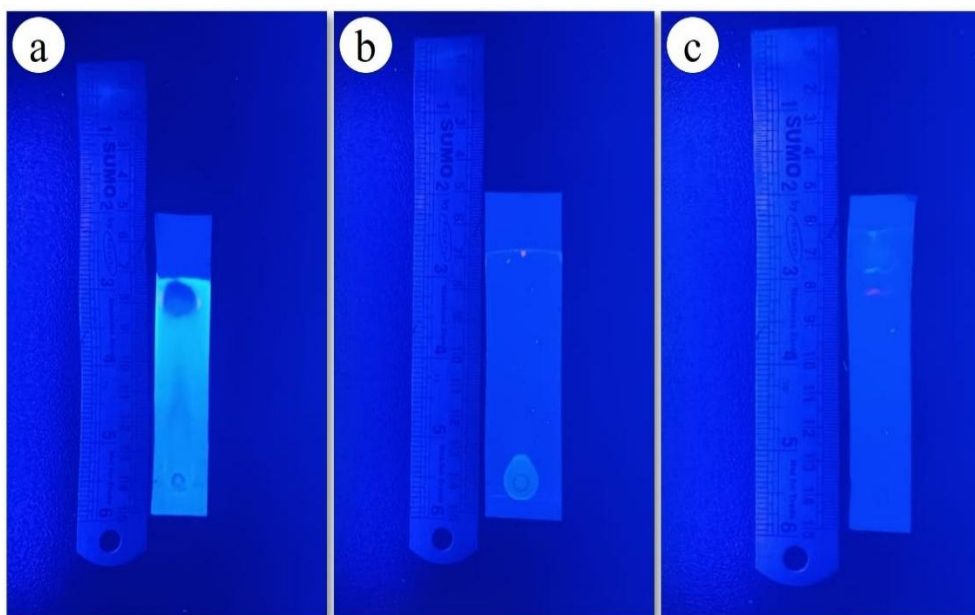


Figure 3: Spots on TLC plates under UV light; a) (Chloroform: methanol) acetone extract; b) (Ethyl acetate: chloroform) hydroethanolic extract and, c) (Ethyl acetate: water: acetic acid) acetone extract

The TLC analysis of the extracts using different mobile phases showed varying Rf values for the spots, indicating the presence of different compounds. The use of multiple mobile phases allowed for the separation and identification of various compounds, including those with Rf values ranging from 0.77 to 0.91 (Table 2; Figure 3). The results of the TLC analysis provide further evidence of the presence

of bioactive compounds in *W. tinctoria* flowers and highlight the importance of using multiple analytical techniques to fully characterize the phytochemical composition of plant extracts. The stem extract of *W. tinctoria* contains numerous phenolic compounds that have significant antioxidant activity (Farzana *et al.*, 2022).

CONCLUSION

The phytochemical analysis of *Wendlandia tinctoria* flowers revealed the presence of various bioactive compounds, including tannins, saponins, phenols, and reducing sugars. These findings suggest that *W. tinctoria* may be a valuable source of bioactive compounds for use in herbal drug formulations. Further research is needed to isolate and characterize the bioactive compounds present in *W. tinctoria* flowers and to explore their potential therapeutic applications.

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