

Chapter 1

Phytochemical screening of flowers of Fire flame bush [*Woodfordia fruticosa* (L.) Kurz]

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ABSTRACT

Woodfordia fruticosa (L.) Kurz, commonly known as Fire Flame Bush, is a medicinally important plant used in traditional therapeutic systems. The present study aimed to investigate the phytochemical constituents of the flowers of *W. fruticosa*. Phytochemical screening of the aqueous, ethanol, and n-hexane extracts of the flowers revealed the presence of various bioactive compounds, including tannins, saponins, phenols, reducing sugars, and alkaloids. The study demonstrates the potential of *W. fruticosa* flowers as a rich source of phytochemicals with potential therapeutic applications. The findings of this study provide a scientific basis for the traditional use of *W. fruticosa* as medicinal agent and highlight its potential for further pharmacological and phytochemical investigations.

Keywords: Bioactive compounds, medicinal plants, phytochemical screening, traditional medicine

INTRODUCTION

Wild flowers have been an integral part of human life for centuries, serving not only as a source of beauty and fragrance but also as a vital source of food and medicine (Kumar, 2015). In many communities, wild flowers are used as a nutritious supplement to the diet, providing essential vitamins, minerals, and antioxidants (Jakubczyk *et al.*, 2022). Moreover, wild flowers have been used for long in

traditional therapeutic systems (Edorh-Tossa *et al.*, 2023). In recent years, there has been a growing interest in the use of wild flowers as a sustainable source of food and medicine.



Figure 1: Flowers of *W. fruticosa*

This is largely due to the increasing recognition of the importance of preserving biodiversity and promoting ecological sustainability. Wild flowers are a rich source of bioactive compounds which have been shown to possess pharmacological values (Valencia-Cordova *et al.*, 2024). *Woodfordia fruticosa* (L.) Kurz, (Figure 1) commonly known as Fire Flame Bush, is a wild flower that has been used in traditional therapeutic practices (Nayak and Kumar, 2023). Despite its medicinal importance, there is a lack of scientific research on the phytochemical constituents of flowers of *W. fruticosa*. Therefore, the present study aims to investigate the phytochemical screening of the flowers of *W. fruticosa* and to explore their potential as a source of food and medicine.

MATERIALS AND METHODOLOGY

The flowers of *W. fruticosa* were collected from the nearby Mahanadi areas of Athagarh division, Cuttack district of Odisha, India (Figure 2). The plant species was identified by the authors. The Soxhlet extraction method was adopted using n-hexane, ethanol, and distilled water for phytochemical analysis. Detection of nine secondary metabolites were conducted using standard methods (Kshirsagar *et al.*, 2025; Sharma *et al.*, 2025).

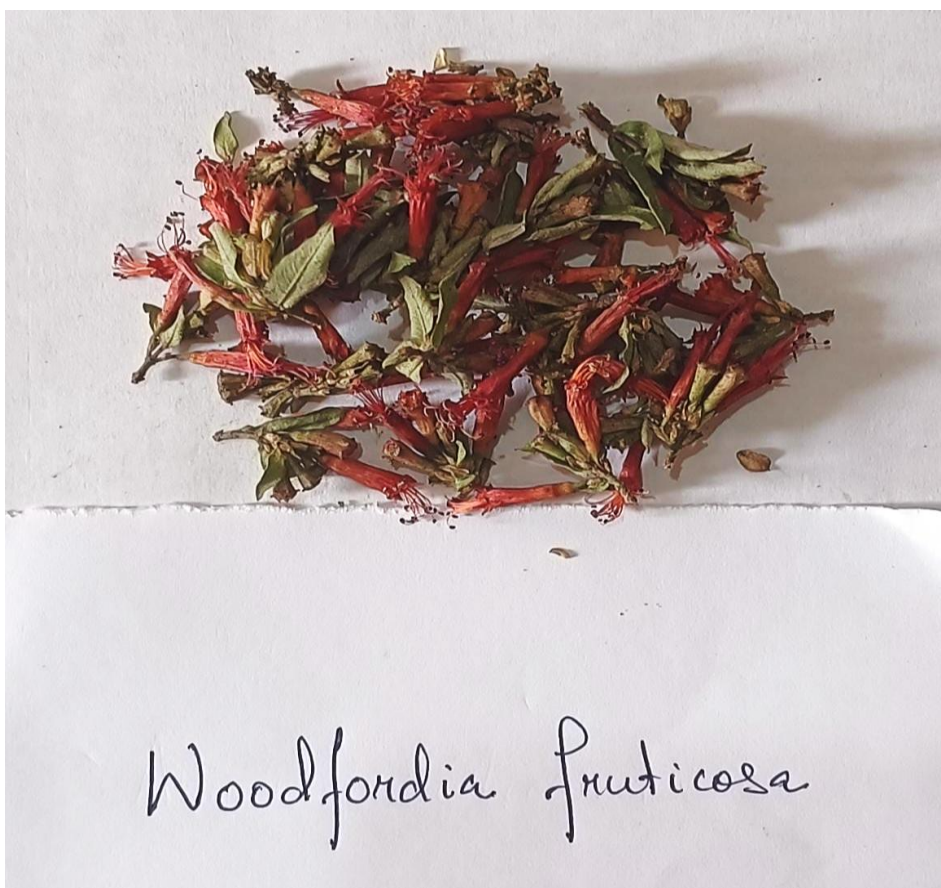


Figure 2: Collected flowers of *W. fruticosa* for experimental works

Test for tannin: About 1 ml of the flower extracts was taken and 3-5 drops of 10% lead acetate solution was added to it. The gelatinous precipitate formation confirmed the presence of tannin.

Test for saponin: About 1 ml of the flowers extracts was added to 1 ml of distilled water and shaken well. The formation of persistent froth was observed confirming the presence of saponin (Yadav et al., 2025).

Test for flavonoids: About 1 ml of the flower extracts was taken. Added 2 ml of NaOH solution and 3-4 drops of dilute HCl to it. The colour initially turned to an intense yellow colour with NaOH solution and later became colourless which confirmed the presence of flavonoids.

Test for terpenoids: To 1 ml of the flower extracts, 6 drops of chloroform was added. Then 5-6 drops of concentrated sulphuric acid were added. The reddish-brown interface confirmed the presence of terpenoids.

Test for phenols: About 1 ml of the flower extracts 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 flower extracts was taken. 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept in the water bath for few minutes. The presence of red-orange precipitate confirmed the presence of reducing sugars (Table 1).

Test for steroids: To 1 ml of the flower extracts, 1 ml of chloroform and 1 ml of concentrated sulphuric acid was added. The appearance of upper red and lower yellow with green fluorescence provides the presence of steroids.

Test for alkaloids: About 1 ml of the flower extracts was taken. Added 3-4 drops of Dragendroff's reagent to it. The formation of a reddish-brown precipitate confirmed the presence of alkaloids (Marndi et al., 2024).

Test for carbonyl compounds: about 1 ml of flower extracts was taken and added 3-4 drops of 2,4- Dinitrophenylhydrazine (DNPH) reagent. The formation of yellow crystal confirmed the presence of carbonyl compounds (Thakur et al., 2024).

RESULTS AND DISCUSSION

The phytochemical screening of the flowers of *W. fruticosa* revealed the presence of various bioactive compounds (Table 1; Figures 3-5). Results revealed that the aqueous, ethanol, and n-hexane extracts of the flowers contained tannins, saponins, phenols, reducing sugars, and alkaloids. However, flavonoids, terpenoids, steroids, and carbonyl compounds were not detected in any of the extracts (Table 1). The phytochemical screening of the flowers of *W. fruticosa* revealed a diverse range of bioactive compounds. The presence of tannins, saponins, and phenols suggests that the plant may possess antimicrobial and anti-inflammatory properties (Huang *et al.*, 2018; Devi *et al.*, 2023). Tannins have been shown to exhibit antimicrobial activity against a range of microorganisms, while saponins have been reported to possess anti-inflammatory and antioxidant properties (Kumar *et al.*, 2013; Devi *et al.*, 2023). The presence of reducing sugars in the extracts suggests that the plant may possess antioxidant activity. Reducing sugars have been shown to scavenge free radicals and reduce oxidative stress (Khatri and Chhetri, 2020). The detection of alkaloids in the extracts suggests that the plant may possess medicinal properties (Hussain *et al.*, 2018). Alkaloids have been reported to exhibit a range of biological activities, including antimicrobial, anti-inflammatory, and antioxidant properties (Heinrich *et al.*, 2021).

Table 1: Qualitative phytochemical analysis of *Woodfordia fruticosa* flowers using different extracts

Bioactive components	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	Not detected	Detected	Detected
Reducing sugars	Detected	Detected	Detected

Steroids	Not detected	Not detected	Not detected
Alkaloids	Detected	Detected	Detected
Carbonyl compounds	Not detected	Not detected	Not detected



Figure 3: Detection of secondary metabolites of *W. fruticosa* flowers using aqueous extract



Figure 4: Detection of secondary metabolites of *W. fruticosa* flowers using ethanol extract

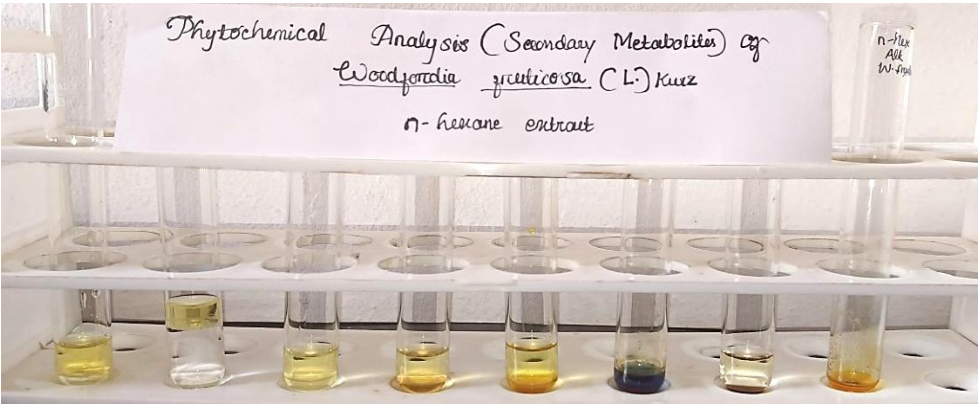


Figure 5: Detection of secondary metabolites of *W. fruticosa* flowers using n-hexane extract

However, further studies are needed to confirm this. The phytochemical screening of the flowers of *W. fruticosa* suggests that the plant may possess medicinal properties and could be a valuable source of bioactive compounds. Further studies are needed to isolate and characterize these compounds and to evaluate their biological activities.

CONCLUSION

The present study investigated the phytochemical constituents of the flowers of *W. fruticosa*, a traditionally used medicinal plant. The phytochemical screening revealed the presence of various bioactive compounds, including tannins, saponins, phenols, reducing sugars, and alkaloids. The results suggest that *W. fruticosa* flowers may possess antimicrobial, anti-inflammatory, and antioxidant properties, making them a valuable source of natural bioactive compounds. The study provides a scientific basis for the traditional use of *W. fruticosa* in medicine and highlights its potential for further pharmacological and phytochemical investigations. Further studies are needed to isolate and characterize the bioactive compounds present in *W. fruticosa* flowers and to evaluate their biological activities. The findings of this study contribute to the conservation and sustainable utilization of this medicinally important plant species.

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