

Chapter 6

Phytochemical analysis of whole plants of *Tribulus terrestris* L.

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Abstract: *Tribulus terrestris*, a traditionally used medicinal plant, was subjected to phytochemical analysis using acetone, methanol, and ethanol extracts. The study aimed to identify the bioactive compounds present in the whole plant. The results revealed the presence of various phytoconstituents, including tannins, saponins, flavonoids, terpenoids, phenolic compounds, reducing sugars, and alkaloids. Present study provides valuable information on the phytochemical profile of whole plant of *T. terrestris*, which can be useful for further pharmacological and therapeutic investigations.

Keywords: Wild tree, medicinal, traditional uses, bioactive compounds

INTRODUCTION

Plants serve as a primary source of food, shelter, clothing, and medicine (Kumar and Jena, 2014; Kumar, 2015; Kumar *et al.*, 2021). Plants have been used in traditional medicine to prevent and treat various health problems (Kumar and Satapathy, 2011; Das *et al.*, 2022; Sethi *et al.*, 2024). They are a rich source of different bioactive compounds which possess diverse pharmacological properties (Kumar and Dash, 2012; Misra *et al.*, 2012). The World Health Organization (WHO) estimates that approximately 80% of the world's population relies on traditional medicine, which is largely based on plant-derived remedies (Kumar *et al.*, 2013; Kumar *et al.*, 2018). Globally researchers facing lot of problems in drug failure and resistance problems (Kumar and Jena, 2014). Therefore, there is a need of screening of medicinal plants for availability of their bioactive compounds (Tripathy *et al.*, 2015). Among the plant species, *Tribulus terrestris*, (Figure 1) a perennial herb usually grows near

coastal areas and sandy soil (Jena and Kumar, 2023). In Ayurveda, it is reported as important medicinal plant (Chhatre *et al.*, 2014).



Figure 1: Plant parts of *T. terrestris*

Therefore, an attempt has been made to screen the bioactive compounds present in whole plant of *T. terrestris* using three solvents (acetone, methanol, and ethanol). The study provides a comprehensive analysis of the bioactive compounds present in the plant and their distribution in different extracts, which can be useful for further pharmacological and therapeutic investigations.

METHODOLOGY

The whole plant of *T. terrestris* was collected from Puri district of Odisha and identified by the authors. The Soxhlet extraction method was adopted using methanol, ethanol, and distilled water for phytochemical analysis through standard methods ([Devi et al., 2023](#); [Rout et al., 2024](#); [Jaiswal et al., 2024](#); [Hossain et al., 2025](#)).

RESULTS AND DISCUSSION

The phytochemical analysis of *Tribulus terrestris* revealed the presence of various bioactive compounds in different solvent extracts ([Figures 2-4](#)). The results are presented in [Table 1](#). The phytochemical screening indicated the presence of tannins, saponins, flavonoids, terpenoids, phenolic compounds, reducing sugars, and alkaloids in various combinations across the different extracts. The presence of these bioactive compounds is consistent with previous reports on the phytochemistry of *T. terrestris*. The acetone extract showed the presence of terpenoids, which was not detected in the methanol and ethanol extracts. This suggests that acetone is a more effective solvent for extracting terpenoids from *T. terrestris*. On the other hand, the methanol extract showed the presence of flavonoids, which was not detected in the acetone and ethanol extracts.

Table 1: Phytochemical analysis of *Tribulus terrestris* (Whole plant) using different extracts

Bioactive compounds	Acetone extract	Methanol extract	Ethanol extract
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: Presence; -ve: Absence)

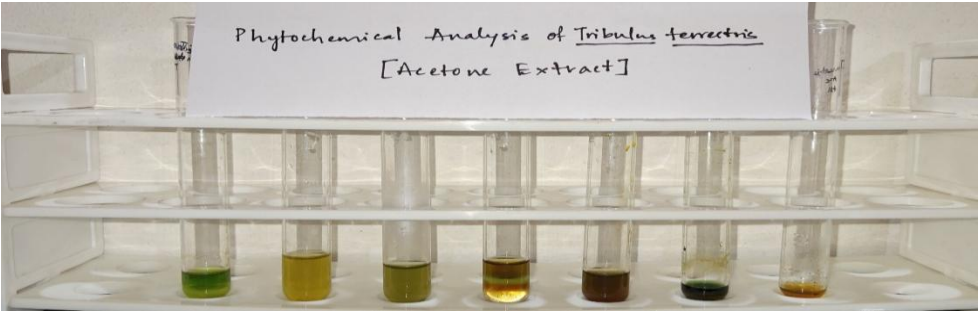


Figure 2: Phytochemical analysis of Acetone extract of *T. terrestris* (Whole plant)

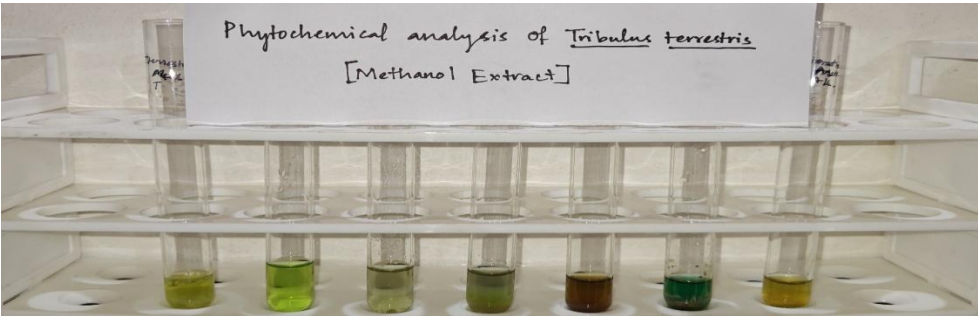


Figure 3: Phytochemical analysis of Methanol extract of *T. terrestris* (Whole plant)

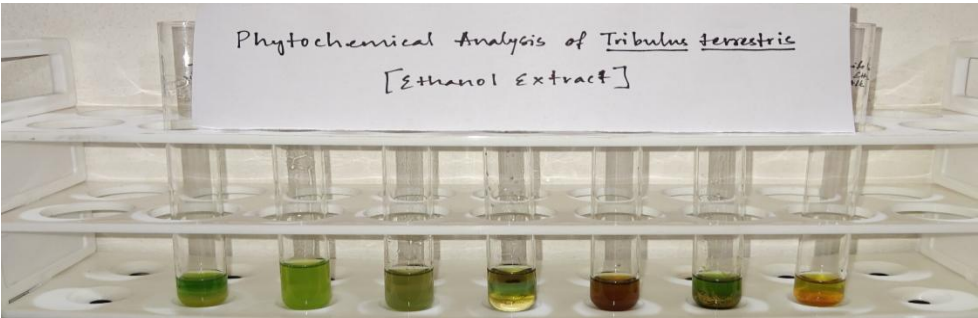


Figure 4: Phytochemical analysis of Ethanol extract of *T. terrestris* (Whole plant)

This indicates that methanol is a more suitable solvent for extracting flavonoids from *T. terrestris*. The presence of saponins and phenolic compounds in all three extracts suggests

that these compounds are widely distributed in *T. terrestris*. Saponins are known for their anti-inflammatory and antioxidant activities, while phenolic compounds possess antimicrobial and anticancer properties. The detection of alkaloids in all three extracts is consistent with previous reports on the phytochemistry of *T. terrestris*. Alkaloids are known for their medicinal properties, including anti-inflammatory, antioxidant, and antimicrobial activities.

CONCLUSION

The present study investigated the phytochemical profile of *Tribulus terrestris* using different solvent extracts. The results revealed the presence of various bioactive compounds, including tannins, saponins, flavonoids, terpenoids, phenolic compounds, reducing sugars, and alkaloids. The study demonstrates the importance of solvent selection in extracting bioactive compounds from plants and highlights the potential of *T. terrestris* as a source of medicinal agents. The findings of this study support the traditional uses of *T. terrestris* in various systems of medicine and provide a scientific basis for its therapeutic applications. The bioactive compounds present in *T. terrestris* may be responsible for its reported anti-inflammatory, antioxidant, antibacterial, and antifungal activities. Further studies are needed to isolate and characterize the specific compounds responsible for the medicinal properties of *T. terrestris*. Additionally, in vivo, and in vitro studies are required to validate the potential therapeutic applications of *T. terrestris*. The results of this study provide a foundation for future research on the phytochemistry and pharmacology of *T. terrestris*.

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