

Chapter 2

Phytochemical analysis of leaves of *Abutilon indicum* (L.) Sweet. (Malvaceae)

Suchita Khodke¹, Nibedita Jena^{2*} and Sanjeet Kumar²

¹Department of Botany, Vinayak Vidnyan Mahavidyalaya, Nandgaon, Khandeshwar, Amravati, Maharashtra, India

²Ambika Prasad Research Foundation, Odisha, India

*Email-Id: nibeditajena838@gmail.com



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ABSTRACT

Present study detected some of the bioactive compounds of *Abutilon indicum* leaves using different extraction solvents (n-hexane, ethanol, and distilled water). The results revealed the presence of various secondary metabolites, including tannins, saponins, phenols, reducing sugars, and alkaloids. The findings provided insights into the potential medicinal properties of *A. indicum* leaves.

Keywords: Antimicrobial resistance, medicinal plants, Malvaceae

INTRODUCTION

Medicinal plants have been a vital part of traditional medicine, providing a rich source of bioactive compounds with potential therapeutic applications (Jaiswal et al., 2024; Hossain et al., 2025). Medicinal plants have been used to treat various ailments, and their effectiveness has been attributed to the presence of secondary metabolites, such as alkaloids, flavonoids, and phenols (Kumar et al., 2012; Kumar et al., 2013; Kumar and Jena, 2014; Dwibedy et al., 2015; Murmu et al., 2016; Kumar et al., 2017; Das et al., 2020; Sahoo et al., 2021; Das et al., 2022; Devi et al., 2022; Singh et al., 2022; Aradhana et al., 2022; Jena et al., 2024; Jena et al., 2025).



Figure 1: Whole plant of *A. indicum*

Abutilon indicum (Figure 1) is a plant species belonging to the Malvaceae family widely used in folk medicine, known for its diverse pharmacological

properties (Nayak and Kumar, 2023; Sunil et al., 2023). It has been traditionally used to treat various health issues (Nayak and Kumar, 2023). There are a lot of works that have been carried out on different plant parts of *A. indicum* but less work is reported on its leaves (Tripathi et al., 2012). Therefore, the present study aims to investigate the secondary metabolites of *A. indicum* leaves using different extraction solvents. By analysing the presence and secondary metabolites, present basic work seeks to provide insights into the potential medicinal significance of the leaves of *A. indicum* and contribute to the development of novel therapeutic agents.

METHODOLOGY

The leaves of *A. indicum* were collected from Khordha district of Odisha, India. The plant species was identified by Dr. Sanjeet Kumar. The Soxhlet extraction method was adopted using dried powder and three solvents for phytochemical analysis (Figure 2). Detection of selected bioactive compounds were conducted using standard methods (Devi et al., 2023; Marndi et al., 2024).

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

Test for saponin: About 1 ml of the leaf extract was taken and 1 ml of distilled water was added and shaken well. The formation of persistent froth was observed confirming the presence of saponin.

Test for flavonoids: About 1 ml of the leaf extract was taken and 2-3 ml of 10% NaOH solution and 3-4 drops of dilute HCl were added to it. The colour initially turned to an intense yellow colour with NaOH solution and later

became colourless. This colour change appearance confirmed the presence of flavonoids.



Figure 2: Dried leaves powder for experimental work

Test for terpenoids: About 1 ml of the leaf extract was added with 6 drops of chloroform and placed in the water bath for a few minutes. Then 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 leaf extract was taken and 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 leaf extract was taken and 2-3 drops of Fehling's solution A followed by Fehling's solution B were added

and kept in the water bath for a few minutes. The presence of red-orange precipitate confirmed the presence of reducing sugar.

Test for steroids: About 1 ml of the leaf extract was taken and 1 ml of chloroform and 1 ml of concentrated sulphuric acid were added to it. The appearance of upper red and lower yellow with green fluorescence provides the presence of steroids.

Test for alkaloids: About 1 ml of the leaf extract was taken and 3-4 drops of Dragendroff's reagent were added. The formation of a reddish-brown precipitate confirmed the presence of alkaloids.

Test for carbonyl compounds: About 1 ml of the leaf extract was taken and 3-4 drops of 2,4-Dinitrophenylhydrazine (DNPH) reagent were added. The formation of yellow crystals confirmed the presence of carbonyl compounds.

RESULTS AND DISCUSSION

The phytochemical analysis of *A. indicum* leaves revealed the presence of various secondary metabolites across different extracts. Saponins and alkaloids were consistently detected in all three extracts (n-hexane, ethanol, and aqueous), while tannins and phenols were found in ethanol and aqueous extracts (Figures 3-5). Reducing sugars were detected in n-hexane and ethanol extracts. Notably, flavonoids, terpenoids, steroids, and carbonyl compounds were absent in all extracts. Presence of the above detected compounds showed the pharmacological potentials of leaves (Juang and Liang, 2020; Heinrich et al., 2021). These findings highlighted the bioactive compounds found in *A. indicum* leaves, providing insights into its potential medicinal properties.



Figure 3: Detection of secondary metabolites of *A. indicum* leaves using n-hexane extract

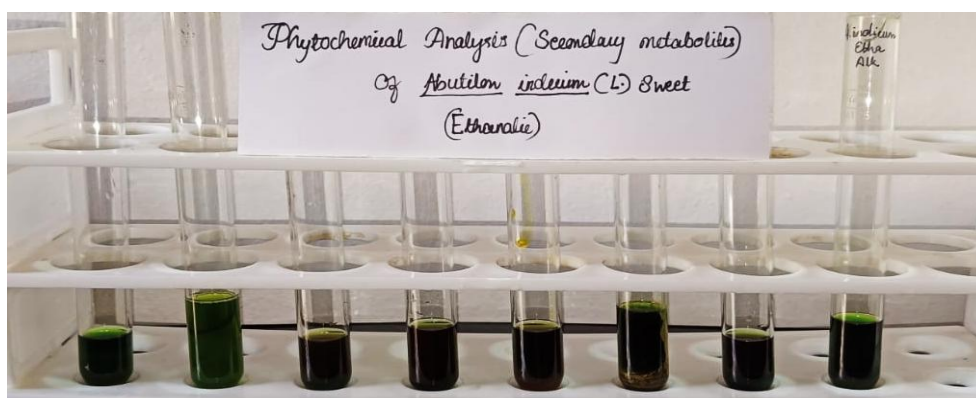


Figure 4: Detection of secondary metabolites of *A. indicum* leaves using ethanolic extract

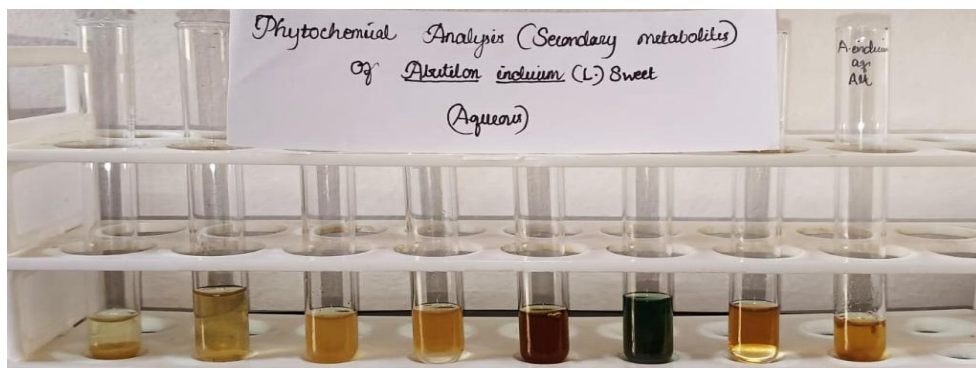


Figure 5: Detection of secondary metabolites of *A. indicum* leaves using aqueous extract

Table 1: Detection of secondary metabolites of *Abutilon indicum* leaves 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	Not detected	Detected	Detected
Reducing sugars	Detected	Detected	Not detected
steroids	Not detected	Not detected	Not detected
Alkaloids	Detected	Detected	Detected
Carbonyl compounds	Not detected	Not detected	Not detected

CONCLUSION

This study confirmed the presence of diverse bioactive compounds in *Abutilon indicum* leaves, supporting its traditional medicinal uses. The secondary metabolites found in the leaves highlighted the importance of solvent selection in phytochemical analysis. These findings provided a foundation for further research into the plant's therapeutic potential and its possible applications in developing novel medicines.

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