

# Chapter 5

## Evaluation of medicinal values and phytochemical analysis of *Lantana camara* flowers: Identification of bioactive compounds

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### ABSTRACT

The present study showcases the phytochemical analysis of *Lantana camara* flowers, focusing on the qualitative and quantitative assessment of bioactive compounds. The qualitative analysis revealed the presence of tannins, saponins, phenolic groups, reducing sugars, and alkaloids in the hydroethanolic extract. Thin-layer chromatography (TLC) analysis, using different mobile phases, further confirmed the presence of various bioactive compounds, with distinct R<sub>f</sub> values for the acetone and hydroethanolic extracts. These findings suggest that *Lantana camara* flowers possess potential medicinal properties, warranting further research and exploration of their therapeutic applications.

Keywords: Bioactive compounds, flowers, medicinal uses

### INTRODUCTION

The search for novel bioactive compounds has led researchers to explore various natural sources, including plants (Cragg and Newman, 2013; Nasim *et al.*, 2022). Flowers have been recognized as a rich source of bioactive compounds, with many

species exhibiting medicinal properties (Kozicka and Hallmann, 2023; Fais and Era, 2024; Seyyedi-Mansour *et al.*, 2025). The diverse range of compounds found in flowers, such as flavonoids, alkaloids, and terpenoids, has sparked interest in their potential therapeutic applications (Sharma *et al.*, 2023; Rao and Poonia, 2024). This study focuses on the phytochemical analysis of *Lantana camara* L., flowers (Figure 1), aiming to identify and characterize the bioactive compounds present and to explore their potential uses in medicine.



Figure 1: Flowers of *L. camara*

## METHODOLOGY

The flowers of *L. camara* were collected from nearby Mahanadi areas of CDA-13, Cuttack, Odisha, India (Figure 2; Nayak and Kumar, 2023). The plant species was identified by the authors (Figure 1). The Soxhlet extraction method was adopted using three extracts for phytochemical analysis. Detection of nine secondary metabolites was conducted using standard methods (Devi *et al.*, 2023; Jena *et al.*, 2024; Marndi *et al.*, 2024; Das *et al.*, 2025; Patra *et al.*, 2025; Roy *et al.*, 2025; Sampatrao *et al.*, 2025).



Figure 2: Collected flowers of *L. camara* for experimental work

**Test for tannin:** 1 ml of flower extract was taken in a test tube, 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 distilled water was added to 1 ml of the flower extract and shaken well. The formation of persistent froth was observed, confirming the presence of saponin.

**Test for flavonoids:** About 1 ml of the flower extract was taken, and 2 ml of NaOH solution and 3-5 drops of dilute HCl were added 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 extract, 5-6 drops of chloroform were added. Then, 4-6 drops of concentrated sulphuric acid were added to it. The reddish-brown interface confirmed the presence of terpenoids.

**Test for phenols:** About 1 ml of the flower extract 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 extract was taken. 2 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 sugars.

**Test for steroids:** To 1 ml of the flower extract, 1 ml of chloroform followed by 1 ml of concentrated sulphuric acid were added. The appearance of upper red and lower yellow with green fluorescence indicated the presence of steroids.

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

**Test for carbonyl compounds:** About 1 ml of flower 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.

### **TLC (Thin-layer chromatography) analysis**

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 to remove surface adherents. 3 g of silica was taken in 20 ml of distilled water, and slurry was prepared by constantly stirring and finally was poured over the slides and the 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 spots were visualized under UV chamber (Kumar and Jena, 2014; Mishra and Bhatnagar, 2024).

RESULTS AND DISCUSSION

The phytochemical analysis of *L. camara* flowers revealed the presence of various bioactive compounds (Table 1; Figure 3). The qualitative analysis showed that the hydro-ethanolic extract contained tannins, saponins, phenolic groups, reducing sugars, and alkaloids. These compounds are known for their potential medicinal properties, including antioxidant, anti-inflammatory, and antimicrobial activities. The TLC analysis using different mobile phases further confirmed the presence of bioactive compounds in the flowers (Table 2; Figure 4). The acetone and hydro-ethanolic extracts showed distinct Rf values, indicating the presence of different compounds. The results suggest that *L. camara* flowers may have potential therapeutic applications, warranting further research and exploration of their medicinal properties. There are several research studies which have reported its pharmacological potentials due to the presence of different bioactive compounds. Mansoori *et al.*, (2020) reported in their study that the phytochemical analysis revealed the presence of alkaloids in *L. camara* crude extracts, which are secondary nitrogenous compounds with known antioxidant potential. Thorat with his co-workers reported that the leaf extracts of *L. camara* have significant antimicrobial activity due to the presence of triterpene secondary metabolites (Thorat *et al.*, 2021).

Table 1: Qualitative phytochemical analysis of *Lantana camara* flowers using hydro-ethanolic flower extract

| Bioactive compounds | Hydro-ethanolic extract |
|---------------------|-------------------------|
| Tannin              | Detected                |
| Saponin             | Detected                |
| Flavonoids          | Not detected            |
| Terpenoids          | Not detected            |

|                    |              |
|--------------------|--------------|
| Phenolic group     | Detected     |
| Reding sugars      | Detected     |
| Steroids           | Not detected |
| Alkaloids          | Detected     |
| Carbonyl compounds | Not detected |

Table 2: TLC analysis of *Lantana camara* flowers using different mobile phases

| Mobile phases                                   | Extracts       | Rf value of spots |                |                |                |
|-------------------------------------------------|----------------|-------------------|----------------|----------------|----------------|
|                                                 |                | S <sub>1</sub>    | S <sub>2</sub> | S <sub>3</sub> | S <sub>4</sub> |
| Chloroform:<br>methanol<br>(1:1)                | Acetone        | 0.82              | 0.86           | 0.91           | 0.94           |
|                                                 | Hydroethanolic | 0.70              | 0.77           | 0.83           | Nil            |
| Ethyl acetate:<br>chloroform (1:9)              | Acetone        | 0.87              | Nil            | Nil            | Nil            |
|                                                 | Hydroethanolic | 0.88              | Nil            | Nil            | Nil            |
| Ethyl acetate:<br>water: acetic acid<br>(8:1:1) | Acetone        | 0.76              | 0.86           | 0.95           | 0.97           |
|                                                 | Hydroethanolic | 0.70              | 0.86           | Nil            | Nil            |

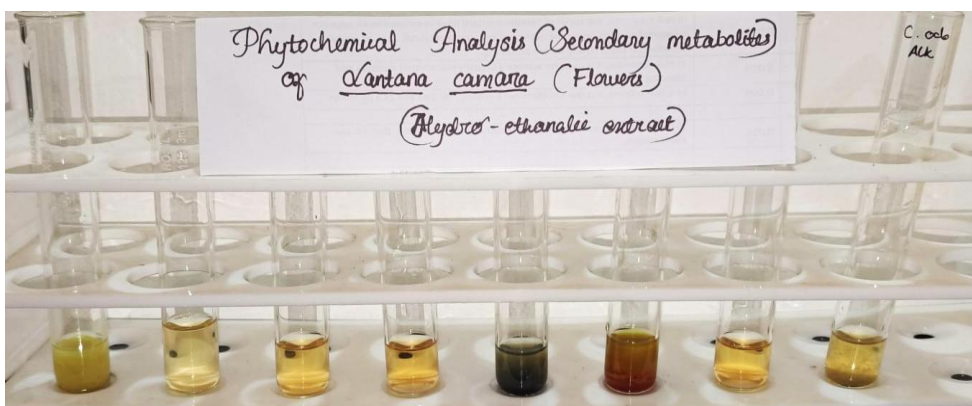


Figure 3: Detection of secondary metabolites of *L. camara* flowers using hydro-ethanolic extract

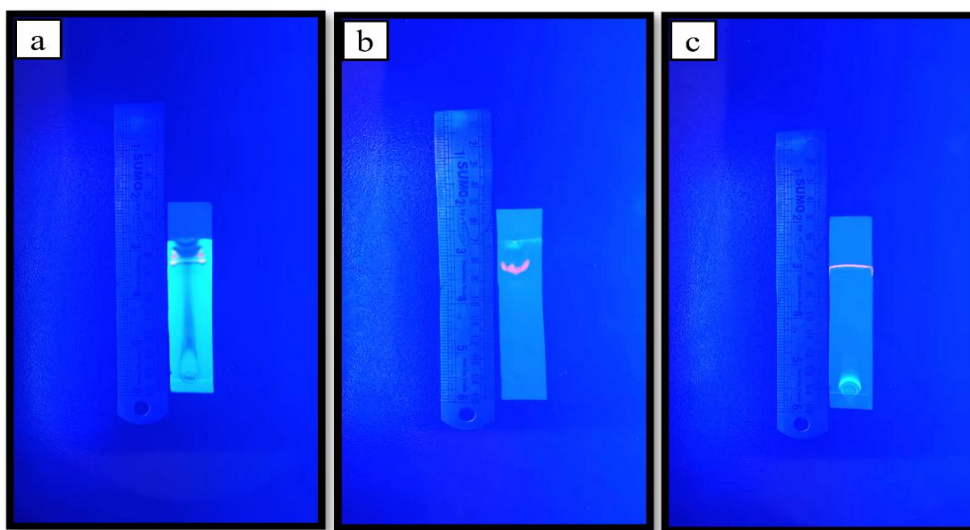


Figure 4: Spots on TLC plates under UV light; a) (Chloroform: methanol); b) (Ethyl acetate: water: acetic acid), and c) (Ethyl acetate: chloroform) using acetone extracts of *L. camara* flowers

## CONCLUSION AND FUTURE ASPECTS

The phytochemical analysis of *Lantana camara* flowers has revealed the presence of various bioactive compounds, including tannins, saponins, phenolic groups, reducing sugars, and alkaloids. These findings suggest that the flowers may have potential therapeutic applications, warranting further research and exploration of their medicinal properties. Future studies should focus on:

1. **Isolation and characterization:** Isolating and characterizing the bioactive compounds present in *L. camara* flowers.
2. **Pharmacological evaluation:** Evaluating the pharmacological activities of the isolated compounds.
3. **Toxicity studies:** Conducting toxicity studies to assess the safety of the compounds.
4. **Clinical trials:** Conducting clinical trials to evaluate the efficacy and safety of the compounds in humans.

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