# Chapter 9

## Phytochemical profiling of fruits of *Holoptelea integrifolia* (Roxb.) Planch.

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**Abstract:** The present study aimed to investigate the bioactive compounds of *Holoptelea integrifolia* fruits using three different solvent extracts (n-hexane, ethanol, and aqueous). Qualitative phytochemical analysis revealed the presence of saponins, phenols, reducing sugars, and alkaloids in selected extracts as per polarity index. Tannins were detected in ethanol and aqueous extracts, while saponins were present in all three extracts. Flavonoids, terpenoids, steroids, and carbonyl compounds were not detected in any of the extracts. The findings of this study suggest that *H. integrifolia* fruits possess potential bioactive compounds that could be explored for their therapeutic applications.

**Keywords**: Bioactive compounds, fruits, trees

### INTRODUCTION

Medicinal plants, particularly trees, have been a vital source of healthcare for centuries, providing a rich repository of therapeutic agents with diverse therapeutic applications (Kanhar *et al.,* 2020; Roy *et al.,* 2025; Jena *et al.,* 2025). In the current situation, where the world is grappling with the challenges of climate change, antimicrobial resistance, and pandemics (Magnano *et al.,* 2023), the importance of medicinal trees cannot be overstated (Sahu *et al.,* 2024). The COVID-19 pandemic has highlighted the vulnerability of modern medicine and the need for alternative approaches to healthcare (Dzieciatkowski *et al.,* 2020; DeSalvo *et al.,* 2021). Medicinal trees, with their rich phytochemical diversity, offer a promising solution (Roy *et al.,* 2025). They have been used in traditional medicine for centuries, and modern science has validated their efficacy in treating various diseases.

*Holoptelea integrifolia* (Roxb.) Planch., a tree species having medicinal uses (Kumar *et al.,* 2022; Nayak and Kumar, 2023). Bark is used to cure diabetes and muscular pain (Nayak and Kumar, 2023). Less reports are available on fruits; therefore, an attempt has been made to evaluate the bioactive compounds available in fruits.



Figure 1: fruits of *H. integrifolia*

In this study, authors aimed to investigate the bioactive compounds of *H. integrifolia* fruits using different solvent extracts, with the goal of exploring their therapeutic potential.

## MATERIALS AND METHODS

The fruits of *H. integrifolia* were collected from the nearby Mahanadi River area of Cuttack district of Odisha, India. The plant species was identified by the authors (Figure 1; Nayak and Kumar, 2023; Rani *et al.,* 2024). The Soxhlet extraction method was adopted using three solvents for phytochemical analysis. Detection of nine secondary metabolites were conducted using standard methods (Devi *et al.,* 2023; Jena *et al.,* 2024; Marndi *et al.,* 2024; Mehra *et al.,* 2025).

**Test for tannin:** About 1 ml of the fruits 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 fruits 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 fruits extract was taken and 2 ml of 2% NaOH solution and 3 to 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.

**Test for terpenoids:** About 1 ml of the fruits 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 phenolic groups:** About 1 ml of the fruits 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 fruits extract was taken and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept in the water bath for some time. The presence of red-orange precipitate confirmed the presence of reducing sugar.

**Test for steroids:** About 1 ml of the fruits extract was taken and 1 ml of chloroform and 1 ml of concentrated sulphuric acid was added into 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 fruits extract was taken and 3 to 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 fruits extract was taken and 3 to 4 drops of 2,4- Dinitrophenylhydrazine (DNPH) reagent were added. The formation of yellow crystal confirmed the presence of carbonyl compounds.

## RESULTS AND DISCUSSION

The qualitative phytochemical analysis of *Holoptelea integrifolia* leaves using different solvent extracts (n-hexane, ethanol, and aqueous) revealed the presence of various bioactive compounds (Figures 2-4). The results (Table 1) showed that saponins were present in all three extracts, indicating their widespread distribution in the leaves. Phenols and reducing sugars were detected in ethanol and aqueous extracts, suggesting their polar nature. Tannins were also present in ethanol and aqueous extracts, indicating their potential role in the plant's defence mechanism. Alkaloids were detected only in the aqueous extract. The absence of flavonoids, terpenoids, steroids, and carbonyl compounds in all three extracts suggests that these compounds may not be present in significant amounts in *H. integrifolia* fruits.

Table 1: Qualitative phytochemical analysis of *Holoptelea integrifolia* fruits using different extracts

| Bioactive compounds | Extracts | | |
|---|---|---|---|
| | n-hexane | Ethanol | Aqueous |
| Tannin | Absent | Present | Present |
| Saponin | Present | Present | Present |
| Flavonoids | Absent | Absent | Absent |
| Terpenoids | Absent | Absent | Absent |
| Phenols | Absent | Present | Present |
| Reducing sugar | Absent | Present | Present |
| Steroid | Absent | Absent | Absent |
| Alkaloid | Absent | Absent | Present |
| Carbonyl compounds | Absent | Absent | Absent |

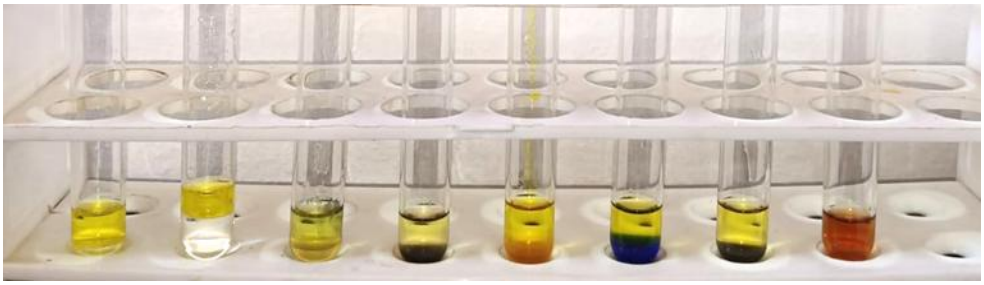


Figure 2: Detection of secondary metabolites of *H. integrifolia* fruits using n-hexane extract

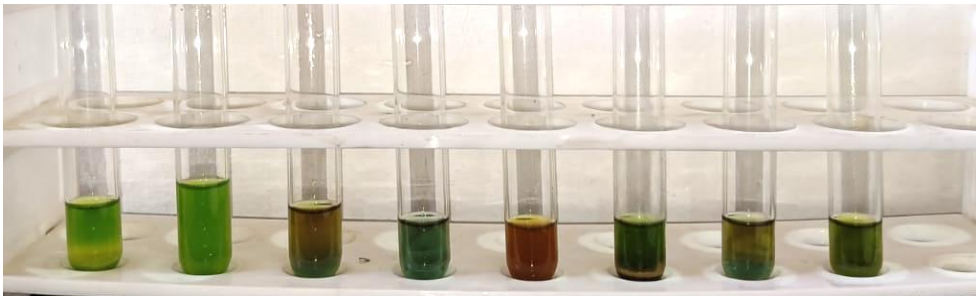


Figure 3: Detection of secondary metabolites of *H. integrifolia* fruits using ethanolic extract

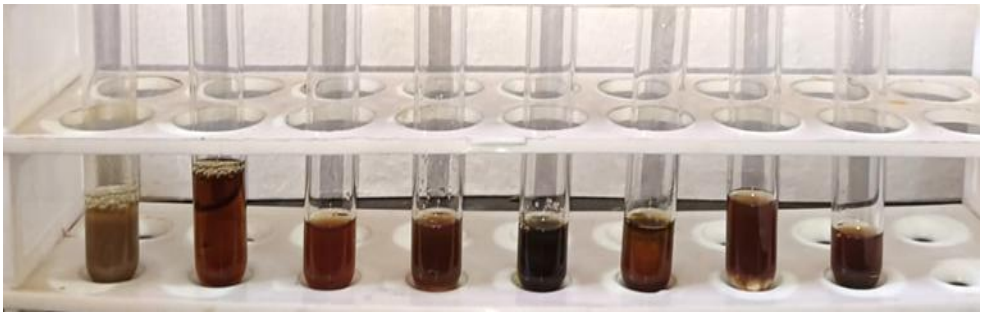


Figure 4: Detection of secondary metabolites of *H. integrifolia* fruits using aqueous extract

The presence of saponins, phenols, and alkaloids in *H. integrifolia* fruits indicates their potential therapeutic applications (Aryal *et al.,* 2022; Timilsena *et al.,* 2023; Sun and Shahrajabian, 2023). Saponins have been reported to possess antifungal activities (Zhang *et al.,* 2006). Phenols are known for their antioxidant and antimicrobial properties (Srivastava *et al.,* 2023), while alkaloids have been reported to possess anti-inflammatory, and analgesic activities (Adamski *et al.,* 2020). Reddy et al., (2008) documented the antimicrobial, antioxidant, and wound-healing potentials of bark of *H. integrifolia.* Ganie and Yadav, (2014) has also documented the ethnobotany, pharmacology and phytochemistry of *H. integrifolia.* Somwong *et al.,* (2022) reported the wound healing and anti-inflammatory activity of bark of *H. integrifolia.* The above reports indicated that less works has been carried out in fruits of *H. integrifolia.*

**CONCLUSION**

The present study investigated the phytochemical constituents of *H. integrifolia* fruits using different solvent extracts. The qualitative phytochemical analysis revealed the presence of

saponins, phenols, reducing sugars, tannins, and alkaloids in various extracts. The study suggests that *H. integrifolia* leaves possess potential bioactive compounds that could be explored for their therapeutic applications. Further studies are needed to isolate, characterize, and evaluate the biological activities of these compounds, which could lead to the development of new herbal medicines.

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