

Chapter 2

Qualitative phytochemical analysis of bark of *Sterculia urens*

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Abstract

The bark of *Sterculia urens* Roxb., were selected for qualitative phytochemical analysis as per their traditional uses. Bark decoction is used to cure diarrhoea and constipation. The Soxhlet method was adopted for extraction using three solvents (aqueous, ethanol, and methanol). Results revealed that bark extracts showed tannin, saponin, phenolic compounds and reducing sugar in aqueous extract of bark which validate its ethnomedicinal uses. Presence of bioactive compounds in other two extracts showed its pharmacological potential.

Keywords: Tree, bark, bioactive compounds

Introduction

Bark is always an important part of herbal formulations and ingredients in traditional therapeutic practices. Bark of trees, stem bark of climbers, and bark including stems of shrubs and herbs are common sources of medicinal agents. Bark is also used to make many life items like rope, baskets, mats, cane chairs, and many more (Kumar, 2015). The indigenous traditional knowledge (ITK) on barks is going to decline due to urbanization, deforestation, and migration from rural and tribal India (Kumar *et al.*, 2012; Kumar *et al.*, 2021; Saha *et al.*, 2022; Das *et al.*, 2022; Dimri *et al.*, 2024). In this aspect, raising awareness about the medicinal uses of the bark of local plants is a very important task, and there is a need to address it in different ways (Snehalatha *et al.*, 2022). Keeping this in view, an attempt has been made to document the bioactive compounds available on the bark of *Sterculia urens* (Figures 1–5) using three extracts. It is a wild tree species belonging to the family Malvaceae. It is commonly known as Karaya. It is native to the Indian Subcontinent, Indo-China,

and Malaysia. The gum of Karaya is used to cure wounds, and plant parts are also useful to treat many health problems. Even though it has a lot of medicinal properties, it is now unexplored among the youth of rural and tribal populations, as well as among non-botanist researchers. Therefore, the present study will be useful to know about its medicinal potential and for identification in the field.

Methodology

Collection of plant sample and preparation of extracts

The bark of *S. urens* was collected from Sundargarh district of Odisha state in April 2024 (Figures 1-2). The plant was identified by the senior author. The Soxhlet method of extraction was adopted using different solvents for phytochemical analysis (Kumar *et al.*, 2013; Devi *et al.*, 2023). Detection of nine secondary metabolites was carried out using standard methods (Landge *et al.*, 2024; Vajha *et al.*, 2024).

Qualitative phytochemical analysis (Devi *et al.*, 2023)

Test for tannin

About 1 ml of the filtrate of bark extract was taken. Added about 3-5 drops of 0.1% lead acetate solution into it. The gelatinous precipitate formation confirmed the presence of tannin (Kumar and Jena, 2014).

Test for saponin

About 1 ml of the filtrate of bark extract was taken and mixed with 1 ml of distilled water and allowed to shake it vigorously. The persistent froth formation after shaking confirmed the presence of saponin (Kumar *et al.*, 2017).

Test for flavonoids

About 1 ml of the filtrate of bark extract was taken and added 2 ml of 2 % NaOH solution followed by H₂SO₄ into it. The colour initially turned to an intense yellow colour with the addition of NaOH solution and later become colourless with sulphuric acid. This change in colour confirmed the presence of flavonoids.

Test for terpenoids

About 2 ml of the filtrate of bark extract was added with 6 drops of chloroform and place it in the water bath for few minutes. Then 6 drops of concentrated H₂SO₄ were added. The appearance of reddish-brown interface confirmed the presence of terpenoids.

Test for phenolic compounds

About 1 ml of the filtrate of bark extract was taken. Few drops of 5% Ferric chloride solution were added into the filtrate extract. The appearance of bluish black colour provides the positive result of the phenolic compounds.



Figure 1: Collection of bark of *S. urens*



Figure 2: Bark of *S. urens*



Figure 3: Leaves of *S. urens*



Figure 4: Flowers of *S. urens*



Figure 5: Fruit of *S. urens*

Test for reducing sugar

About 1 ml of the filtrate of bark extract was taken and 2 drops of Fehling's solution A followed by Fehling's solution B were added and kept it in water bath for few minutes. The presence of red orange precipitate confirmed the positive result of the test for reducing sugar.

Test for steroids

About 1 ml of the filtrate of bark extract was taken. 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 provide the positive result for the presence of steroids.

Test for alkaloids

About 1 ml of the filtrate of bark extract was taken and added 3 to 4 drops of Dragendroff's reagent. The formation of reddish-brown precipitate confirmed the presence of alkaloids.

Test for carbonyl compounds

About 1 ml of the filtrate of bark extract was taken and added 3 to 4 drops of 2,4-Di-nitrophenylhydrazine reagent. The formation of yellow crystal confirmed the presence of carbonyl compounds.

Results and discussion

During field works in Rourkela Forest Division, Odisha, it was noticed that bark is used to cure food poisoning by the local tribal communities. It was also noted that bark is commonly consumed by the Asian Elephants of the division (Present study).

Table 1: Phytochemical screening using different extracts of *S. urens* bark

Bioactive compounds	Aqueous	Methanol	Ethanol
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: Positive; -ve: negative)

Therefore, phytochemical screening of bark of Karaya is carried out and results revealed that tannin, saponin, phenolic compounds and reducing sugar are detected in aqueous extract of bark (Figure 6). In methanol extract, tannin, saponin and phenolic compounds are present (Figure 7) whereas tannin, saponin, phenolic compounds and reducing sugar are observed in ethanol extract of bark of Karaya (Table 1; Figure 8). Most of reserchers have published their works on the gum of *S. urens*. Silva *et al.*, (2021) documented the potentials of *Sterculia* gum in new drug delivery systems. Rahman *et al.*, (2023) documnted the bioactive compounds and their antibacterial activitiy against *V. cholerae*. Antibacterial and cytotoxic properties from esterified *Sterculia* gum was also reported (Lipovy *et al.*, 2018; Silva *et al.*, 2020).

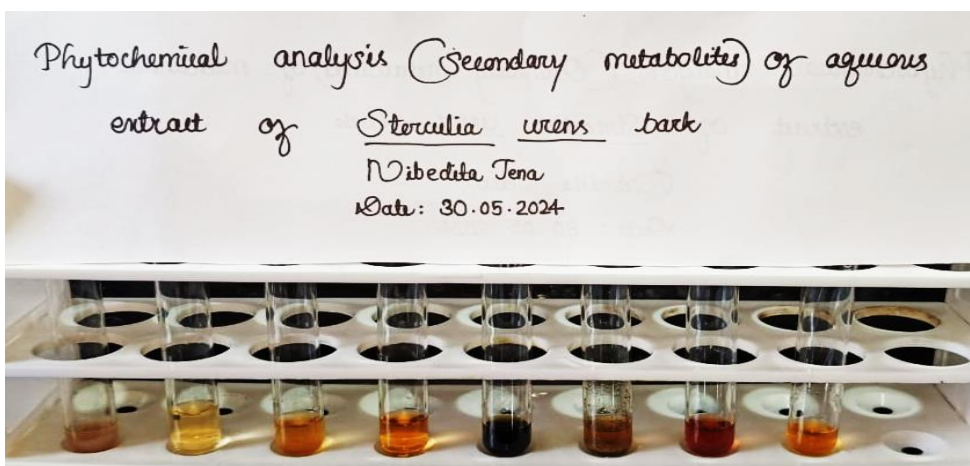


Figure 6: Detection of secondary metabolites using aqueous extract of *S. urens* bark

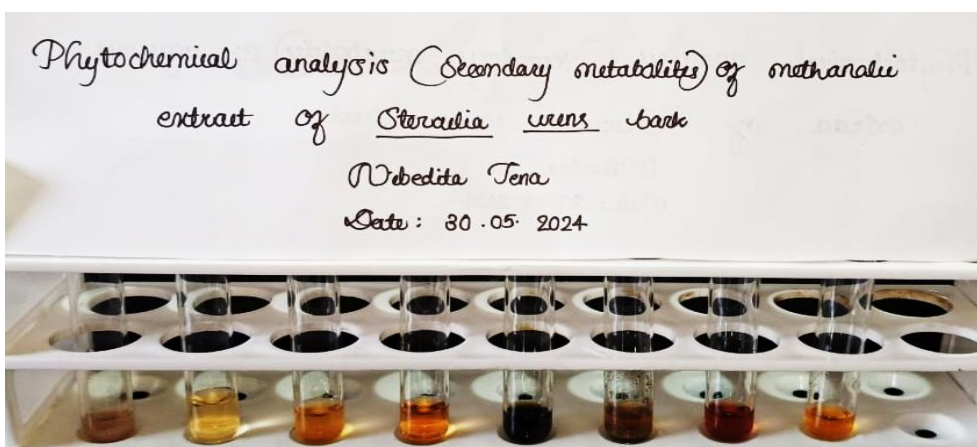


Figure 7: Detection of secondary metabolites using methanolic extract of *S. urens* bark



Figure 8: Detection of secondary metabolites using ethanolic extract of *S. urens* bark

Conclusion

Known for its traditional medicinal applications, Karaya is an important wild medicinal tree from India. Bark is a typical remedy for constipation in rural and indigenous communities. The present study's identified bioactive compounds have demonstrated pharmacological potential; however, additional investigation is required, along with more intricate pharmacological actions and an evaluation of the material's ecological benefits.

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