

Research Article

Phytochemical analysis of bark of *Pterocarpus marsupium* Roxb. (Fabaceae)

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Abstract: *Pterocarpus marsupium* Roxb. is a medicinally valuable plant species traditionally used to treat various ailments. This study aimed to investigate the phytochemical constituents and medicinal uses of *P. marsupium* bark. Qualitative phytochemical screening revealed the presence of tannins, saponins, flavonoids, phenolic compounds, reducing sugars, steroids, and alkaloids in various extracts of the bark. The plant's medicinal uses, including anti-inflammatory, anti-cataract, antidiabetic, antihyperlipidemic, and nephroprotective activities, are also reviewed. The findings of this study provide scientific validation for the traditional uses of *P. marsupium* and highlight its potential as a rich source of bioactive compounds for pharmaceutical applications.

Keywords: Phytochemical analysis, medicinal uses, bioactive compounds, traditional medicine, pharmacological activities

Introduction

Diabetes mellitus is a chronic metabolic disorder characterized by high blood sugar levels, which can lead to serious complications such as cardiovascular disease, kidney damage, and blindness (Antar et

al., 2023). According to the World Health Organization (WHO), the global prevalence of diabetes has risen from 108 million in 1980 to 422 million in 2014, with the majority of cases being type 2 diabetes (Liu et al., 2020). The increasing prevalence of diabetes poses a significant burden on healthcare systems worldwide (Arokiasamy et al., 2021). Despite the availability of conventional treatments such as insulin therapy and oral hypoglycemic agents, many people with diabetes continue to experience poor glycaemic control, leading to increased morbidity and mortality (Guerci et al., 2019). Furthermore, the high cost of conventional treatments and the risk of adverse effects make them inaccessible to many people, particularly in developing countries (Jonathan et al., 2004). Traditional medicine has long been used to treat various ailments, including diabetes. Plants have been a rich source of bioactive compounds with potential antidiabetic properties. *Pterocarpus marsupium* is one such plant that has been traditionally used in Ayurvedic medicine to treat diabetes (Pant et al., 2017). The plant's bark has been reported to possess antidiabetic and antioxidant activities. This study aims to investigate the phytochemical constituents and medicinal uses of *P. marsupium* bark, with a focus on its potential antidiabetic properties. The study will provide valuable insights into the plant's bioactive compounds and their potential applications in the development of new antidiabetic therapies.



Figure 1: Different plant parts of *P. marsupium*

Methodology

The barks of *P. marsupium* were collected from the Rourkela Forest Division of Sundargarh district of Odisha, India. The plant species was identified by the authors (Figure 1 & 2). The Soxhlet extraction method was adopted using different solvents for phytochemical analysis (Devi et al., 2024; Marndi et al., 2024; Singh et al., 2024).



Figure 2: Bark of *P. marsupium*

Qualitative phytochemical analysis

Detection of nine secondary metabolites were conducted using standard methods (Thakur et al., 2025).

Test for Tannin: About 1 ml of the fruit extract was taken. Added 3-5 drops of 10% lead acetate solution to it. The formation of gelatinous precipitate confirmed the positive results for the presence of tannin (Kumar et al., 2024).

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

Test for flavonoids: About 1 ml of the extract was taken. Added 2 ml of 2% NaOH solution and then dilute HCL to it. The colour initially turned to an intense yellow with NaOH solution and later became colourless. This colour changing transformation confirmed for the presence of flavonoids (Ankari et al., 2024).

Test for terpenoids: About 1 ml of the filtrate 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 appearance of reddish-brown interface confirmed the presence of terpenoids.

Test for phenolic compounds: About 1 ml of the fruit extract was taken and added few drops of 5% ferric chloride solution to it. The dark bluish black appearance confirmed the presence of phenolic compounds.

Test for reducing sugars: About 1 ml of the fruit extract was taken and 2-3 drops of Fehling's solution A and B were respectively added. Then kept in the water bath for some time. The presence of red-orange precipitate confirmed the presence of reducing sugar (Table 2).

Test for steroids: About 1 ml of the fruit extract was taken. 1 ml of chloroform and 1 ml of concentrated sulphuric acid was added into it. The appearance of 2 phases with the upper red and lower yellow with green fluorescence confirmed the presence of steroids (Acharya et al. 2024).

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

Results and discussion

The phytochemical screening of *P. marsupium* bark revealed the presence of various bioactive compounds (Table 2). The aqueous, methanol, and ethanol extracts of the bark were found to contain tannins, saponins, phenolic compounds, reducing sugars, and alkaloids. Flavonoids were detected only in the aqueous extract, while terpenoids were present only in the ethanol extract. Steroids were found in both aqueous and methanol extracts. The medicinal uses of *P. marsupium* were also reviewed. The bark has been traditionally used to treat various ailments, including diabetes, inflammation, and urinary disorders. The plant has been reported to possess anti-inflammatory, anti-cataract, antidiabetic, antihyperlipidemic, and nephroprotective activities (Table 1).

Table 1: Medicinal uses of *P. marsupium*

Plant parts	Uses	Source(s)
Bark	Anti-inflammatory	Majeed et al., (2023)
Bark	Anti-cataract activity	Vats et al., (2004)
Heartwood	Diabetes	Dar et al., (2022)
	Antihyperlipidemic	Jahromi and Ray, (1993)
	Polyuria disease	Deguchi et al., (2019)
	Acute toxicity	Koyagura et al., (2022)
	Nephroprotective	Gupta et al., (2016)
Leaves	Antimicrobial	Kalaivani et al., (2011)
Wood	Hypoglycaemic activity	Ahmad et al., (1991)

Table 2: Qualitative phytochemical screening of *P. marsupium* bark using different extracts

Bioactive compounds	Extracts		
	Aqueous	Methanol	Ethanol
Tannin	Presence	Presence	Presence
Saponin	Presence	Presence	Presence
Flavonoids	Presence	Absence	Absence
Terpenoids	Absence	Absence	Presence
Phenols	Presence	Presence	Presence
Reducing sugars	Presence	Presence	Presence
Steroids	Presence	Absence	Absence
Alkaloids	Presence	Presence	Presence
Carbonyl compounds	Absence	Absence	Absence

Figure 3: Detection of secondary metabolites using aqueous extract of *P. marsupium* bark



Figure 4: Detection of secondary metabolites using methanol extract of *P. marsupium* bark

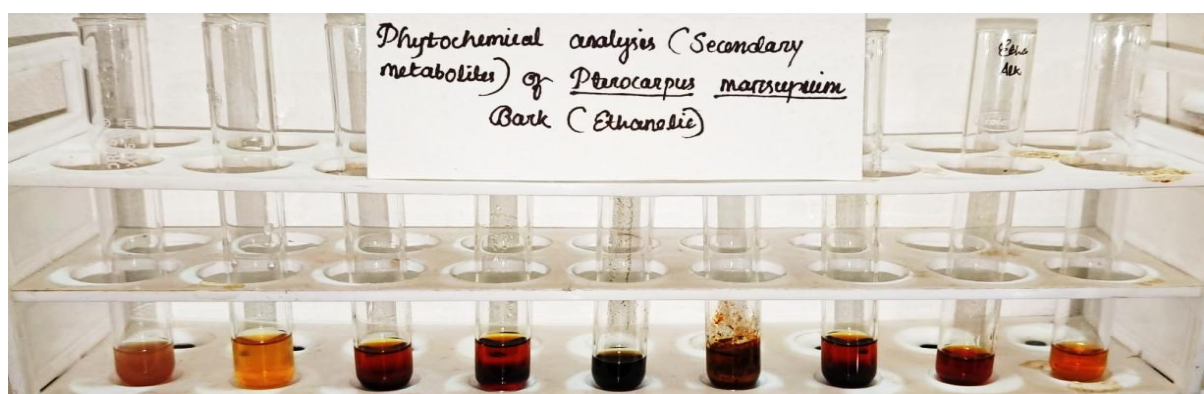


Figure 5: Detection of secondary metabolites using ethanol extract of *P. marsupium* bark

The phytochemical analysis and medicinal uses of *P. marsupium* bark suggest its potential as a valuable source of bioactive compounds for pharmaceutical applications. The presence of various phytoconstituents, including tannins, saponins, flavonoids, and phenolic compounds, may contribute to the plant's reported medicinal properties. Further studies are needed to isolate and characterize the bioactive compounds present in the bark and to evaluate their pharmacological activities in detail.

Conclusion

The present study has provided valuable insights into the phytochemical constituents and medicinal uses of *P. marsupium* bark. The phytochemical screening revealed the presence of various bioactive compounds, including tannins, saponins, flavonoids, and phenolic compounds (Figure 3-5). The plant's bark has been traditionally used to treat various ailments, including diabetes, and the study's findings provide scientific validation for its antidiabetic properties. The study's findings suggest that *P. marsupium* bark has the potential to be developed into a natural remedy for diabetes. Further studies are needed to isolate and characterize the bioactive compounds present in the bark and to evaluate their pharmacological activities in detail. However, the study's results are promising and highlight the importance of traditional medicine in the search for new treatments for diabetes and other diseases.

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