



Phytochemical profile and antioxidant potential of leaves of *Ougeinia oojeinensis* (Roxb.) Hochr. (Fabaceae)

Pramod Kumar Soni¹, Rajkumari Supriya Devi², Sanjeet Kumar², Shinde Changdeo³

¹ Department of Dravyaguna, Shri NPA GAC, Raipur, Chhattisgarh, India

² Ambika Prasad Research Foundation, Odisha, India

³ Department of Botany, Sahakar Maharshi Bhausaheb Santuji Thorat Arts, Science and Commerce College Sangamner, Ahilyanagar, Maharashtra, India

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Abstract

Ougeinia oojeinensis is a medicinally important tree species widely distributed in India and traditionally valued for its therapeutic properties. The present study evaluated the qualitative and quantitative phytochemical composition and antioxidant activity of leaf extracts prepared using aqueous, ethanol, and n-hexane solvents. Qualitative screening of primary metabolites revealed the presence of proteins and carbohydrates in the aqueous and ethanol extracts, while starch, sucrose, lipids and amino acids were not detected in any extract. Phytochemical screening showed the presence of tannins, flavonoids and reducing sugars in the aqueous and ethanol extracts, whereas saponins were detected only in the aqueous extract. Terpenoids, phenolics, steroids and alkaloids were not detected in the tested extracts. Quantitative analysis recorded tannin (67.94 mg/100 mL), saponin (4.58%), total phenol (6.58 mg/100 mL), and total flavonoid (0.17 mg/mL). Antioxidant evaluation demonstrated concentration-dependent activity in both ethanol and aqueous extracts. At 0.0625 mg/mL, ethanol and aqueous extracts showed 49.10% and 49.40% inhibition, respectively, which increased to 55.28% and 55.35% at 1.0 mg/mL. These findings indicate that *O. oojeinensis* leaves contain several bioactive phytoconstituents, particularly tannins, flavonoids, saponins and phenolic compounds, and exhibit measurable antioxidant activity. The study provides preliminary scientific evidence supporting further investigation of *O. oojeinensis* leaves for their potential biological and pharmacological applications.

Keywords: Antioxidants, bioactive compounds, flavonoids, phytochemicals, tannins

Introduction

Medicinal tree species have long been important in traditional healthcare and remain valuable sources of bioactive compounds for addressing contemporary health problems (Devi *et al.*, 2018^[9]; Satapathy *et al.*, 2021^[24]; Narayanankutty *et al.*, 2024; Das *et al.*, 2026; Devi *et al.*, 2026)^[1, 6, 18]. The increasing burden of several global health problems such as diabetes, cardiovascular disorders, cancer, liver diseases and inflammation, together with emerging infections and antimicrobial resistance has created a need for new and effective therapeutic agents (Placha and Jampilek, 2021; Das *et al.*, 2025)^[5, 19]. Medicinal trees contain diverse secondary metabolites which may exhibit

pharmacological properties (Das *et al.*, 2020; Rani *et al.*, 2025; Razzaq *et al.*, 2025)^[4, 20, 21]. However, many medicinal tree species remain scientifically underexplored, highlighting the need for systematic phytochemical, pharmacological and toxicological studies (Dwibedy *et al.*, 2015; Sahu *et al.*, 2024; Asraoui *et al.*, 2025)^[2, 10, 22]. The study of medicinal trees is also important for documenting and scientifically validating traditional knowledge, particularly that of Indigenous and local communities (Lama *et al.*, 2022^[16]; Jijie *et al.*, 2025). Such research can support the discovery of new therapeutic leads, preservation of traditional knowledge, biodiversity conservation and sustainable utilization of tree resources.

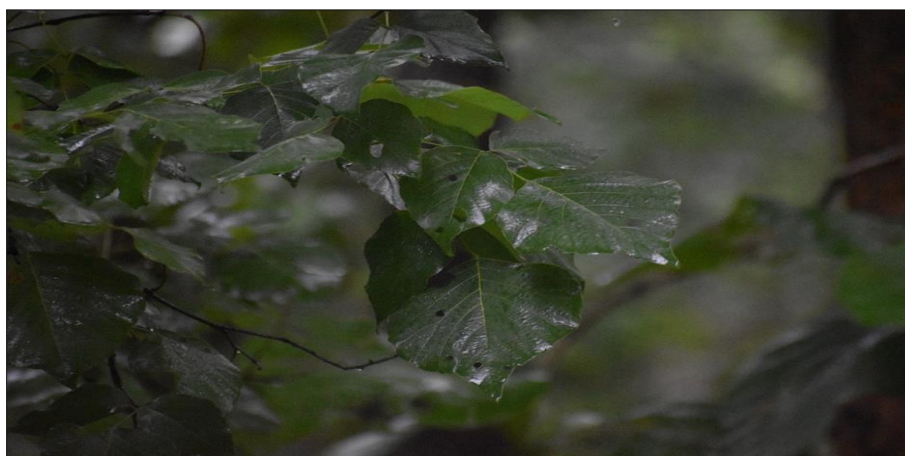


Fig 1: Leaves of *Ougeinia oojeinensis*

In the context of emerging diseases and growing healthcare challenges, integrating ethnobotany, phytochemistry, pharmacology and modern drug-discovery approaches on tree species can help identify promising medicinal tree resources and develop evidence-based applications while ensuring ethical recognition and benefit-sharing with traditional knowledge holders (Kumar *et al.*, 2012; Thakur *et al.*, 2025; Chele *et al.*, 2025) [3, 13, 20]. Among the medicinal tree species, *Ougeinia oojeinensis* is belonging to the family Fabaceae having ethnomedicinal uses (Kumar *et al.*, 2011) [14]. Plant parts of *Ougeinia oojeinensis* has pharmacological values (Sahu *et al.*, 2008; Velmurugan *et*

al., 2011) [23, 27]. Therefore, the present study was undertaken to characterize the primary and secondary metabolites of *O. oojeinensis* leaves (Figure 1) along with evaluation of antioxidant activity.

Materials and methods

The present investigation focused on the leaves of *O. oojeinensis*. Leaves are collected from Cuttack, Odisha, India and identified by the authors (Figure 2). Soxhlet extraction was carried out using three solvents (aqueous, ethanol and *n*-hexane) and extracts were used for experimental works (Jena *et al.*, 2025) [11].



Fig 2: Collection of plant parts for experimental works

Qualitative analysis of primary metabolites:

The aqueous, ethanol, and *n*-hexane leaf extracts were qualitatively screened for selected primary metabolites, including proteins, carbohydrates, starch, sucrose, lipids and amino acids (Das *et al.*, 2026) [6]. The results were recorded as positive (+) or negative (–).

Qualitative analysis of bioactive compounds: The extracts were screened for selected secondary or bioactive constituents, including tannins, saponins, flavonoids, terpenoids, phenolic groups, reducing sugars, steroids and alkaloids (Marndi *et al.*, 2024) [17].

Quantitative phytochemical analysis: Selected secondary metabolites were quantitatively estimated in the leaves. The reported constituents included tannin, saponin, total phenol, and total flavonoid. The quantities were expressed in the units provided in the dataset (Soni *et al.*, 2026) [25].

Antioxidant assay: Antioxidant activity was evaluated for aqueous and ethanol leaf extracts at concentrations ranging from 0.0625 to 1.0 mg/mL. The results were expressed as percentage inhibition. The supplied dataset does not identify the specific antioxidant assay method or reagent used; consequently, the assay is referred to here as the antioxidant assay without assigning a specific method (Kumari *et al.*, 2026; Acharya *et al.*, 2026) [1, 15].

Results and discussion

The qualitative screening demonstrated that proteins and carbohydrates were detected in both aqueous and ethanol extracts of *O. oojeinensis* leaves. In contrast, neither protein nor carbohydrate was detected in the *n*-hexane extract. Starch, sucrose, lipid, and amino acid were not detected in any of the three extracts. The presence of proteins and carbohydrates in the aqueous and ethanol extracts suggests that these relatively polar constituents were extractable in polar solvents (Table 1). The secondary metabolite screening revealed clear differences among the extracts. Tannins were detected in both aqueous and ethanol extracts, whereas they were absent in the *n*-hexane extract. Saponins were detected only in the aqueous extract and were absent from both ethanol and *n*-hexane extracts. Flavonoids were detected in aqueous and ethanol extracts but not in the *n*-hexane extract (Table 2). Quantitative analysis demonstrated the presence of several selected secondary metabolites in the leaves of *O. oojeinensis*. Tannin was recorded at 67.94 mg/100 mL, while saponin was quantified at 4.58%. The total phenolic content was reported as 6.58 mg/100 mL, whereas the total flavonoid content was 0.17 mg/mL. Among the quantified constituents, tannin showed a notable value of 67.94 mg/100 mL (Table 3). The antioxidant assay showed that both aqueous and ethanol extracts exhibited increasing inhibition with increasing extract concentration (Table 4). For the ethanol extract, inhibition increased from

49.10% at 0.0625 mg/mL to 50.74% at 0.125 mg/mL, 52.23% at 0.25 mg/mL, 53.34% at 0.5 mg/mL, and 55.28% at 1.0 mg/mL. The aqueous extract showed 49.40% inhibition at 0.0625 mg/mL, increasing to 50.37% at 0.125 mg/mL, 51.71% at 0.25 mg/mL, 53.49% at 0.5 mg/mL, and 55.35% at 1.0 mg/mL. At the lowest tested concentration, the aqueous extract showed slightly greater inhibition than the ethanol extract. At 0.5 mg/mL, the aqueous extract also showed higher inhibition than the ethanol extract. At 1.0 mg/mL, the aqueous extract produced 55.35% inhibition compared with 55.28% for the ethanol extract. Overall, the two extracts displayed very similar antioxidant responses across the tested concentrations.

Table 1: Qualitative phytochemical analysis of primary metabolites of leaves of *Ougeinia oojeinensis*

Primary metabolites	Aqueous extract	Ethanol extract	n-Hexane extract
Protein	+	+	-
Carbohydrates	+	+	-
Starch	-	-	-
Sucrose	-	-	-
Lipid	-	-	-
Amino acid	-	-	-

(-: Not present; +: Present)

Table 2: Qualitative phytochemical analysis of secondary metabolites of leaves of *Ougeinia oojeinensis*

Bioactive compounds	Aqueous extract	Ethanol extract	n-Hexane extract
Tannin	+	+	-
Saponin	+	-	-
Flavonoid	+	+	-
Terpenoid	-	-	-
Phenolic Group	-	-	-
Reducing sugar	+	+	-
Steroids	-	-	-
Alkaloids	-	-	-

(-: Not present; +: Present)

Table 3: Quantitative phytochemical analysis of leaves of *Ougeinia oojeinensis*

Secondary metabolites	Quantity
Tannin	67.94 mg/100mL
Saponin	4.58 %
Total Phenol	6.58 mg/100mL
Total Flavonoid	0.17 mg/mL

Table 4: Antioxidant assay of leaves of *Ougeinia oojeinensis*

Extract	Concentration (mg/mL)	Inhibition Percentage (%)
Ethanol	0.0625	49.10
	0.125	50.74
	0.25	52.23
	0.5	53.34
	1.0	55.28
Aqueous	0.0625	49.40
	0.125	50.37
	0.25	51.71
	0.5	53.49
	1.0	55.35

The phytochemical screening of *O. oojeinensis* leaves demonstrated the presence of several classes of potentially important plant constituents. The detection of proteins and carbohydrates in aqueous and ethanol extracts, together with

their absence in the *n*-hexane extract, indicates that the observed primary metabolite profile was associated predominantly with the polar extracts.

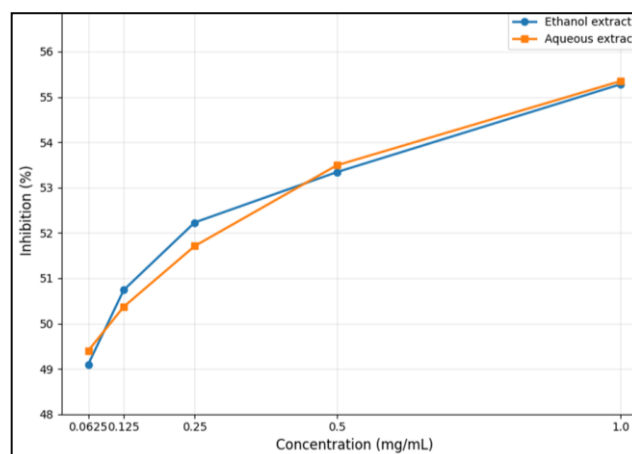


Fig 3: Concentration-dependent antioxidant activity of aqueous and ethanol leaf extracts of *O. oojeinensis*

The absence of starch, sucrose, lipids, and amino acids in the qualitative screening indicates that these constituents were not detected under the conditions employed. The secondary metabolite profile was more informative. Tannins and flavonoids were consistently detected in both aqueous and ethanol extracts, while saponins were detected exclusively in the aqueous extract. This difference may reflect variation in the extractability of compounds according to solvent characteristics. The complete absence of positive reactions in the *n*-hexane extract for the tested bioactive compounds suggests that the constituents detected in this screening were more readily recovered in the polar extraction systems used in the study. The quantitative results further support the phytochemical characterization of the leaves. Tannin was recorded at 67.94 mg/100 mL, while total phenol and total flavonoid were reported at 6.58 mg/100 mL and 0.17 mg/mL, respectively. Saponin was quantified at 4.58%. The presence of these constituents is noteworthy because tannins, flavonoids, saponins, and phenolic compounds are widely investigated for their biological properties. The antioxidant assay demonstrated a concentration-dependent increase in inhibition for both aqueous and ethanol extracts. Ethanol extract activity increased from 49.10% to 55.28% over the concentration range tested, whereas aqueous extract activity increased from 49.40% to 55.35%. This pattern indicates that increasing extract concentration was associated with increased antioxidant inhibition under the conditions of the assay. Interestingly, the aqueous and ethanol extracts displayed highly comparable activity. The difference between the two extracts at the highest concentration was only 0.07 percentage points, with the aqueous extract showing 55.35% inhibition and the ethanol extract showing 55.28%. This similarity suggests that both extraction systems recovered constituents contributing to the measured antioxidant response (Figure 3).

Conclusion

The present study indicates that the leaves of *Ougeinia oojeinensis* possess a diverse phytochemical profile and appreciable antioxidant potential, particularly in aqueous and ethanol extracts. The presence of tannins, flavonoids,

saponins, phenolic compounds, proteins, and carbohydrates suggests that the leaves may serve as a promising source of biologically active constituents. Both aqueous and ethanol extracts showed concentration-dependent antioxidant activity, with approximately 55% inhibition at 1.0 mg/mL. These preliminary findings support the traditional and potential therapeutic significance of *O. oojeinensis*. Further studies involving isolation and characterization of active compounds, detailed pharmacological and toxicological evaluation and *in vivo* investigations are recommended to establish its therapeutic potential and mechanisms of action.

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