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Research Article

## Assessment of antioxidant properties of *Terminalia pendula* var. *pendula* flowers via DPPH radical scavenging assay

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**Abstract:** Plant-derived natural antioxidants are increasingly being studied for their potential role in preventing disorders related to oxidative stress. The present study evaluates the antioxidant potential of flower extracts of *Terminalia pendula* var. *pendula* using the DPPH (2, 2-diphenyl-1-picrylhydrazyl) free radical scavenging assay. Ethanol and methanol extracts were prepared and tested at various concentrations to determine their radical scavenging capacity, with quercetin used as the reference standard. Both extracts demonstrated significant antioxidant activity, with inhibition values increasing with increasing concentration. The methanol extract showed greater performance than the ethanol extract, suggesting better extraction of active phytoconstituents in methanol. However, the activity of both extracts remained lower than that of the standard quercetin. The observed antioxidant potential may be linked to the presence of phenolic and flavonoid compounds identified in the species. These findings highlight the potential of *Terminalia pendula* var. *pendula* as a natural source of antioxidant compounds and support further research aimed at identifying and isolating its active phytochemicals.

**Keywords:** Bioactive compounds, oxidation inhibitor, *Terminalia*, therapeutic traditional medicine

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### Introduction

Deciduous trees are an important component of the forest ecosystems of the Indian subcontinent. These trees shed their leaves seasonally to adapt to varying climatic conditions, such as extended dry periods and temperature fluctuations (Ramachandran et al., 2026). Environmental stresses and various anthropogenic activities have influenced these trees, leading to the evolution of rich sources

of phytochemicals (Ogwu et al., 2025). Many species contain bioactive compounds such as phenolics, flavonoids, tannins, alkaloids and terpenoids, which are responsible for a wide range of biological activities (Mohd Amer et al., 2021; Suresh Rao et al., 2024). These activities include antioxidant, anti-inflammatory, antimicrobial and hepatoprotective effects (Gurajala et al., 2012).



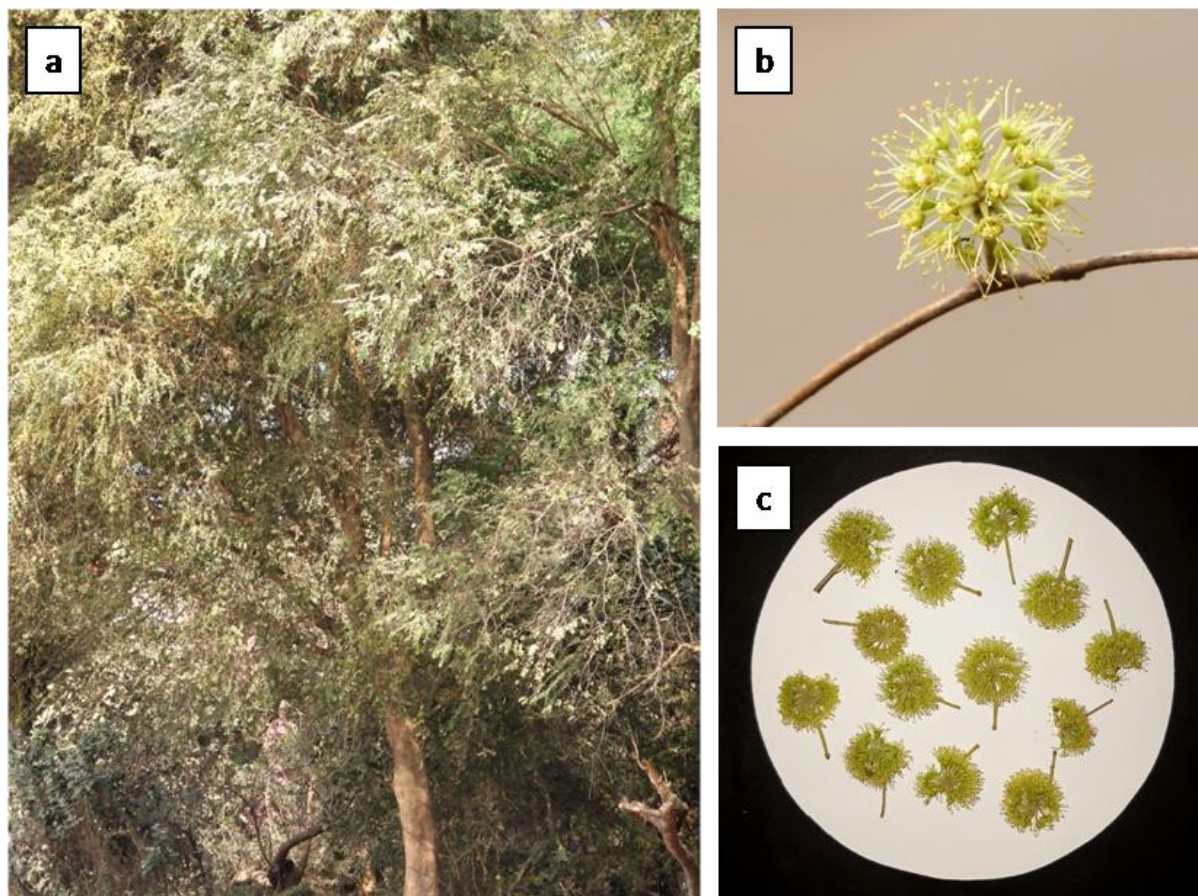
**Figure 1:** Inflorescence of *Terminalia pendula* var. *pendula*

One such species is *Terminalia pendula* var. *pendula* (family Combretaceae), which was previously known as *Anogeissus pendula* and *Anogeissus acuminata*. Commonly referred to as the Button tree (Figure 1) and Dhaura or Dhok in Hindi. This tree can grow to a height of 9-15 metres in height. It is widely distributed in the semi-deciduous and tropical regions of India as well as in countries such as Cambodia, Bangladesh, Laos, Myanmar, Thailand, Vietnam and parts of the Arabian Peninsula and Africa (Yadav et al., 2019). The Button tree thrives in dry and hot regions, with annual rainfall ranging between 400-800 mm and can withstand extreme temperatures between -3°C to 47°C (Nainwal and Verma, 2018). It is characterized by greyish-silver bark that develops fissures as it ages and it typically grows in clusters (Suresh Rao et al., 2024). This species is valued for its timber, fodder and fuel wood. Its wood is exceptionally hard, tough, strong and durable, which has led to its classification as the third toughest timber in the world (Dadhich et al., 2022), comparable to teak in terms of transverse strength. The leaves of the plant produce a dark green dye and also serve as fodder, especially during the summer months when the tree becomes lush green and provides fresh forage for livestock (Meena et al., 2018). In ethnomedicinal practices, various parts of the plant have been used to treat different ailments (Yadav et al., 2019; Gurajala et al., 2012; Suresh Rao et al., 2024). For

instance, a paste made from the leaves is commonly applied externally to address swellings, while decoctions of the leaves and twigs are used for treating burns (Nainwal and Verma, 2018). The bark has been traditionally employed in the treatment of anaemia and dysentery (Singh et al., 2017; Nainwal and Verma, 2018), whereas the fruits are used for conditions such as urticaria, hiccups and constipation. In Ayurvedic medicine, this plant is characterized as acrid, bitter, astringent, cooling and helpful for healing wounds. The roots are utilized to treat asthma, fatigue, dysentery, inflammation and blood disorders and decoctions of the roots are known to relieve toothache. The gum obtained from the tree, known as Ghatti or Indian gum, is traditionally used as a tonic, particularly following childbirth (Jagetia and Zairempuii, 2019). Given its significance in ethnomedicine, the antioxidant investigation of the flowers of *Terminalia pendula* var. *pendula* may enhance our understanding of its phytochemical profile and biological activities, thereby supporting its potential application in natural product research and drug discovery.

### Methodology

Flowers of *Terminalia pendula* var. *pendula* (Figure 1) were collected from the Mahanadi River region of Cuttack district, Odisha, India. The identification of the samples was carried out using standard flora references (Saxena and Brahmam, 1995).



**Plate 1:** (a) Habitat, (b) flower and (c) flower sample of *Terminalia pendula* var. *pendula*

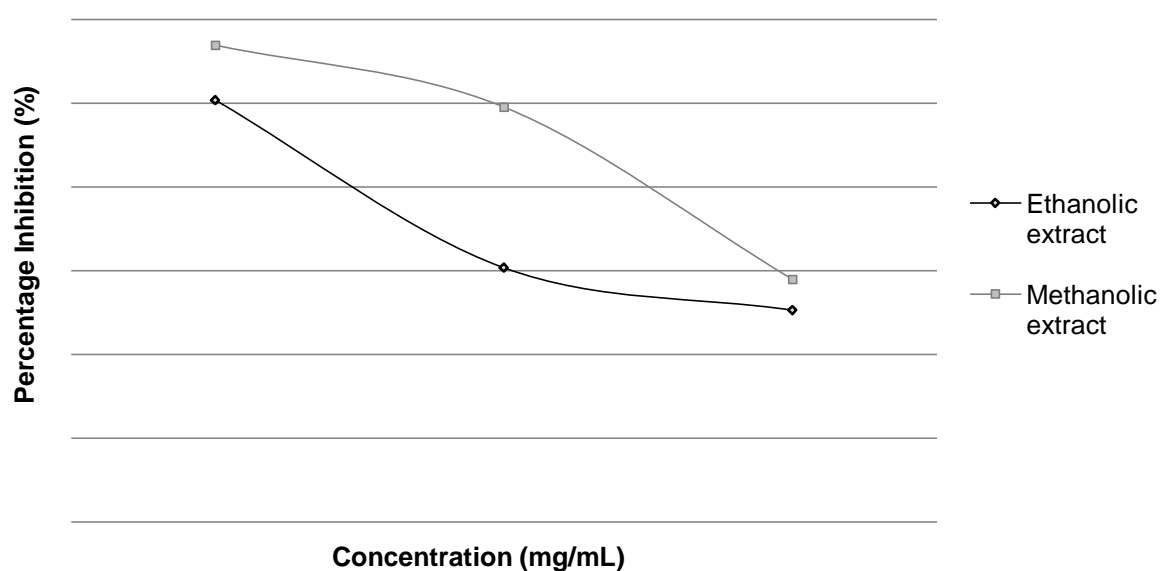
The samples (Plate 1c) were washed, shade-dried, crushed and then subjected to maceration using methanol and ethanol. The antioxidant activity was evaluated using the DPPH radical scavenging assay following the methodology described by Baliyan et al., (2022) with minor modifications. Various concentrations of the extracts were prepared and 1 mL of 0.1 mM DPPH solution was mixed with the extract, adjusting the final volume to 3 mL. A control was set up using a mixture of 1 mL DPPH and 2 mL methanol. After incubating the mixtures in the dark for 20 minutes at room temperature, absorbance was measured at 517 nm using a UV–Visible spectrophotometer and percentage inhibition was calculated to plot a concentration vs. percentage inhibition graph using the following equation.

$$\% \text{ Inhibition} = \frac{A_0 - A_s}{A_0} \times 100$$

Where  $A_0$  is the absorbance of the control and  $A_s$  is the absorbance of the sample after blank correction.

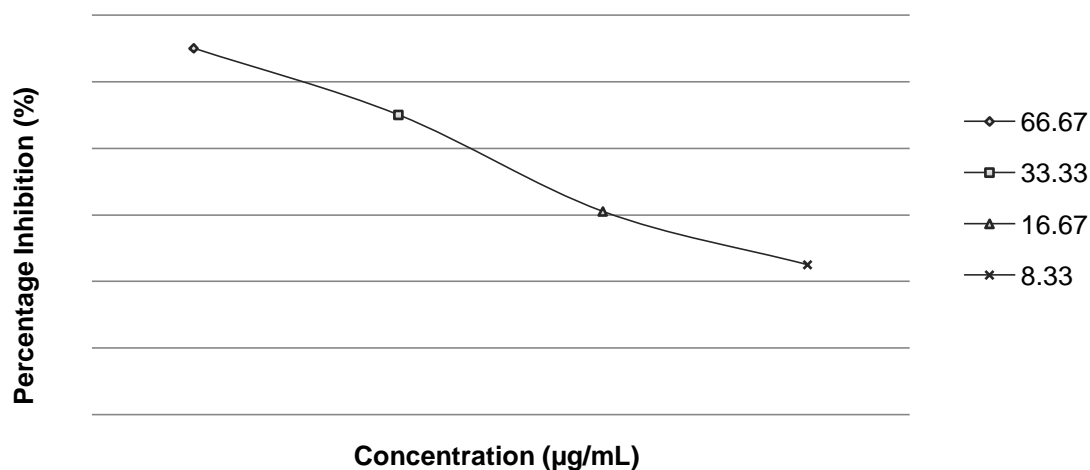
## Results and discussion

Free radical scavenging is crucial for protecting biological systems from oxidative stress caused by reactive oxygen species (Lobo et al., 2010). In this study, the antioxidant potential of the flower extracts of *Terminalia pendula* var. *pendula* was assessed using the DPPH radical scavenging assay. Both ethanolic and methanolic extracts demonstrated the ability to neutralize DPPH radicals, with the activity increasing at higher concentrations (Figure 2). The methanolic extract showed greater inhibition at all tested concentrations, recording 56.95 % inhibition at 0.5 mg/mL, followed by 49.55% at 0.25 mg/mL and 28.96% at 0.125 mg/mL. In comparison, the ethanolic extract exhibited lower inhibition values of 50.39%, 30.37% and 25.3% at the corresponding concentrations.



**Figure 2:** Percentage inhibition against concentration showing DPPH free radical scavenging activity of various extracts of *Terminalia pendula* var. *pendula* (flowers)

The standard antioxidant, quercetin (Figure 3), showed significantly higher activity, ranging from 96.85% to 97.5% inhibition, even at lower concentrations. The antioxidant potential observed in the extracts may be attributed to the presence of phytochemicals such as tannins and flavonoids found in the plant (Mohd Amer et al., 2021). These compounds are well recognized for their radical scavenging properties and may contribute to their traditional medicinal uses.



**Figure 3:** Percentage inhibition against concentration showing DPPH free radical scavenging activity of standard (Quercetin)

### Research gaps and future aspects

Despite its traditional use in medicine, the antioxidant potential of *Terminalia pendula* var. *pendula* flowers has been minimally investigated and the bioactive compounds responsible for its activity remain largely unexplored. Further studies involving detailed phytochemical analysis, isolation of active compounds and evaluation of additional biological activities are required to validate its therapeutic potential.

### Conclusion

The present experimental study demonstrated that flower extracts of *Terminalia pendula* var. *pendula* have measurable DPPH free radical scavenging activity. The methanolic extract showed higher antioxidant activity compared to the ethanolic extract, indicating a more efficient extraction of polar bioactive compounds. Although the activity was lower than that of the standard quercetin, the results support the presence of natural antioxidant components in the plant and emphasise its potential for further phytochemical and pharmacological research.

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