

Research Article

Phytochemical characterization and *in vitro* antioxidant potential of *Cordia dichotoma* G. Forst. fruit extracts

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Abstract: Antioxidants work their magic by neutralizing free radicals. They do this by donating electrons or hydrogen atoms, which helps to prevent oxidative damage to our cells and slows down the development of various degenerative diseases. Present study looked into the antioxidant capabilities of n-hexane, ethanolic and aqueous extracts from the fruits of *Cordia dichotoma* G. Forst. All the extracts demonstrated a concentration-dependent ability to scavenge radicals by using the DPPH free radical scavenging assay, testing concentrations from 0.125 to 1.0 mg/ml. The aqueous extract stood out with the highest inhibition rates (74.17-90.87%), followed by the ethanolic extract (68.12-89.69%) and the n-hexane extract (62.91-84.47%). The peak inhibition for all extracts occurred at 1.0 mg/ml, with the aqueous extract showing the most impressive activity at 90.87%. These results suggest that the fruit extracts of *C. dichotoma*, particularly the polar fractions, have notable antioxidant potential, highlighting their potential as a natural source of antioxidants and these findings could further aid in the development of novel pharmaceutical and nutraceutical formulations.

Keywords: Nutraceutical, oxidative damage, pharmaceutical, radical scavenging assay

Introduction

Free radicals and reactive oxygen species (ROS) are constantly produced in our bodies as natural byproducts of metabolism (Bardaweel et al., 2018; Forrester et al., 2018). While a small amount of ROS plays a crucial role in cellular signaling and supporting our immune system, too much of it can lead to oxidative stress (Kozlov et al., 2024; Fang et al., 2025). This condition is linked to a range of chronic

and degenerative diseases, such as cancer, diabetes, heart problems, neurodegenerative disorders and even premature aging (Leyane et al., 2022; Tavakolpournegari et al., 2025). Although our bodies have built-in antioxidant defenses, they often fall short when faced with excessive oxidative damage, especially during times of environmental stress, poor nutrition or illness. As a result, there's a growing interest in finding external antioxidants, especially those from natural sources, that can help boost our body's defenses and reduce oxidative harm (Kalogerakou and Antoniadou, 2024; Gulcin, 2025; Manful et al., 2025).



Figure 1: Fruits of *C. dichotoma*

Plants have always been a treasure trove of bioactive compounds, like phenolics, flavonoids, tannins and alkaloids, many of which boast impressive antioxidant abilities (Riaz et al., 2023). Unlike synthetic antioxidants such as butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT), which have raised eyebrows due to potential toxicity concerns, antioxidants derived from plants are generally seen as safer and more sustainable options (Ren et al., 2025). This has sparked a wave of research into medicinal and edible plants to uncover their potential for scavenging free radicals, with the goal of finding new sources of natural antioxidants for use in nutraceuticals, pharmaceuticals and food preservation. *Cordia dichotoma* G. Forst., commonly known as "Lasoda" or "Indian cherry" is a medium-sized tree found throughout the tropical and subtropical regions of Asia (Jamkhande et al., 2013; Constantine et al., 2023). Different parts of the plant, including its fruits, bark and leaves have been used in traditional folk and Ayurvedic medicine to tackle respiratory issues, urinary problems, ulcers and inflammation (Stalin, 2021; Raghuvanshi et al., 2022). The fruits are especially popular, enjoyed both as food and as a traditional remedy (Hussain et al., 2020). Previous studies have hinted at a variety

of secondary metabolites like flavonoids and phenolic contents in the plant that could be behind its health benefits (Raina et al., 2025). However, despite its long-standing use in traditional medicine, there's still a lack of thorough scientific research on the phytochemical makeup and antioxidant potential of *C. dichotoma* fruit extracts made with solvents of different polarities. In the present study, authors set out to explore the phytochemical makeup and assess the *in vitro* antioxidant capabilities of n-hexane, ethanolic and aqueous extracts from *C. dichotoma* fruits, using the DPPH free radical scavenging assay. Since the polarity of solvents plays a crucial role in how effectively different types of phytochemicals are extracted, authors conducted a comparative analysis of non-polar, moderately polar and polar extracts. This approach aimed to pinpoint the most effective extract and lay the groundwork for considering this often-overlooked fruit as a valuable natural source of antioxidants.

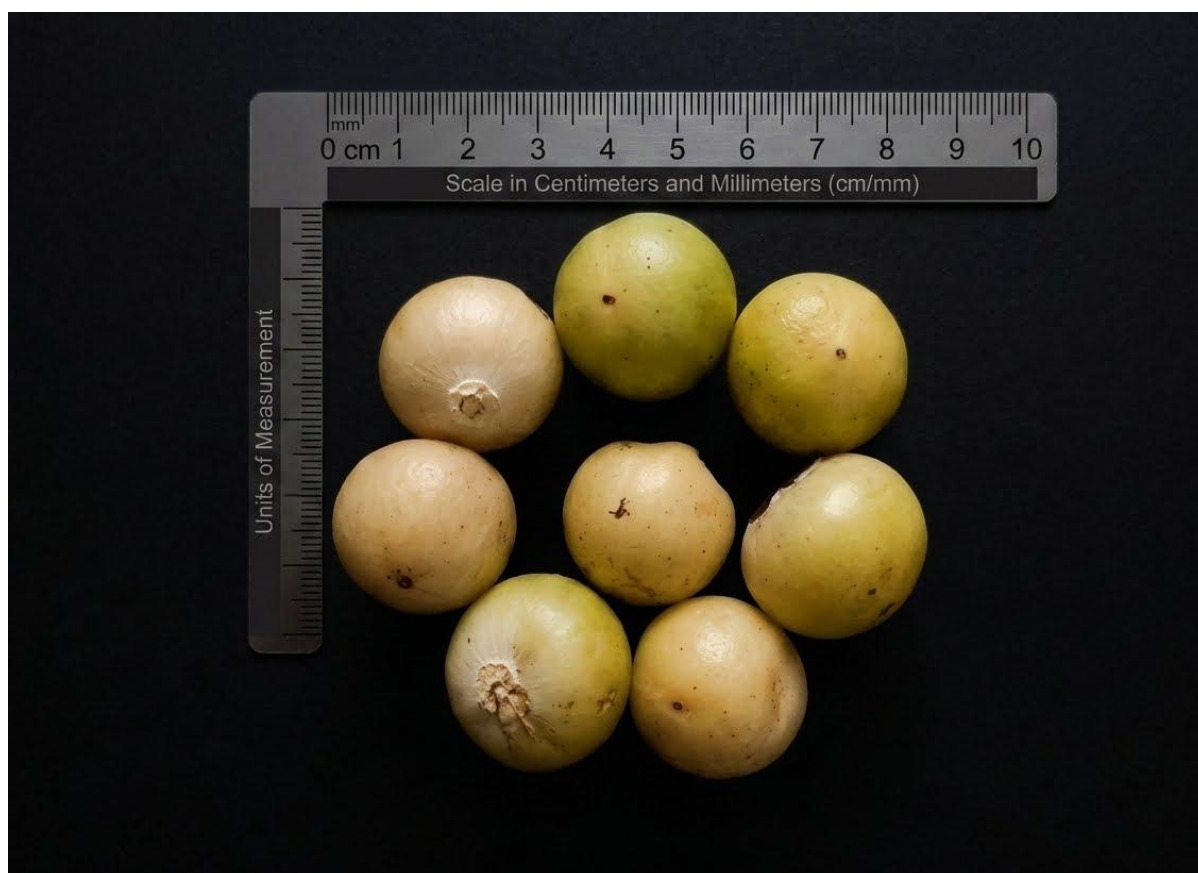


Figure 2: Collected *C. dichotoma* fruits for DPPH assay

Methodology

The present study combines field surveys, lab experiments and a thorough review of existing literature on *C. dichotoma*. Authors gathered relevant peer-reviewed articles, review papers, ethnobotanical surveys and pharmacological studies from scientific databases like Google Scholar, Scopus, PubMed and Web of Science. Authors used key search terms such as “*Cordia dichotoma*”, “medicinal uses” and “potent scavenging bioactives compounds” to guide our search. The field survey took place from March to May 2026, where authors identified plant specimens with the help of the flora guide by Saxena and Brahman (1995). Additionally, they conducted experimental assay to confirm the presence of

phytoconstituents and evaluate the antioxidant activity of *C. dichotoma* fruits using the DPPH radical scavenging assay.

Antioxidant DPPH assay

C. dichotoma fruits were collected from nearby Mahanadi areas of Cuttack District, Odisha, India (Figures 1 & 2). The fruits were thoroughly washed with distilled water and macerated with different solvents like n-hexane, ethanol and distilled water separately. The DPPH radical scavenging assay was used to evaluate the filtered extract following Dintu et al., (2026) with minor modifications. 1 ml of 0.1 mM DPPH solution prepared in methanol was added to prepared concentrations of aqueous, ethanolic and n-hexane extracts (1.0, 0.5, 0.25 and 0.125 mg/mL) using the respective solvents adjusting the final volume to 2 ml. 1 mL 0.1 mM DPPH in 1 mL methanol was used as control. Sample blanks (without DPPH) were used for background correction of absorbance. Reaction mixtures were exposed to dark incubation at room temperature for 20 minutes and the absorbance was spectrophotometrically taken at 517 nm. Percentage of radical scavenging activity was calculated using the following formula (Table 1; Jena et al., 2025).

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

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

Results and discussion

The DPPH free radical scavenging assay showed that all three extracts from *C. dichotoma* fruits displayed antioxidant activity that increased with concentration, ranging from 0.125 to 1.0 mg/ml. Among them, the aqueous extract stood out with the highest inhibition rates (74.17-90.87%), followed closely by the ethanolic extract (68.12–89.69%) and then the n-hexane extract (62.91-84.47%) (Table1; Figure 3). All extracts peaked in their activity at 1.0 mg/ml. This pattern - aqueous > ethanolic > n-hexane can be explained by the superior ability of polar solvents to extract phenolic and flavonoid compounds, which are known for their capacity to donate hydrogen or electrons to neutralize the DPPH radical. In contrast, the n-hexane extract's lower activity is likely due to its higher levels of lipophilic components, which are less effective at scavenging radicals. These results highlight the significant antioxidant potential of *C. dichotoma* fruits, especially their polar extracts, reinforcing their traditional uses and suggesting they could be a valuable natural source of antioxidants for future research and healthcare.

Table 1: Antioxidant potential of *C. dichotoma* fruits extracts using DPPH assay

Concentration (in mg/ml)	Inhibition (%)		
	n-Hexane	Ethanolic	Aqueous
0.125	62.91	68.12	74.17
0.25	66.58	68.36	81.87

0.5	73.93	78.19	83.64
1.0	84.47	89.09	90.87

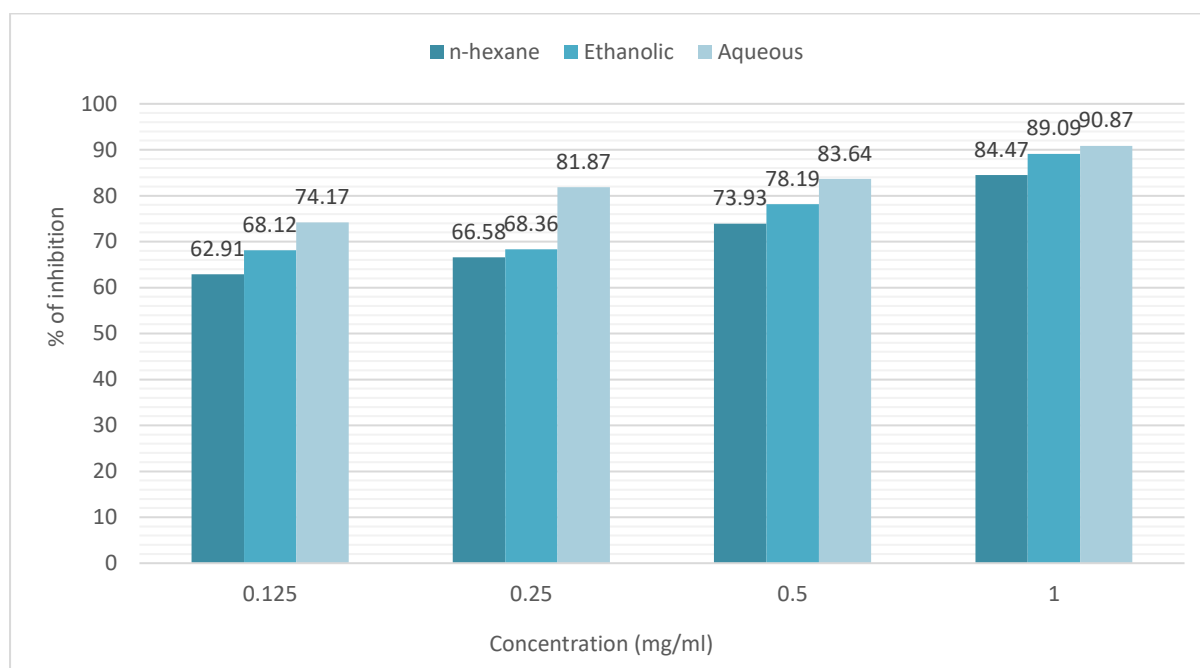


Figure 3: Antioxidant activity of *C. dichotoma* fruit

Conclusion

The current investigation has shown that extracts from *C. dichotoma* fruit have antioxidant activity that increases with concentration. The DPPH free radical scavenging assay revealed that the aqueous extract was the most effective, achieving an impressive 90.87% activity at 1.0 mg/ml, followed closely by the ethanolic extract at 89.69% and the n-hexane extract at 84.47%. These results suggest that polar solvents are better at extracting the antioxidant compounds from *C. dichotoma* fruits, pointing to their potential as a natural, safe and easily accessible source of antioxidants. Looking ahead, future research should aim to quantify the total phenolic and flavonoid content, determine IC₅₀ values and confirm these findings with additional antioxidant assays like FRAP (Ferric Reducing Antioxidant Power), ABTS (2,2'-azinobis-3-ethylbenzothiazoline-6-sulfonic acid) or reducing power tests. Moreover, further investigations into isolating and characterizing the active compounds, along with *in vivo* studies, are essential to fully understand the therapeutic potential of *C. dichotoma* fruits for use in nutraceutical and pharmaceutical fields.

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