
Research Article

***Gliricidia sepium* (Jacq.) Kunth (Fabaceae): antioxidant potential of the flowers of a shade tree**

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Abstract: *Gliricidia sepium* is a well-known leguminous tree with vibrant lilac shade flowers widely distributed in the tropical and subtropical regions. Native to the Central and South America, this species has been introduced to several countries due to its adaptability to warm climates and its importance in agroforestry systems. The plant is also traditionally valued for its medicinal properties and bioactive compounds. The present study evaluates the antioxidant potential of *G. sepium* flower extracts using the 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. Methanolic and ethanolic extracts were prepared and tested at different concentrations. Both the extracts exhibited radical scavenging activity, with the ethanolic extract showing comparatively higher inhibition values than the methanolic extract. The presence of flavonoids and other polyphenolic compounds reported in *G. sepium* may attribute to the observed antioxidant activity. According to the observed results, the flowers of *G. sepium* possess antioxidant potential and may be considered further pharmacological studies and product development.

Keywords: Fabaceae, folk medicine, free radical scavenging, *Gliricidia*, polyphenols

Introduction

The movement of plant species beyond their native ranges has been a common practice throughout agricultural history, often driven by the search for crops and trees that can adapt to new environments and provide economic or ecological benefits or sometimes, both (Shelef et al., 2017). Many species native to one region have been successfully introduced into other tropical and subtropical areas where climatic conditions are similar (Fan et al., 2025). One such example is *Gliricidia sepium*, a medium-sized leguminous tree belonging to the family Fabaceae (Saxena and Brahmam, 1994). It is widely distributed across tropical and subtropical regions of the world. The species is native to Mexico and Central America, including countries such as Belize, Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua, where it commonly grows in seasonally dry tropical forests (Plants of the World Online, 2026). Due to its adaptability to warm climates and relatively dry conditions, the plant has been widely introduced and naturalized in many tropical regions including Asia, Africa, Caribbean and the Pacific Islands (Wafaey et al., 2023). In countries such as the Philippines, it is popularly known as 'kakawate' (Patil et al., 2026). In its native region, *G. sepium* is traditionally used as a shade tree in cocoa and coffee plantations, particularly in Mexico. Because it provides protective shade for cocoa trees, it earned the name 'Madrecacao', meaning 'mother of cocoa' (Juanico et al., 2023). The genus name *Gliricidia* originates from Latin, where *glis* means mouse and *cidium* means killer, collectively translating to 'mouse killer' (Juanico et al., 2023). This name reflects the traditional use of the plant as a rodenticide, where its toxic seeds or ground bark are mixed with food such as cooked maize to kill rodents (Nison and Shrikumar, 2023). The toxicity of the plant is attributed to compounds such as canavanine, a thermostable non-protein amino acid reported in the seeds and bark, which is known to be harmful to rodents (Wafaey et al., 2023). For its ecological adaptability, agricultural importance and traditional uses, *G. sepium* has become an important multipurpose species in tropical agroforestry systems worldwide (Pradeep et al., 2025). At the same time, its traditional uses cover a wide range of medicinal and practical purposes (Juanico et al., 2023). Various parts of the plant are employed in folk medicine to treat conditions such as fever, headache, bruises, burns, rheumatism, ulcers, wounds and it is also reported to possess expectorant, sedative and suppurative properties (Table 1). The seeds are commonly used as a rat poison, while the wood is utilized for railway sleepers, farm implements and furniture (Juanico et al., 2023). Leaves are widely used medicinally; leaf tea is consumed to relieve cough, asthma and skin infections, while crushed fresh leaves are applied as a poultice to treat rheumatic pain, sprains and fractures (Nison and Shrikumar, 2023; Wafaey et al., 2023). Leaf decoctions are traditionally used to manage urticaria, skin rashes, burns and erysipelas; and leaf juice or decoctions, combined with bark decoctions, are applied for scabies, dermatitis and itching skin conditions (Nison and Shrikumar, 2023; Wafaey et al., 2023). Fresh leaves are also used as a natural insect repellent (Nison and Shrikumar, 2023). Ethnomedicinal reports from Panama indicate the use of leaf decoctions to treat urticaria, skin rashes, burns and erysipelas, whereas in Guatemala and Costa Rica, bark decoctions are used to manage bacterial and protozoal infections (Patil et al., 2026). Additionally, the branches are used to reduce fever in both children and adults and the plant has been reported to show activity against pathogens such as *Microsporium canis*, *Trichophyton mentagrophytes* and *Neisseria gonorrhoeae* (Patil et al., 2026). Beyond its

medicinal value, *G. sepium* is also an important agroforestry species known for improving soil fertility through nitrogen fixation and green manure, also contributing to animal feed, environmental management and anti-inflammatory applications (Pradeep et al., 2025).



Figure 1: Inflorescence of *Gliricidia sepium*

Table 1: Ethnomedicinal uses of different plant parts of *Gliricidia sepium*

Plant part	Medicinal use(s)	Source(s)
Whole plant	In treatment of fever, headache, bruises, burns, rheumatism, ulcers and wounds; also reported as an expectorant and sedative	Nison and Shrikumar, 2023; Wafaey et al., 2023
Leaves	Brewed as tea for cough and asthma	
	Crushed and applied for rheumatic pain, sprains and fractures	Nison and Shrikumar, 2023; Wafaey et al., 2023; Patil et al., 2026
	In treatment of skin conditions such as urticaria, rashes, burns, scabies, dermatitis and itching	
Bark decoction	In treatment of bacterial and protozoal infections	Wafaey et al., 2023; Patil et al., 2026
Branches	Traditionally as a remedy to reduce fever	

Given the wide range of uses, the flowers of the plant were evaluated for assessing its antioxidant potential through the current study as it remains an area less explored in terms of ethnobotanical documentation and pharmacological research.

Methodology

Collection of *Gliricidia sepium* flowers were done from nearby Mahanadi areas of Cuttack district, Odisha, India (Figure 1). Identification was complied with reference to flora guide (Saxena and Brahmam, 1994). Flowers were carefully handled, washed and shade dried to remove excess moisture. Samples (Figure 2) were then macerated with ethanol and methanol separately (Kaur et al., 2026; Kumar et al., 2026). The 2, 2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging assay was used to evaluate the filtered extract following Baliyan et al., (2022) with minor modifications.



Figure 2: Flower sample of *Gliricidia sepium*

1 mL of 0.1 mM DPPH solution prepared in methanol was added to prepared concentrations of ethanolic and methanolic extracts (1.0, 0.5, 0.25 and 0.125 mg/mL) using the respective solvents adjusting the final volume to 3 mL. 1 mL 0.1 mM DPPH in 2 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.

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

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

Results and discussion

Compounds such as isovestitol, formononetin, afrormosin, kaempferol glycosides, isorhamnetin and isoquercitrin belong to the flavonoid and polyphenolic groups that are widely recognized for their antioxidant properties (Jasmine et al., 2017; Dias et al., 2021; Jan et al., 2022). The phytochemical profile of *Gliricidia sepium* presented in Table 2 indicates the presence of several classes of these polyphenolic compounds, including isoflavonoids, flavonoids, flavonol glycosides, pterocarpan and rotenoids identified from different parts of the plant.

Table 2: Major phytochemical constituents isolated from different parts of *Gliricidia sepium* (Wafaey et al., 2023)

Plant part	Major phytochemicals identified	Chemical class
Heartwood	7,4'-dihydroxy-3'-methoxyisoflavan, isovestitol, formononetin, afrormosin	Isoflavonoids
	Medicarpin (3-hydroxy-9-methoxy pterocarpan)	Pterocarpan
	Sepiol, 2'-O-methysepiol	Isoflavones
	Robinetin, 7,3',4'-trihydroxyflavanone	Phenolic flavonoids
Leaves	Isovestitol, 7,4'-dihydroxy-3'-methoxyisoflavan, medicarpin	Isoflavans / Pterocarpan
	Kaempferol-O-glycosides, isorhamnetin	Flavonol glycosides
Bark	Vestitol, 2'-O-methylvestitol	Isoflavans
	Gliricidol, 2-methoxygliricidol, gliricidin, 12a-hydroxyrotenoids	Rotenoids
Flowers	Isoquercitrin	Flavonol glycoside

These phytochemicals can donate hydrogen atoms or electrons to neutralize free radicals and thereby reduce oxidative stress (Ahmad et al., 2025). Since the flowers of *G. sepium* have also been reported to contain flavonol glycosides such as isoquercitrin (Table 2), the presence of these bioactive compounds suggests a potential antioxidant capacity. Therefore, the antioxidant activity of the flower extract was assessed using the DPPH assay, which revealed a concentration dependent free radical scavenging activity. Out of the two tested extracts, ethanolic extract exhibited inhibition ranging from 42.35% at 0.125 mg/mL to 54.61% at 1 mg/mL. The methanolic extract on the other hand, showed a similar trend, increasing from 41.45% at 0.125 mg/mL to 46.62% at 1 mg/mL. The standard antioxidant Quercetin showed much higher activity, with inhibition values ranging from 96.85% to 97.50% at concentrations of 8.33-66.67 μ g/mL. The results indicated comparatively higher antioxidant activity of the ethanolic extract than the methanolic extract although both their performance remained lower compared to the standard.

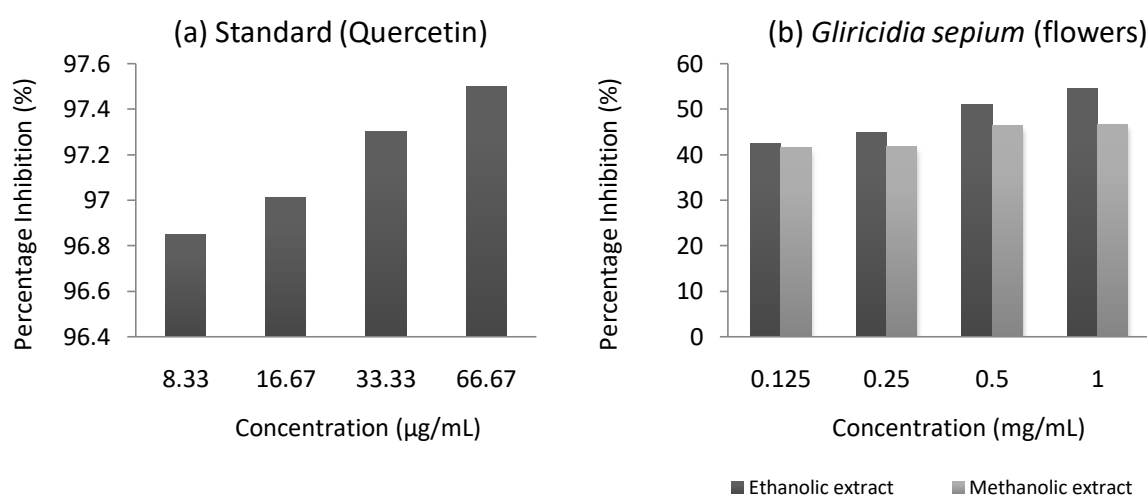


Figure 3: Percentage inhibition against concentration showing DPPH free radical scavenging activity of (a) Quercetin standard and (b) methanolic and ethanolic flower extracts of *Gliricidia sepium*

Research gaps

Gliricidia sepium has been widely studied for its agroforestry value, medicinal uses and phytochemical constituents, most of the previous studies have focused on leaves, bark and heartwood extracts. However, limited information is available on the phytochemical composition, ethnomedicinal documentation and pharmacological aspect of the flowers of *G. sepium*. Since flowers of the plant are reported to contain flavonol glycosides and other phenolic compounds that may contribute to antioxidant activity, systematic evaluation of their bioactivity remains insufficient. Therefore, the present study was undertaken to investigate the antioxidant potential of *G. sepium* flower extracts, helping to fill this gap and provide a preliminary insight into their possible pharmacological relevance which may be used for its further detailed evaluation.

Conclusion

Distinct flowers of *Gliricidia sepium* possess reported flavonol glycoside which led to its measurable antioxidant activity as evaluated in this study. Both methanolic and ethanolic floral extracts showed free radical scavenging activity, with the ethanolic extract exhibiting higher inhibition. Although the activity was lower than the standard Quercetin, the antioxidant activity clearly attributes to the presence of bioactive compounds reported in the plant. Further studies should be encouraged involving detailed phytochemical analysis and additional antioxidant assays of *G. sepium* which would help to better understand the therapeutic potential of its under explored flowers.

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