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FLUORESCENCE EVALUATION, PHYTOCHEMICAL ANALYSIS, AND ANTIOXIDANT ACTIVITY OF HYDRO-ALCOHOLIC EXTRACT OF DALBERGIA SISSOO ROXB.

Ragipati Suneetha[1*], Dr. S. Janet Beula[2], Donthula Srilatha[3], Dr. Madireddy Mamata[4], Vanitha Bolla[5], Kandhagatla Saisneha[6]

[1]Assistant Professor, Department of Medicinal Chemistry, Teegala Ram Reddy College of Pharmacy, #4-202, Meerpet, Balapur(M), Ranga Reddy dist., Telangana, India-500097.
[2]Associate Professor, Department of Pharmaceutical chemistry, MRM College of Pharmacy Chintapallyguda(v), Ibrahimpatanam(M), Rangareddy dist, Telangana,501510.
[3]Assistant Professor, Department of Pharmaceutics, Brilliant Grammar School Educational Society's Group of Institutions-Integrated Campus, Near By Ramoji Film city, Hayathnagar, Abdullahpurmet, Rangareddy, Telangana, India- 501505.
[4]Associate Professor & HOD, Department of Pharmaceutical Analysis, Trinity College of Pharmaceutical Sciences, Peddapalli, Bandarikunta, Telangana 505172.
[5]Assistant Professor, Department of Pharmacology, Teegala Ram Reddy college of pharmacy, #4-202, Meerpet, Balapur(M), Ranga Reddy dist., Telangana, India-500097.
[6]Assistant Professor, Department of Pharmaceutical Analysis and Quality Assurance, Teegala Ram Reddy College of Pharmacy, #4-202, Meerpet, Balapur(M), Ranga Reddy dist., Telangana, India-500097.

***Corresponding Author: Ragipati Suneetha**

Assistant Professor, Department of Medicinal Chemistry, Teegala Ram Reddy College of Pharmacy, #4-202, Meerpet, Balapur(M), Ranga Reddy dist., Telangana, India-500097.

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ABSTRACT

Medicinal plants are recognized as important sources of natural bioactive compounds with diverse therapeutic properties. *Dalbergia sissoo* Roxb., commonly known as Indian rosewood, has been traditionally used for the management of inflammation, wounds, skin diseases, and gastrointestinal disorders. The present study was undertaken to evaluate the fluorescence characteristics, phytochemical constituents, and antioxidant activity of the hydro-methanolic extract of *D. sissoo* Roxb. Fluorescence evaluation of the powdered drug was carried out using different chemical reagents under visible and ultraviolet light, which aids in identification and standardization of crude plant materials. Preliminary phytochemical screening of the extract revealed the presence of alkaloids, flavonoids, phenolic compounds, tannins, saponins, glycosides, and terpenoids. These secondary metabolites are known for their beneficial pharmacological effects. The antioxidant potential of the extract was determined by standard in vitro free radical scavenging methods and showed significant activity in a concentration-dependent manner. The observed antioxidant effect may be attributed to the presence of phenolic and flavonoid compounds capable of neutralizing reactive oxygen species. The findings indicate that *D. sissoo*. possesses valuable phytochemicals with promising antioxidant potential and supports its traditional medicinal importance.

KEYWORDS: Dalbergia sissoo, fluorescence evaluation, phytochemical analysis, antioxidant activity.

INTRODUCTION

Medicinal plants have long been recognized as valuable sources of therapeutic agents and continue to play a significant role in healthcare systems worldwide. The World Health Organization has estimated that a large proportion of the global population depends on traditional plant-based medicines for primary healthcare needs. Natural products derived from plants are rich in secondary metabolites such as alkaloids, flavonoids, tannins, glycosides, and terpenoids, which exhibit

diverse pharmacological properties including antioxidant, anti-inflammatory, antimicrobial, and anticancer activities.[1,2]

Oxidative stress, caused by an imbalance between free radical generation and antioxidant defense mechanisms, is considered a major factor in the pathogenesis of several chronic disorders such as diabetes mellitus, cardiovascular diseases, neurodegenerative conditions, and cancer. Antioxidants obtained from natural sources are therefore gaining considerable attention because of their ability to scavenge free radicals and reduce oxidative damage.[3,4] Plant extracts rich in phenolic and flavonoid compounds are particularly important due to their strong reducing and radical-quenching capacities.[5]

Dalbergia sissoo Roxb., belonging to the family Fabaceae, is commonly known as Indian rosewood or Shisham. It is a large deciduous tree widely distributed in the Indian subcontinent and is valued for both its medicinal and economic importance. Various parts of the plant, including leaves, bark, roots, and seeds, have been traditionally used in Ayurveda and folk medicine for the treatment of skin diseases, inflammation, ulcers, diarrhoea, fever, and wounds.[6,7] Previous phytochemical investigations on D. sissoo have reported the presence of flavonoids, tannins, phenolic compounds, neoflavanoids, and other bioactive constituents responsible for its pharmacological potential.[8]

Standardization of crude herbal drugs is an essential step in ensuring their quality, purity, and authenticity. Fluorescence analysis is a simple and reliable pharmacognostic method used for identification of plant powders based on their characteristic colour changes under visible and ultraviolet light after treatment with specific reagents.[9] This method serves as an important parameter in the evaluation of herbal raw materials.

Hydro-methanolic solvents are widely employed for extraction because they efficiently dissolve both polar and moderately non-polar phytoconstituents. Therefore, the present study was designed to evaluate the fluorescence characteristics, phytochemical profile, and antioxidant activity of the hydro-methanolic extract of *Dalbergia sissoo* Roxb., in order to provide scientific support for its traditional uses and future therapeutic applications.[10]

MATERIALS AND METHODS

Plant Material Collection

Fresh and healthy leaves of *Dalbergia sissoo* Roxb. were collected during the month of February 2026 from the local area of Hyderabad, Telangana, India. The plant material was selected based on its morphological characteristics and free from disease or physical damage. The collected leaves were thoroughly washed with running water to remove adhering dust and other foreign matter, followed by rinsing with distilled water. The cleaned plant material was shade dried at room temperature for several days until a constant weight was obtained. After complete drying, the leaves were coarsely powdered using a mechanical grinder and stored in an airtight container for further experimental studies.

The plant was authenticated by a qualified botanist Dr. K. Srinivasa Reddy, M. Sc., Ph. D, Asst. Professor, Dept. of Botany, and Govt. Degree College for Woman, Nalgonda, and Telangana State.

Preparation of plant extract[11]

About 250 g of the powdered material was packed in a thimble and subjected to successive extraction using a Soxhlet apparatus. Initially, the powder was defatted with petroleum ether (60–80°C) for 6–8 hours to remove fatty substances, chlorophyll, and other non-polar impurities. After completion of defatting, the marc was removed, air dried, and again placed in the Soxhlet apparatus.

The dried marc was then extracted with hydro-alcoholic solvent (ethanol: water, 70: 30 v/v) for until the siphon tube solution became colourless. The obtained extract was filtered and concentrated under reduced pressure using a rotary vacuum evaporator. The concentrated extract was further dried on a water bath at controlled temperature to obtain a semisolid mass. The dried hydro-alcoholic extract was weighed to determine the percentage yield and stored in an airtight container at 4°C for further phytochemical and pharmacological studies.

Phytochemical screening[12]

The extract was subjected to preliminary phytochemical screening in order to detect the presence of various phytoconstituents by using standard phytochemical procedures.

Fluorescence Analysis

Fluorescence analysis of powdered leaves of *D. sissoo* Roxb. was carried out by treating the powder with various chemical reagents and observing the colour changes under visible light, short ultraviolet wavelength (254 nm), and long ultraviolet wavelength (365 nm). The results are presented in table 2.

Antioxidant activity by DPPH free radical scavenging assay[15]

The antioxidant activity was performed using 1,1-diphenyl-2 picrylhydrazyl (DPPH) method.

The DPPH radical scavenging activity of the hydro ethanolic extract of leaves *D. sissoo* was estimated using modified and stable DPPH assay. Stock reagent solution was prepared by dissolving 2.5 mg of DPPH in 100 ml of hydro alcoholic solvent. A volume of 100 µl hydro alcoholic extract was allowed to react with 3 ml of DPPH solution. The reaction mixture was vortex and kept in the dark at room temperature for 30 min, and absorbance was recorded at 517 nm. A control sample with no added extract was also analyzed, and the results

were expressed as percent inhibition/radical scavenging activity (%RSA) and calculated using the following formula.

RSA (%) = [A control – A sample/A control] × 100

where, A = absorbance at 517 nm

RESULTS AND DISCUSSION

Organoleptic characteristics and Percentage Yield

The extract was found to be a dark greenish-brown coloured mass with a semi-solid, sticky consistency and percentage yield is13.0% w/w with characteristic herbal odor.

The preliminary phytochemical studies were carried out according to the procedures described. The extract was examined for the presence of various phytoconstituents such as alkaloids, flavonoids, tannins & phenolic compounds, phytosterols, carbohydrates, and amino acids. The results obtained are presented in Table 1.

Table 1: Phytochemical screening of *Dalbergia sissoo* Roxb.

S. No.	Chemical constituents	Hydro alcoholic extract
1.	Alkaloids	++
2.	Flavonoids	+++
3.	Tannins	+++
	Phenolic compounds	+++
4.	Phytosterols	+++
5.	Carbohydrates	++
6.	Amino acids	++

+++ (highly present), ++ (moderately present)

Table 2: Fluorescence Analysis of *Dalbergia sissoo* Roxb.

S.No	Treatment	Visible light	UV 254 nm	UV 365 nm
1	Powder as such	Green	Dark green	Brownish green
2	Powder+distilled water	Light green	Greenish brown	Yellowish green
3	Powder+methanol	Green	Olive green	Fluorescent green
4	Powder+ethanol	Yellowish green	Greenish brown	Bright green
5	Powder+chloroform	Dark green	Brown	Greenish yellow
6	Powder+petroleum ether	Pale green	Brownish green	Yellow green
7	Powder+1N Hcl	Brownish green	Dark brown	Yellowish brown
8	Powder+ 1 N NaOH aq.	Dark green	Blackish green	Bright green
9	Powder+1 N NaOH alc.	Greenish brown	Brown	Reddish brown
10	Powder+con. H2SO4	Dark brown	Black	Orange brown
11	Powder+con HNO3	Brown	Dark brown	Yellowish
12	Powder+acetic acid	Greenish yellow	Brownish green	

The powdered leaf material of *Dalbergia sissoo* exhibited characteristic fluorescence behaviour with different reagents under visible and ultraviolet light. Distinct colour changes observed under short and long UV wavelengths may be attributed to the presence of phytoconstituents such as flavonoids, phenolics, alkaloids, and other secondary metabolites. Fluorescence analysis serves as an important pharmacognostic tool for the identification, authentication, and standardization of crude herbal materials. The results obtained are presented in Table 2.

Antioxidant activity

Table 3: Antioxidant (DPPH) activity of *D. sissoo* leaf hydro ethanolic extract.

S. No	Plant part used	Solvent used	DPPH % Inhibition
1	Leaves	Hydro alcoholic	69.65±0.56

The antioxidant potential of the hydroethanolic leaf extract of *Dalbergia sissoo* was evaluated using the DPPH free radical scavenging assay, which is a widely accepted and rapid method for assessing the hydrogen-donating ability of plant extracts. In the present study, the hydroethanolic extract exhibited 69.65 ± 0.56% inhibition of DPPH radicals, indicating significant antioxidant activity. The results obtained are presented in Table 3.

The observed free radical scavenging effect may be attributed to the presence of phytoconstituents such as phenolics, flavonoids, tannins, and other polyphenolic compounds commonly reported in D. sissoo leaves. These secondary metabolites are known to neutralize free radicals by donating electrons or hydrogen atoms, thereby reducing oxidative stress. The hydroethanolic solvent system is considered effective for extracting both polar and moderately polar bioactive constituents, which

may explain the appreciable antioxidant response obtained in this study.

Oxidative stress plays an important role in the pathogenesis of several chronic disorders, including cardiovascular diseases, diabetes, inflammation, cancer, and ageing-related complications. Therefore, the strong DPPH scavenging activity of the extract suggests that D. sissoo leaves could serve as a promising natural source of antioxidants for therapeutic or nutraceutical applications.

The low standard deviation value indicates good reproducibility and reliability of the experimental findings. Overall, the results support the traditional medicinal importance of Dalbergia sissoo and justify further studies for isolation, characterization, and in vivo evaluation of its antioxidant principles.

CONCLUSION

The present study demonstrated that the hydroalcoholic extract of *Dalbergia sissoo* possesses significant pharmacognostic and phytochemical potential. Fluorescence evaluation of the powdered drug showed characteristic colour changes under visible and UV light with different reagents, which can serve as a useful parameter for identification and standardization of the plant material. Preliminary phytochemical screening confirmed the presence of important bioactive constituents such as flavonoids, phenolics, tannins, alkaloids, and phytosterols. The extract also exhibited appreciable antioxidant activity, indicating its ability to scavenge free radicals effectively. These findings suggest that *D. sissoo* is a promising natural source of antioxidant compounds and may be useful for the development of herbal formulations for oxidative stress-related disorders. Further isolation and characterization of active constituents are recommended.

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