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PRELIMINARY PHYTOCHEMICAL SCREENING, FT-IR, AND HPTLC ANALYSIS, AND ANTIOXIDANT, ANTIMICROBIAL ACTIVITIES OF METHANOLIC EXTRACTS OF DALBERGIA SISSO LEAVES

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Dalbergia sisso, FT-IR spectroscopy, HPTLC analysis, Antioxidant, Antimicrobial.

ABSTRACT
Background: *Dalbergia sissoo* is a well-known plant known as Shisham. It has medicinal importance, including analgesic, antipyretic, and antiemetic properties. Therefore, the primary objective of this research is to investigate the bioactive constituents in the methanolic leaf extract of Dalbergia sisso by characterizing it using FT-IR and HPTLC techniques, and to determine its antioxidant and antimicrobial activities. **Methodology:** A Soxhlet apparatus was used for the extraction process. 150 g of *Dalbergia sisso* powdered leaves was extracted using a Soxhlet apparatus for 30 hours, utilizing methanol as a solvent. The solvent was vaporized and concentrated to produce a dry residue once the extraction was finished. The yield percentages for the methanolic extract were 4.8% respectively. **Result and Discussion:** FT-IR spectroscopy showed different peak values for functional compounds in the methanolic extract. The FTIR spectrum of the methanolic leaf extract shows the interpretation of the chemical bonds in the methanolic leaf extract. HPTLC studies revealed that the active compound lupeol is present in the methanolic extract. **Conclusion:** It has been concluded that the methanolic extract of *Dalbergia sisso leaves* contains lupeol and quercetin bioactive compounds. The methanolic extract of *Dalbergia sisso leaves was* found to have antioxidant and antimicrobial effects. The HPTLC technique found lupeol, which may possess antioxidant and antimicrobial activities. The FT-IR spectrum revealed the presence of hydroxyl, hydrocarbon, aldehyde, allene, and secondary alcohol groups in the methanolic extract, consistent with the presence of quercetin. The methanolic leaf extracts show the presence of saponin, alkaloids, flavonoids, anthraquinone glycosides, and tannins.

INTRODUCTION

Herbs have many benefits. Therefore, herbal medicine can treat more diseases with fewer side effects than conventional medicines, as traditional medicines cannot cure all diseases [1]. A plant, *Dalbergia sissoo*, is also known as the Indian rosewood tree. In Hindi, it is known as Shishaam. It is also used as timber, fuelwood, shelter, and shade. This plant also has medicinal importance. The aerial parts extract showed analgesic,

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antipyretic, and estrogen-like activities [2]. Its leaf juice is used for anthelmintic, nose, and eye diseases. It has also been utilized in digestive disorders, scalding urine, and scabies, and is also used as an anti-dandruff agent [3]. The chemical constituent found in *Dalbergia sisso* leaves is isoflavone-O-glycoside. In the stem bark, there are dalbergin, dalbergichromene, dalberginone, and methyl dalbergin [4]. The ethanolic extract of *Dalbergia sisso* bark possesses a significant antidiabetic effect [5].

A major bioactive compound isolated from the *Dalbergia sisso* leaf of the Chinese herb is Evodiamine, a quinoline alkaloid that possesses anti-inflammatory, anticancer, antianxiety, antiobesity, antiallergic, and antinociceptive effects [6]. Fluorescence is one of the initial phenomena manifested by the fact that certain chemical compounds exhibit fluorescence in the visible region of daylight. More natural products that don't fluoresce visibly in daylight can fluoresce when exposed to UV light. Some crude drugs are frequently assessed qualitatively in this way because, although the substance itself may not be fluorescent, they can often be transformed into a fluorescent derivative by applying some reagents.

This is a crucial pharmacognostic evaluation parameter, with alterations in color and appearance [7,8]. HPTLC meets all the requirements for modern analytical labs, enhancing resolution and allowing for more accurate quantitative measurements [9]. The technology of analytical chemistry can be defined in simplified terms as the method of obtaining information about a sample through the chemical evaluation of some kind [10]. Current strategies are being employed to ensure greater control over medicinal plant products, by WHO guidelines. Adulteration has become a primary problem because of sophisticated medicinal studies and approved techniques about the legitimacy of natural drugs beyond the days. However, in the current state of medicinal studies, adulteration can be managed through existing medical techniques [11]. HPTLC is extensively used for the identification, assay, and balance research of raw substances and formulated products [12]. Antioxidants have been suggested to prevent oxidative damage caused by free radicals and ROS, and may help prevent the prevalence of disorders, cancers, and aging [13]. The search for materials with high antimicrobial activity has been one of the most intensive areas of study aimed at reducing the risk of infectious diseases caused by microorganisms, fungi, viruses, and parasites that are pathogenic to humans. Plant extracts are nevertheless the primary sources of many healing agents, which include antimicrobial agents for the remedy of infectious diseases [14]. FT-IR spectroscopy probes the vibrational properties of amino acids and their cofactors that are sensitive to minute structural modifications [15].

The physical and chemical properties of both organic extractants and solid sorbents can be investigated using specialized instrumental techniques, including Fourier Transform Infrared (FTIR) spectroscopy [16]. Qualitative Fourier transform infrared (FTIR) spectroscopy has long been set up and applied in a huge range of fields, which include pharmaceutical, bio-scientific, and medical fields [17]. Synthetic antioxidants are carcinogenic, toxic to testicles, cause oxidative damage to DNA, and cause cell death. Good food antioxidants often replace synthetic antioxidants due to the fundamental health concerns associated with them. Antioxidants are essential for preventing infections as well as degenerative diseases because they scavenge and inhibit free radicals [18].

MATERIAL METHODOLOGY

Plant collection and authentication

The *Dalbergia sisso* leaves were collected from Dinara (M. P) in 2021 and then dried at room temperature. After this, it is crushed to obtain a coarse powder. The collected samples were identified by Dr. Jagdish Arya, Botanist at the Central Ayurvedic Research Institute, Jhansi (U.P.), with voucher number 3-27/2006-07/RARI/Jhs/Drug Supply/1821, dated 07/03/2022.

Drugs and Chemicals

The chemicals and solvents used in the research studies were of analytical grade and sourced from commercial suppliers.

Physical Evaluation

Physical examinations of the leaf extract were conducted, and the extractive values and ash values were calculated using the methodology outlined in the WHO guidelines [19].

Fluorescence analysis

Take approximately 0.5 g of powdered plant into a clean and dry test tube. To every test tube, 5ml of various solvents, like 5%NaOH, 50%H_2SO_4, 50%HNO_3, Water, Chloroform, Glacial acetic acid, conc HCl, conc HNO_3, ether, Methanol, and Hexane have been separately added. Then, all the test tubes were shaken and allowed to stand for approximately 20-25 minutes. The solutions acquired were determined under visible light and UV

short-wavelength light (254nm) and UV long-wavelength light (365nm) for their feature coloration [20].

Preparation of *Dalbergia sisso* leaves extract

A Soxhlet apparatus is used for the extraction process. 150 g of *Dalbergia sisso* powder was extracted using a Soxhlet apparatus for 30 hours, employing methanol as the solvent. The solvent was vaporized and concentrated to produce a dry residue once the extraction was finished. The yield percentages for the methanolic extract were 4.8% respectively.

Phytochemical Analysis

A phytochemical test was conducted on the pure methanolic extract of the leaves using the methodology outlined in Trease and Evans [21].

PROCEDURE FOR DIFFERENT SPECTRAL ANALYSIS

HPTLC analysis

Sample extraction

A mixture of 2 g of powdered sample and 20 mL of methanol was sonicated for 15 min, and then centrifuged at 5000 rpm for 5 min. The resulting supernatant, after filtration through a 0.45 µm syringe filter, was used as a sample solution for HPTLC analysis.

Preparation of the standard solution

5mg of lupeol dissolved in a 5ml methanol solvent and kept in a glass vial for further HPTLC analysis.

HPTLC chromatography conditions

The test solution and standards were spotted in the shape of 8mm-wide strips onto TLC silica gel 60 F254 aluminum plates (10 cm × 10cm). TLC plate development was conducted in a 5-fold through chamber saturated with mobile phase (7:3 0.2 v/v/v) of toluene, ethyl acetate, and formic acid for 20 minutes at 25±2°C, up to a migration distance of 7cm. At 254 and 366 nm, as well as following derivatization with an anisaldehyde-sulfuric acid reagent. HPTLC profiles were recorded. After derivatization, the concentration of lupeol was measured at 514nm.

FT-IR analysis

The Fourier Transform Infrared Spectrophotometer (FTIR) is a highly effective instrument for determining the specific chemical bonds and functional groups that exist within compounds. The captured wavelength of light can be utilized to determine a chemical bond. The infrared absorption spectrum can provide insight into the significance of the chemical bonds present in a molecule. Dry powder methanol extract was used for FTIR analysis. A clear sample disk was formed by placing 10mg of dry powder into 100mg of KBr pellets. Analysis was performed between 400 and 4000 cm-1 on an FTIR spectrometer (Shimadzu, IRAffinity 1, Japan) with a resolution of 4 cm^{-1} and a scan speed of 4 cm^{-1}.

Antimicrobial activity test

The strains used in this study were diluted to 0.5 standard. Microcentrifuge tubes contained 100 µL of diluted bacterial culture (E. coli-MTCC452), while other tubes contained 5 µL of different treatment dilutions. The tubes were then incubated for one day. After incubation, all contents were transferred to a 96-well plate, and turbidity was measured using an ELISA microplate reader (iMark, Bio-Rad) set at 630nm. A positive ciprofloxacin control was used at 10µg [22].

Antioxidant activity assay

On a 96-well plate, mix 0.1 mL of 0.1 mM DPPH solution with 5 µL of the reserve stock solution of the test compound. The reaction was performed in triplicate, and the same buffer was prepared with 0.2 mL of DMSO/methanol and 5 µL of different concentrations of the mixture. Three hours of darkness were spent on the plate. Decolorization was measured at 495nm utilizing a microplate reader (iMark, BioRad) at the end of the incubation period. A control was utilized, consisting of a reaction mixture of 20 µL of deionized water. “Percentage inhibition” is used to indicate uptake activity relative to the control group. The IC-50 is calculated using the software GraphPad Prism [23, 24].

RESULT AND DISCUSSION

Physical evaluation

Dalbergia sisso leaves were analyzed for their physicochemical characteristics, including extractive value, moisture content, ash value, and fluorescence analysis. The results of the evaluated parameters are mentioned in Table 1. The fluorescence studies are cited in Table 2.

Phytochemical screening results

Phytochemical studies of the methanolic extract of Dalbergia sisso leaves are mentioned in Table 3. The analyses revealed the

presence of alkaloids, saponins, anthraquinone glycosides, tannins, and flavonoids in the methanolic extract of *Dalbergia sisso* leaves.

Table 1: Physical evaluation parameters

SN	Parameters	Observation
	Moisture contents	5.90±0.27
Ash values		
(a)	Total ash values	6.42±0.39
(b)	Acid-soluble extractive values	4.13±0.98
Extractive values		
(a)	Aqueous soluble extractive values	16.47±0.97
(b)	Alcohols' soluble extractive values	20.31±0.82
(c)	Petroleum ether soluble extractive values	8.44±0.73
(d)	N-hexane soluble extractive values	6.32±0.15
(e)	Chloroform soluble extractive values	3.78±0.26

HPTLC Analysis:

HPTLC studies of a methanolic extract from Dalbergia sisso leaves were analyzed at 254nm, 366nm, and under white light after derivatization. The HPTLC chromatogram at 254nm is shown in Figure 1. The HPTLC chromatogram at 366 nm is shown in Figure 2, while under white light, it is shown in Figure 3. The HPTLC studies revealed the presence of lupeol. The densitometric scan of methanolic *Dalbergia sisso* leaves is presented in Table 4 and Figure 4.

FTIR Analysis:

The FT-IR analysis of the methanolic extract of *Dalbergia sisso* leaves was performed. The bonds were determined by interpreting the infrared absorption spectra. The FTIR spectrum of the methanolic leaves extract (Figure 6), while Table 6 shows the interpretation of the chemical bonds in the methanolic leaves extract. Strong bonds were found at 3335.67 cm-1, 2925.17 cm-1, 1967.81 cm-1, 1620.47 cm-1, 1498.47 cm-1, 1364.98 cm-1, 1148.25 cm-1 and 1075.05 cm-1 while the others varied from weak to medium. These results demonstrated the presence of hydroxyl groups, hydrocarbon groups, aldehyde groups, allene groups, and secondary alcohols similar to those of quercetin, as mentioned in Table 5.

Table 2: Fluorescence analysis of *Dalbergia sisso* leaves.

SNo.	Chemical Test	Day light	Short term	Long term
1.	5% NaOH	Light yellow	Dark Yellow	Dark Brown
2.	50% H_2SO_4	Black	Dark Black	Dark Black
3.	50%HNO_3	Black	Dark Brown	Dark Black
4.	Water	Brown	Light Brown	Dark Brown
5.	Chloroform	Yellowish brown	Brown	Dark Brown
6.	Glacial Acetic acid	Yellow	Brownish Yellow	Dark Brown
7.	Conc HCl	Black	Black	Dark Black
8.	Conc HNO_3	Black	Black	Dark Black
9.	Ether	Dark Green	Brown	Dark Brown
10.	Methanol	Yellowish Brown	Light Brown	Dark Brown
11.	Hexane	Light Yellow	Dark Yellow	Brown

Table 3: Phytochemical screening of methanolic *Dalbergia sisso* leaves extracts

SNo.	Test	Methanol extract
1.	Alkaloids Mayer test Dragendroff test Hager test Wagner test	 +++ +-+ ++- +++
2.	Saponins	+++
3.	Tannins 5%Ferric Chloride test	 -++

SNo.	Test	Methanol extract
	Lead acetate solution test	++-
	Potassium dichromate test	+++
	Dil nitric acid	-++
4.	Anthraquinone glycosides	
	Borntrager test	+++
5.	Flavanoids	
	Shinoda test	+++
	Sodiumhydroxide test	++-

+ indicates presence, - Indicates absence

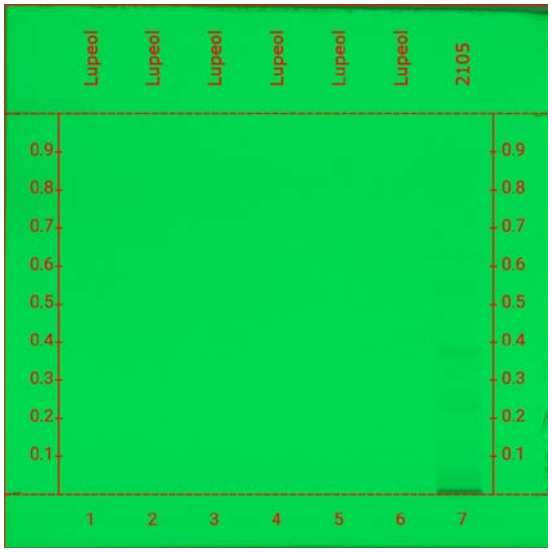

Figure 1: HPTLC Chromatogram at 254nm

#A=Sample analyzed at 254nm, #2015: Sample *Dalbergia sisso* extract

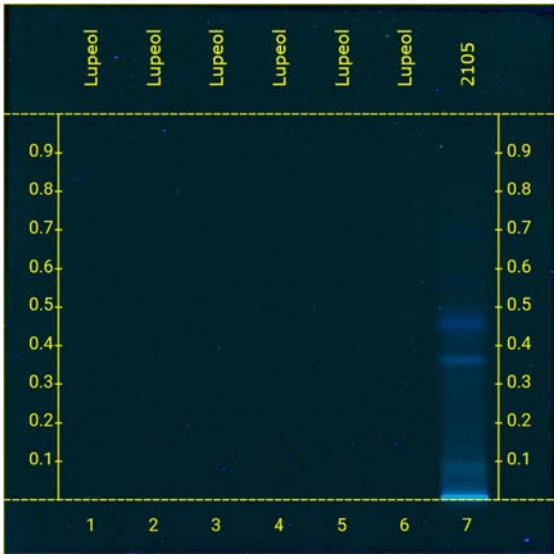

Figure 2: HPTLC Chromatogram at 366nm

#B=Sample analyzed at 366nm, #2015: Sample *Dalbergia sisso* extract

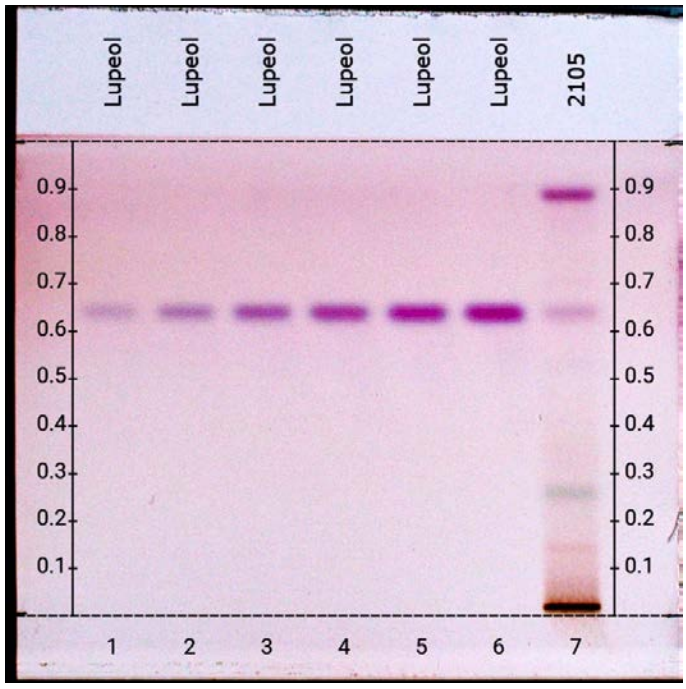

Figure 3: HPTLC chromatograms under white light after derivatization

#2015: Sample *Dalbergia sisso* extract

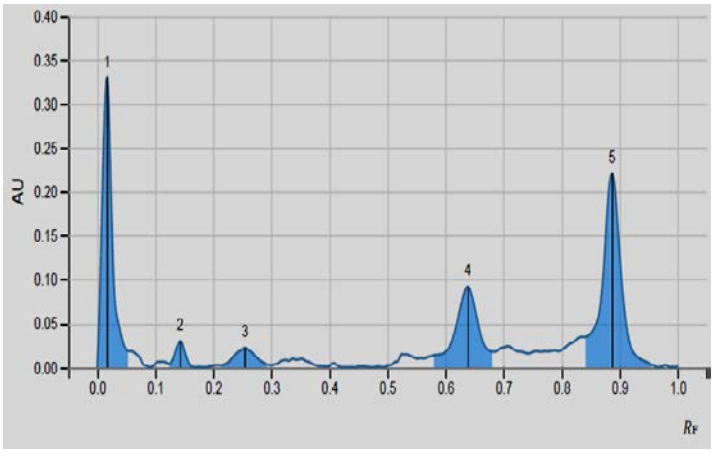

Figure 4 Densitometric scan of methanolic *Dalbergia sisso* leaf extract

Table 4: Densitometric Rf values of methanolic *Dalbergia sisso* leaf extract.

Peak	Start		Max			End		Area		Substance Name
	R_F	H	R_F	H	%	R_F	H	A	%	
1	0.000	0.0000	0.017	0.3297	47.53	0.057	0.0183	0.00680	32.29	-
2	0.124	0.0040	0.143	0.0297	4.29	0.169	0.0000	0.00058	2.78	-
3	0.213	0.0021	0.254	0.0221	3.18	0.294	0.0026	0.00096	4.54	-
4	0.577	0.0131	0.639	0.0917	13.21	0.683	0.0177	0.00438	20.80	Lupeol
5	0.840	0.0344	0.887	0.2205	31.79	0.956	0.0024	0.00834	39.60	-

Retention factor (Rf) values: At 254nm: 0.008, 0.044, 0.236, 0.372, 0.534, and 0.622, At 366nm: 0.008, 0.081, 0.362, and 0.454, Derivatized: 0.018, 0.144, 0.255, 0.641, and 0.888, The chromatogram obtained with test solutions shows bands at Rf 0.64 corresponding to that of lupeol respectively. The amount of lupeol was found to be 43.94µg/g, respectively.

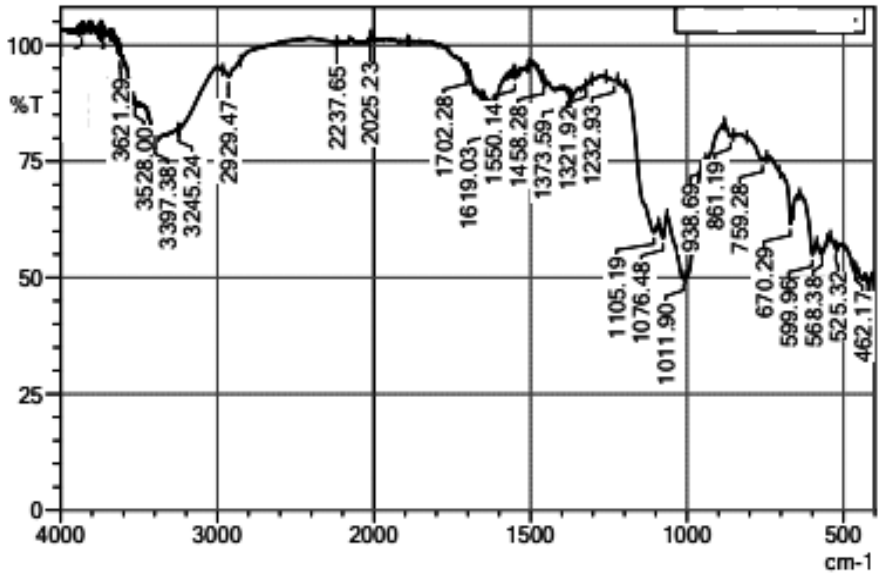

Figure 5: FT-IR spectra of Quercetin

Table 5: FT-IR analysis of Quercetin

Spectrum No.	Wave No. cm^{-1}	Wave No. cm^{-1} (Ref 25,26)	Functional Gr. Assignment	Predicted Compounds
1.	3621.29, 3528.00	3700-3500 cm^{-1}	O-H stretchings bond	Free hydroxyl groups
2.	3397.38, 3245.24	3400-3200 cm^{-1}	O-H stretchings bond	Hydroxyl groups
3.	2929.47	3000-2700 cm^{-1}	C-H stretchings bond	Aldehyde groups
4.	2237.65	2260-2200 cm^{-1}	C≡ C stretchings bond	Alkyne groups
5.	1702.28	1715-1694 cm-1	C=O stretchings bond	Carbonyl group
6.	1619.03, 1550.14	1620-1535 cm^{-1}	N=O stretchings bond	C-NO_2 groups
7.	1373.59,1321.92, 1232.93,1105.19	1400-1000 cm^{-1}	C-F stretchings	C-Fgroups
8.	1076.48,1011.90, 938.69, 861.19, 759.28	1100-750cm^{-1}	C-C stretchings	C-C groups
9.	759.28, 670.29	800-600cm^{-1}	C-Cl stretchings	C-Cl groups
10.	599.96, 568.38, 525.32	600-500cm^{-1}	C-Br stretchings	C-Br groups
11.	462.17	800-400cm^{-1}	C-X stretchings (X=F,Cl,Br or I)	C-X gr.(X=F,Cl,Br or I)

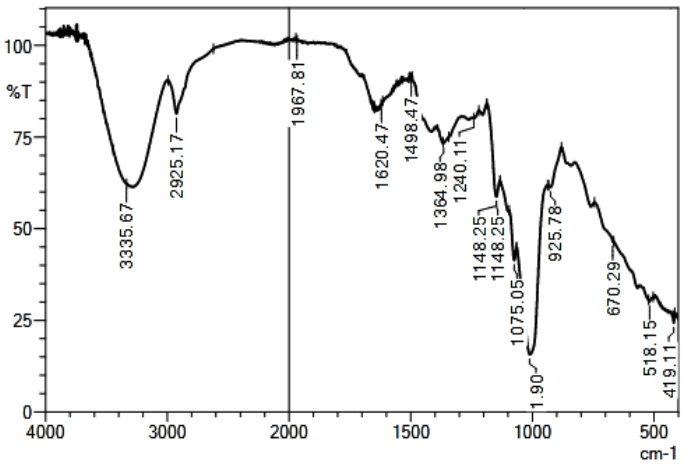

Figure 6: FTIR spectrum of the methanolic extract of *Dalbergia sisso leaves.*

Antimicrobial activity

The antimicrobial activity of the methanolic extract of *Dalbergia sisso* leaves has been assessed in this research study at various concentrations.

Table 7: Antimicrobial activity of *Dalbergia sisso* leaves methanolic extract

Sample	MIC(µg/ml)
Dalberia sisso leaves	245 µg/ml

Antioxidant activity

The antioxidant activity (DPPH scavenging) was observed in the methanolic extract of Dalbergia sisso leaves (IC50 = 370.4 ± 0.069 µg/ml, i.e., 50% inhibition at this concentration), which is equivalent to that of ascorbic acid (IC50 = 10.72 ± 0.23 µg/ml).

Table 6: FT-IR analysis of *Dalbergia sisso* leaves methanolic extract

Spectrum No.	Wave No. cm^{-1}	Wave No. cm^{-1} (Ref 25,26)	Functional Gr. Assignment	Predicted Compounds
1.	3335.67	3400-3200cm^{-1}	O-H stretching bond	Hydroxyl Group
2.	2925.17	3000-2700cm^{-1}	C-H stretching bond	Aldehyde Group
3.	1967.81	2000-1900cm^{-1}	C=C=C stretching bond	Allene group
4.	1620.47	1670-1620cm^{-1}	C=C stretching bond	Hydrocarbon group
5.	1498.47	1499cm^{-1}	C=C stretching bond	Hydrocarbon group
6.	1364.98	1400-1000cm^{-1}	C-F stretchings	C-Fgroup
7.	1240.11	1400-1000cm^{-1}	C-F stretchings	C-Fgroup
8.	1148.25	1400-1000cm^{-1}	C-F stretchings	C-Fgroup
9.	1075.05	1100-750cm^{-1}	C-C stretchings	C-Cgroup
10.	925.78	1100-750cm^{-1}	C-C stretchings	C-Cstretching
11.	670.29	800-600cm^{-1}	C-Cl stretchings	C-Cl group
12.	518.15	600-500cm^{-1}	C-Br stretchings	C-Br group
13.	419.11	800-400cm^{-1}	C-X stretchings(X=F,Cl,Br or I)	C-Xgr.(X=F,Cl,Br or I)

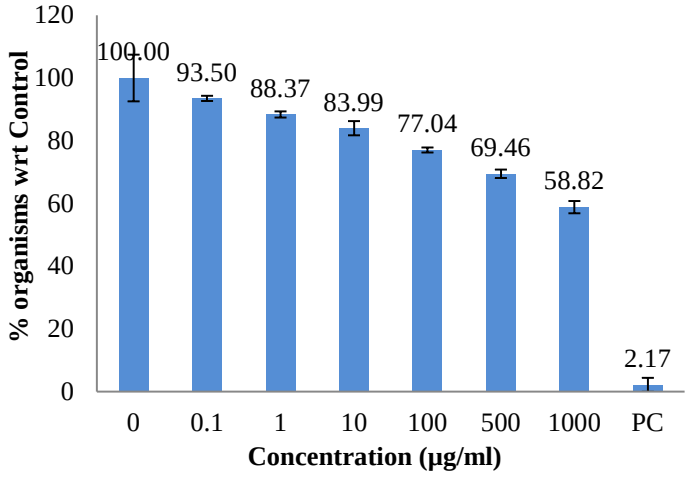

Figure 7: Anti-microbial graphical studies of *Dalbergia sisso* leaves methanolic extract.

The yield of the methanolic extract from *Dalbergia sisso leaves* was 4.8%. Table 2 represents a preliminary phytochemical screening of the methanolic extract of Dalbergia sisso leaves. In these studies, various chemical constituents, including alkaloids, saponins, tannins, anthraquinones, glycosides, and flavonoids, were identified. These phytochemical groups possess medicinal properties. For example, alkaloids exhibit various biological activities, including anti-inflammatory [27], cytotoxic [28], and antimalarial [29] properties. Equivalently, tannins, flavonoids, and saponins derived from medicinal plants possess many biological activities [30-32]. The physical evaluation parameters listed in Table 1 showed that the moisture content of the leaves was 5.90±0.27, the total ash value was 6.42±0.39, and the acid-soluble ash value was 4.13±0.98. The alcohol soluble extractive

value of *Dalbergia sisso* leaves is 20.31±0.82, which is higher than other extractive values, indicating that Dalbergia sisso leaves are highly soluble in alcohol solvent. Fluorescence analysis and the reaction of chemical powders with various chemicals/ reagents are very fast methods for identifying the desired samples. In the current research, various organic solvents were used to assess the fluorescence properties of the dried leaf powder listed in Table 3. These results are encouraging. There are various parameters, such as ash, acid value, and fluorescence, which are frequently used to obtain good information about the purity and structure of APIs.

FT-IR spectroscopy studies are one of the important tools for identifying samples. In this research studies the bonds were determined by interpreting the infrared absorption spectra. Figure 5 shows the spectra of quercetin, which demonstrates the presence of hydroxyl, aldehyde, alkyne, carboxyl, and secondary alcohol groups. Figure 6 shows the FTIR spectrum of the Dalbergia sisso methanolic leaves extract, while Table 6 shows the interpretation of the chemical bonds in the methanolic leaves extract. Strong bonds were found at 3335.67 cm-1, 2925.17 cm-1, 1967.81 cm-1, 1620.47cm-1, 1498.47 cm-1, 1364.98 cm-1, 1148.47cm-1, and 1075.05 cm-1 while the other varies from weak to medium.

The FT-IR results of *Dalbergia sisso* methanolic leaves extract demonstrated the presence of hydroxyl group, aldehyde group, alkyne group, and secondary alcohol groups similar to quercetin. Flavanols, which include quercetin and its derivatives, are suggested to be present in many medicinal plant extracts and fruit juices. These compounds are pronounced to be effective antioxidants, especially in inhibiting lipid oxidation [33]. Quercetin has been suggested to exhibit the highest free radical scavenging activity among other flavonol compounds [34].

HPTLC fingerprints enable the distinction and identification of particular plants from closely related species [35]. A clear separation of components was shown in Figures 1, 2, and 3 HPTLC of the methanolic leaves extract of *Dalbergia sisso*. HPTLC fingerprint analysis of *Dalbergia sisso* methanolic extract identified the presence of lupeol. Lupeol is a pharmacologically active pentacyclic triterpenoid found in many medicinal plants. Lupeol has anti-inflammatory and cholesterol-lowering properties. It has also been tested against diseases such as ulcers, diabetes, heart disease, kidney disease, and arthritis [36]. The DPPH free radical scavenging test is a primary method used to measure the ability of plant extracts to scavenge free radicals produced by DPPH reagents [37]. The antioxidant activity (DPPH scavenging) was observed in Dalbergia sisso leaves methanolic extract (IC50=370.4±0.069 µg/ml, i.e., 50% inhibition at this concentration), which is equivalent to (IC50=10.72±0.23 µg/ml) of ascorbic acid.

The graphical antimicrobial studies of *Dalbergia sisso* leaves 'methanolic extract are represented in Figure 7, which shows that at different concentrations, the extract exhibits antimicrobial activity. The MIC of *Dalbergia sisso* leaves' methanolic extract is 245 µg/ml. Research studies have investigated the antioxidant and antimicrobial activity of the methanolic extract from Dalbergia sisso leaves, which may be attributed to the presence of bioactive compounds, including quercetin and lupeol, identified through FT-IR and HPTLC analytical studies. Due to the presence of bioactive compounds such as lupeol and quercetin, the methanolic extract of Dalbergia sisso leaves can be further investigated for its potential as an anti-ulcer, antidiabetic, and antihypertensive agent, as well as a cholesterol-lowering drug. The *Dalbergia sisso* plant extracts could become a valuable commercial resource for further research. Only a small portion of the plant species in the world are thought to have had their bioactive chemicals thoroughly studied. The enormous reservoir of chemicals and phytoconstituents has not yet been investigated for potential advantageous use [38].

CONCLUSION

It has been concluded that *Dalbergia sisso* methanol leaves extract contains lupeol and quercetin bioactive compounds. This study presents preliminary data on the chemical composition of Dalbergia sisso leaves, as determined using FT-IR and HPTLC methods. The methanol extract of *Dalbergia sisso* leaves was shown to have antioxidant and antibacterial properties. These antioxidant and antibacterial properties can be attributed to the high content of lupeol and quercetin, which were detected for the first time by FT-IR and HPTLC, respectively.

This study also found that the methanol extract of *Dalbergia sisso leaves* may have antimicrobial, anti-inflammatory, antibacterial, antioxidant, antidiabetic, and anti-obesity properties due to the presence of lupeol and quercetin. Fluorescence analysis of *Dalbergia sisso* leaf powder shows a specific color after treatment with various reagents. Methanol

leaf extract contains alkaloids, saponins, tannins, anthraquinone glycosides, and flavonoids. The result indicated that the *Dalbergia sisso* leaves have a highly alcoholic soluble extractive value. The chemical bonds or functional groups that are present in the methanolic leaf extract of *Dalbergia sisso* were predicted using FTIR. FT-IR analysis studies of quercetin and the methanol extract of *Dalbergia sisso* leaves showed the presence of functional groups in both, thus confirming that the methanol extract contains quercetin. The results showed that the methanolic leaf extract of Dalbergia sisso was more effective against DPPH radicals.

FINANCIAL ASSISTANCE
NIL

CONFLICT OF INTEREST
The authors declare no conflict of interest.

AUTHOR CONTRIBUTION
All authors contributed equally to this work. Varun Chaddha has performed the experimental work and prepared the manuscript. Reena Gupta developed the concept, analyzed the results, and corrected the manuscript.

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