



Evaluation of Phytochemical Compounds in Methanolic Extract of *Bombax ceiba* (Flower) Using UV-VIS and FTIR Analysis

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ABSTRACT

The aim of the research work to be evaluate the pharmacological potentials of the *Bombax ceiba* (Flower) Phytochemical, antioxidant and antibacterial properties of methanolic extract were carried out. To investigate the medicinally active substances present in the methanolic extract of *Bombax ceiba* (Flower) by using the analysis of UV-VIS and FTIR. The present study was carried out to characterize the bioactive constituents present in the methanolic extract of *Bombax ceiba* (Flower) using UV-Vis and FTIR spectroscopic techniques. UV-VIS method was performed using a Perkin-Elmer Lambda 19 spectrometer while the FTIR method was performed using Buck scientific M530 system was used to detect the characteristic of peak values and their functional groups. UV-Visible spectrum revealed that the varying peaks in the range of 220- 900nm recording the absorptions at its respective wavelengths. It showed a λ max peak at 500nm. Spectrophotometer system for the characteristic of peak values and their functional groups were detected. From The UV-VIS profile showed the peaks at 238.45, 287.30, 299.70, 351.70, 354.20, 360.40 and 362.90 nm with the absorption values 4.000, 2.803, 2.315, 1.754, 1.768, 1.789 and 1.772 respectively. The result of UV-VIS spectroscopic analysis confirms the presence of phenols and Flavonoids in the *Bombax ceiba* (Flower) extract. The results of the present FTIR study confirms the presence of Phenol, Alkane, Alkene, Carboxylic acid, Aromatic compound, Nitro compound, Alcohol, Benzene and Bromo alkanes compounds.

KEY WORDS: *Bombax ceiba*, UV-VIS, FTIR, Phytochemicals, Medicinal importance.

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INTRODUCTION

The *Bombax ceibas* are a silk cotton tree, belonging to the family of Bombacaceae is a large deciduous tree found throughout the India. the well known for the medicinal properties ethnopharmacologically in the society for centuries and in traditional systems like Ayurveda, Siddha, and Unani. The plant extract is known for pharmacological activities such as anti-inflammatory, antihypertensive, antimicrobial, analgesic, antiangiogenic, anti-viral [1]. The *Bombax ceiba* (Bombacaceae) is an important medicinal plant of tropical and subtropical India. *Bombax ceiba* is a Latin word means splendid or marvellous may be named after its very tall height whereas species name ceiba is a Latinized form of the South American name for Silk Cotton. It belongs to the family Bombacaceae which includes around 30 genera with about 250 species of tropical trees. the commonly known as Simbal, Simul, Indian bombax or Red Silk cotton and found widely in temperate Asia, tropical Asia, Africa and Australia. The India, it can be found all altitudes of sea level for 1500 m elevation. The tree is a strong light-demander, fast growing and grows best on deep sandy loams or other well-drained soils throughout the year Medicinal usage of *Bombax ceiba* has been reported in many traditional systems of medicine such as Ayurveda, Siddha and Unani medicine since ancient times [2].

The interesting part tree, taken for the current study its flower which used an astringent good skin pimples, splenomegaly and haemorrhoids. *Bombax ceiba* is used in medicinal purpose in the region. Tribal community use *Bombax ceiba* plant to treat various diseases. The available for bark of *Bombax ceiba* which shows its medicinal utility in dysentery, stomachache, and vomiting. Leaves of *Bombax ceiba* are extensively used in various treatments of anemia. Flowers of *Bombax ceiba* are being also used in treating the cancerous as well as paralysis [3]. The *Bombax ceiba* (syn. *Bombax malabaricum*) is an

important medicinal plant of tropical and subtropical India commonly known as Silk Cotton Tree or Simal [4]. There is a tall deciduous tree, with straight buttressed trunk and wide spreading branches. Almost every part of the plant is used to medicine for maximum number of ailments. Its bark is mucilaginous, demulcent and emetic, and is used in healing wounds, bark paste is good for skin eruptions [5, 6].

The studies of secondary metabolites like triterpenoids obtained from plants influenced both cellular and humoral immune responses in rats and mice and it has been reported that polyphenols, flavone are effective scavengers of free radicals, and also helps in the modulation of immune functions(7).The scientific report available in the literature against the effect of the phytoconstituents enriched extract in immune modulation. The present study was undertaken to assess the in-vivo antioxidant and immunomodulatory activity of *Bombax ceiba* flower extract. The Medicinal plants used for centuries as remedies for human diseases because they contain components of therapeutic value. About 80% of world population relies on the use of traditional medicine which is predominantly based on plant material. The large deciduous tree with a straight cylindrical stem and horizontally spreading branches in whorls. The horizontally branching system in whorls, large size and the buttress at the base are the first seen characteristics to distinguish the species in the forest. The tree reached up to 40 meter in height and 2 meter in diameter with the clear bole of 24-30 meter. Large trees are invariably buttressed at the base. The stem buttresses at the base and go up to 5-6 meter in height. Family: Braginaceae. The *Bombax ceiba* possesses the active constituents which have a direct role in the management of diabetes mellitus [8].

Ultra violet visible spectrophotometry (UV-Vis) study helps to ascertain the spectral features of photons in the UV-visible region. The color of the chemicals is responsible for the absorption in the visible ranges. Molecules undergo electronic transitions in these ranges of the electromagnetic Spectrum [9]. Fourier Transform Infrared Spectroscopy (FTIR) is a vibrational spectroscopic technique that makes use infrared radiation to vibrate molecular bonds in a given sample. It is one of the most widely used method to categorize the chemical constituents and has been used as a necessary method to identify medicines for pharmacopeia in several countries [10].

MATERIAL AND METHODS

Chemicals

All chemicals were procured from Ponmani Scientific Chemicals Suppliers, Tiruchirappalli, Tamilnadu, India and were of analytical grade.

Sample

In this study, *Bombax ceiba* (flower) was collected from a Thanjavur, Tamilnadu, India.

Samples preparation

The (*Bombax ceiba*) plant Materials was cleaned and shade dried until all the water molecules evaporated and the dried plant materials (petals of flower) was taken and grinded into coarse powder. The powdered samples were stored in a clean glassware container until needed for analysis with proper labeling.

Sample extraction

The *Bombax ceiba* (flower) extract was prepared by Soxhlet method. About 20 gm of powdered was uniformly packed into a thimble and extracted with 250 ml of different solvents separately. The solvents used for petroleum ether, chloroform, ethyl acetate, acetone methanol, ethanol and water as per polarity. The extraction for 24 hours or till the solvent in siphon tube of an extractor becomes colorless. After the extract was taken in a beaker and kept on hot plate and heated at 30-40 °C till all the solvent got evaporated. Extract was kept in refrigerator at 4 °C for their future use in photochemical analysis.

UV -VIS Spectrophotometric Analysis:

The UV-VIS spectrum of methanolic extract was taken at the 200 to 800 nm wavelength due to the sharpness of the peaks and proper baseline. The profile showed the peaks at 250-900 nm using Perkin Elmer Spectrophotometer and the characteristic peaks were detected [11].

FTIR Analysis:

The FTIR spectrum was identify the functional groups of the active components present in plant based on the peaks values in the region of IR radiation. The results of FTIR analysis confirmed the presence of alcohol, phenol, alkanes, aldehyde, aromatic compound, secondary alcohol, aromatic amines and halogen compound. The transmittance was recorded between 500 and 3500 cm⁻¹ on FTIR spectrophotometer (Jasco FT/IR-6300). The functional groups present in the leaves were identified from the spectra [12].

RESULT AND DISCUSSION

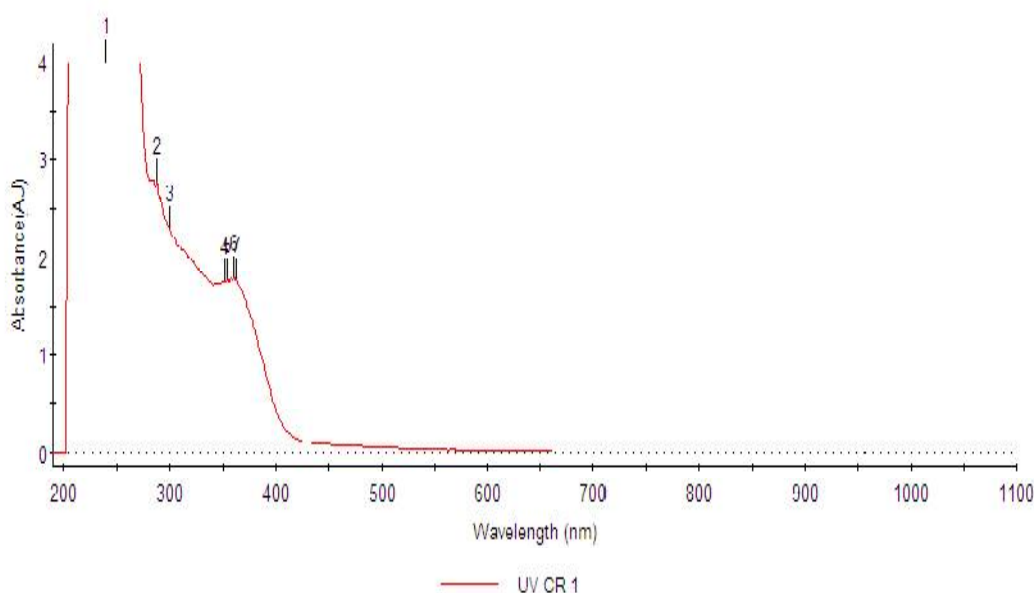
The qualitative UV-Vis spectrum profile of methanolic extract of *Bombax ceiba* (flower) was selected from 250 nm to 900 nm due to sharpness of peaks and proper baseline. UV-Vis spectrum profile of methanolic extract of *Bombax ceiba* (flower) was given in Fig.1 and its absorption values were given in table 1. The

profile showed the peaks from 250 to 900 nm and the profile showed the peaks at 238.45, 287.30, 299.70, 351.70, 354.20, 360.40 and 362.90 nm with the absorption values 4.000, 2.803, 2.315, 1.754, 1.768, 1.789 and 1.772 respectively. UV-Vis analysis result compared with literature data. The spectra for phenolic compounds (tannins) and Flavonoids typically also lie in the range of 230-290 nm (13). The result of UV-VIS spectroscopic analysis confirms the presence of phenols and Flavonoids in the *Bombax ceiba* (flower) extracts.

Table 1: UV-Vis Peak Values of Methanolic extract of *Bombax ceiba* (flower)

S. No	Wavelength(nm)	Absorption values	Literature (Nehaetal,2006)
1	238.45	4.000	Phenol and Flavonoid
2	287.30	2.803	
3	299.70	2.315	
4	351.70	1.754	
5	354.20	1.768	
6	360.40	1.789	
7	362.90	1.772	

Fig 1: UV-Vis Spectrum of Methanolic extract of *Bombax ceiba* (flower)



The Fourier Transform Infrared Spectrophotometer is perhaps the most powerful tool for identifying the types of chemical bonds present in compounds. The wavelength of light absorbed is characteristic of the chemical bond can be seen in the annotated spectrum. The dried powder of different solvent extracts of each plant materials were used for FTIR analysis. 10 mg of the dried methanolic extract of *Bombax ceiba* powder was encapsulated in 100 mg of KBr pellet, in order to prepare translucent sample discs.

The powder sample was each plant specimen was loaded in FTIR spectroscope (Shimadzu, IR Affinity 1, Japan), with a Scan range from 400 to 4000 cm^{-1} with a resolution of 4 cm^{-1} . Fig.2 and Table.2. When the *Bombax ceiba* extract was passed into the FTIR, the functional groups of the components were separated based on its peaks ratio. The results of FTIR analysis confirmed. The presence of phenol, alkane, alkene, carboxylic acid, aromatic compound, nitro compound, alcohol, and benzene and bromo alkanes compounds which shows major peaks at 3866.38, 3377.80, 2948.13, 2836.09, 2525.75, 2370.80, 2338.64, 2217.85, 2043.99, 1657.70, 1454.91, 1416.78, 1113.43, 1025.63 and 679.86 respectively(14).

The methanol extract filtrated through 0.22 μm membrane filter and then finally exposed to UV-VIS test. For further use both extracts of DMSO as a stock 500 mg/ml. The stored at 4 $^{\circ}\text{C}$ to prevent degradation of bioactive compound for further use. The results also suggest that the extract of *Bombax ceiba* has antioxidant and anti inflammatory properties (15). Spectroscopic methods have become a powerful tool for secondary metabolite profiling for qualitative and quantitative analysis of the pharmaceutical and biological materials. The present study of UV-VIS spectrophotometer revealed that the presence of phenolic compound like tannin and flavonid compound which indicates the medicinal properties of this plant. Phenolic compound tannin used as antioxidant, anti inflammatory and anti cancer and flavonoid

compound used as Antioxidative Activity, Hepatoprotective, Anti-Inflammatory, Anticancer and Antiviral activity of this plant extract also observed from this study(16).

Table 2: Functional group analysis of methanolic extract of *Bombax ceiba*(flower)by using FTIR spectroscopy

S.No	Peak Values	Bond	Functional Groups
1	3866.38	O-H Stretch	Alcohol,Phenol
2	3377.80	O-H Stretch, H bonded	Alcohols, Phenols
3	2948.13	C-H Stretch	Alkynes
4	2836.09	H-C=O:C-H Stretch	Aldehydes
5	2525.75	O-H Stretch	Carboxylic Acid
6	2370.80	C=C-stretch	Alkene
7	2338.64	C=H-stretch	Alkene
8	2217.85	-C=C-Stretch	Alkynes
9	2043.99	C≡C Stretch	Alkynyl
10	1657.70	C=O-Stretch	Carboxylic acid
11	1454.91	C-C Stretch(in-ring)	Aromatics
12	1416.78	C=C-Stretch	Aromatic compound
13	1113.43	C-N Stretch	Aliphatic amine
14	1025.63	C-N Stretch	Aliphatic amine
15	679.86	C-X-Stretch	Bromo alkenes

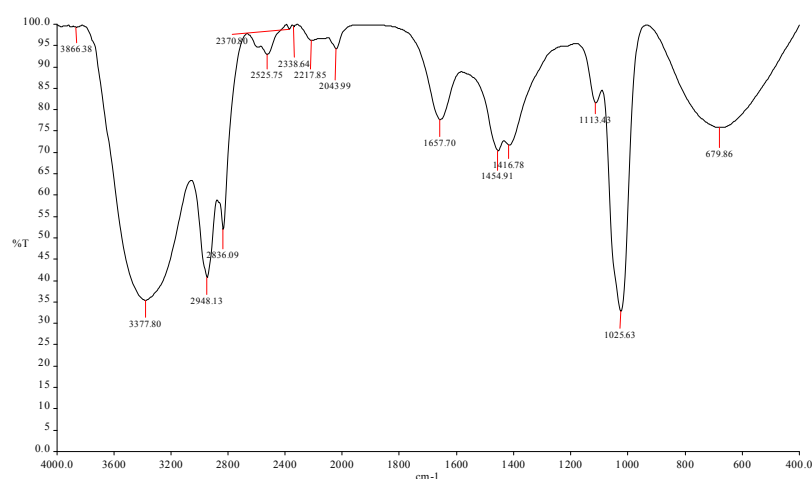


Fig 2: Functional group analysis of methanolic extract of *Bombax ceiba* (flower).

By using FT-IR spectrum, we can confirm the functional constituent's presence in the given leaf extract and even evaluate the qualities of medicinal materials. The results of the present study spectrum also revealed the functional constituents present in methanolic extracts of *Bombax ceiba*. The results of the present study confirms the presence of phenol, alkane alkene, carboxylic acid, aromatic compound, nitro compound, alcohol, benzene and bromo alkanes compounds in methanolic extract of *Bombax ceiba*. The results of the present study suggest that various medicinal properties of the *Bombax ceiba*(17). The results of the present study developed novel phytochemical marker to identify the medicinally important. Further advanced spectroscopic studies are required for the structural elucidation and identification of active principles present in the extract of *Bombax ceiba*.

CONCLUSION

The present study demonstrated that that *Bombax ceiba* plant has been extensively used in Unanisystem of medicine as well as different ethno-medicines since antiquity. Various part of the plant is used to anti-diarrheal, siccative, blood purifier, anti-asthmatic, avaricious, to increase consistency of semen, semen procreator, uterine tonic, amenorrhoea, abortifacient, anti-leucorrhoeic etc. Scientific validation regarding antioxidant, analgesic, anti-inflammatory, antipyretic, anti-carcinogenic, cytotoxic, antibacterial activities on modern scientific parameter further authenticate the wisdom of ancient Unani scholars and tribal peoples. However there is further need to identify and isolate the pharmacologically active molecules from different parts of this plant so as it can be better utilized. Identification of the antioxidant

constituents of the *Bombax ceiba* (flower) extracts which are helpful for the anti-cancer properties are yet to be studied.

CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest. The research received no specific grant from any funding agency in the public, community, or non-for profit sectors.

REFERENCES

1. Chaudhary PH, Khadabadi SS. (2012). *Bombax ceiba* Linn. Pharmacognosy, ethnobotany and phyto-pharmacology. PharmacogCommun.;2: 2-9.
2. Chakraborty DD, Ravi V and Chakraborty. (2010). Phytochemical evaluation and TLC protocol of various extracts of *Bombax ceiba* Linn. IJPSR. 1: 66-73
3. Jain V, Verma SK (2012). Pharmacology of *Bombax ceiba* L, Springer, Heidelberg.
4. Nadkarni KM. (1976). Indian Materia Medica. Popular Prakashan; 43.
5. Varier PK, Nambiar VPK, Ramankutty C. Indian Medicinal Plants - A Compendium of 500 species. Orient Longman Publishing, Kerala. 1997; 289-92.
6. Warriar PK. Indian Medicinal Plants a compendium of 500 species, Orient Longman private limited Chennai. 1994; 2: 224-89.
7. BadriaFarid, MikhaeilBotros, MaatooqGalal and Amer MA, Mohamed. Immuno-modulatory Triterpenoids from the Oleogum Resin of *Boswelliacarterii* Birdwood. 2003; 505-516.
8. RawatMukesh, ParmarNamita. Medicinal Plants with Antidiabetic Potential. American-Eurasian J Agric & Environ Sci. 2013;13(1): 81-94.
9. Gunasekaran, S. UV-VIS spectroscopic analysis of blood serum. Asian Journal of Microbiology Biotech and Environmental Science, 2003; 5(4): 581-582.
10. Subashini MS, Rajendran P, Ashok G, Kanthesh BM, TLC, FTIR and GCMS analysis of leaves of *Gymnemasylvestre* R.Br from Kolli Hills, Tamil Nadu, India. International Journal of Current Microbiology and Applied Sciences. 2015; 4(7): 757-764.
11. Iqbalhussain et al. UV-VIS spectroscopic analysis profile of ascorbic acid in medicinal plants of Pakistan. World ApplSci J. 2010;9(7): 800-803.
12. Nanzeen bobby et al. FT-IR studies on the leaves of *Albizialebeckbenth*. Int J pharm sci. 2012;4:293-296.
13. Deepa. Studies on the phytochemistry, spectroscopic characterization and Antibacterial efficacy of *Salicornia Brachiata*. Int J Pharm Pharm Sci. 2014; 6(6):430-432.
14. Parag A. Pednekar, Bhanu Raman. Antimicrobial and Antioxidant Potential with FTIR analysis of *Ampelocissuslatifolia* (roxb.) Planch. Leaves. Asian Journal of Pharmaceutical and Clinical Research. 2013; 6(1): 67-73.
15. Sathyaprabha, G., Kumaravel, S., and Panneerselvam, A. Bioactive Compounds Identification of *Pleurotus platypus* and *Pleurotuseous* by GC-MS. Advan. in Appl. Sci. Res. 2011; 2(6): 51-54.
16. Wu Y, Shan L, Yang S, et al. Identification and antioxidant activity of melanin isolated from *Hypoxylonarcheri*, a companion fungus of *Tremella fuciformis*: Basic Microbiol. 2008; 48:217-221.
17. RajeshwariSahu et al. Ultraviolet-Visible and Fourier Transform Infrared Spectroscopic Studies on Non-Conventional Species of Curcuma. IJACS. 2014; 2(4): 300-302.

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