WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
SJIF Impact Factor 8.084
Volume 12, Issue 19, 625-632. Research Article ISSN 2277–7105

PHYTOCHEMICAL SCREENING BY FTIR SPECTROSCOPIC ANALYSIS OF LEAF EXTRACTS OF *BAUHINIA RACEMOSA*

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Article Received on
15 September 2023,
Revised on 05 Oct. 2023,
Accepted on 26 Oct. 2023
DOI: 10.20959/wjpr202319-29949

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ABSTRACT

The goal of the current work is to use FTIR spectroscopy to evaluate the ethanol, chloroform, acetone, and petroleum ether extracts of leaves and of Bauhinia racemosa. The FTIR spectroscopy analyses identified numerous functional chemicals in the extracts with distinct distinctive peak values. The existence of carbohydrates, alkaloids, glycosides, saponins, phytosterols, phenols, tanin, flavanoids, proteins, and amino acid components, which showed prominent peaks, was confirmed by FTIR analysis of ethanol and acetone leaf extracts of Bauhinia racemosa. The characteristic peak values and their functional groups were found using the FTIR technique on a spectrophotometer instrument. The FTIR spectrum profiles that the present study's findings produced for Bauhinia racemosa's medicinally significant plants can be applied in the workplace.

KEYWORDS: *Bauhinia racemosa*, FTIR Spectroscopy; Functional groups.

INTRODUCTION

A rising number of people are now interested in learning more about the study of medicinal plants. Herbal medicines can be found mostly in medicinal plants. Due to the negative side effects of pharmaceuticals revealed by contemporary medicine, there is a huge need for plant-based medications. Multinational pharmaceutical corporations and domestic producers of herbal-based medications are becoming increasingly interested in medicinal plants since they are safe and very effective. The bioactive components found in medicinal plants are abundant and have pharmacological activity.[1] Many medicinal plants are utilised as alternative medicines for treating human and animal ailments because they generally have less adverse effects than synthetic pharmaceuticals. The phytochemical substances found in medicinal plants will help identify the chemical makeup of the plants by revealing some information

about the many functional groups responsible for their medicinal effects. The richest bioresources for traditional systems of medicine and folk remedies are recreated in pharmaceutical businesses through the use of medicinal plants.[2] India is the birthplace of the revived indigenous medical systems known as Siddha, Ayurveda, and Unani. A single plant is used to prepare traditional medical systems. The effectiveness is dependent on the usage of the appropriate plant component and its biological activities, which are caused by the presence secondary metabolite in a raw drug.[3-4] The current study was created to analyse the various functional groups found in these plant extracts based on this traditional use. Knowing the chemical makeup of the components found in medicinal plants can help us understand the functional groups that are responsible for their therapeutic effects.[5] Saponins are found in the crude dry powder of 11 different plants using FTIR spectroscopy.[6] The spectroscopic study using FTIR carried out using leaf, stem, and root samples from Eclipta prostrata and Eclipta alba that were ground up.[7-8] Utilising spectroscopy, the functional groups in different Aerva lanata extracts are found. FTIR spectroscopy approach used to identify elements and functional groups in the ethanol extract of the entire Ichnocarpus frutescens plant.[9] A review of the literature found that medicinal plants like Bauhinia racemose have not yet been the subject of FTIR analysis of functional groups. Therefore, an effort is made in the current work to investigate the functional groups of phytoactive chemicals found in the leaf extracts of the bauhinia racemosa using solvents such ethanol, chloroform, acetone, and petroleum ether.

MATERIAL AND METHOD

Preparation of leaf extract

Bauhinia racemosa's shade-dried leaves were ground into a fine powder using a mechanical grinder. Bauhinia racemosa leaf powder weighing 20 grammes was combined with 150 ml of solvent and four different solvents were extracted using a Soxhlet equipment. Whatman No. 1 filter paper was used to filter the extract, and the filtrate was then collected. They gathered the supernatants. At 28.1 °C, room temperature, the supernatants were collected and decreased to 150 ml by evaporation. In preparation for further study, extracts of the bauhinia racemosa leaf powder was made using four different solvents, including ethanol, chloroform, acetone, and petroleum ether.

Fourier Transform Infrared Spectrophotometer (FTIR)

Perhaps the most effective tool for determining the sorts of chemical bonds (functional groups) present in compounds is the Fourier Transform Infrared Spectrophotometer (FTIR). As can be seen in the annotated spectrum, the wavelength of light that is absorbed is indicative of the chemical bond. It is possible to identify the chemical bonds of a molecule by reading the infrared absorption spectra. For the FTIR study, dried powder containing various solvent extracts of plant components was used.

RESULTS AND DISCUSSION

The FTIR spectrum of Bauhinia racemosa leaf extracts, which were made using various solvents. The information on the peak values and likely functional groups (as determined by FTIR analysis) contained in the leaf extracts of Bauhinia Racemosa in ethanol, chloroform, acetone, and petroleum ether is shown in Tables 1 through 4.

Due to O-H and C-H stretching, the ethanolic extract of Bauhinia racemosa peaks at 3347 cm^{-1}, 2917 cm^{-1}, and 2849 cm^{-1}. The presence of the benzene ring is confirmed by bands at 1613 cm^{-1}, 1514 cm^{-1}, and 1462 cm^{-1}. The band caused by the NO2 group was detected at 1375 cm^{-1}. Due to stretching of the C-OH group and the keto (C=O) group, the band at 1710 cm^{-1} and 1047 cm^{-1}.

Due to the alkyl group's C-H stretching, the chloroform extract exhibits a distinctive peak at 2916 cm^{-1} and 2848 cm^{-1}, respectively. The presence of the benzene ring is confirmed by the band at 1619 cm^{-1} and 1462 cm^{-1}. The presence of the -NO2 group is indicated by the band at 1375 cm^{-1}. Stretching of the C-Cl molecule may be seen in the band at 729 cm^{-1}.

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Table 1: FTIR Interpretation of Bauhinia racemosa leaves in Ethanol extract.

No.	Wave number cm^{-1} [Test sample]	Wave number cm^{-1} [Reference article]	Functional group assignment	Phyto compounds Identified
1	3347	3570-3200	O-H stretch, Hydroxy group, H-bonded	Poly Hydroxy compound
2	2917	2970-2950	C-H stretch	Aliphatic Alkanes compound
3	2849	2850-2815	C-H stretch	Methoxy methyl ether compound
4	1710	1700-1725	C=O stretch,	Carbonyl compound
5	1613	1650-1600	C=O stretching vibration,	Ketone group Ketone compound
6	1514	1510-1450	C=C-C, Aromatic ring stretch	Aromatic compound
7	1462	1510-1450	C=C-C, Aromatic ring stretch	Aromatic compound
8	1375	1410-1310	O-H bend, Alcoholic group	Phenol or tertiary alcohol
9	1223	1340-1250	CN stretch	Aromatic primary amine,
10	1047	1100-1000	Phosphate ion	Phosphate compound

Table 2: FTIR Interpretation of Bauhinia racemosa leaves in Chloroform extract.

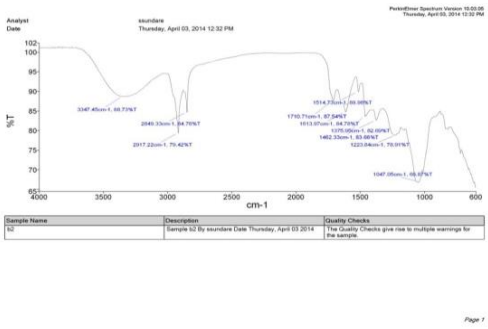
No.	Wave number cm^{-1} Test sample]	Wave number cm^{-1} [Reference article]	Functional group assignment	Phyto compounds Identified
1	2916	2970-2950	C-H stretch	Aliphatic Alkanes compound
2	2848	2850-2815	C-H stretch	Methoxy methyl ether compound
3	1619	1650-1600	C=O stretching vibration,	Ketone group Ketone compound
4	1710	1700-1725	C=O stretch,	Carbonyl compound
5	1462	1510-1450	C=C-C, Aromatic ring stretch	Aromatic compound
6	1375	1410-1310	O-H bend, Alcoholic group	Phenol or tertiary alcohol
7	1315	1410-1310	O-H bend, Alcoholic group	Phenol or tertiary alcohol
8	1035	1100-1000	Phosphate ion	Phosphate compound
9	1006	1100-1000	Phosphate ion	Phosphate compound
10	729	700-800	C- Cl stretch	Aliphatic chloro- compounds
11	719	700-800	C- Cl stretch	Aliphatic chloro- compounds

Table 3: FTIR Interpretation of *Bauhinia racemosa* Leaves in Acetone extract.

No.	Wave number cm^{-1} Test sample]	Wave number cm^{-1} [Reference article]	Functional group assignment	Phyto compounds Identified
1	3372	3400-3200	O-H stretch	Poly Hydroxy compound
2	2916	2970-2950	C-H stretch	Aliphatic Alkanes compound
3	2848	2850-2815	C-H stretch	Methoxy methyl ether compound
4	1518	1510-1450	C=C-C Aromatic ring	Aromatic compound
5	1607	1650-1600	C=O stretching	Ketone compound
6	1375	1410-1310	O-H bend, Alcoholic group	Phenol or tertiary alcohol
7	1247	1340-1250	CN stretch	Aromatic primary amine,
8	1065	1100-1000	Phosphate ion	Phosphate compound
9	1006	1100-1000	Phosphate ion	Phosphate compound

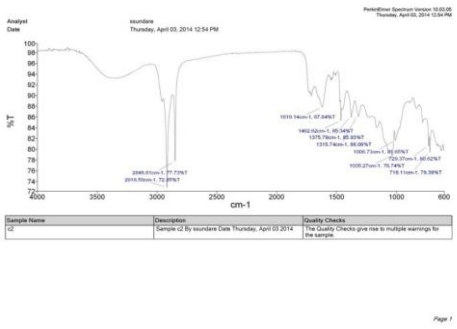
Table 4: FTIR Interpretation of *Bauhinia racemosa leaves in* Petroleum Ether.

No.	Wave number cm^{-1} [Test sample]	Wave number cm^{-1} [Reference article]	Functional group assignment	Phyto compounds Identified
1	2916	2970-2950	C-H stretch	Aliphatic Alkanes compound
2	2848	2850-2815	C-H stretch	Methoxy methyl ether compound
3	1626	1650-1600	C=O stretching	Ketone compound
4	1735	1700-1725	C=O stretch,	Carbonyl compound
5	1462,	1510-1450	C=C-C, Aromatic ring stretch	Aromatic compound
6	1376,	1410-1310	O-H bend, Alcoholic group	Phenol or tertiary alcohol
7	1063	1100-1000	Phosphate ion	Phosphate compound
8	1006	1100-1000	Phosphate ion	Phosphate compound
9	729	700-800	C-Cl stretch	Aliphatic chloro- compounds
10	719.	700-800	C-Cl stretch	Aliphatic chloro- compounds



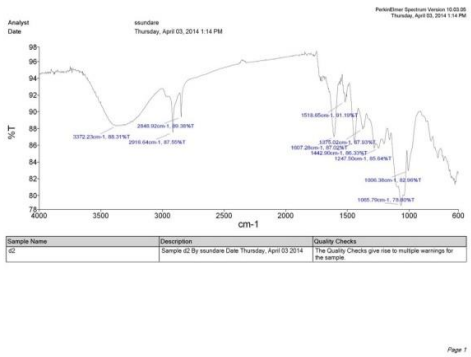
(a)

Fig. (a) *Bauhinia racemosa* in ethanol extract.



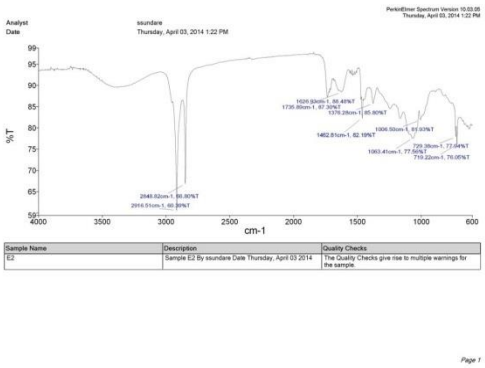
(b)

Fig. (b) *Bauhinia racemosa* in chloroform extract.



(C)

Fig. (c) Bauhinia racemosa in acetone extract.



(d)

Fig. (d) *Bauhinia racemosa* in petroleum ether extract.

CONCLUSION

The varied functional groups found in the various extracts likely point to the existence of carbohydrates, alkaloids, glycosides, saponins, phytosterols, phenols, tannin flavonoids, proteins, and amino acids. The objective reflection of componential disparities is reflected in spectral differences. Using FT-IR spectrum, we may distinguish between the medicinal materials and adulterants, establish the presence of the functional constituent in the given parts and extract, and even assess the quality of the medicinal materials. The findings of the current study were consistent with earlier findings made by several plant biologists and taxonomists. The FTIR spectrum was widely used by researchers[11–18] as a tool for separating closely related plants and other species. The present study's findings led to the development of novel phytochemical markers needed for the identification of the active principles present and the structural elucidation of those markers.

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