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FOURIER TRANSFORM INFRARED SPECTROSCOPY ANALYSIS OF *AERVA LANATA*

N. Packialakshmi*[1] and B. Sudharsan[1]

[1]*PG and Research Department of Microbiology, Jamal Mohamed College (Autonomous), Trichirappalli-620020, Tamil Nadu, India.

ABSTRACT

Aervalanata (Linn) is widely used in urinary disorders in southern part of India as a source of pashanabheda. The present study is aimed to analyse the chloroform and ethyl acetate extracts of leaves and flower through FTIR spectroscopy method. The FTIR spectroscopic studies revealed different characteristic peak values with various functional compounds in the extracts. The main objective of the study is to observe the salient features exhibited by the Fourier transform infrared Spectroscopy the vibrational assignments, intensities and wave number of dominant peak were obtained from absorption spectra. Various functional groups like alcohol, carboxylic acid, nitro compound, aromatics, halogens, phenols, amino acids, amides etc. were identified by the various solvent extraction of *Aervalanata*. This articles attempts to reveal the use of Fourier Transform Infrared Spectroscopy and at the same time creating interest among the prospective researcher in herbal analysis and this study creates a platform to screen many bioactive components to treat various diseases.

KEYWORDS

Fourier Transform Infrared Spectroscopy, Antioxidants and *Aervalanata.*

Author for Correspondence:
Packialakshmi N,
PG and Research Department of Microbiology,
Jamal Mohamed College (Autonomous),
Trichirappalli-620020, Tamil Nadu, India.

Email: packia_lakshmi_1977@yahoo.com

INTRODUCTION

Herb is an immeasurable wealth of nature not only from the global environment perspective but also from the medicinal point of view. It plays a significant role ameliorating the disease resistant ability and combating against various unfavorable metabolic activities within the living system[1]. Herbal medicine is the mainstay of about 75-85% of the world population, mainly in the developing

countries, for primary health care because of better cultural acceptability, better compatibility switch the human body and lesser side effects. The chemical constituents present in them are a part of the physiological functions of living flora and hence they are believed to have better compatibility with the human body[2]. *Aervalanata* is a self-generating erect or spreading perennial herb found throughout India. It can be found as an ingredient in traditional herbal formulations. Whole plant may be used for its rich flavonoid and polyphenol content. Though a lot of research is going on in the plant, it is used only for its traditional claim in ayurveda. Hence, an attempt is made in the present study to analyze the functional groups of phytoactive compounds present in the leaf extracts (in different solvents such as chloroform and ethyl acetate) of the medicinal plants by FTIR spectroscopic analysis.

MATERIAL AND METHODS

Plant sample collection

Aervalanata leaf, flower and stem were collected from the Thuraiyur, Trichy district, Tamil Nadu, India. The *Aervalanata* were identified by the Rapinat Herbarium St. josephs college, Trichirapalli, Tamil Nadu, India. The plant parts were separated from the plant and dried under shade. After drying, it was powdered and used for our studies.

Photography of Plant

Aervalanata (Figure No.3).

Preparation of plant extract

The leaves, Flower and Stem of *Aervalanata* were dried under shade and powdered. The powdered material was subjected to successive solvents extraction with water, ethyl acetate and chloroform using Soxhlet apparatus. The extracts were concentrated to dryness under vacuum.

Loading of the sample

The sample was added using a pasture's pipette carefully above the stand. The elevate is added on top of the stand. The mobile phase slowly flows down through the silica gel column by gravity leaving behind zone of color and a compound was elevated from the column. The elevated compounds are allowed to air dry for 5 to 10 day. The dried elevated substances are subjected for FTIR analysis. The analysis is help to known the functional group present. The analysis is help to know the functional group present in the plant. In the present study of *Aervalanata* plants of different parts were analyzed by column chromatography and then the elevated compound for future analyzed by FTIR. The elevated compounds compared for their changes in functional group and its activities.

Fourier transfer infrared spectroscopic analysis (FTIR)

The whole plant *Aervalanata* was dried at 60^0C and ground into fine powder use in a mortar and pestle. 2 ml of the sample was mixed in the 100 mg KBR (FTIR grade) and then compressed to prepare a salt disk (3mm diameter). The disk was medially kept in the sample holder and FTIR spectra were recorded in the absorbance range between 400 and 400 cm^{-1}. All investigations were carried out with a shimadzu FTIR spectrometer.

RESULTS AND DISCUSSION

The present study showed that different compounds were separated from *Aervalanata*. These eluted compounds were subjected to FTIR analysis. The FTIR spectrum was used to identify the functional group of the active components based on the peak value in the region of infrared radiation. The result of FTIR peak values and functional groups were represented in Table No.1, Figure No.1 and Table No.2, and Figure No.2. The presence of various functional groups of different compounds was found. FTIR spectroscopy is proved to be a reliable and sensitive method for detection of bimolecular composition.

The absorption spectrum of the *Aervalanata* aqueous extract leaf sample. The peak value shown in Table No.1 and Figure No.1. The peak value at 3407.24 to amines. The peak value at 2925.74 to carboxylic acids. The peak value at 2103.49 and 1631.74 attributed to alkenes. The peak value at 1403.20 to phenols. The peak value at 1072.85 to ethers. The peak value at 614.53 to halogens compound.

The absorption Spectrum of *Aervalanata* the ethyl acetate extract leaf sample. The peak values are shown in Table No.2 and Figure No.2. The peak value at 3386.94 to amine compound. The peak value at 2957.60 and 2825.56 attributed to carboxylic acid compound. The peak value at 2140.27 and 1645.33 attributed to alkenes. The peak value at 1447.26 to ethyl compound. The peak value at 1382.43 to alcohols. The peak value at 1325.49 to nitro compound. The peak value at 1241.79 to phenol compound. The peak value at 1078.32 to ethers compound. The peak value at 826.94, 778.51 and617.19 attributed to aromatic compound. The peak value at 519.99 to halogens compound.

The earlier study packialakshmi and Naziya[3] revealed that different compounds were separated from *Carallumafim briyeta* by using column chromatography. The eluted compounds were subjected to FTIR analysis. The FTIR spectrum was used to identified the functional group of the active components based on the peak value in the region of infrared radiation.

Muruganantham *et al*[4]. carried out the FTIR and EDS spectral analysis of plant parts like leaf, stem, and root of the medicinal plants, *Eclipta alba* and *Eclipta prostrate* and reported the presence of characteristic functional groups of carboxylic acids, amines, amides, sulphur derivatives, polysaccharides, nitrates, chlorates, and carbohydrate that are responsible for various medicinal properties of both herbal plants. The *Ecliptaalba* contains a higher percentage of useful elements like Na, Mg, K, Ca, Cu, Zn, and Fe than *Ecliptaprostrata*. In addition, *Ecliptaprostrata* contains more of the toxic element Cd than Ecliptaalba (Muruganantham *et al*, 2009). The FTIR analysis of methanolic and aqueous leaf extracts of *Bauhinia racemosa* revealed the presence of protein, oil, fats, phenolic compounds, flavonoids, saponins, tannins and carbohydrate as major functional groups[5]. Ragavendran *et al*[6] screened the functional groups of carboxylic acids, amines, amides, sulphur derivatives, polysaccharides, organic hydrocarbons, halogens that are responsible for various medicinal properties of *Aervalanata*. Thangarajan Starlin *et al*[7]. while analyzing the ethanolic extracts of *Ichnocarpusfrutescens*, by FTIR, revealed functional group components of amino acids, amides, amines, carboxylic acid, carbonyl compounds, organic hydrocarbons and halogens. The earlier study revealed the presence of nutritive values in the leaves of *Aervalanata* the carbohydrate, crude protein and ash were found to be moderately high[8]. The earlier study confirms the traditional medical practice and previous pharmacological observations and supplement treatment for other health problems such as allergic reactions, arthritis, some malignancies resulting from hormone deficiencies[9,10].

Table No.1: Infrared spectrum analysis of *Aerva lanata* aqueous extract of leaf powder

S.No	Peak value	Stretching	Interpretation
1	3407.24	N - H	Amines
2	2925.74	O-H	Carboxylic acids
3	2103.49	C =C	Alkenes
4	1631.74	C=C	Alkenes
5	1403.20	C-O	Phenols
6	1072.85	C-O	Ethers
7	614.53	C-Cl	Halogens

Table No.2: Infrared spectrum analysis of *Aerva lanata* Ethyl acetate extract of leaf powder

S.No	Peak value	Stretching	Interpretation
1	3386.94	N - H	Amines
2	2925.60	O-H	Carboxylic acids
3	2857.56	O-H	Carboxylic acids
4	2140.27	C=C	Monosubstited
5	1645.33	C-O	Alkenes
6	1447.26	C-O	Ethyl
7	1382.43	C-Cl	Alcohol
8	1325.49	N=O	Nitro compounds
9	1241.79	C-O	Phenols
10	1078.32	C-O	Ether
11	826.94	C-H	Aromatics
12	778.51	C-H	Aromatics
13	617.19	C-H	Aromatics
14	519.99	C-CL	Halogens

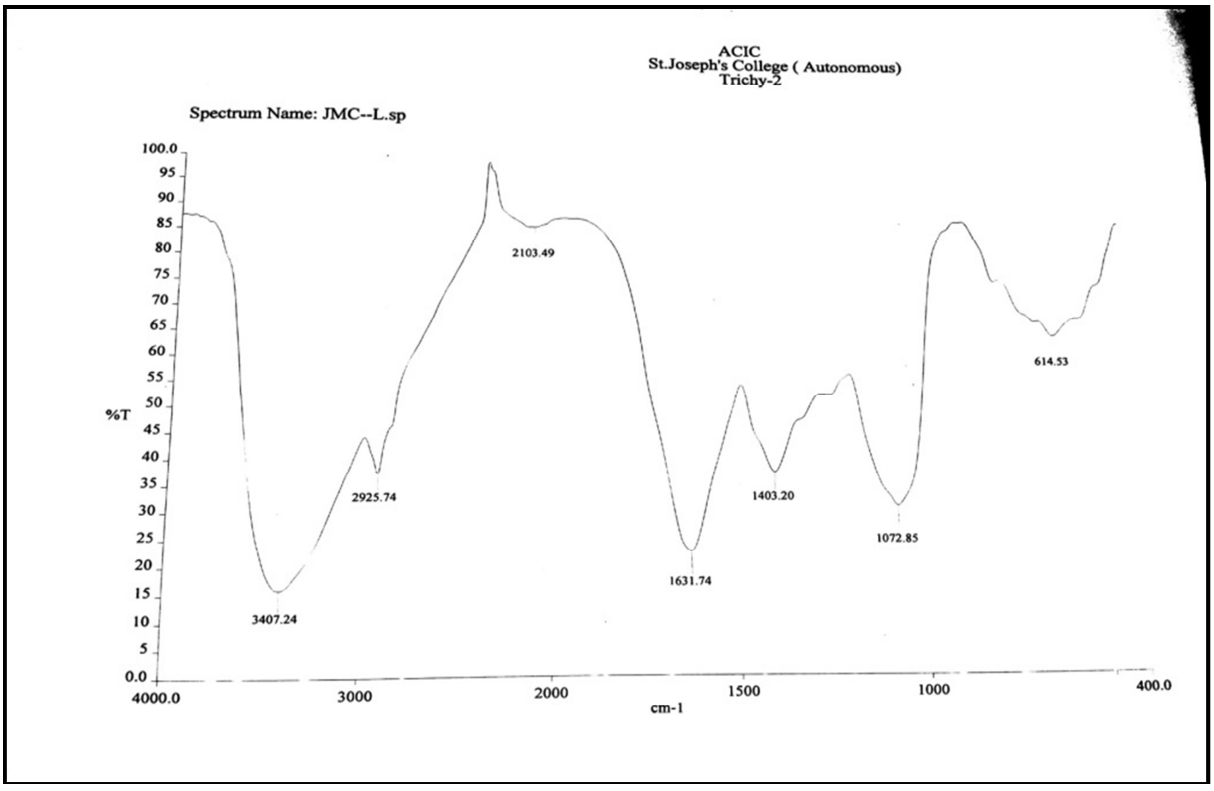

Figure No.1: Infrared spectrum analysis of *Aerva lanata* aqueous extract of leaf powder

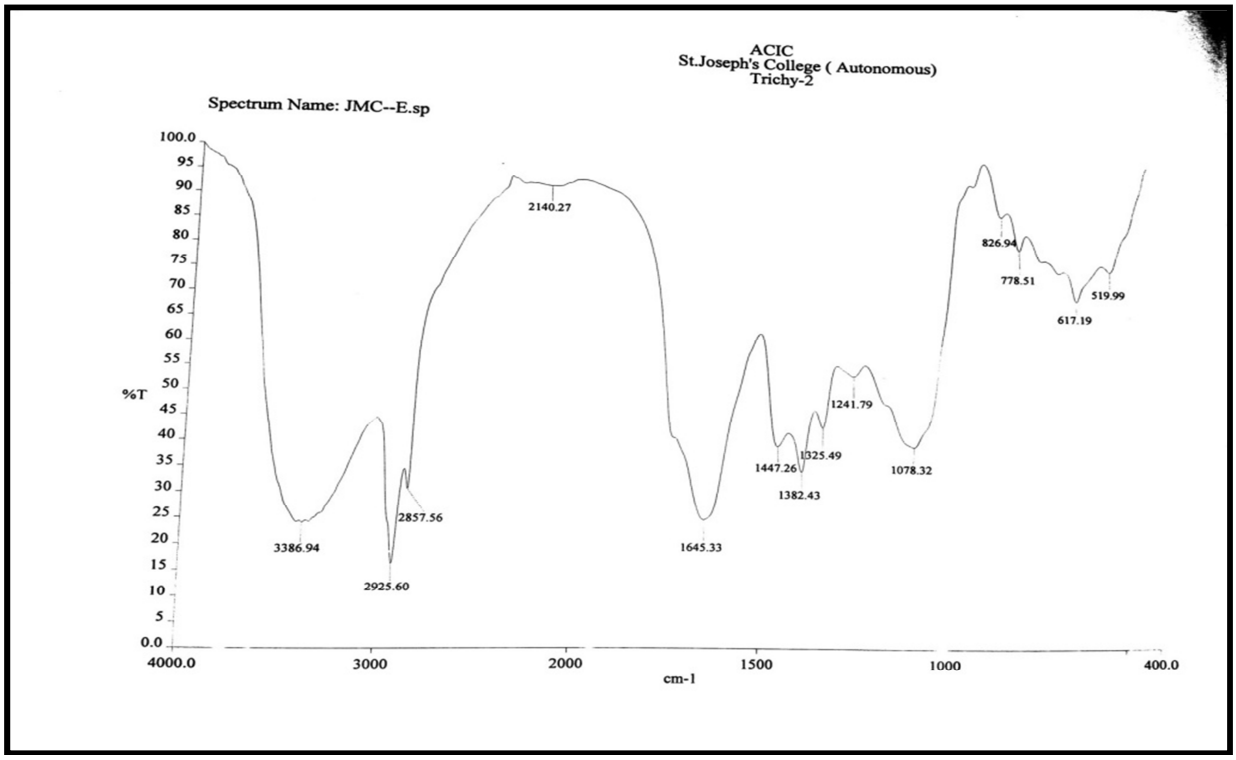

Figure No.2: Infrared spectrum analysis of *Aerva lanata* Ethyl acetate extract of leaf powder

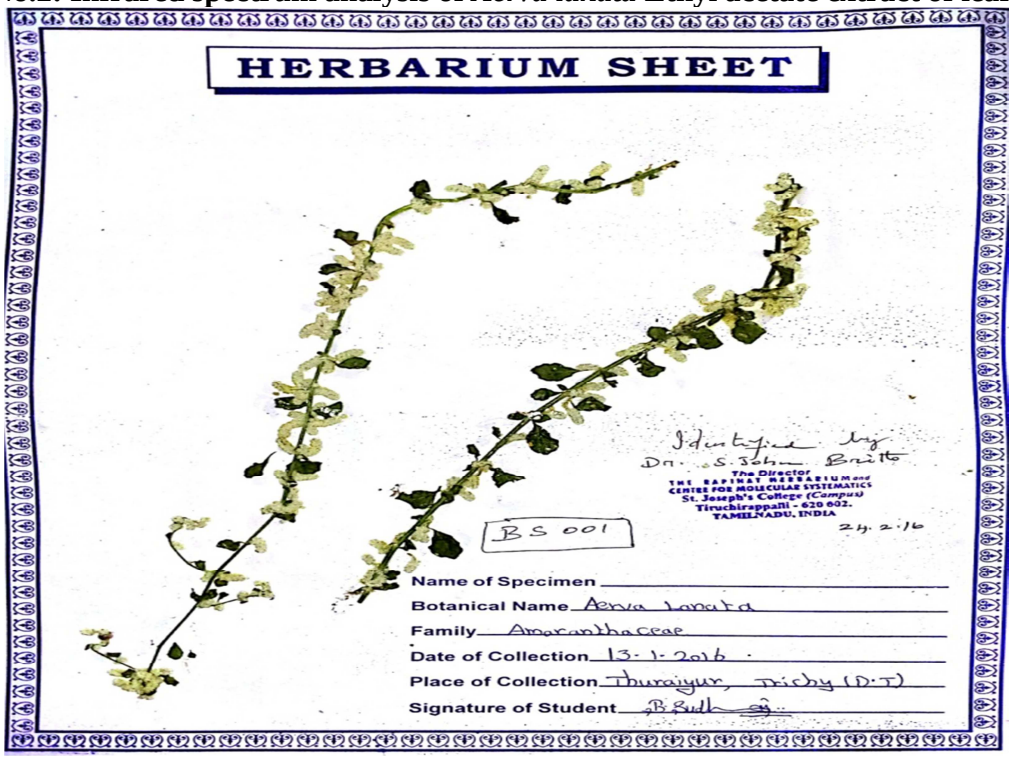

Figure No.3: *Aerva lanata* [BS 001]

CONCLUSION

An attempt has been made in this work to study the functional derivatives of the sample. By observing the position and relative intensities of the band in FTIR. The spectra analysis indicated that the specific functional group. FTIR spectroscopy technique showed that the presence of functional groups which can be isolated and further screened for different kind of biological activities depending their therapeutic uses. Further research will be needed to find out the structural analysis of compound by use of different analytic method such as NMR and Mass spectrophotometer.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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