Research Article **CODEN: AJPCFF** **ISSN: 2321 – 0915**

Asian Journal of Phytomedicine and Clinical Research

Journal home page: www.ajpcrjournal.com

FOURIER TRANSFORM INFRARED SPECTROSCOPY ANALYSIS OF *TEPHROSIA PURPUREA* LINN (SHARPUNKHA, WILD INDIGO)

N. Packialakshmi*[1] and M. Mohamed Firnas Khan[1]

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

ABSTRACT

An antioxidant is a molecule capable of slowing or preventing the oxidation of other molecules. Oxidation is a chemical reaction that transfers electrons from a substance to an oxidizing agent. Oxidation reaction can produce free radicals which start chain reactions that damage cells. Antioxidants terminate these chain reactions by removing free radical intermediates and inhibit other oxidation reactions by being oxidized themselves. As a result antioxidants are often reducing agents such asthiols, ascorbic, acid or polyphenols. 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 *Tephrosia purpurea*. This articles attempts to reveal the use of Fourier Transform Infrared Spectroscopy and 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 *Tephrosia purpurea.*

Author for Correspondence:

Packialakshmi N,
PG and Research Department of Microbiology,
Jamal Mohamed College (Autonomous),
Trichirappalli, Tamil Nadu, India.

Email: packia_lakshmi_1977@yahoo.com

INTRODUCTION

Tephrosia purpurea is a species of flowering plant in the pea family, fabacea that has a pantropical distribution. It is a common wasteland weed. In many parts it is under cultivation as green manure crop. It is found throughout India and Sri Lanka in poor soils[1]. The root and seed are reported to have insecticidal and piscicidal properties and also used as vermifuge[2]. The roots are also reported to be effective in leprous wound and their juice is applied to the eruption on skin. Its aerial parts and roots are used in bronchial asthma, hepatic ailments, pain and

inflammation. *Tephrosia purpurea* is a wild plant known as "Sarapunkha" in Sanskrit,'Purpletephrosia' or 'Wild indigo' in English and "Avuri" or "Kolinji" in Tamil and 'Unhali' in Gujarati. In Ayurvedic system of medicine various part of this plant are used as remedy for impotency, asthma, diarrhea, gonorrhea, ulcear and urinary disorders [3].

Tephrosia purpurea 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. Hepatocytes may show apoptotic changes due to reasons like alcoholism, hepatitis, use of hepatotoxic drugs etc. Use of liver restoratives and correctives is part of the regimen for liver diseases. *Tephrosia purpurea* is an important ingredient of these liver tonics. It is a plant with great research interest and a number of articles and papers have been published on the other potentials of this herb. This article tries to review the literature on the plant *Tephrosia purpurea* and highlight the possible reasons behind the poor translational outcomes from research and how do we address those reasons[4,5]

MATERIAL AND METHODS

Collection of Plant Materials

Tephrosia purpurea leaf, bark, flower and seed were collected from the Panaikulam village, Ramanathapuram District, Tamil Nadu, India. The plants were identified by the Rapinant Herbarium *Tephrosia purpurea* (Fa 001) St.josephs College, Tiruchirappali, Tamil Nadu, India. The plant were separated from the plant and dried under shade. After drying, it was powdered and used for our studies.

Photography of Plant

Tephrosia purpurea (Figure No.1).

Preparation of Plant Extract

The different parts of *Teprosia purpurea* plant bark, leaf, flower, and seed were collected and dried for 2-3 days and further dried at 60^0 C. The Dried plant parts were extracting with solvents. Ethanol and Chloroform separately and incubated at room temperature for 48 hours with stirring at regular interval. The extract were filtered with the Whitman filter paper, and then dried by using rotary evaporator. The filtrate was stored in screw cap bottle at -20 C for further use.

Fourier Transform Infrared Spectroscopic Analysis (FTIR)

The whole plant *Tephrosia purpurea* was dried at 60^0C and ground into fine powder using a mortar and pestle. Two milligrams of the sample was mixed with 100mg KBr (FTIR grade) and then compressed to prepare a salt disc (3mm diameter). The disc was immediately kept in the sample holder and FTIR spectra were recorded in the absorption range between 400 and 400cm $^{-1}$.All investigations were carried out with a Shimadzu FTIR spectrometer.

RESULT AND DISCUSSION

The present study showed that different compounds were separated from *Tephrosia purpurea.* 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.2, Table No.2, Figure No.3, Table No.3 Figure No.4 and Table No.4, Figure No.5. 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 *Tephrosia purpurea* aqueous extract. The peak value shown in Table No.1 and Figure No.2. The peak value at 1456.40, 1319.54 and 1271.20 cm^{-1} attributed to nitro compound. The peak value at 774.70, 696.93 and 614.01 cm^{-1} represent the Aromatics compound. The absorption peak value at 2923.46 and 2855.01 cm^{-1} Carboxylic acid. The peak value at 1379.10 and 1233.15 cm^{-1} attributed phenol compounds. The N-H strecting was found to be presence due to the

appearance of absorption peak value at 3296.77cm^{-1} at Amines compound. The peak value at 2300.47 cm^{-1} shows Amines compound. The peak value at 1073.70 cm^{-1} revealed the presence of the Ethers compound. The peak value at 520.61cm^{-1} shows Halogen compounds

The absorption Spectrum of *Tephrosia purpurea* the chloroform extract. The peak values are shown in Table No.2 and Figure No.3. The peak value at 1316.11, 1273.22 and 1156.83 cm^{-1} attributed ti Nitro compounds. The peak value at 2920.78 and 2854.05 cm^{-1} represent the Carboxylic acid. The absorption peak value at 2301.27 cm^{-1} represent the Amino acid Compound. The c=o strecting was found to be presence due to the appearance of absorption peak value at 1735.33 cm^{-1} is Acid anhydrides compound. The peak value at 1644.97 cm^{-1} revealed at presence of the N=o stretching. The peak value at 1457.27 cm^{-1} show Alkanes compounds. The peak value at 1377.32cm^{-1} revealed the presence of the Alcohol. The peak value at 1228.45 cm^{-1} revealed the presence of the Phenols. The peak value at 1074.35 cm^{-1}show in Ethers. The peak value at 721.08 cm^{-1} show Aromatics compound. The peak value at 612.40 cm^{-1} revealed at the presence of the Halogens. The peak value at 3273.23 cm^{-1} show amines compound.

The absorption spectrum of the aqueous extract of *Tephrosia purpurea* seed sample. The peak value shown in Table No.3 and Figure No.4. The peak value at 3754.78 and 3405.80 cm^{-1} attributed to Amines compound. The peak value at 1405.16 and 1235.95 cm^{-1} represents the phenols compound. The absorption of peak value at 668.29 and 616.06 cm^{-1} represent the Halogen compounds. The C-O stretching was found to be presence due to appearance of absorption peak value at 1075.56 cm^{-1}. The peak value at 891.86cm revealed at presence of the C-H stretching. The peak value at 1634.72 cm^{-1} shows Alkanes. The peak value at 2928.09 cm^{-1} shows Carboxylic acid.

The absorption spectrum of the *Tephrosia purpurea* chloro form extract Seed sample are shown in Table 4 and figure5.The peak value at 895.71, 827.04 and 779.94 cm^{-1} attributed to aromatic compound. The peak value at 665.26, 619.56, 511.21 cm^{-1} revealed the presence of the Halogen compounds. The peak value at 1642.31 and 1322.61 cm^{-1} represent the nitro compounds. The absorption peak value at 3405.04 represent the Alcohol compound. The N-H stretching was found to be presence due to the appearance of absorption peak at 2288.19 cm^{-1} the peak at 2926.96 reveled at presence of the O-H stretching. The peak value at 1382.90 cm^{-1} shows phenols. The peak value at 1070.32 cm^{-1} shows ethers.

In earlier study Devi *et al*[6] revealed the methanol extract in various parts of *Tephrosia purpurea* showed maximum inhibitory activity (66 percent). The order of DPPH radical scavenging ability of different extracts of *Tephrosia purpurea* was methanol, ethanol, chloroform, acetone, aqueous, petroleum ether respectively. The present study concluded the chloroform extract gave the maximum activity against the pathogens.

The earlier study packialakshmi and Nazia[7] revealed that different compounds were separated from *Carallumafimbriyeta* by using column chromatography. The eluted compounds were subjected to FTIR spectrum 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 present result concluded that the active components were identified through FTIR analysis.

The earlier study[8]reported that the *Tephrosia purpurea* posses significant against $cc1_4$induced liver damage in rat. As fraction A is a flavonoids and it has shown hepatoprotective activity it is concluded that hepatoprotective activity in the drug is due to presence of flavonoids. The higher activity of leaves extract may be contributed due to synergistic effect of flavonoids present in the drug.

Table No.1: Infrared spectrum analysis of *Tephrosia purpurea* aqueous extract by leaf powder

S.No	Peak value	Stretching	Interpretation
1	3296.77	N-H	Amines
2	2923.46	O-H	Carboxylic acid
3	2855.091	O-H	Carboxylic acid
4	2300.47	N-H	Amino acids
5	1640.35	N=H	Amides
6	1456.40	C-H	Nitro compounds
7	1379.10	N=O	Phenols
8	1319.54	N=O	Nitro compounds
9	1271.20	N=O	Nitro compounds
10	1233.15	C-O	Phenols
11	1073.45	C-O	Ethers
12	774.70	C-H	Aromatics
13	696.93	C-H	Aromatics
14	614.01	C-H	Aromatics
15	520.61	C-L	Halogens

Table No.2: Infrared spectrum analysis of *Tephrosia purpurea* Chloroform extract by leaf powder

S.No	Peak value	Stretching	Interpretation
1	3273.23	N-H	Amines
2	2920.78	O-H	Carboxylic acid
3	2854.05.17	O-H	Carboxylic acid
4	2301.27	N-H	Amino acids
5	1735.33	C=O	Acid anhydrides
6	1644.97	N=O	Amides
7	1457.27	C-H	Alkanes
8	1377.32	C-O	Alcohols
9	1316.11	N=O	Nitro compounds
10	1273.22	N=O	Nitro compounds
11	1228.45	C-O	Phenols
12	1156.83	C-F	Nitro compounds
13	1074.35	C-O	Ethers
14	721.08	C-H	Aromatics
15	612.40	C-L	Halogens

Table No.3: Infrared spectrum analysis of *Tephrosia purpurea* aqueous extract by seed powder

S.No	Peak value	Stretching	Interpretation
1	3754.78	N-H Rocking	Amines
2	3405.80	N-H	Amines
3	2928.09	O-H	Carboxylic acid
4	1634.72	C=C	Alkanes
5	1405.16	C-O	Phenols
6	1235.95	C-O	Phenols
7	1075.56	C-O	Ethers
8	891.86	C-H	Aromatics
9	668.29	C-CL	Halogens
10	616.06	C-CL	Halogens

Table No.4: Infrared spectrum analysis of *Tephrosia purpurea* chloroform extract by seed powder

S.No	Peak value	Stretching	Interpretation
1	3405.04	O-H	Alcohol
2	2926.96	O-H	Carboxylic acids
3	2288.19	N-H	Amino acids
4	1642.31	N=O	Nitro compounds
5	1382.90	N=O	Phenols
6	1322.61	N=O	Nitro compounds
7	1070.32	C-O	Ethers
8	895.71	C-H	Aromatics
9	827.04	C-H	Aromatics
10	779.94	C-H	Aromatics
11	665.26	C-Cl	Halogens
12	619.59	C-Cl	Halogens
13	511.21	C-Cl	Halogens

Figure No.1: *Tephrosia purpurea*

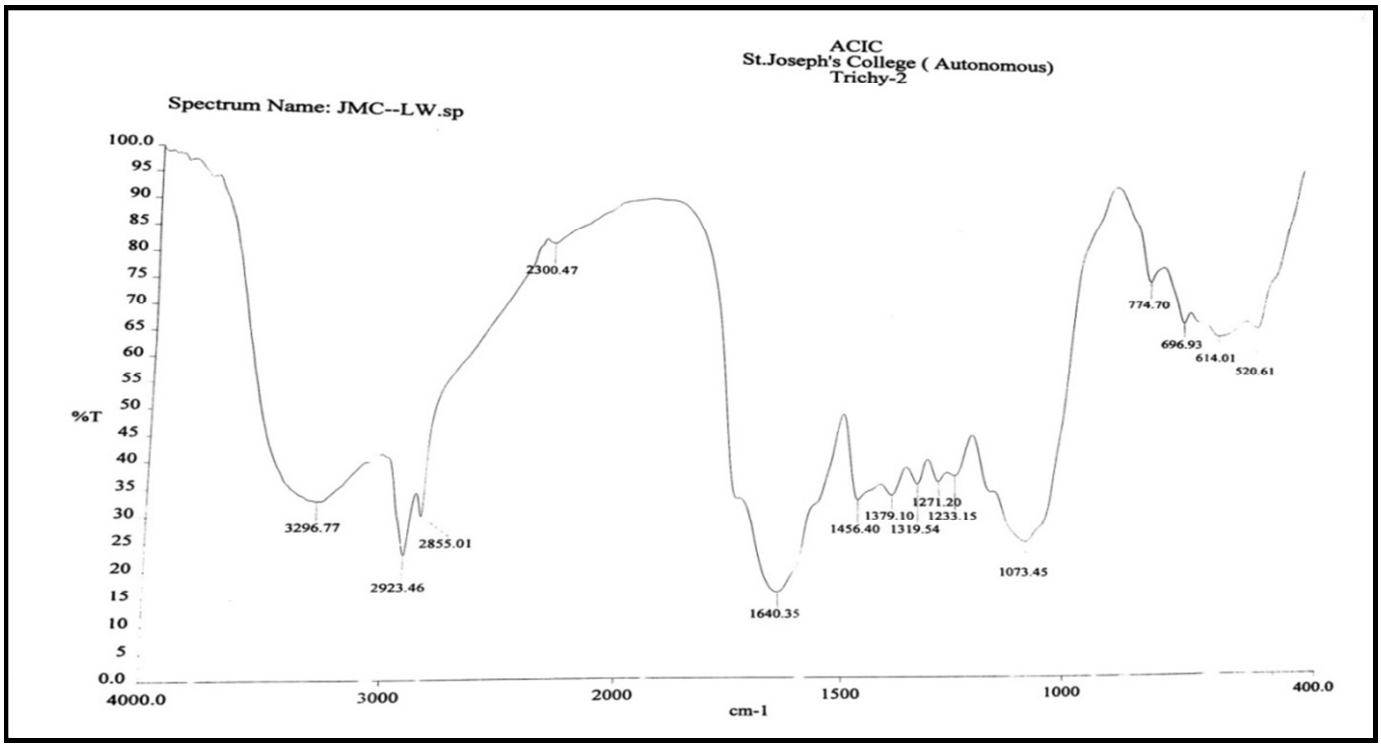

Figure No.2: IR Spectrum of JMC-LW

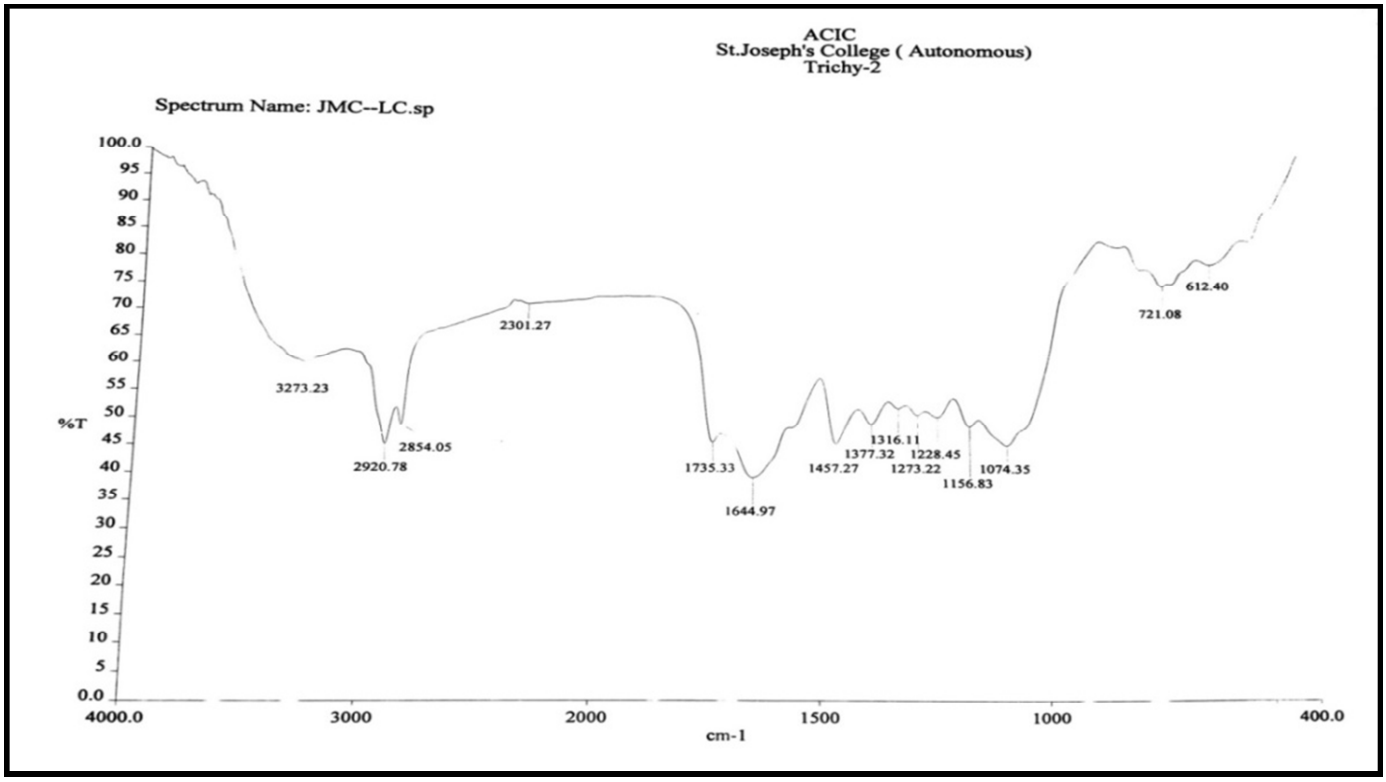

Figure No.3: IR Spectrum of JMC-LC

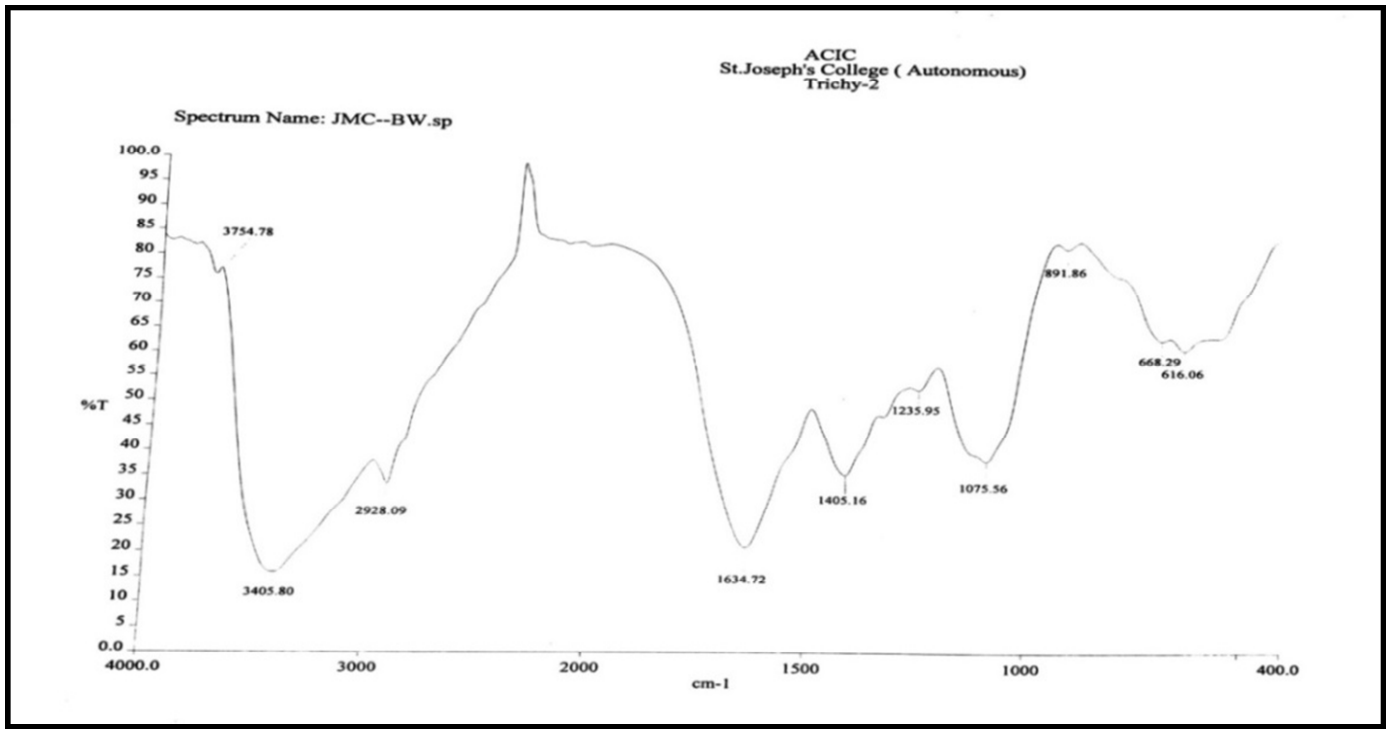

Figure No.4: IR Spectrum of JMC-BW

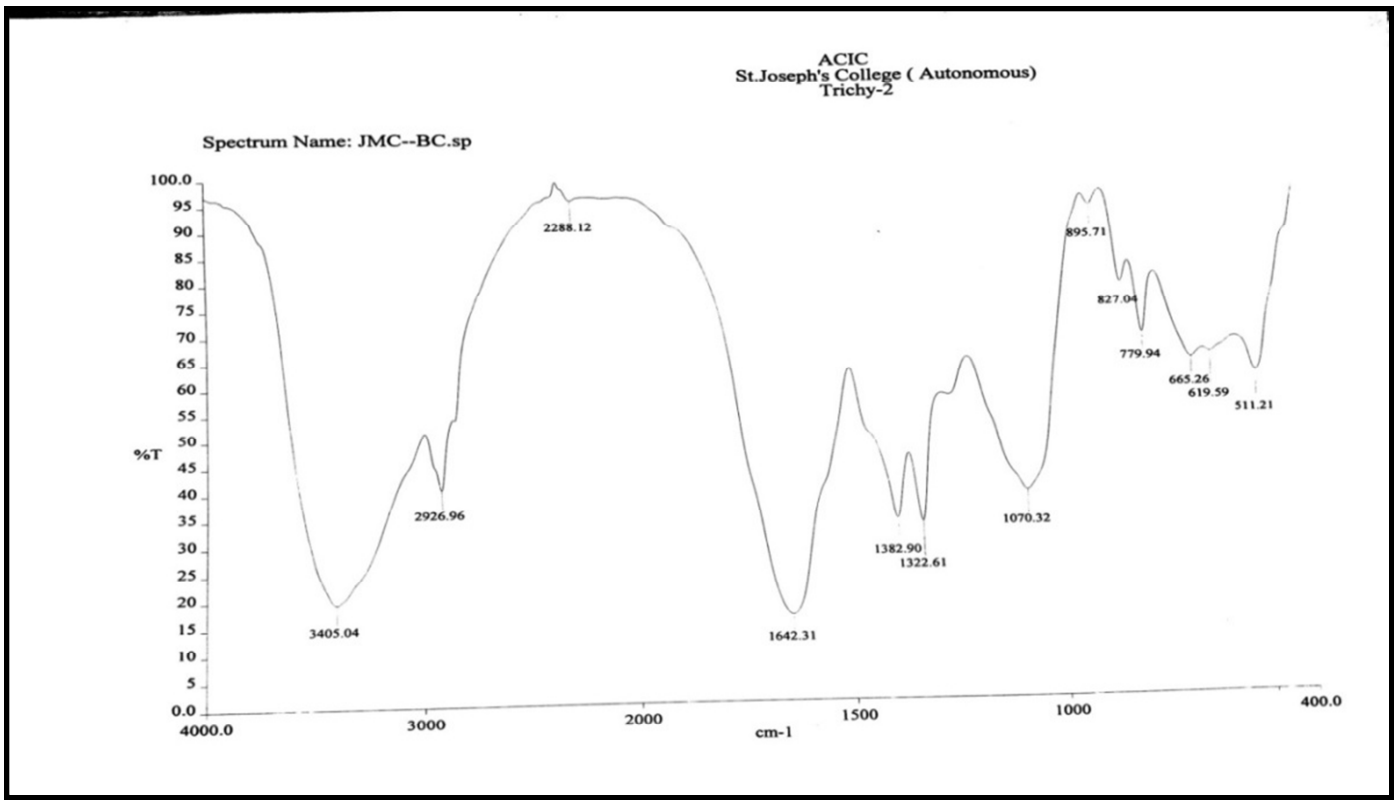

Figure No.5: IR Spectrum of JMC-BC

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.

ACKNOWLEDGEMENT

The authors are thankful to principle and Management of Jamal Mohamed College (Autonomous), Trichirapalli for offering facilities to carry out this study.

CONFLICT OF INTEREST

We declare that we have no conflict of interest.

BIBLIOGRAPHY

1. Arnold M D and Harry L. “Poisonous Plants of Hawaii” Tokyo, *Japan: Charles E. Tuttle Co*, 1968, 57-58.
2. Joshi S G. “Oleaceae. In: Medicinal Plants” New Delhi, *Oxford and IBH publishing Co. Pvt. Ltd*, 2000, 211.
3. Zafar R, Mujeeb M and Ahmed S. “Preliminary phytochemical screening of root culture of *Tephrosia purpurea*” (Linn.) Pers, *Hamdard Medicus*, XI VIII, 2004.
4. Warrier P K, Nambiar V P K, Ramankutty C and Vasudevan R N. Indian medicinal *Tephrosia purpurea* in dimethyl benzanthracene (DMBA) induced hamster buccal pouch carcinoma, *Indian J Pharmacology*, 3(2), 2006, 185-89.
5. Hatcher H, Planalp R, Cho J, Torti F M and Torti S V. Curcumin from ancient medicine to current clinical trials, *Cell Mol Life Sci*, 65(11), 2008, 1631-5.
6. Gayathri Devi S, Sabna K A, Mary Shobanas C. Evaluation of *in vitro* free radical scavenging activity of *Tephrosia purpurea, World journal of pharmacy and pharmaceutical science,* 3(7), 2014, 1236-1244.
7. Packialakshmi N, Naziya S, Fourier transform infrared spectroscopy analysis of various solvent extracts of *Carallumafimbriyata, Asian journal of biomedical and pharmaceutical science,* 4(36), 2014, 20-25.
8. Llavarasan R, Mohideen S, Vijayalakshm M and Manamnam G. Hepatoprotective effect of *Cassia angustifolia vahl, Indian J. Pharm. Sci.,* 63(6), 2001, 504-507.
9. Neba Ngwa Akongnwi. Effects of improved Fallow with *Tephrosia purpurea* on Leoidopterus Borer attacks on maize and yield parameters in a mid altitude area of North West Cameroon, *Journal of Academic and industrial research*, 3(11), 2015, 527-532.
10. Kumar G S, Jayaveera K N, kumar C K, Sanjay U P, Swamy B M and Kumar D V. Antimicrobial effects of Indian medical plants against acne-inducing bacteria. *Tropical Journal of pharmaceutical research*, 2007, 6(2), 2007, 717-723.
11. Kumar, Deepak, Dhamodrarn P, Nilceni P and Balakrishnan N. Larvicidae activity of *Teprosia purpurea* on (L) against the larvae of *cukexauinavefasiciatus, Journal of applied pharmaceutical science,* 2(7), 2012, 219-221.
12. Noor Afsal khan. *In vitro* antimicrobial activity of triterpenoidsaponin from *Tephrosia purpurea* seeds extracts, *European Journal of Chemistry,* 2(2), 2011, 189-192.
13. Leng Chee Chany, Daniel Chavez, Lyndas L. Song, Norman R, Fransworth, John M, Pezzulo And Douglas Kinghorn A. Absolute configuration of Noval Bioactive flavanoids

from *Tephrosia purpurea*, *American chemical society*, 2(4), 2000, 515-518.

14. Sathish Kumar A, Amudha P and Sathesh Kannan. Evaluation oh Anxiolytic Activity of Hydrochronic activity of *Tephrosia purpurea (L)* person Swiss Albino mice, *International Journal of Pharmaceutical Science and Research,* 2(5), 2011, 1262-1269.
15. Ajain, Singhai A K and Dixit V K. A Comparative study of ethanol extract of leaves of *Tephrosia purpurea* and the flavanoids isolated for hepatoprotective activity, *Indian Journal of pharmaceutical science,* 68(6), 2006, 740-743.
16. Soloman S G, Cheikyula J O and Anju D O. Behavior Response of Hetero branches longifillis Juveniles Val Exposed to freeze dried Bark Extract of *Tephrosia vogelii* as an Anaesthetic, *Journal of Stress Physiology and Biochemistry,* 10(1), 2014, 82-92.

Please cite this article in press as: N. Packialakshmi and M. Mohamed Firnas Khan. Fourier transform infrared spectroscopy analysis of *tephrosia purpurea* linn (sharpunkha, wild indigo), *Asian Journal of Phytomedicine and Clinical Research,* 4(1), 2016, 20 - 28.