International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Assessment of Functional Group in Herbal Formulation Thalisapaththiri Choornam through Fourier Transform Infrared Spectroscopy

Vinothinee .R[1], Antonyduraichi .R[2]

[1]PG Scholar, Department of PG Gunapadam, Government Siddha Medical College, Palayamkottai.

[2]Lecturer Grade II, Department of PG Gunapadam, Government Siddha Medical College, Palayamkottai
vinothinee15696[at]gmail.com

Abstract: ***Siddha medical practice originated from time immemorial and developed gradually to an longer extent. Pharmacological evaluation of these plants and their taxonomical relatives leads to development of invaluable drugs for dreaded diseases. Hepatocytes (hepar =liver + cyte = cell) are responsible for making many of the proteins in the body that are required for many functions. The siddha formulation "Thalisapathithiri chooranam" is used .The functional groups of this formulation are analysed through FTIR Spectrocopy and the biological roles of the functional groups are discussed in this paper. To explore the elemental characterization of herbal Thalisapaththiri choornam.The ingredients used in the trial drug are Elam (Eletteria cardamomum), Sathikkai (Myristica fragrans, Vaalmilagu (Piper cubeba), Vaividagam (Embelia ribes),Chirakam (Cuminum cyminum), Kottam (Costus speciosus), Nellivatral (Dry alma roots), Sombu (Foeniculum vulgare) Karampu (Syzygium aromaticum), Chatipaththiri (Myrstica fragrens), Lavangapattai (Cinnamomumverum), Thaniya (Coriandrum sativum), Thippili (Piper longum), Akarkara (Anacyclus pyrethrum), Thandrikai(Terminalia bellerica)Jadamanji (Nardostachys grandiflora), Thalisapaththiri (Abies spectabilies),Sugar (Saccharum officinarum).The trial drug is prepared as per siddha literature kannuswaamy paramparai vaithiyam pg no. 105. The Functional Group studied through FTIR study. It can be correlated in WHO recommended parameters for confirmed the standardizations in above drug. FTIR Characterization of trial drug "Thalisapaththiri choornam" shows the presence of some functional group such as alkenes, Nitrocompound, Aromatic compounds, Carboxylic acid, alkyl aryl ether, phosphorus,alcohol amine salt, silicon function and Halo compounds. This study forms the base for the pharmaceutical analysis of "Thalisapaththiri choornam" which will be followed by safety and efficacy studies later. All the modern scientific parameters provide it is minimal size particles and good characteristic nature of the drug. Thae characterized functional groups are analysed throughresearch papers from journals which provide the information that they have hepatoproctetive, antioxidant, hypolipidemic, Immunomodulator, antimicrobial, antiviral, cytotoxic activities .So Thalisapaththiri choornam is highly therapeutic in Jaundice as mentioned in siddha text books.***

Keywords: FT-IR, Thalisapaththiri chooranam, Herbal Siddha Formulation, Functional groups, Jaundice

1. Introduction

The World Health Organization (WHO) is estimated that 80% of populations used traditional medicine developing countries for primary health care needs (WHO Guidelines-2007). In that way, Siddha medicine has profound vital role in disease prevention and prophylaxis through its herbal medicine and other forms of medicine like choornam, chendooram, Parpam and other 32 types of preparation (Thiyagarajan.R-2006). The standardization of drug and clinical efficacy of study in Thalisapaththiri choornam (Kannusamy paramparai vaithiyam –page-105), here performed the Spectroscopic standardization of Thalisapaththiri choornam. The spectroscopic standardization Scanning electron microscopy, Energy Dispersion X-ray Spectrometric analysis and Infrared (FTIR) studies were used and results were documented.

The spectroscopic standardization to help the reducing the adulteration and definitely helps to understand the characterization of selected ingredients. Modern parameters are very useful to find out the drug adulteration and misidentification. The unidentified chemical compounds, physiochemical compounds were producing hazards to human health. So , Indian system of medicine is needed for standardization. So, saint siddhars used purification methods (suththi muraigal) in ancient periods, the structural standardization will be proved via spectroscopic studies and FTIR analysis. As per guidelines of WHO and AYUSH insisted the guidelines for quality control to better standardization of the drugs as pertain to Pharmacopeia Laboratory of Indian Medicine (PLIM). The Systematic steps should be taken to standardization of traditional drugs by using modern techniques like FTIR. In siddha text "Kannusamy paramparai vaithiyam" page no. 105 mentioned the indication of Thalisapaththiri choornam.

2. Materials and Methods

INGREDIENTS OF TRIAL DRUG OF THALISAPATHTHIRI CHOORANAM

1.Elam (Eletteria cardamomum)	2 Varagan(8.4 gm)
2.Sathikkai (Myristica fragrans)	2 Varagan (8.4gm)
3.Vaalmilagu (Piper cubeba)	2 Varagan(8.4 gm)
4.Vaividagam (Embelia ribes)	2 Varagan(8.4 gm)
5.Chirakam (Cuminum cyminum)	2 Varagan(8.4 gm)

6.Kottam (Costus speciosus)	2 Varagan (8.4 gm)
7.Nellivatral (Dry alma roots)	2 Varagan (8.4 gm)
8.Sombu (Foeniculum vulgare)	2 Varagan(8.4 gm)
9.Karampu (Syzygium aromaticum)	2 Varagan (8.4 gm)
10.Chatipaththiri (Myrstica fragrens)	2Varagan (8.4 gm)
11.Lavangapattai (Cinnamomum verum)	2 Varagan (8.4 gm)
12.Thaniya (Coriandrum sativum)	2 Varagan (8.4 gm)
13.Thippili (Piper longum)	2 Varagan(8.4 gm)
14.Akarkara (Anacyclus pyrethrum)	2 Varagan(8.4 gm)
15.Thandrikai (Terminalia bellerica)	2 Varagan (8.4 gm)
16.Jadamanji (Nardostachys grandiflora)	2 Varagan (8.4 gm)
17.Thalisapaththiri (Abies spectabilies)	2 Varagan (8.4 gm)
18.Sugar (Saccharum officinarum)	1/2 pagam (In chooranam)

Purification of Raw Drugs

Elam (Eletteria cardamomum)
Dust sand waste particles to be removed and dry under direct sunlight

Sathikkai (Myristica fragrans)
Mixed with mud and thoroughly rubbed through and husk is removed.

Vaalmilagu (piper cubebe)
Remove the dust particles and fry it away.

Vaividagam (Embelia ribes)
Remove the dust particles and fry it away.

Chirakam (Cuminum Cyminum)
Dust, sand and waste particle must be removed and dried under sunlight.

Kottam (Costus speciosus)
Dust, sand, waste partiles to be removed and dried under sunlight

Nellivatral (Dry alma roots)
Remove the dust particles

Sombu (Foeniculum vulgare)
Remove the dust particles

Karampu (Syzygium aromaticum)
Dust, sand, waste particles to be removed and dried under direct sunlight.

Chatipaththiri (Myrstica fragrens)
Soak in lime juice and dry it away

Lavagapattai(cinnamomum veram)
Dry it in sunlight.

Thaniya (Coriandrum sativum)
For purification it should be enclosed in a piece of cloth and made to hang with support and soaking it into hot water or lime juice and allowed to heat and dried under sunlight.

Thippili(Piper longum)
Soak in lemon juice and dry it

Akarkara (Anacyclus pyrethrum)
Remove out the dust particle.

Thandrikai (Terminalia bellerica)
The inner seed is removed.

Jadamanji (Nardostachys grandiflora)
Outer covering is scrapped off then chopped into small pieces and dried in sunlight.

Thalisapaththiri(Abies spectabilies)
Remove the dust particles keep it in sunlight and fry it away.

Sugar (Saccharum officinarum)
Remove the dust particles

3. Process

Method of Preparation
The ingredients are slightly fried in earthern plate then by using stone mortar. The ingredients are powdered well and filtered by a sieve to it half quantity of powdered sugar candy is added. Then the powders are mixed well thoroughly and stored in a airtight glass container.

Shelf Life:
3 months

Indication:
- Kaasam (Cough)
- Shyam (Tuberculosis)
- Kaikaal erivu (Pheripheral neuritis)
- Thaagam (Thirst)
- Vikkal (Hiccup)
- Suram (Fever)
- Asthivettai (Veneral heat affecting the bones in the system - osteotables)
- Vaandhi (Vomitting)
- Arosagam (Tastelessness)
- Nenjerivu (Heart burn)
- Gunmam (Peptic ulcer)
- Kaamalai (Jaundice)

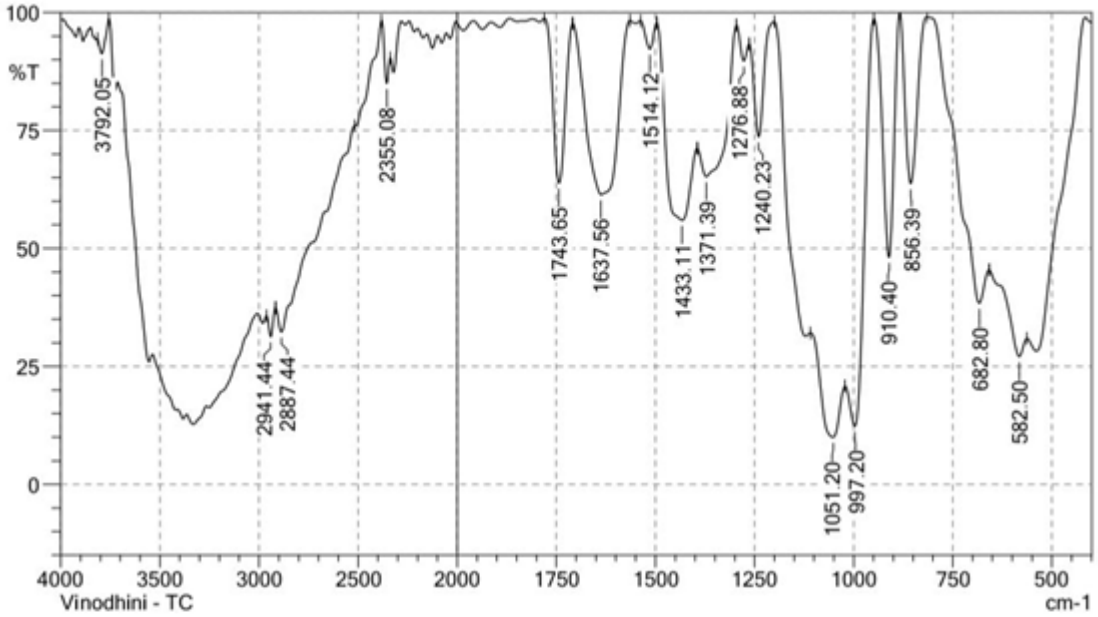
Dosage
800 – 1000mg (Thirigadi)

4. Results and Interpretation

FTIR Analysis

FT – IR Spectra were recorded at *Kalasalingam* Academy of Research and Education (International Research Centre), *Srivilliputhur*. IRTracer – 100 Fourier Transform Infrared (FTIR) Spectrophotometer was used to derive the FT – IR Spectra of *Thalisapaththiri chooranam* in Potassium Bromide (KBC) matrix with scan rate of 20 spectra per second at the resolution 0.25 cm¹ in the wave number region 400-4000 cm. The samples were ground to fine powder using agate motor and pestle and then mixed with KBr. They were pelletized by applying pressure to prepare the specimen (the size of specimen about 13 mm diameter and 0.3 mm in thickness) to recorded the FT-IR spectra under Standard conditions. The recorded spectrum is given in Figure 1.]

Table 1: FTIR Spectra of TC Chooranam



No.	Peak	Intensity	Corr. Intensity	Base (H)	Base (L)	Area	Corr. Area	Comment
1	582.50	27.11	6.77	657.73	563.21	6016.379	173.451	
2	682.80	38.41	15.53	815.89	657.73	5140.546	753.789	
3	856.39	63.75	35.89	883.40	815.89	1204.311	1173.609	
4	910.40	48.12	51.35	948.98	883.40	1590.813	1548.324	
5	997.20	12.34	35.12	1022.27	948.98	4319.827	1370.568	
6	1051.20	10.00	14.56	1109.07	1022.27	7105.442	719.922	
7	1240.23	73.67	21.38	1263.37	1199.72	793.992	519.718	
8	1276.88	89.73	5.25	1296.16	1263.37	239.750	86.681	
9	1371.39	65.23	12.15	1394.53	1296.16	2683.517	1137.814	
10	1433.11	56.01	25.26	1496.76	1394.53	3384.130	1803.128	
11	1514.12	92.28	5.74	1537.27	1496.76	196.163	117.054	
12	1637.56	61.41	36.58	1708.93	1564.27	3433.464	3142.908	
13	1743.65	63.88	34.34	1780.30	1708.93	1247.205	1121.015	
14	2355.08	84.99	8.48	2382.09	2337.72	434.839	183.091	
15	2887.44	32.30	7.93	2916.37	2517.10	18772.565	1489.228	
16	2941.44	31.30	5.21	2962.66	2916.37	3051.154	115.390	
17	3792.05	91.28	4.85	3815.20	3757.33	354.801	154.880	

Table 2: FTIR Interpretation of TC Chooranam

Wave number in cm $^{-1}$	Vibrational modes in TC in IR region	Functional group
582.50cm $^{-1}$	C-l stretching	Halo compound
682.80cm^{-1}	C=C stretching	Alkenes
856.39cm $^{-1}$	C-H stretching	Aromatic compound
910.40cm $^{-1}$	C-H bending	Alkanes
997.20cm $^{-1}$	P-oe esters	Phosphorus
1051.20cm $^{-1}$	C-N stretching	Amine
1240.23cm $^{-1}$	C-oe stretching	Alkyl aryl ether
1276.88cm $^{-1}$	C-N stretching	**A**mine
1371.39cm $^{-1}$	O-H bending	Alcohol
1433.11cm $^{-1}$	O-H bending	Carboxylic acid
1514.12cm $^{-1}$	N-O stretching	Nitro compounds
1637.56cm $^{-1}$	C=C stretching	Alkene
1743.65	C-H bending	Aromatic compound
2355.08	Si- H silane	Silicon function
2877.44	N-H stretching	Amine salt
2941.44	N- H stretching	Amine salt
3792.05	O-H stretching	Alcohol

5. Results

From the above analysis, the test drug TC is known to have Alkane, Alkene, Nitrocompound, Aromatic compound, Alkyl aryl ether, silicon function, Amine salts, Alcohol and Halo compound. These compounds have some pharmaceutical properties and are briefly discussed below.

- The sample drug TC through FTIR has its Peak value 582.50cm $^{-1}$, which has C-l stretching exhibit halo compound and the peak value 682.80cm $^{-1}$ 1637.56cm C=C stretching exhibit functional group alkenes.
- Peak value 856.39cm -1 has C-H stretching exhibit functional group aromatic compound.
- Peak values 910.40cm $^{-1}$ cm $^{-1}$1743.65c $^{-1}$ have C-H bending exhibit functional group Aromatic compounds.
- Peak values 997.20cm $^{-1}$ have P-oe ester exhibit functional group phosphorus.
- Peak value 1051.20cm $^{-1}$,1276.88 cm has C-H stretching show functional group like Amine .

- Peak value 1240.23cm $^{-1}$ C-oe stretch exhibit functional group of Alkyl & Aryl ether.
- Peak values 1371.39cm $^{-1}$,1433.11cm $^{-1}$, 37992.05 cm has O- H stretching exhibit functional group of Alcohol.
- Peak value 1514.12 cm has N-O stretching exhibit functional group nitro compound.
- 2355.08 cm si- H silane exhibit functional group silicon.
- 2877.44 cm, 2941.44cm N-H stretching exhibit functional group amine salt.

Interpretation

FTIR instrumental analysis was done. The test drug was identified to have 12 peaks. They are the functional groups present in the trial drug Aavarai panchaga choornam. The above table shows the presence of Alkanes, Alkenes, Nitro compounds, Flurocompounds, Halocompounds and Aromatic compounds.

- **Alkanes -** They have (2,3&4alkyl groups bonded to the carbon atoms of double bond are disubstituted, trisubstituted , tetrasubstituted) exhibit high antimicrobial activity, immunomodulator and antioxidantactivity.
- **Alcohol** – Alcoholic group of substances acts as antimicrobial and antiseptic agents. It is also used as a vasodilator, disinfectant and an anti- inflammatory agent.
- **Amines** – Amines are inorganic derivatives of ammonia, they play a very significant role in the creating aminoacids. Amines have anti-cytotoxicbactivity, anti-viral, hypolipidimic activity.
- **Alkene** - This is used as a general anaesthetic and have antioxidant activity. This is also used to prepare some organic compounds such as ethyl alcohol, acetic acid and acetaldehyde.
- **Nitro compounds** – They are organic compounds that contain one or more nitro functional groups. They have anti-cancer, anti-anti bacterial and anti-parasitic activities.
- **Carboxlic acid -** acts as Anti bacterial, hepatoprotective, Anti pyretic and cytotoxic , Anti oxidant .
- **Alkyl Halides and Aryl Halides.**
  Alkyl halides have little biological activity. They protect against bacteria and fungi.
  Aryl halides Several aromatic chloro compounds are used as insecticides, fungicides and bactericides.
- **Aromatic compounds**
- They have antibacterial, anti dyspepsia and antioxidant activities. Several aromatic chloro compounds are used as insecticides, fungicides and bactericides.

6. Conclusion

Nowadays it is very essential to validate the traditional formulations to get various knowledge regarding the science behind those formulations. The FTIR characterization findings of Thaliasapaththiri chooranam shows the presence of functional group through theirstrectcg and bends which is responsible for its functional activity. According to this presence of functional group with hepatoproctetive, hpolipidemic, antiviral, antimicribial, antioxidant activities which is mentioned in siddha texts as indication for jaundice. It will have subjected to further many studies to validate its efficacy and safety through proper standardization procedure. Thus this drug can be taken to the next level of isolation of active principles which is responsible for therapeutic effectshelps to standardize Siddha Materia Medica(Mineral And Animal Kingdom),

Acknowledgement

I wish to express my sincere thanks to Dr.R. Antony Duraichi, Lecturer, Department. of Gunapadam, GSMC, Palayamkottai, for the valuable support and for giving the authentication for the raw materials of the drug used in the preparation of medicine.

I wish to express my sincere thanks to International Research Centre, Kalasalingam Academy of Research and Education, Krishnan kovil for providing the FTIR result of the drug.

Reference

[1] Kannuswaamy paramparai vaithiyam pg no.105 First edition (1948) published by Rathnanayakar&sons ref pg.no.64
[2] Synthesis and spectral characterization of new bis(2 (pyrimidin-2-yl)ethoxy) alkanes and their pharmacological activity Vangavaragu Jhansi Rani et al. Arch Pharm (Weinheim). 2012 Aug.
[3] Rania Mhiri Characterization of aromatic compounds and biological activities of essential oils from Tunisian aromatic plants Springer June 2018 Journal of Food Measurement and Characterization 12(2) DOI:10.1007/s11694-017-9698-8
[4] 4.Pharmacological effects of Aliphatic Nitro compounds Marvin H. Goldhttps://doi.org/10.1016/B978-0-08-010909-150047-3.
[5] Thiru K.S.Murugesa Mudhaliyar, Gunapadam Mooligai vaguppu (part 1), Department of Indian Medicine & Homeopathy, Chennai-106: 2013.
[6] Sambasivampillai .T.V., Siddha Medical Dictionary (TamilEnglish),Department of Indian Medicine & Homeopathy, Chennai-106, 4th print-2016.
[7] Somasundaram. S, Maruthuva ThavaraIyal, Vol – 1, Ilangovan publishers, Tirunelveli – 2, 1997 edition
[8] Fourier Transform Infra-red Spectroscopy available at: https://www.lpdlabservices.co.uk/analytical_techniques
[9] chemical_analysis/ftir.php
[10] Asep Bayu Dani Nandiyanto, Rosi Oktiani, Risti Ragadhita, How to Read and Interpret FTIR
[11] Spectroscope of Organic Material, Indonesian Journal of Science & Technology,4(1)(2019)97-118
[12] Wikipedia. 2021. “Alcohols (medicine)”. Last modified February 19, 2021. http:// en.wikipedia.org/wiki/-Alcohol-Medicine.
[13] Properties and Uses of Amines. [January 15, 2016]: available at ; https://byjus.com/chemistry/uses-ofamines/
[14] Synthesis and pharmacological activities of amine bromide burnam, bruce. S current medicinal chemistry vol. 12 No. 17,2005,Bentham science publishers.

[15] Hepatoprotective effect of aqueous extract of cardamom against gentamicin induced hepatic damage in ratsMohamed Aboubakr*, Abdelazem Mohamed AbdelazemInternational Journal of Basic and Applied Sciences
[16] Hepatoproctetive activity of piper longum Linn S. S. Jalalpure M. B. Patel , N. S. Prakash, K. Hemalatha, M. V. Manavi
[17] Department of pharmagonoay and phtochemistry Indian j pharm. Sci., 2003,65(4) , 363-366