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FTIR Characterization analysis of the siddha formulation Sarakkondrai Ilai Chooranam(SIC)

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Abstract

The aim of the study is to characterize the Siddha formulation Sarakkondrai ilai chooranam using FT-IR analysis. Fourier transform infrared spectroscopy is a fast and nondestructive analytical method. The FT-IR spectroscopy applied in the mid infra red region 3000cm^{-1} to 500cm^{-1} revealed the presence of functional groups like Amine salt, Alcohol, Carboxylic acid, Alkane, Esters, Delta lactone, Aldehyde, aromatic compound, Iminoloxime, Alkene, Phenol, Sulfone, Fluoro compound, Sulfonide and Halo compound. This study highlights the modern standardizing techniques for bringing herbal formulation into focus.

Keywords: Sarakkondrai ilai chooranam, FT-IR, Functional groups

Introduction

Siddha is a holistic medical system that has been practiced in India. Siddha system is considered to be one of the ancient system of medicine in the world. It is one among the AYUSH system in India. Siddha Materia Medica is classified into three categories which include herbal, mineral and drugs from animal origin. Sarakkondrai ilai chooranam is a Siddha formulation. It is indicated as a good drug for Neerizhivu (Diabetes mellitus)

mentioned in classical Siddha literature.[10]. There is no scientific proofs are available regarding this formulation. FT-IR was done for this Siddha formulation to evaluate functional groups identification. It is an excellent tool for qualitative analysis. Siddha herbal medicinal preparations has increased tremendously over the past three decades. Although this treatment therapy showed good effectiveness on the other hand many of them remain untested.

There are several external factors that can affect the quality of herbal medicines, such as geographical area, time of growth and the method of the manufacturing process. This paper summarizes FT-IR is used to quantify different quality and secondary metabolite from Sarakkondrai ilai Chooranam. Fourier Transform Infrared Spectroscopy is one of the most widely used for quality control in the pharmaceutical industries. Recently FT-IR spectroscopy has developed quickly due to its low noise, rapid speed, high repeatability, easy operation ,low expensive..FT-IR has become increasingly useful in the fields of evaluating herbal qualities.[11]

Materials and Methods

The herbal formulation SIC formulation was taken from Siddha text Sarabendra Vaithya

Muraigal (Neerizhivu Chikitchai)-Page no;40 and 41.Author name-K.Vasudevasastri, Dr.VenkatRajan.[10].The leaves of *Cassia fistula* was collected from in and around ,Tirunelveli district, Palayamkottai, Tamilnadu.The raw drug was identified and authenticated by Gunapadam department in Government Siddha Medical College, Palayamkottai-627002, Tamil nadu.

Purification and Preparation:

Cut and remove the stalk and unnecessary parts of leaves of *Cassia fistula* Linn. It is dried in shade and processed to obtain fine powder, Then it is filtered using pure white cloth.



Fig.1. *Cassia fistula* L Plant.



Fig.2. SIC

Table:1 Ingredients of SIC

S.no	Tamil Name	English Name	Botanical name	Parts used	Quantity	Family
1	Sarakkondrai	Golden shower	<i>Cassia fistula</i> <i>Linn</i>	leaves	q.s	Caesalpiniaceae

Dosage :1250-1500 mg
Adjuvant: Hot water

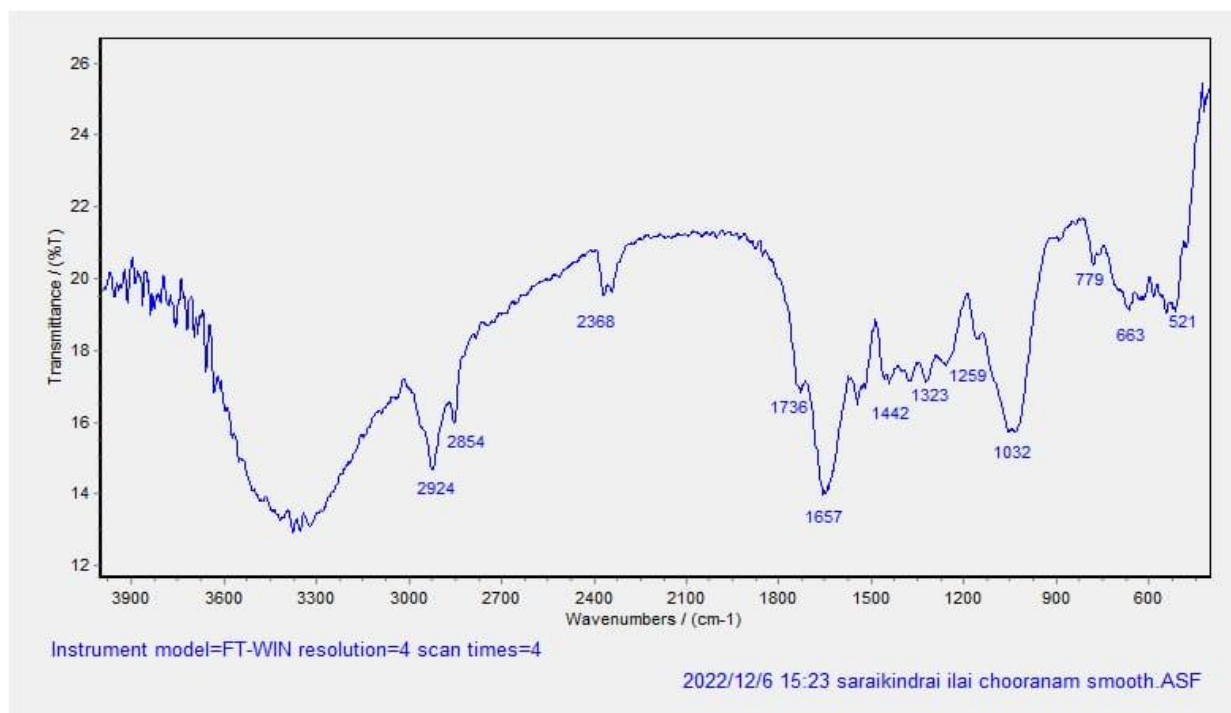


Fig:1 FTIR Spectra of Sarakkondrai Ilai Chooranam

Table:2 Functional group for Peak values

S.no	Wave Length(cm^{-1})	Appearance	Group	Compound
1	2924	Strong broad	N-H stretching O-H stretching C-H stretching	Amine salt, Alcohol, Carboxylic acid, Alkane
2	2854	Strong broad	O-H stretching N-H stretching C-H stretching	Carboxylic acid, Alcohol, Amine salt, Alkane
3	1736	Strong	C=O stretching	Esters, daltalactone, Aldehyde
4	1657	Medium	C=N stretching C=C stretching C-H bending	Imine, Alkane, Aromatic compound
5	1323	Strong	S=O stretching O-H stretching C-N stretching	Sulfone, Phenol, Aromatic amine
6	1259	Strong	C-F stretching C-O stretching	Fluorocompound, Aromatic ester
7	1032	Strong	S=O stretching C-F stretching	Fluoroncompound, Sulfoxide
8	779	Strong	C-Cl stretching	Halo compound
9	663	Strong	C-I stretching C-Br stretching	Halo compound
10	521	strong	C-Br stretching	Halo compound

Results and Discussion

FT-IR results showed the presence of functional groups of various phytochemicals respectively amine salt, alcohol, carboxylic acid, alkane, esters, delta lactone aldehyde, imine, alkene, aromatic compound. These phytochemicals have various functional groups like O-H, C-O, C-H, C=C, S=O, C-Br, C-I, C-Cl, C-F, C-N and N-H. Functional group analysis plays a vital role in understanding the overall physicochemical properties of the extract. FT-IR spectral analysis of leaves extracts of *Cassia fistula* showed the presence of phytochemicals carrying hydrogen bonded -OH functional group. This hydroxyl functionality is an integral part of most of the phenolic phytochemicals such as flavanoids and tannins. Amino acids, amines and Carboxylic acid have insulin mimetic properties and trigger insulin secretion.[8]

The functional groups of carboxylic acids, amines, amides, sulphur derivatives, polysaccharides, organic hydrocarbons and halogens that is responsible for various medicinal properties was studied in SIC. No bond was found in the region of 2220-2260 cm^{-1} indicating that no cyanide group was present in the samples. This implies that the plant has no toxicity due to cyanide group.[9]

Amine Salt:

Amines play a vital role of pain killers activity and also used as solvents for antihistamine diphenhydramine which are used in Benadryl syrups. Amines are important sources of amino acids which regulate the vitamin levels in our bodies. amines are useful stimulants for neurotransmitters like serotonin for our bodies. amine characteristically form salts with acids.

Alcohol

The presence of alcohol, phenols, alkanes, alkynes, aldehydes, aromatic compounds, aromatic amines and aromatic hydrocarbons.[1]

Carboxylic acid

The carboxyl group consisting of a carbonyl (C=O) with a hydroxyl group (O=H) attached to

the same carbon atom and is usually written as -COOH or CO_2H . Carboxylic acids also play significant roles in the medicinal fields. The most important roles that carboxylic functions play in pharmaceuticals are solubilizer acting in modulating solubility, lipophilicity, and cell permeation e.g. antibiotic or antihistaminic drug classes. Prodrug and or bioprecursor acting as compounds not biologically active but converted into active ones in specific conditions e.g. antihypertensive, antithrombotic or antiviral classes. Providing specific interactions with an enzyme triggering or blocking its biological response e.g. blood cholesterol reducing drug, nonsteroidal anti-inflammatory drugs. Carboxylic acid containing drugs play a major role in the medical treatment of pain and disease. Carboxylic acid involve in carbohydrates digestion and absorption.[5]

Alkanes:

Alkanes are investigated for treatment in asthma, psoriasis, atopic dermatitis, inflammatory disorders (unspecified) and chronic obstructive pulmonary disease (COPD). An antiepileptic drug used to treat partial onset seizures in adults.[2]

Delta lactone:

Glucono delta lactone GDL is a naturally derived food grade product derived from non Gmo sources. The unique characteristics are due to lactone formation. It can be combined with antimicrobials and will function as part of an effective preservative system. Delta lactone moiety showed remarkable in vitro cytotoxic activity against cancer cell lines. Strong cytotoxicity against leukemia and breast cancer cells.[6]

Aldehyde:

Reactive aldehyde are known to be involved in diseases associated with oxidative stress including diabetes.

Flouro Compound:

Fluorine substitution is being increasingly used to enhance the binding affinity of a compound to a

target protein or indirectly by influencing the polarity of other groups of the compound which interact with the protein. Metabolic stability can determine the bioavailability of compounds and substitution with fluorine at the site of metabolic attack can prevent oxidative metabolism based on the fact that the C-F bond. Also, substitution at adjacent or distal sites to the site of metabolic attack can also affect drug metabolism due to inductive/resonance effects or conformational and electrostatic effects.

Halocompounds:

Halocompounds are very useful organic compounds. Haloalkenes are slightly soluble in water. The haloalkanes are very essential for the existence of human beings as well as for all living beings because they are used in medicines.

Conclusion

FT-IR spectral analysis of SIC extracts of Cassia fistula showed the presence of phytochemicals carrying hydrogen bonded-OH functional group. This hydroxyl functionality is an integral part of most of the phenolic phytochemicals such as flavanoids and tannins. The FT-IR study was to confirm the antidiabetic activity of SIC.

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