

FOURIER TRANSFORM INFRARED SPECTROSCOPY ANALYSIS OF KADUKKAI POO CHOORNAM, A POLYHERBAL SIDDHA FORMULATION

¹Rishipriya.C.R, ²A.Manoharan, ³P.Sathish Kumar

¹PG Scholar, ²Professor and HOD, ³Lecturer

Department of Pothu Maruthuvam Government Siddha Medicine College and Hospital
Palayamkottai, Tirunelveli -627002, Tamilnadu,India.

Abstract- Kadukkai Poo Choornam is a polyherbal formulation mentioned in the Siddha literature prescribed for the management of bleeding disorders like bleeding hemorrhoids,menorrhagia.The literature review of the ingredients present in KPC revealed that the drugs are having good styptic,anti inflammatory, analgesic, antibacterial properties. But the compound form of medicine Kadukkai Poo Choornam has not been established through standardization procedure for its global acceptance. For the identification of Phytoconstituents from the medicinal plants there are various Techniques such as FTIR, HPTLC and GC-MS analysis . Fourier Transform Infrared Spectroscopy is one of the extensively used method to analyse and categorize the chemical constituents and has been used as a necessary method to Identify the medicines for pharmacopeia in several countries .In this research paper FT-IR spectroscopy of Kadukkai Poo Choornam reveals the presence of more than 10 functional groups through the stretching and bend. By collecting the literature reviews of these functional groups assures the pharmacological properties of the drug and this paper will be helpful for further studies and Standardization of the drug.

Key words:FT-IR spectroscopy, Kadukkai Poo Choornam, functional groups

INTRODUCTION

Siddha medicine is an indigenous system of medicine mostly practised in the southern part of India.World Health Organization endorsed siddha system of medicine as a codified medical system.About 65% of Indian population is using Indian medicine for their primary health care.Even though, the siddha medicinal formulations are well documented and time tested standard preparations, there is a need to document standardization procedures based on current analytic techniques to prevent adulteration and to maintain quality control on par with contemporary medical world.

Kadukkai Poo Choornam is a polyherbal formulation prescribed in the management of bleeding disorders like bleeding hemorrhoids,menorrhagia.The literature review of the ingredients present in KPC revealed that the drugs are having good styptic,anti inflammatory, analgesic, antibacterial properties. But the compound form of medicine Kadukkai Poo Choornam has not been established through standardization procedure for its global acceptance doing FTIR characterization for this formulation to evaluate functional groups Identification that will be useful in further studies and drug standardization .

It is important to identify and analyse the major phytochemicals present in a Medicinal plant. Because these phytochemicals are the major reason for the therapeutic potential of the plants. For the identification of Phytoconstituents from the medicinal plants there are various Techniques such as FTIR, HPTLC and GC-MS analysis . Fourier Transform Infrared Spectroscopy is one of the extensively used method to analyse and categorize the chemical constituents and has been used as a necessary method to Identify the medicines for pharmacopeia in several countries . It is a non-destructive analytical technique that provides a structural information on molecular features of a large range of compounds . FTIR Spectroscopy has been recognized as a dependable and sensitive method for finding the functional groups present in the plant extracts and they were determined with the aid of IR region in the Range of 400-4000cm⁻¹ . The wavelength of light fascinated is a characteristic of the chemical bond which might be seen in the annotated spectrum. The chemical bonds in the molecules have been predicted using FTIR.

MATERIALS AND METHODS

Trial drug selection

The trial drug Kadukkai Poo Chooranam is mentioned in siddha literature Pathartha Guna Chinthamani (Moolikai vakuppu) written by C.Kannusamy Pillai.

Ingredients of the trial drug

SL no:	Tamil name	Botanical name	Family	Parts used
1	Kadukkai poo	<i>Terminalia chebula</i>	Combretaceae	Leaf gall
2	Kirambu	<i>Syzygium aromaticum</i>	Myrtaceae	Flower bud
3	Lavanga pattai	<i>Cinnamomum verum</i>	Lauraceae	Stem bark

Collection of raw drugs

Raw drugs are thoroughly identified and collected from the herbal drug shop, Thuckkalay, Kanyakumari district, Tamil Nadu.

Authentication of the raw drugs

The collected raw drugs are identified and authenticated by the medicinal botanist and gunapadam experts of Government Siddha Medical College and Hospital, Palayamkottai, Tirunelveli, Tamil Nadu.

Preparation of trial drug

Adulterants, dust and other unnecessary particles are removed and the collected raw drugs are confirmed and dried under sunlight. Then they are powdered separately into fine powders and mixed together. The prepared Chooranam was kept in an air-tight container and labelled as Kadukkai Poo Chooranam (KPC).

FT-IR analysis

The drug was subjected to FT-IR analysis using KBr pressed disk technique on Analytical Technologies FT-IR spectrophotometer (Model: INFRA 3000-50) and the characteristic peaks were detected and recorded. Functional groups have vibration frequencies that are characteristic of that functional group. These vibration frequencies fall within the infrared (IR) frequency range. As such, passing an IR signal through the organic compound causes the functional groups to vibrate at specific frequencies. In other words, an infrared signal that passes through an organic compound will be absorbed at these characteristic frequencies, which can be transformed into a unique spectrum. The beam from an IR source passes through a monochromatic controller with a selector, ensuring that only specified wavelengths are emitted, which may vary from 4000 to 400 cm^{-1} . The sample is placed in a holder in the path of the IR source. A detector reads the analog signal and converts the signal to a spectrum. A computer is used to analyze the signals and identify the peaks.

RESULTS AND DISCUSSION

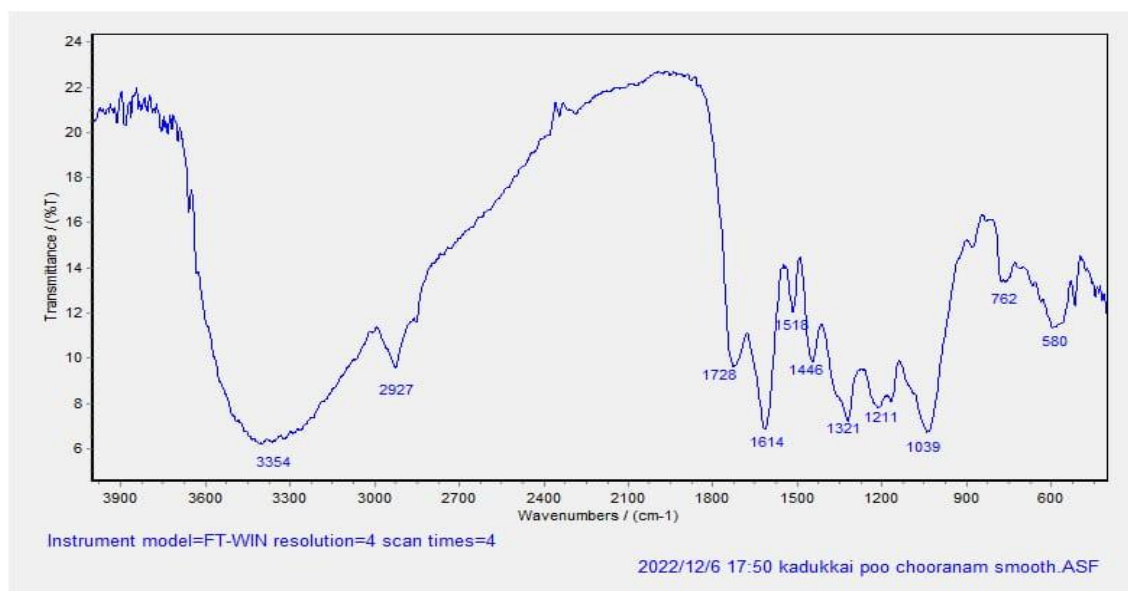


Table 1. FTIR Spectral of Kadukkaipoo Chooranam

S. No	Peak	Characteristic Absorptions (cm^{-1})	Possible Functional Group	Class
1	580	300 - 600	C-Br Stretch	Alkyl Halides
2	762	600 - 900	C - H out of plane	Aromatics
3	1039	900 - 1200	S=O stretching	sulfoxide
4	1211	1200 - 1500	C-O stretching	vinyl ether
5	1321	1200 - 1500	S=O stretching	Sulfone
6	1446	1200 - 1500	Ar C-C stretching	Aromatics
7	1518	1500 - 1800	N-O stretching	nitro compound
8	1614	1500 - 1800	C=C Stretching	Alkenes
9	1728	1500 - 1800	C=O Stretching	Aldehydes
10	2927	2700 - 3000	C-H stretching	Alkane
11	3354	3300 - 3600	N-H stretching	aliphatic primary amine

From above FTIR Analysis, Kadukkai Poo chooranam contains functional groups such as Alkyl halides, Aromatics, Sulfoxide, Vinyl ether, Sulfone, Nitro compounds, Alkenes, Aldehydes, Alkanes and Aliphatic primary amines. These compounds have good pharmacological activities.

Alkyl halides

Alkyl halides have been observed for general anaesthetic binding. Two chiral alkyl halide anesthetics, isoflurane and halothane are on the WHO's list of essential medicines.

Aromatic compounds

Aromatic compounds are a major component of the global carbon pool and include a diverse range of compounds lignin, amino acid. These are also a natural source of Antioxidants.

Sulfoxide

Sulfoxides are organo phosphorus compounds containing sulfur and oxygen atoms. Dimethyl sulfoxide is a most important sulfoxide, it is known to easily cross cell membrane and can facilitate transdermal drug delivery.

Vinyl ether

Vinyl ether is a volatile chemical compound used as an adequate and safe analgesic agent.

Sulfone

The sulfones, like the sulfonamides, are structural analogs of para-amino benzoic acid. They are bacteriostatic and are principally used for the treatment of leprosy. Researchers have also determined many therapeutic activities of sulfone containing compounds including antibacterial, antifungal, anti-HIV, anti-proliferative and Anti-inflammatory effects.

Nitro compounds

Nitro compounds are organic compounds containing one or more nitro group. They display a wide spectrum of activities that include antineoplastic, antibiotic, antihypertensive, antiparasitic, tranquilizers, vasodilatory and anti-inflammatory properties.

Alkenes

Alkenes are acyclic hydrocarbons having one carbon to carbon double bond. It is used as general anaesthetic.

Alkanes

Alkanes are saturated hydrocarbons, they consist of carbon and hydrogen atoms. These atoms bonded by single bond. Semi-fluorinated alkanes can dissolve lipophilic drugs and thus used as new drug carriers.

Aldehydes

Aldehydes are derived from alcohol after removal of hydrogen in a process of dehydrogenation. Reactive aldehydes can be produce antimicrobial, immunomodulatory properties.

Aliphatic primary amines

These are volatile liquids with ammoniacal odour. Histamine is a naturally occurring cyclic aliphatic amine which aids in the normal functions of immune system, vasodilation, muscular contraction, stomach secretions and act as a neurotransmitter.

CONCLUSION

FT-IR spectroscopy of Kadukkai Poo Choornam reveals the presence of more than 10 functional groups through the stretching and bends. By collecting the literature reviews of these functional groups assures the pharmacological properties of the drug and this paper will be helpful for further studies and Standardization of the drug.

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