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FOURIER TRANSFORM INFRARED SPECTROSCOPY ANALYSIS OF SIDDHA HERBAL DRUG VASAMBU CHOORANAM

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ABSTRACT
Background: Siddha Medicine has its own unique way of treating many chronic and challenging diseases.Out of 4448 diseases mentioned in Siddha Literatures, Siddhars have dealt with many life-threatening diseases which have more prevalence now-a- days.Yugi Muni classified Gunmam into eight types. One among them is Erigunmam (Peptic Ulcer disease). Vasambu Chooranam is a monoherbal drug indicated for Erigunmam which is mentioned in the Siddha Literature "Gunapadam MooligaiVaguppu". **Aim:** The aim of the study is to assess the morphology and elemental characterization of Vasambu Chooranam.The functional groups are analysed through FT-IR spectroscopy and pharmacological roles of functional groups are discussed in the study. **Materials and Methods:** The raw drugs are collected, purified and then made into micronized powder. The drug was subjected into characterization through FT-IR analysis. **Results:** FTIR Spectroscopic Investigation showed the presence of characteristic peak values with different useful mixtures of functional groups such as aromatic compounds, sulfoxide, secondary alcohol and carboxylic acid which is responsible for its functional activity. **Conclusion:** The instrumental analysis FT-IRS study of Vasambu Chooranam revealed the presence of functional groups through the stretch and bends which is responsible for its functional activity. The functional groups in Vasambu Chooranam possess analgesic and anti-inflammatory activities. This will ensure the efficacy and therapeutic effect of the drug.

KEYWORDS: Fourier Transform Infrared Spectroscopy, Vasambu, Peptic Ulcer, Siddha Medicine, Acorus calamus.

INTRODUCTION
Medicinal plants are the richest biosource of drugs for traditional systems of medicine; therefore man has been using plant extracts to protect himself against several diseases and also to improve his health and lifestyle.[3] A variety of techniques can be used to determine and estimate the presence of phytoconstituents in medical plants.[3] Chromatography and spectroscopic techniques are the most useful and popular tools used for this purpose.[3]

Fourier Transform Infrared Spectroscopy is one of the extensively used method to categorize the chemical constituents and has been used as a necessary method to identify the medicines for pharmacopeia in several countries.[6] It is a non destructive analytical technique that provides structural information on molecular features of a large range of compounds.[6] 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} .[6] It is possibly the major ,authoritative technique used for identifying the types of chemical groups (functional groups) present in compounds.[6] 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..[6]

MATERIALS AND METHODS
Drug selection:
The Siddha formulation Vasambu Chooranam was mentioned in Siddha literature Gunapadam Mooligai Vaguppu written by Dr.K.S.Murugesa Mudhaliyar.

Collection of raw materials:
Raw drug was collected from the herbal drug shop, Thackkalay, Kanyakumari district, Tamil Nadu.

Authentication of raw materials:
The raw drug was identified and authenticated by Medicinal Botanist and Gunapadam experts at Govt. Siddha Medical College, Palayamkottai, Tamilnadu.

Process of drug preparation:
The ingredient of the trial drug is purified according to the proper procedure methods described in Siddha Classical literature.[5] Vasambu is burnt up and made into ash. The drug was labelled as Vasambu Chooranam (VC).

Table 1: Ingredients of the trial drug.

S. no.	Tamil name	Scientific name	Parts used	Quantity
1	Vasambu	*Acorus calamus* l.	Rhizome	Q.s

RESULTS AND DISCUSSION

FT-IR spectra were recorded on Vasambu Chooranam at Siddha Regional Research Institute, Poojappura, Thiruvananthapuram, Kerala. Instrumental model=FT=WIN was used to derive the FT-IR spectra of Vasambu Chooranam.

The test drug was identified to have peaks which reflects the functional groups present in Vasambu Chooranam. The FTIR analysis of Vasambu Chooranam shows the spectrum which denotes the molecular absorption and transmission. It forms the molecular finger print of sample drug. It also denotes the functional groups and amount of compound present in the sample. The functional groups are responsible for therapeutic efficacy of the herbal drug Vasambu Chooranam.

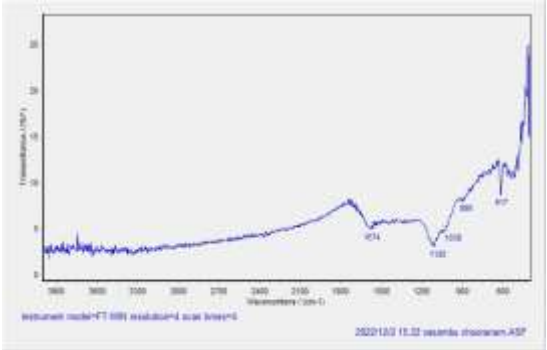

Figure 1: FTIR spectrum analysis of rhizomes of *acorus calamus L*.

Table 2: FTIR interpretation of compounds of dried rhizomes of *acorus calamus L*.

S. No	Peak	Characteristic Absorptions (cm^{-1})	Possible Functional Group	Class
1	617	600 - 900	C-H out of plane	Aromatics
2	895	600 - 900	=CH out of plane	Alkenes
4	1038	900 - 1200	S=O stretching	sulfoxide
5	1120	900 - 1200	C-O stretching	secondary alcohol
6	1574	1500 - 1800	C-O stretching	Carboxylic acid

The results of FT-IR spectroscopy confirms the presence of various chemical constituents such as aromatics, alkenes, sulfoxide, secondary alcohol and carboxylic acid in the rhizomes of *Acorus calamus L.*(Table 2 and Figure 1).

The strong instance peaks are identified at 1120cm^{-1} and 1574cm^{-1} which are assigned to the C-O stretching vibration indicating the existence of secondary alcohol and carboxylic acid compounds in the dried rhizomes of *Acorus calamus L*. The peak at 1038cm^{-1} which is assigned to the sulfoxide compound frequency vibration. The peak at 895cm^{-1}attributes to =CH out of plane vibration which is assigned to the alkene compound. The peak at 617cm^{-1} attributes to C-H out of plane which is assigned to the aromatic compounds.

Pharmacological properties

Aromatics:
All aromatic compounds are hydrocarbons. They serve as the basis for many drugs, antiseptics, solvents. Salicylic acid (2-hydroxybenzoic acid) is derived from the metabolism of Salicin and it is used in medical treatment. Salicylic acid has a narrow therapeutic window. So, it provides the appropriate anti-inflammatory effect.[8]

Carboxylicacids:
Carboxylic acids containing medicines are widely used in the treatment of pain and disorders in medicine. NSAIDs are one of the important drug classes that provide analgesic, antipyretic, and at higher doses, anti-

inflammatory effects in various pathological conditions.[9]

Sulfoxide:
Sulfoxide compounds such as dimethyl sulfoxide appears to reduce pain by inhibiting the transmission of pain messages by nerves rather through a process of healing damaged joints. DMSO has been documented in laboratory studies such as anti inflammation, nerve blockade (analgesia),effects on connective tissue etc.[2]

Alcohol:
It acts as an antiseptic when it is applied topically.It is a CNS depressant. Alcohol given before meals is an appetite stimulant.In severe neuralgias like trigeminal neuralgia, It causes permanent loss of transmission and relieves pain.[7]

Alkenes:
Alkene is used as a solvent in many pharmaceuticals, including oral, injectable and topical formulations such as diazepam and lorazepam. Alkenes are also used as general anesthesia.

CONCLUSION
FTIR spectroscopy is an important investigatory tool in the field of pharmaceutical science for the structure elucidation. It was concluded that presence of functional groups of Vasambu Chooranam have analgesic and anti-inflammatory activities. This will ensure the quality, efficacy and therapeutic effect of Vasambu Chooranam. These findings will give valuable information for clinical studies in future.

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