A Conspectus on Ftir Characterization of Siddha Drug - Karuveppilai Vadagam

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***Abstract*—Siddha medicine represents one of the oldest medical systems in the world, rich in herbal knowledge and practice.**

Among various formulations, Karuveppilai Vadagam is noted for its potential health benefits, particularly in restoring organ functionality. This study aims to leverage FTIR (Fourier Transform Infrared Spectroscopy) to characterize the functional groups within Karuveppilai Vadagam, providing insights into its chemical composition that underlies its therapeutic action.

Materials and Methods: FTIR spectroscopy was employed to analyze the KaruveppilaiVadagam sample. The sample was prepared by mixing with potassium bromide (KBr) to form a pellet and then analyzed in the spectral range of 4000-400 cm^-1.

Results and Discussion :The FTIR analysis revealed several functional groups:Alkanes: Indicating the presence of saturated hydrocarbons which may contribute to the formulation's stability.Mercaptans: Suggesting sulfur-containing compounds, potentially involved in antioxidantactivities.Amines: Highlighting the presence of nitrogen-containing organic compounds that can influence neurotransmission and metabolic processes..Halides (Chlorides, Bromides, Iodides): These functional groups may signify antimicrobial properties and their role in biochemical pathways..Nitro groups: Associated with various biological activities, which might contribute to the therapeutic effects of the formulation.The identification of these functional groups not only underscores the complexity of Karuveppilai Vadagam but also opens new avenues for research into its systemic effects.

Conclusion:This study conspectus highlights the presence of a diverse range of functional groups in the Siddha formulation Karuveppilai Vadagam, suggesting a multifaceted approach to health management. As further research is conducted, these findings may lead to a better understanding of Siddha medicine's role in contemporary healthcare

***Index Terms*—FTIR characterization,Karuveppilai, Siddha,Vadagam**

I. INTRODUCTION

Introduction of FTIR (Fourier Transform Infrared Spectroscopy) characterization for Siddha treatment, specifically the "KaruveppilaiVadagam," is a significant step towards standardizing traditional remedies in the Rational method of Siddha medicine (Manudamaruthuvum).

Overview of Key Components:

1. Siddha Medicine Classification: Devamaruthuvum (Divine Method): This method typically relies on spiritual or divine interventions and may not be scientifically verifiable.Manudamaruthuvum (Rational Method): This approach uses herbal formulations and emphasizes the rationality of treatment through the understanding of medicinal properties and their effects.Asuramaruthuvum (Surgical Method): This method includes surgical interventions and is akin to modern surgical practices.
2. Karuveppilai Vadagam:Karuveppilai refers to curry leaves (Murraya koenigii), which are commonly used in Siddha medicine for their numerous health benefits, including antioxidant, anti-inflammatory, and antimicrobial properties. Vadagam is a form of herbal preparation that could reference a kind of Siddha medicine in form of pellets.

FTIR Characterization:

FTIR spectroscopy is a powerful analytical technique that helps in the identification of organic and inorganic compounds by measuring how they absorb infrared light at different wavelengths.

Purpose of FTIR in Siddha Medicine: To create spectra that serve as "fingerprints" of the herbal preparations.These fingerprints can help in:

Standardization: Ensuring quality and consistency in herbal formulations.

Identification: Differentiating between various herbal products and ensuring authenticity.
Research: Providing data for pharmacological studies to understand active compounds in the treatment.

Steps Involved in FTIR Characterization of KaruveppilaiVadagam:

1. Sample Preparation: The KaruveppilaiVadagam is prepared according to traditional protocols.
2. FTIR Analysis: The prepared sample is subjected to FTIR spectroscopy to gather data on absorption peaks.
3. Data Interpretation: Analyzing the resulting spectrum to identify functional groups and compounds present in the Vadagam.
4. Standardization Development: Creating a standardized method based on the FTIR results to allow for consistent preparation and use of the Vadagam in practice.

II. EXPERIMENTAL SECTION
DETAILS REGARDING THE SAMPLE.

KaruveppilaiVadagam" is an interesting Siddha formulation known for its use in addressing various gastrointestinal disorders. The ingredients listed for this formulation each contribute unique properties that are beneficial for digestive health. Here's a brief overview of each component:

1. Karuveppilai (Murraya koenigii): Commonly known as curry leaf, it is renowned for its potential to stimulate appetite and improve digestion. It is often used in traditional remedies for nausea and digestive issues.
2. Koththumalli (Coriandrum sativum): Also known as coriander, this herb is valued for its carminative properties, which help relieve gas and bloating. It's widely used in cooking and traditional medicine to enhance flavor and aid digestion.
3. Common Salt (Sodium chloride): Salt is essential for maintaining electrolyte balance and can aid in digestion by stimulating the secretion of gastric juices.
4. Milagu (Piper nigrum): Known as black pepper, it is often referred to as the "king of spices." It possesses strong digestive properties and may help in the stimulation of appetite, making it useful in formulations designed for gastrointestinal issues.
5. Kichchili kizhangu (Curcuma zedoaria): More commonly known as greater galanga, this rhizome is traditionally used for its digestive benefits, helping to ease digestive disorders and promote overall gut health.
6. Saathipaththiri (Myristica fragrans): Commonly known as nutmeg, it is often used in small quantities for its aromatic and digestive properties. Nutmeg is known for its ability to alleviate nausea and improve appetite.

The preparation of "Karuveppilai Vadagam" follows traditional methods as outlined in Siddha texts such as the Siddha VaithiyaThirattu, emphasizing the holistic approach of Siddha medicine towards health and wellness. This formulation exemplifies the intricate knowledge of herbal medicine and its applications in treating gastrointestinal ailments.

III. DETAILS REGARDING FTIR ANALYSIS

FT-IR spectra were recorded at Kalasalingamacademy of Research and Education, International Research Centre, India. The sample in vadagam form were grounded to fine powder form using agate motor and pestle. They were then Pelletized by applying pressure to prepare the specimen to record the FT-IR Spectra and used to determine the presence of thefunctional groups and bands in the “KaruveppilaiVadagam”

FTIR Spectroscopy Analysis of Karuveppilai Vadagam

FT-IR spectra of “KaruveppilaiVadagam” were recorded at the Kalasalingam Academy of Research and Education, International Research Centre, India. The methodology employed involved several key steps:

1. Sample Preparation: The vadagam sample was initially in its natural form.It was then ground into a fine powder using an agate mortar and pestle to ensure a homogeneous sample that is suitable for spectroscopic analysis.
2. Pelletization: The fine powder was subsequently pelletized. This process involved applying pressure to form a solid disk or pellet, which is essential for obtaining clear and interpretable FT-IR spectra.

3. FT-IR Spectra Recording: The prepared sample pellets were then subjected to FT-IR spectroscopy, which facilitated the identification of various functional groups present in the "KaruveppilaiVadagam."

IV. ANALYSIS AND IMPLICATION:

- FT-IR spectroscopy is a powerful technique for characterizing molecular structures and identifying specific functional groups within a compound.
- The resulting spectra can reveal important information about the chemical composition and functional characteristics of the vadagam, contributing to our understanding of its properties and potential applications in various fields, such as food science, pharmacology, and Siddha medicine.

By analyzing the FT-IR spectra, researchers can identify key bands corresponding to specific functional groups, aiding in the elucidation of the chemical nature of "KaruveppilaiVadagam."

V. IMAGE OF KARUVEPPILAI VADAGAM

Table [1] FTIR interpretation of "KaruveppilaiVadagam

Wave number (cm-1)	Vibrational modes of "Karuveppilai Vadagam" in IR region	Functional group
2931.80	C-H (Stretch)	Alkane
2349.30	S-H	Mercaptane
2308.79	S-H	Mercaptane
1637.56	N-H (Bend)	Amines
1415.75	N=O	Nitro(R-NO2)
1319.31	C-N	Amines
1246.02	C-N	Amines
1157.29	C-N	Amines
767.67	C-X	Chloride
532.35	C-X	Bromide,Iodide

VI. DISCUSSION

The identification of various functional groups in the Siddha formulation "KaruveppilaiVadagam" through FTIR (Fourier Transform Infrared) spectrum analysis is a significant aspect of understanding its chemical composition and potential therapeutic properties. Each functional group has specific absorption bands associated with their molecular vibrations, which can be detected using FTIR spectroscopy.

Here's a brief overview of the identified functional groups:

1. Alkanes: Characterized by C-H stretching vibrations, typically observed in the range of 2850-2960 cm^{-1}.
2. Mercaptans (Thiols): They display a distinct peak associated with the S-H stretching vibration, which is generally found around 2540 cm^{-1}.
3. Amines: Primary and secondary amines show N-H stretching vibrations, typically within 3300-3500 cm^{-1}. The presence can often be confirmed by peaks that may also indicate bending vibrations in the region of 1500-1600 cm^{-1}.
4. Halides (Chloride, Bromide, Iodide): These compounds may give rise to particular C-X stretching bands depending on the halide, often seen in the lower wavenumber region (usually below 800 cm^{-1}).
5. Nitro groups: The presence of nitro groups can be identified by their characteristic peaks in the region of around 1500-1600 cm^{-1} (N-O stretching) and 1300-1350 cm^{-1}.

The spectral data gathered from the FTIR analysis provides a confirmatory identification of these functional groups based on their characteristic absorption frequencies. This information is crucial for understanding the potential medicinal properties of the formulation and its active components. Further analysis, such as NMR or mass spectrometry, could complement the findings from FTIR and provide additional information on the structural

characteristics of the compounds present in "KaruveppilaiVadagam."

VII. CONCLUSION

The characterization of the Siddha formulation "Karuveppilai Vadagam" using techniques such as Fourier Transform Infrared Spectroscopy (FTIR) is essential for standardizing its functional behavior and understanding its chemical composition. By identifying various compounds such as alkanes, mercaptans, amines, chlorides, bromides, and iodides, researchers can gain insights into the formulation's therapeutic properties and mechanisms of action.

The presence of these compounds suggests a range of potential health benefits, particularly regarding the anti-diarrheal activity attributed to "KaruveppilaiVadagam." For instance, specific alkane compounds may have antimicrobial properties, while amines and thiols could play roles in digestive health and modulation of gut function.

Additionally, standardization through FTIR characterization allows for the replication of the formulation in future studies, enhancing its credibility and enabling further research into its efficacy and safety. This approach provides a scientific basis for the Siddha medicine and could pave the way for more extensive clinical trials.

The identification of key chemical constituents in "KaruveppilaiVadagam" through FTIR will not only enrich the understanding of its therapeutic use for conditions such as diarrhea but also contribute to standardizing Siddha formulations, making them more accessible for modern scientific scrutiny and validation.

By applying modern analytical techniques like FTIR to traditional Siddha treatments, researchers can provide more transparency, quality assurance, and scientific validation to integrative medicine practices. This can contribute to not only the conservation of Siddha traditional knowledge but also its potential integration with contemporary healthcare systems.

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