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ASSESSMENT OF FUNCTIONAL GROUPS IN MARUTHAM PATTAI KUDINEER USING FOURIER TRANSFORM INFRARED (FTIR) SPECTROSCOPY

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ABSTRACT

Marutham Pattai Kudineer is a traditional Siddha herbal formulation. To evaluate the functional groups present in Marutham Pattai Kudineer using Fourier Transform Infrared (FT-IR) spectroscopy. The formulation was prepared according to Siddha literature and subjected to FT-IR spectral analysis to identify functional groups based on characteristic absorption peaks. The FT-IR spectrum revealed very weak or negligible peaks corresponding to O–H/N–H, C–H, and C=O/C=C functional groups, with minor absorptions in the fingerprint region indicating trace phytoconstituents. The spectral profile indicates low detectable phytochemical content.

KEYWORDS: Marutham Pattai Kudineer, *Terminalia arjuna*, Siddha, FTIR.

INTRODUCTION

Siddha science is an ancient medical system. Siddha medical system is based on various amazing principles such as Theory of Arusuvai, Theory of Panchabootham, Concept of Thonnooththaaru (96 principles), Concept of Naadi and so on.[1] Though it is consider that the herbal formulations are always safe, scientific validation is essential nowadays because of our changing environmental condition. Some modern analytical equipments are helpful to get knowledge regarding the traditional medicinal compound formulations.[2] Marutham Pattai Kudineer is a traditional preparation formulated as per classical Siddha texts. Fourier Transform Infrared Spectroscopy (FT-IR) is a widely used analytical technique that helps in identifying functional groups present in a compound by measuring the absorption of infrared radiation at different wavelengths. It provides a characteristic molecular fingerprint useful for structural analysis of herbal formulations.

MATERIALS AND METHODS

Siddha herbal formulation: Marutham Pattai Kudineer
Drug Reference: GUNAPADAM MOOLIGAI VAGUPPU- Ka. Sa. MURUGESA MUDALIAR
Drug Ingredients

Table 1: Details of Marutham Pattai.

Drug name	Botanical Name	Family	Part used
MARUTHAM PATTAI	*Terminalia arjuna*	Combretaceae	Bark

Drug Authentication

The drug was purchased from raw drug store and authenticated in Department of Gunapadam, Government Siddha Medical College and Hospital, Tirunelveli. Then, the drug was purified, dried and grounded into coarse powder. (Kudineer chooranam).

FTIR Analysis: Sample processed using Bruker Alpha-E by ATR module (attenuated total reflectance). Sample positioned on the Crystl platform with perfect alignment of keeping anvil in up position. To ensure that the sample makes good contact angle with the crystal prior to start of the IR radiation exposure. Spectra measurement was achieved with desired wavelength and the corresponding

observational peaks/ waves were recorded with wavenumber were subjected to further interpretation. Software used for the analysis is OPUS version 7 for functional group analysis. Signal detection processed through DTGS detector. Baseline correction adjusted ass per the requirement.

RESULT AND DISCUSSION

FT-IR Analysis

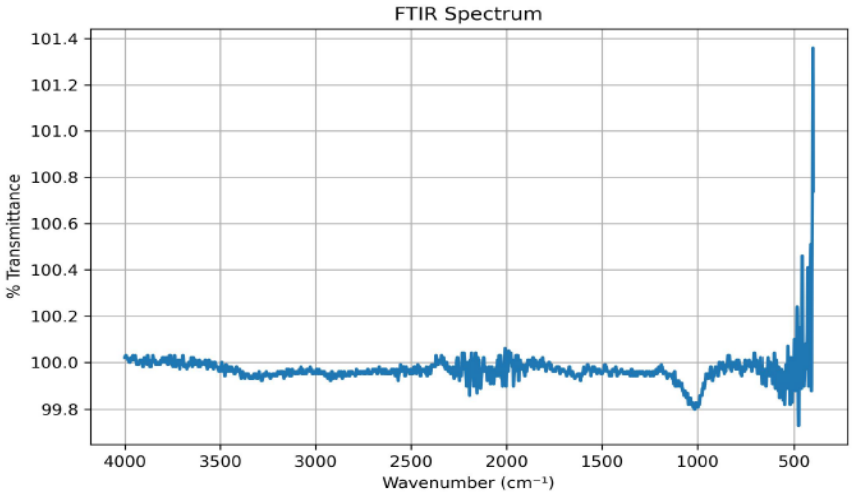

Figure 1: FT-IR Spectrum.

Table2: FT-IR Peak Table.

Approx. Peak / Region (cm^{-1})	ProbableFunctional Group(s)	Interpretation
~3400–3200	O–H / N–H stretching (very weak/flattened)	Suggests very low or masked hydroxyl/amine content; possible dilution or low concentration of polar phytoconstituents
~2950–2850	C–H stretching (very weak)	Indicates minimal aliphatic hydrocarbon presence or reduced signal intensity
~1700–1600	C=O / C=C stretching (negligible)	Lack of strong peaks suggests absence or very low levels of carbonyl/aromatic compounds
~1450–1350	C–H bending (weak)	Minor aliphatic deformation signals
~1200–1000	C–O / C–N stretching (slight dip ~1000 cm^{-1})	Indicates trace glycosidic or ether linkages
~900–500	Fingerprint region (slight fluctuations)	Weak skeletal vibrations; may indicate trace aromatic or inorganic/mineral contributions

Functional Group Interpretation

The FT-IR spectrum of MPK exhibits low intensity and minimal characteristic peaks, indicating a reduced presence of detectable functional groups.

Hydroxyl and Amine Groups

The weak O–H/N–H stretching suggests low levels of alcohols, phenols, or proteins.

Aliphatic Compounds

Weak C–H stretching indicates minimal hydrocarbon content.

Carbonyl and Aromatic Compounds

The absence of significant peaks in this region suggests very low concentrations of flavonoids, polyphenols, or other aromatic phytoconstituents.

Glycosidic Linkages

Minor absorption near 1000 cm^{-1} indicates trace carbohydrate or ether groups.

The overall spectral pattern may be influenced by factors such as sample dilution, preparation method, or instrumental sensitivity. Despite weak peak intensities, the presence of minor absorptions suggests that trace phytochemical constituents are present, though not in concentrations sufficient to produce strong IR signals.

CONCLUSION

The FT-IR analysis of the drug demonstrates minimal and weak functional group representation, indicating low detectable phytochemical concentration under the given conditions. The spectral data suggest limited chemical complexity, possibly due to formulation or analytical factors. Therefore, FT-IR alone may not be sufficient for complete characterization of the formulation. Further studies using advanced analytical techniques are

recommended to better understand its chemical composition.

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