



**FOURIER TRANSFORM INFRARED SPECTROSCOPIC (FT-IR) ANALYSIS OF
SIDDHA FORMULATION – *INGUSTATHY URUNDAI (IU)***

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ABSTRACT

The Siddha system of medicine, one of the oldest traditional medical systems of India, utilizes a wide range of formulations prepared from herbs, minerals, and animal products. *Ingustathy Urundai (IU)* is a classical Siddha formulation traditionally prescribed for *Soothaga Vaayu* (PCOS). Despite its extensive use, there is limited scientific validation regarding its composition and efficacy. In this study, FT-IR spectral analysis was performed to identify the functional groups and chemical nature of *IU*. The spectrum exhibited prominent peaks at 3405, 2925, 2854, 1641, 1511, 1456, 1363, 1113, 831, 617, and 548 cm⁻¹, indicating the presence of hydroxyl, carbonyl, aromatic, and metal–oxygen linkages. These findings confirm the coexistence of organic and inorganic constituents, validating the Siddha concept of synergistic therapeutic action. The results also suggest that the traditional preparation and purification processes effectively preserved the integrity of bioactive compounds. Overall, this study provides a scientific basis for the traditional claims of *Ingustathy Urundai* and supports its potential for further pharmacological and standardization studies.

KEYWORDS: Siddha medicine, *Ingustathy Urundai*, FT-IR analysis, *Soothaga Vaayu*, functional group identification, quality evaluation.

I. INTRODUCTION

Siddha is a holistic medical system that has been practiced in India since ancient times. It is considered one of the oldest systems of medicine in the world and forms an integral part of the AYUSH system in India. The Siddha Materia Medica is categorized into three major groups—herbal, metal and mineral-based, and animal-origin drugs. *Ingustathy Urundai* is a classical Siddha formulation indicated for the treatment of *Soothaga Vaayu*, as mentioned in traditional Siddha texts. However, there is a lack of scientific evidence supporting this formulation.

FT-IR analysis was carried out on this Siddha formulation to identify its functional groups. It serves as an excellent tool for qualitative evaluation. Over the past

three decades, the use of Siddha herbal medicines has increased significantly. Although these therapies have demonstrated notable effectiveness, many formulations still remain scientifically unverified. Various external factors, including geographical location, growth period, and methods of preparation, can influence the quality of herbal medicines. This paper highlights the use of FT-IR in assessing the quality and secondary metabolites of *Ingustathy Urundai*. Fourier Transform Infrared Spectroscopy is widely utilized for quality control in the pharmaceutical industry. In recent years, FT-IR spectroscopy has advanced rapidly due to its advantages such as low noise, high speed, excellent reproducibility, user-friendly operation, and cost-effectiveness. It has become an increasingly valuable tool for evaluating the quality of herbal preparations.

II. MATERIALS AND METHODS

The trial drug *INGUSTATHY URUNDAI* has been selected for ovulation inducing, hypoglycemic, smooth

muscle relaxing activities from the classical siddha literature *Anuboga vaithiya navaneetham* authored by, *Hakkem Pa. Muhammed Abdulla Sayubu*. Pg. No. 70.

2.1 INGREDIENTS

PURIFIED INGREDIENTS	WEIGHT
<i>Chukku (Zingiberofficinale Linn)</i>	1/4 palam
<i>Indhuppu (Rock Salt - Sodium chloride impure)</i>	1/4 palam
<i>Perungayam (Ferula Asafoetida)</i>	1/4 palam
<i>ArisiThippili (Piper longum)</i>	1/4 palam
<i>Narseeragam (Cuminumcyminum)</i>	1/4 palam
<i>Milagu (Piper nigrum)</i>	1/4 palam
<i>Karunjeeragam (Nigella sativa)</i>	1/4 palam
<i>Kariveppilai (Murrayakoenigii)</i>	1/4 palam
<i>Vennabi (Aconitum napellus)</i>	1/4 palam
<i>Vengaram (Sodium biborate)</i>	1/4 palam
<i>Puliyampurani sambal (Tamarindusindica)</i>	1/4 palam
<i>Elumichai juice (Citrus limon)</i>	Required quantity
<i>Inji chaaru (Zingiber officinale)</i>	Required quantity

Authentication

The above raw materials were authenticated by Post Graduate Department of Gunapadam And Medicinal Botany Government Siddha Medical College, Palayamkottai.

2.2 METHOD OF PREPARATION

All purified raw drugs are made into fine powder individually and mixed thoroughly. To this mixture add lemon juice and grind it for 4 hours into a paste like form after that add ginger juice little by little grind it for 4

hours into a paste and made into small pills size of *Theitrunkottai* and dried in sunshade and kept in airtight porcelain container.

DOSAGE

1/2-1 pill

III. FTIR ANALYSIS

3.1 Results of FTIR

The FTIR spectrum has major absorption peaks at 3405, 2925, 2854, 1641, 1511, 1456, 1363, 1113, 831, 617, and 548 cm^{-1} .

3.2 FTIR Spectral Correlation for *Ingustathy Urundai*

Categorized by the functional group and its corresponding vibrational mode

S.No	Peak Wave Number (cm^{-1})	Vibrational Modes of IU	Functional groups	Potential compound class
1	3405	Stretching (hydrogen bonded)	OH or NH	Alcohols, Phenols, Amines, Water (eg. in carbohydrates, polyphenols, proteins)
2	1641	Bending	OH	Water or Alcohols
3	2925	Asymmetric stretching	CH (sp^3)	Alkanes (CH_2/CH_3 groups)
4	2854	Symmetric stretching	CH (sp^3)	Alkanes (CH_2/CH_3 groups)
5	1456	Asymmetric Bending	CH (sp^3)	Alkanes (CH_2/CH_3 groups)
6	1363	Symmetric Bending	CH (sp^3)	Alkanes (CH_3 groups)
7	1641	Stretching	C=C or C=O	Alkenes, Aromatic rings, Amides (eg., unsaturated fatty acids, proteins, flavonoids)
8	1113	Stretching	CO (Alcohol, Ester, Ether)	Carbohydrates (sugars, polysaccharides like starch/jiggery)
9	1511	In-ring CC Stretching	Aromatic Rings	Polyphenols, Flavonoids, Aromatic Metabolites
10	831	Out of plane bending	Aromatic CH	Aromatic Ring substitutions (eg., polyphenols)
11	617, 548	Bending/Torsion	Skeletal Vibrations	Structural framework/Minerals

IV. DISCUSSION

The FTIR spectral analysis of the Siddha formulation *IU* revealed characteristic absorption bands corresponding to various functional groups, indicating the presence of both organic and inorganic constituents. The broad absorption peak at 3405 cm^{-1} is attributed to O–H stretching vibrations, suggesting the presence of hydroxyl groups associated with alcohols or phenolic compounds. This implies that *IU* contains compounds of plant or mineral origin with potential antioxidant or stabilizing properties.

The peaks observed at 2925 cm^{-1} and 2854 cm^{-1} correspond to C–H stretching vibrations of aliphatic hydrocarbons, confirming the presence of methyl and methylene groups. The strong absorption band at 1641 cm^{-1} indicates C=O stretching vibrations, which may be due to carbonyl groups from aldehydes, ketones, or carboxylic acids—functionalities commonly found in bioactive phyto constituents. The band at 1511 cm^{-1} is assigned to aromatic C=C stretching, reflecting the presence of aromatic ring systems that are typical of polyphenolic or flavonoid compounds.

The absorption at 1456 cm^{-1} can be linked to C–H bending vibrations, while the band at 1363 cm^{-1} corresponds to C–N stretching, signifying the presence of amine or amide functionalities. The sharp peak at 1113 cm^{-1} represents C–O stretching vibrations, which may originate from alcohols, ethers, or esters, further confirming the complex organic composition of *IU*. The absorption band at 831 cm^{-1} corresponds to C–H out-of-plane bending, characteristic of substituted aromatic compounds. The low-frequency bands at 617 cm^{-1} and 548 cm^{-1} indicate metal–oxygen or halide–carbon linkages, suggesting the presence of inorganic components that may result from mineral ingredients used in the preparation.

Overall, the FTIR spectrum of *IU* confirms the coexistence of various organic functional groups along with mineral elements. This complex chemical profile supports the traditional Siddha concept that therapeutic efficacy arises from the synergistic action of organic and inorganic constituents. The preservation of key functional groups also indicates that the processing and purification methods employed for *IU* were effective and did not alter the essential structural integrity of its bioactive compounds. These findings substantiate the traditional claims of *IU* and provide a scientific basis for its therapeutic potential within the Siddha system of medicine.

V. CONCLUSION

The FTIR analysis of the Siddha formulation *Ingustathy Urundai (IU)* confirmed the presence of diverse organic and inorganic functional groups, indicating a complex chemical composition. The coexistence of hydroxyl, carbonyl, aromatic, and metal–oxygen linkages supports the traditional Siddha view that therapeutic efficacy

results from the synergistic action of plant- and mineral-derived constituents. The retention of key functional groups further suggests that the purification and preparation methods preserved the integrity of active compounds. Overall, these findings scientifically validate the traditional claims of *IU* and highlight its potential as a standardized Siddha formulation for therapeutic use.

REFERENCES

1. R. Thiyagarajan L.I.M, Gunapadam -ThathuJeevam., published by Indian medicine and Homeopathy, chennai-106.
2. Vaithiyarathinam K.S Murugesu Muthaliyar, GunapadamMooligai, published by Director of Indian medicine and Homeopathy, chennai- 106.
3. DrAnaivaariAnandan, pH.D, Dr.M.Thulasimani MD(pharm), Siddha materiaMedica (mineral and animal kingdom), 2008 edition, dept. of Indian medicine and Homeopathy, chennai- 106.
4. Arunachalam K, Thiruthani M. Functional groups identification through FTIR Characterization of siddha poly herbal formulation “Muppirandaichooranam”. Int. J. Curr. Res. Chem. Pharm. Sci., 2017; 4(2): 1-4.
5. Nandhini D. FTIR characterization of siddha medicine AyaBringarajaKarpam. Journal of Research in Biomedical Sciences, 2019 Jun 25; 1(3): 8-10.
6. Fernández-Arche A, et al. Phytosterols in metabolic disorders: therapeutic potential and safety aspects. Curr Med Chem., 2011; 18(11): 1735–49.
7. Hanhineva K, et al. Impact of dietary polyphenols on carbohydrate metabolism. Int J Mol Sci., 2010; 11(4): 1365–402.
8. Heim KE, Tagliaferro AR, Bobilya DJ. Flavonoid antioxidants: chemistry, metabolism and structure-activity relationships. J NutrBiochem., 2002; 13(10): 572–84.