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STANDARDIZATION OF SIDDHA POLYHERBAL FORMULATION PANCHABAKIYA CHOORANAM THROUGH ICPOES AND FTIR TECHNIQUES

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ABSTRACT: Siddha system of medicine is a traditional medicinal system being followed mainly in South India. It is better known as one among the AYUSH medicinal system. The present study aims to standardize the Siddha poly-herbal formulation *Panchabakiya chooranam* (PBC), which is mentioned in the Siddha classical text Anuboga vaidya Brahma ragasyam indicated for stomach burn, burning sensation in anus and diarrhea. Accordingly, PBC was studied through Inductively Coupled Plasma Optical Emission Spectrometric analysis (ICP-OES) and Fourier Transform Infrared Spectroscopy (FTIR) techniques to identify the metals and functional groups present in it. Results showed that the sample contains elements such as Calcium, Iron, Sodium, Potassium, and Phosphorous. Among the detected elements Phosphorus was present in a maximum concentration, and iron was in lowest concentration. Moreover, the toxic metals namely, Mercury, Arsenic, Cadmium, Nickel, and Lead were in Below Detectable Level, which ensures that the drug is safe to consume. Besides, functional groups such as Alcohols, alkanes, amides are identified using IR spectrum.

INTRODUCTION: Medicinal plants are used since the evolution of mankind for food and treating various diseases. Our ancestors lived a healthy life due to their attachment with nature and nature products. After a dip in their importance among the people in the recent past, they are recouping its significance in recent few years. Numerous herbal-based drugs are being developed by local, multi-national drug companies, local traditional healers, etc. As there is a global resurgence in demand for traditional drugs, medicinal herbs are becoming endangered, and there is a possibility of lack of quality in those drugs.

Thus, there is an exigency to address the quality of the traditional drugs to ensure patients safety and to preserve its efficiency. In this way, the herbal drug *Panchabakiya chooranam*, a traditional Siddha polyherbal formulation is standardized by using FTIR and ICP-OES techniques. Inductively coupled plasma/optical emission spectrometry (ICP/OES) is a powerful tool for the determination of metals in a variety of different sample matrices. The technique is based upon the spontaneous emission of photons from atoms and ions that have been excited in an RF discharge ¹.

Infrared spectroscopy probes the molecular vibrations. Functional groups can be associated with characteristic infrared absorption bands, which correspond to the fundamental vibrations of the functional groups (Colthup *et al.*, 1975; Griffith and de Haseth 1986) ². The selective absorption (or emission) of infrared radiation arises in the mutual vibrations of the atoms constituting the molecules.

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A molecule does not absorb radiation of all wavelengths however selects only a few narrow wavelength intervals known as absorption bands. The resulting absorption pattern is characteristic of the molecule which reflects elemental interactions and chemical diversity in sample ³.

MATERIALS AND METHODS:

Details Regarding Sample: The drug *Panchabakiya chooranam* is mentioned in Siddha literature Anuboga vaidhya Brahma ragasyam ⁴. The indication of the sample drug as per Siddha literature is Stomach burn, burning sensation in anus and diarrhea.

Drug Collection and Authentication: All the ingredients of the drug are bought in Ramasamy Chetty country drug shop, Parrys, Chennai and authenticated at Department of Botany, Government Siddha Medical College, Chennai.

TABLE 1: INGREDIENTS OF PANCHABAKIYA CHOORANAM

S. no.	Tamil name	Botanical name	Part used	Voucher specimen no.
1	Maankottai paruppu	<i>Mangifera indica</i>	Seed kernel	GSMC/MB-234/18
2	Karuvepilai	<i>Murraya koenigii</i>	Leaves	GSMC/MB-235/18
3	Sundakai vatral	<i>Solanum torvum</i>	Dried fruit	GSMC/MB-236/18
4	Venthayam	<i>Trigonella foenum-graecum</i>	Seed	GSMC/MB-237/18
5	Omum	<i>Trachyspermum ammi</i>	Seed	GSMC/MB-238/18

Details Regarding Experiment:

ICP-OES: The Inductively Coupled Plasma Optical Emission Spectrometric (ICP-OES) analysis was done at Sophisticated Analytical Instrumental Facility (SAIF) in IIT Madras, Chennai - 600036 using Perkin Elmer Optima 5300 DV. The digestion sample was prepared by using 100 mg of *Panchabakiya chooranam* added with 3 ml of Nitric acid and 25 ml of Distilled water.

Fourier Transform-Infra Red Spectroscopy (FTIR): FTIR analysis was done at SAIF, IIT Madras. IR data was acquired using Perkin Elmer FT-IR spectrometer. For sampling techniques, KBr method (Price, 1972) was followed. The sample PBC was grounded using an agate mortar and pestle to give a very fine powder. The fine powder sample was mixed with about 100 mg dried potassium bromide salt.

The mixture was then pressed under hydraulic press using a die to yield a transparent disc (measure about 13 mm diameter and 0.3 mm in thickness) through which the beam of spectrometer passed. The analysis was done using BRUKER RFS 27: Standalone FT-Raman Spectrometer.

RESULTS AND DISCUSSION:

ICP-OES:

TABLE 2: CONCENTRATION OF ELEMENTS IN PANCHABAKIYA CHOORANAM

S. no.	Elements	Wavelength in nm	Detected levels mg/L
1	Arsenic	As 188.979	BDL
2	Calcium	Ca 315.807	34.100
3	Cadmium	Cd 228.802	BDL
4	Iron	Fe 238.204	0.330
5	Mercury	Hg 253.652	BDL
6	Potassium	K 766.491	30.821
7	Sodium	Na 589.592	23.110
8	Nickel	Ni 231.604	BDL
9	Lead	Pb 220.353	BDL
10	Phosphorus	P 213.617	48.541

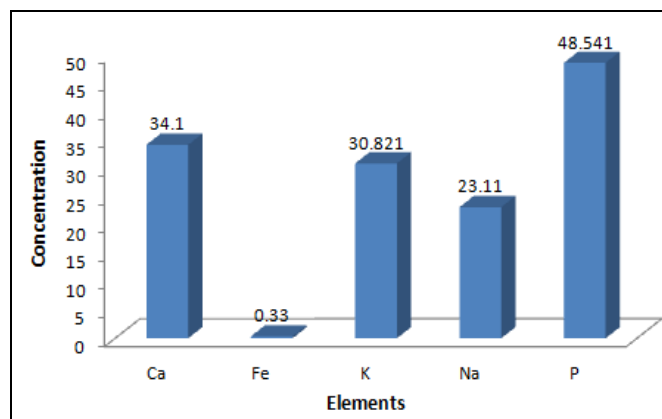


FIG. 1: ELEMENTAL CONCENTRATION OF PANCHABAKIYA CHOORANAM

FTIR Analysis:

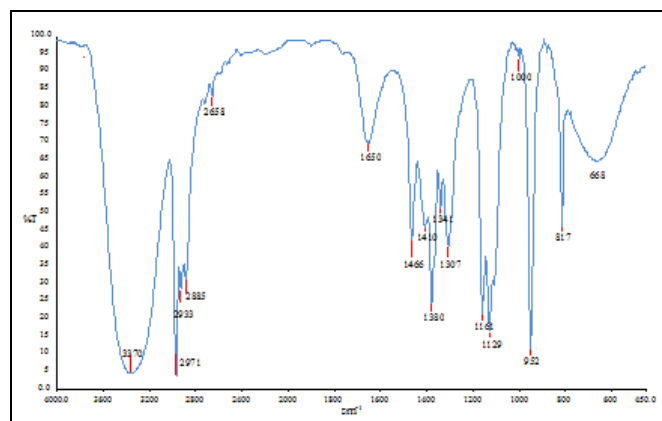


FIG. 2: GRAPH SHOWING DIFFERENT ABSORBANCE PEAKS OF PANCHABAKIYA CHOORANAM

TABLE 3: FTIR PEAK VALUES AND FUNCTIONAL GROUPS OF PANCHABAKIYA CHOORANAM

S. no.	Absorption band peak	Possible interaction
1	3370	O-H Stretch
2	2971	C-H Stretch
3	2933	C-H Stretch
4	2885	C-H Stretch
5	2658	C-H Stretch
6	1650	N-H Bend
7	1410	CH ₂ -CH Bend
8	1380	CH ₃ Bend
9	1161	C-O Bend
10	1129	C-O Bend
11	1000	C-O Bend

DISCUSSION: ICP-OES results revealed that heavy metals like Mercury, Arsenic, Cadmium, Nickel, and Lead are present Below Detectable Level (BDL) which ensures the safety of the drug. The elements such as Calcium, iron, sodium, potassium, and phosphorus are present. Calcium is a component of Calcium carbonate, and Sodium is a part of Sodium bicarbonate. Calcium carbonate and Sodium bicarbonate are antacids⁵ which correlates with the indications of the drug. Among all the elements, Phosphorus was present in maximum concentration followed by Calcium, Potassium, and Sodium. The least concentrated element in the sample was Iron.

In FTIR analysis the broad peak at 3370 cm⁻¹ belongs to O-H stretch which indicates Alcohol. Peaks at 2971, 2933, 2885 and 2656 indicate C-H stretch which correlates with alkanes the medium stretch at peak 1650 cm⁻¹ correlates with N-H stretch which may be 2° amides. Peaks at 1410 cm⁻¹ and 1380 cm⁻¹ indicate CH₂-CH bend and CH₃ bend; both are corresponding to alkanes. C-O bends at the following peaks at 1161 cm⁻¹, 1129 cm⁻¹ and 1000 cm⁻¹ may belong to ether, ester, alcohols or carboxylic acids.

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CONCLUSION: Inductively Coupled Plasma Optic Emission Spectroscopy (ICP-OES) results show that the sample contains heavy metals such as Calcium, Iron, Sodium, Potassium, and Phosphorous. Phosphorus and Iron were the highest and lowest concentrated elements in the sample respectively. As per FTIR analysis bonds on the surface of *Panchabakiya chooranam* samples gave various peaks representing the presence of many functional groups such as Alcohols, alkanes, amides. Present work can be considered as the first step towards the identification of heavy metals and functional groups.

The present study is only a preliminary analysis, and exact nature of different peaks given by the sample along with the characterization is to be studied.

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CONFLICT OF INTEREST: Nil

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