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FOURIER TRANSFORM INFRARED SPECTROSCOPY ANALYSIS OF *SIDDHA* HERBAL DRUG "*MAAVILINGAPATTAI CHOORANAM*"

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ABSTRACT
Siddha system of medicine is one of the ancient and unique system of medicine in India. In this *Siddha* system of medicine herbal drugs plays an important role to cure the disease without causing any adverse effect. One of such novel herbal preparation is *Maavilingapattai Chooranam (MPC)* which comprise of 16 potential herbal ingredients. The main objective of the present study was to standardize the *Siddha* herbal drug *Maavilingapattai Chooranam* by using FTIR Spectroscopic analysis. FTIR study reveals the different characteristic peak values with various functional compounds present in the extracts of the drug *(MPC)*. The result of the study shows that the presence of functional groups Alcohols, Phenols, 1,2 Amines, Amides, Aromatics, Alkines, Alkynes, α,β unsaturated aldehydes, Ketones, Aromatic amines, Alkylhalides, Carboxylic acids, Esters, Saturated aliphatic, Alkenes, 1^{o} amines, Alkanes, Nitro compounds and Aromatics. These findings will help for further preclinical and clinical studies in *Maavilingapattai Chooranam*.

KEYWORDS: *Maavilingapattai Chooranam*, FTIR analysis, Spectroscopy, *MPC*, Standardization.

1. INTRODUCTION
In the recent years, Traditional *Siddha* system of medicine growing worldwide for its natural inheritance, effective treatment, healthy lifestyle and uniqueness in the holistic approach. It is the only system of medicine which is a mixture of art, philosophy and science.[1] Herbal drugs play an important role in the *Siddha* system of medicine. With the growing awareness of the health care and safety aspects, peoples are moving towards the herbal medicines.

WHO provides guidelines for prevention, control, safety, efficacy and standardization of herbal preparations. Standardization of the *Siddha* drugs is very much essential to access the safety, efficacy and quality assurance for production and manufacturing of the herbal drugs. Active research work and scientific documentation of the drugs gives worldwide acceptance of the practice. Among the *Siddha* system of medicines, one of the novel herbal preparation is *Maavilingapattai Chooranam* which is indicated for Jaundice mentioned in the classical *Siddha* literature *"Sirorathina Vaidhiya Booshanam".* The present study was to standardize the *Siddha* herbal drug *Maavilingapattai Chooranam* by using FTIR Spectroscopic analysis.

FTIR Spectroscopic technique is used to identify the functional groups of the chemical constituents, but it has been widely used for the identification, quality control and manufacturing process supervision of herbal medicines in recent years. The efficacy of the herbal medicines depends on the amount of the active components present in the drug.[2] Thus the result of the study gives valuable information about the drug *(MPC)* which ensures the safety, efficacy and quality of the drug.

2. MATERIALS AND METHODS

Drug selection

Table 1: Ingredients of *Maavilingapattai Chooranam*.

S.no	Name of drugs	Botanical name
1.	*Iruveli*	*Vetiveria zizanioides*
2.	*Vilamichu*	*Plectranthus vettiveroides*
3.	*Chiru kurinchan*	*Gymnema sylvestre*
4.	*Poonai vanangi*	*Acalypha indica*
5.	*Kozhunji*	*Tephrosia purpurea*
6.	*Koovilam*	*Aegle marmelos*
7.	*Pathiri*	*Stereospermum colais*
8.	*Thulasi*	*Ocimum sanctum*
9.	*Musumusukkai*	*Mukia maderaspatana*
10.	*Musuttai*	*Rivea ornate*
11.	*Vila*	*Limonia acidissima*
12.	*Nannari*	*Hemidesmus indicus*
13.	*Kurundhotti*	*Sida rhombifolia*
14.	*Ashwagandhi*	*Withania somnifera*
15.	*Parangichakkai*	*Smilax china*
16.	*Maavilingapattai*	*Crataeva magna*
17.	*Seenisarkarai*	*Saccharum officinarum*

All the raw materials were purified as per the classical *Siddha* literature.[3] After the purification process, *Maavilingapattai Chooranam* was prepared as per the *Siddha* classical literature *"Sirorathina Vaidhiya Booshanam".* Then the *Maavilingapattai Chooranam* was purified by *Pittaviyal* method (steam cooking in milk) as per *Siddha* classical literature.[4] Finally, the end product of *MPC* was kept in an air tight container and labeled as ***"Maavilinga Pattai Chooranam" (MPC)***.

Sophisticated instrumental analysis

FTIR - Fourier Transform Infra-red Spectroscopy[5]

FTIR (Fourier Transform Infra-red Spectroscopy) is a sensitive technique particularly for identifying organic chemicals in a whole range of applications although it can also characterise some inorganics. Examples include paints, adhesives, resins, polymers, coatings and **drugs**. FTIR is an effective analytical instrument for detecting functional groups. FTIR analysis was done at Tamilnadu test house, Vanagaram, Chennai.

Applications

- Quatitative scans and Qualitative scan
- Solids, liquids, gases
- Organic samples, inorganic samples
- Unknown identification and Impurities
- Screening formulation & Pharmaceuticals.

Figure 1: Ftir Instrument.

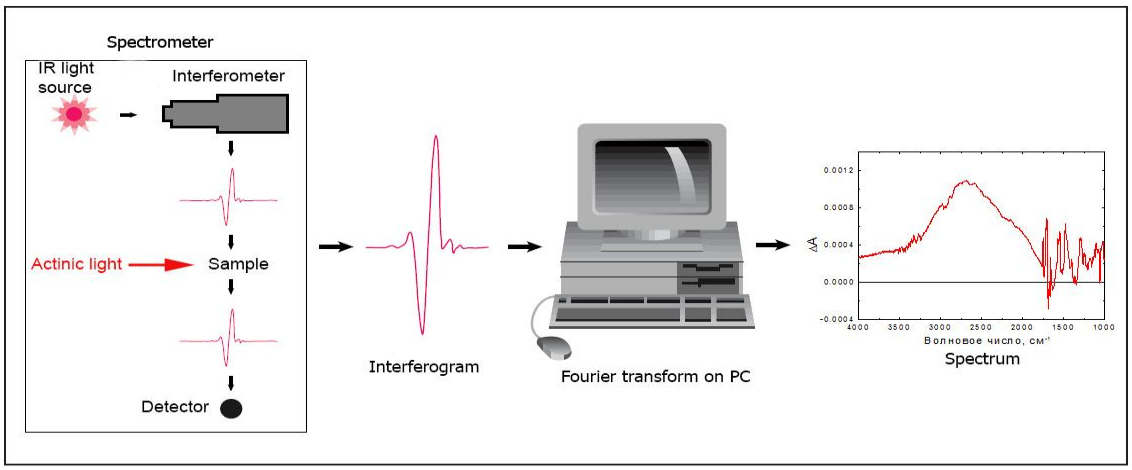

Figure 2: Ftir Mechanism.

Principle

Spectrophotometric tests are commonly used in the Identification of chemical substances and quantification of polymorphic forms. The test procedures are applicable to substances that absorb IR radiation. The IR absorption spectrum of a substance compared with that obtained concomitantly for the corresponding reference standard / reference substance provide conclusive evidence of the identity of the substance being tested.

Recording Infrared spectrum of a solid as a disc (as per USP ‹197K›)

- Triturate about 1 to 2 mg of the substance to be examined with 300 to 400 mg, unless otherwise specified, of finely powdered and dried potassium bromide. If the substance is a hydrochloride it is preferable to use potassium chloride.
- Carefully grind the mixture and spread it uniformly in a suitable die.
- Submit it to the pressure of about 800 mPa (8 tons/cm2).
- Examine the disc visually and if any lack of uniform transparency is observed, reject the disc and prepare again.
- Record the spectrum between 4000 to 650 cm-1 unless otherwise specified in individual standard test procedure.
- When sample and standard are measured for concordance, the transmittance obtained at the start of the scan range, should not deviate by more than 10% between them (For ex. If the standard shows a transmittance of 75%, the sample transmittance can be between 65% and 85%).

3. RESULTS AND DISCUSSION

FTIR Spectrum Analysis

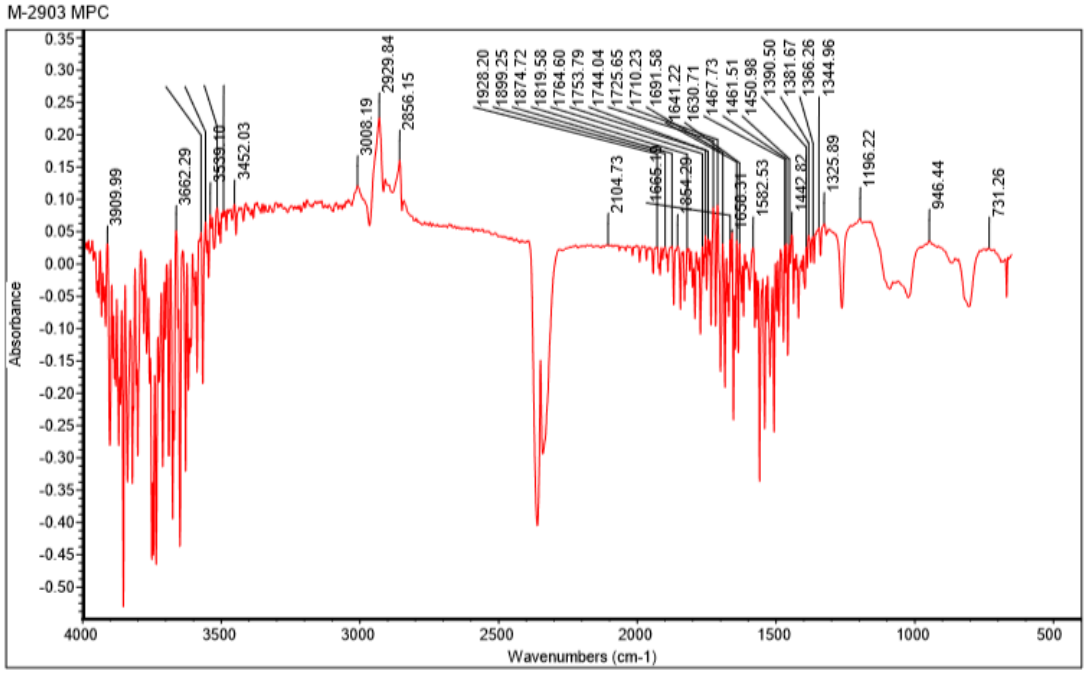

Figure 3: FTIR Spectrum analysis.

Table 2: FT-IR Interpretation of *MPC.*

Absorption peak cm^{-1}	Stretch	Functional group
3909	O-H stretch, Free hydroxyl	Alcohols Phenols
3452	N-H stretch	1,2 Amines Amides
3008	C-H stretch =C-H Stretch	Aromatics Alkines
2104	-C=N Stretch	Alkynes
1665	C=O stretch	α,β unsaturated aldehydes, Ketones
1325	C-N stretch	Aromatic amines
1196	C-H wag($-CH_2$ x)	Alkylhalides
946	O-H bend	Carboxylic acids
1764	C=O stretch	Esters,

		Saturated aliphatic
1710	C=O stretch	α,β unsaturated aldehydes, Ketones
1641	-C=C- stretch	Alkenes
1630	N-H bend	1^o amines
1390	C-H bend	Alkanes
1344	N-O symmetric stretch	Nitro compounds
1582	C-C stretching (ring)	Aromatics

In the FTIR Spectroscopic analysis, the trial drug *Maavilingapattai Chooranam* excibits the peak value which shows in table 2. The wave number of 3909, 3452, 3008, 2104, 1665, 1325, 1196, 946, 1764, 1710, 1641, 1630, 1390, 1344, 1582 having O-H Stretch, N-H Stretch, C-H Stretch, =C-H Stretch, -C=N Stretch, C=O Stretch, C-N Stretch, C-N wag (-CH_2x), O-H bend, C=O Stretch, -C=C Stretch, N-H bend, C-H bend, N-O symmetric stretch, C-C Stretch (ring). This indicates the presence of functional compounds of Alcohols, Phenols, 1,2 Amines, Amides, Aromatics, Alkines, Alkynes, α,β unsaturated aldehydes, Ketones, Aromatic amines, Alkylhalides, Carboxylic acids, Esters, Saturated aliphatic, Alkenes, 1^o amines, Alkanes, Nitro compounds and Aromatics.

- **Phenols** possess high anti-oxidant property which enhances the drug effect against the liver disease. It also possesses diverse biological activities, for example, hepatoprotective activity and antidepressant activities.
- **Aromatic amines** have anti-oxidant property. In liver aromatic amines invovles metabolic activation and also involved in detoxification.[6]
- **OH group** has higher potential towards inhibitory activity against microorganisms.
- **Amines** enhance the drug effect against the hepatic disease. It also act on the neurotransmitters, it is involved in the protein synthesis.[7]
- **Alkanes** have little biological activity, it protect against Microorganism.[8]
- **α, β unsaturated aldehydes** involved in free radical scavenging activity and also used in the treatment of cancer.
- **Nitro compounds** acts against the infectious diseases and also it suppress the tumour growth.

4. CONCLUSION

From the above FTIR Spectroscopic study can conclude that the presence of functional groups of Alcohols, Phenols, 1,2 Amines, Amides, Aromatics, Alkines, Alkynes, α,β unsaturated aldehydes, Ketones, Aromatic amines, Alkylhalides, Carboxylic acids, Esters, Saturated aliphatic, Alkenes, 1^o amines, Alkanes, Nitro compounds and Aromatics. Presence of these active components ensures the quality and efficacy of the drug *MPC*. These findings will give valuable information for future clinical trials.

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