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Assessment of Functional Group in Herbomineral Formulation Aavaraipanchaga Choornam through Fourier Transform Infrared Spectroscopy

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Abstract: ***The Siddha system of medicine is one among parts of the AYUSH system. The Siddha medicine is used to treat various diseases, especially Diabetes Mellitus. In siddha system medicines were prepared from Herbals, Minerals, salts and Metals as well as the marine and animals products also used in the system. The herbomineraldrug Aavaraipanchagachoornam is coarse powder in nature which is widely used in Siddha medicine for Diabetes Mellitus. The objective of the present study to explore the elemental characterization and assessment of functional groups inherbo mineral drug Aavaraipanchagachoornam. The ingredients used in the trial drug are Cassiaauriculata, Terminalisarjuna, Asparagus racemosus, Syzgiumcumini, Stereospermumsuaveolens, Salacia reticulata, Cosciniumfenestratum, Hyoscyamusniger and Asbestos. The trial drug is prepared as per siddha literature kannuswaamypillaipatharthagunavilakampg no. 64.The drug was subjected into Characterization through FTIR analysis. The Functional Group studied through FTIR study. It can be correlated in WHO recommended parameters for confirmed standardizations in above drug. FTIR Characterization of trial drug "Aavaraipanchagachoornam" shows the presence of some functional group such as carboxylic acid, alkenes, alkanes, Nitrocompound, Aromatic compounds, Flurocompounds and Halo compounds. This study forms the base for the pharmaceutical analysis of "Aavaraipanchagachoornam" which ensures the efficacy and therapeutic effect of the drug.***

Keywords: FTIR, *Aavaraipanchagachoornam*, Herbomineral formulation, Functional groups

1. Introduction

The World Health Organization estimated that 80% of populations used traditional medicinein developing countries for primary health care needs (WHO Guidelines-2007). In that way, Siddha medicine has profound vital role in disease prevention and prophylaxis through its herbal medicine and other forms of medicine like *choornam*, *chendooram*, *Parpam* and other 32 types of preparation (Thiyagarajan.R-2006). In siddha text "*Kannusamypatharthagunavilakam*" page no. 64 mentioned the indication of *Aavaraipanchagachoornam* to treat Diabetes mellitus (*Madhumegam*). Therapeutic activity of a herbal formulation depends on its phytochemical constituents. Standardization is a system that ensures a predefined amount of quantity, quality and therapeutic effect of ingredients in each dose. Standardization is an important step for the establishment of a consistent biological activity, a consistent chemical profile, or simply a quality assurance program for the manufacturing of an herbal drug. The spectroscopic standardization help the reducing the adulteration and definitely helps to understand the characterization of selected ingredients. Modern parameters are very useful to find out the drug adulteration and misidentification. The unidentified chemical compounds, physiochemical compounds were producing hazards to human health. So, Indian system of medicine is needed for standardization, the structural standardization will be proved via spectroscopic studies and FTIR analysis. FT - IR is one of the important analytical techniques which is used to determine the organic compounds, including chemical bond, as well as organic content (e.g., protein, carbohydrate and lipid).In this article the trial drug *Aavaraipanchagachoornam*is subjected to access the functional groups present in the drug, with the help of FT – IR instrument. As per guidelines of WHO and AYUSH insisted the guidelines for quality control to better standardization of the drugs as pertain to Pharmacopeia Laboratory of Indian Medicine (PLIM). The Systematic steps should be taken to standardization of traditional drugs by using modern techniques like FTIR.

2. Materials and Methods

In the present study, Herbo mineral drug preparation (*Aavaraipanchagachoornam*) has been selected to establish its standardization status from the classical Siddha literature. The key ingredients used in the formulation were listed below. Purification and Preparation of the *Aavaraipanchagachoornam* was carried out as per classical text literature mentioned. The drugs are authenticated at Department of Gunapadam, Government Siddha Medical College, Palayamkottai.

Ingredients of Drug:

Ingredients	Botanicalname / Chemicalname	Quantity
Aavarai	Cassia auriculata	16.8gm
Maruthamarapattai	Terminalia arjuna	70gm
Naavalpattai	Syzygiumcumini	70 gm
Naavalkottai	Syzygiumcumini	70gm
Kadalalinjalpattai	Celasiareticulata	70gm
Thaneervittankizhangu	Asparagus racemosus	70gm
Paathriver	Stereospermumsuaveolens	70gm
Maramanjal.	Cosciniumfenestratum	35 gm
Kalnaar	Asbestos	35gm
Kurosaaniomam.	Hyoscyamus Niger	8.75gm

Purification of raw drugs:

1) ***Aavaraiilai* (*leaf*)**
Stalk of the leaf and veins are removed, washed in water and dried in shadow for 7 days.
2) ***Aavaraipoo* (*Flower*) -**
Stalk of the flower and pollen grain are removed, was hed and dried in shadow for 7 days
3) ***Aavaraipattai*(*bark*) –**
Outer layer of the bark is peeled off, washed and dried in shadow
4) ***AavaraiVer* (*Root*)**
Remove the mud and dried in shadow
5) ***Aavaraikaai* (*youngfruit*)-**
Collected and dried in shadow for 7 days
6) ***Kadalalinjilpattai***
Outer layer of the bark is taken out and cut into small pieces and dried in shadow
7) ***Maruthamarapattai***
Outer covering of the burk is peeled off and dried in and dried in shadow
8) ***Naavalpattai***
Collected and dried in sunlight
9) ***Naavalkottai*:**
Cleaned and dried in shadow for 7 days and then removed the outer shell of the seeds
10) ***Thaneervittankizhangu***.
Dust is removed and it is dried in shadow
11) ***PaathriVer (Root*)**
Remove the mud and dried in shadow for 7 days.
12) ***Maramanjal***
Outer layer is peeled off and cut into small pieces and dried in shadow for 7 days.
13) ***Kalnaar***
Soaked in cow's urine for 10 days and dried in sunlight.
14) ***Kurosaaniomam***
Mixed with mud and thoroughly rubbed through and husk is removed.

Method of preparation:
The above ingredients are finely powdered and 12gm of powder is taken and boiled in 670 ml (1/2padi) of water and it is reduced to 83.75 ml (1/8 padi) and this decotion is taken twice daily

Shelf life:
3 hours for decotion
3 months for chooranam

Dosage:
1/8 padi (83.75ml) twice a day

Adjuvant:
Sugar

Indication:
Madhumegam (Diabetes mellitus)
Thegakaangai (body heat)
Thaagam (poly dipsia).

FTIR Analysis:
FT – IR Spectra were recorded at *Kalasalingam* Academy of Research and Education (International Research Centre), *Srivilliputhur*. IRTracer – 100 Fourier Transform Infrared (FTIR) Spectrophotometer was used to derive the FT – IR Spectra of *Aavaraipanchagachoornam*in Potassium Bromide (KBC) matrix with scan rate of 20 spectra per second at the resolution 0.25 cm^{1} in the wave number region 400-4000 cm. The samples were ground to fine powder using agate motor and pestle and then mixed with KBr. They were pelletized by applying pressure to prepare the specimen (the size of specimen about 13 mm diameter and 0.3 mm in thickness) to recorded the FT-IR spectra under Standard conditions. The recorded spectrum is given in Table 1.

3. Results

Table 1: FTIR spectra of *Aavaraipanchagachoornam*

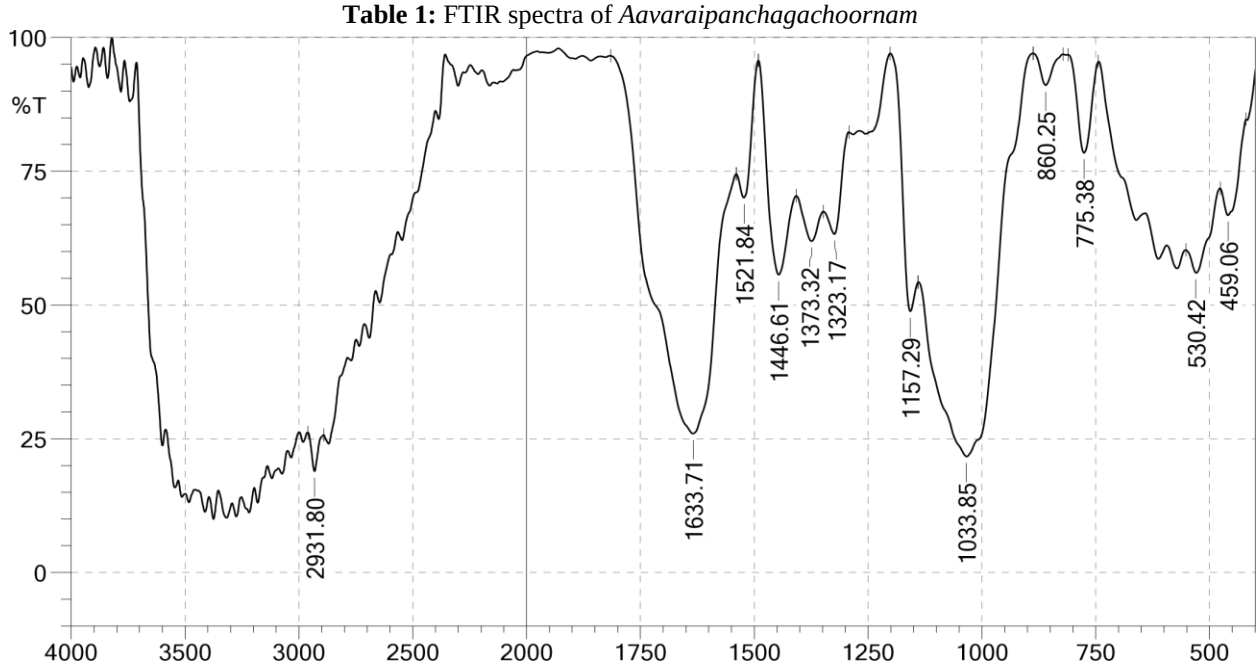

Table 2: FTIR Interpretation of *Aavaraipanchagachoornam*

Wave number in cm $^{-1}$	Vibrational modes in APC in IR region	Functional group
2931.80cm $^{-1}$	O-H stretching	Carboxylic acid
1633.71cm^{-1}	C=C stretching	Alkenes
1521.84cm $^{-1}$	N-O stretching	Nitrocompound
1446.61cm $^{-1}$	C-H bending	Alkanes
1373.32cm $^{-1}$	N-O stretching	Nitrocompound
1323.17cm $^{-1}$	N-O stretching	Nitro compound
1157.29cm $^{-1}$	C-F stretching	Fluro compounds
1033.85cm $^{-1}$	C-F stretching	Fluro compounds
860.25cm $^{-1}$	C-H bending	Aromatic compounds
775.38cm $^{-1}$	C-Cl stretching	Halo compounds
530.42cm $^{-1}$	C-I stretching	Halo compounds
459.06cm $^{-1}$	C-I stretching	Halocompounds

4. Discussion

From the above analysis, the test drug APC is known to have carboxylic acid, Alkane, Alkene, Nitrocompound, Aromatic compound, Alkyl Halides and Aryl Halides. These compounds have some pharmaceutical properties and are briefly discussed below.

- The sample drug APC through FTIR has its Peak value 2931.80cm $^{-1}$, which has O-H stretching exhibit functional group carboxylic acid
- Peak value 1446.61cm $^{-1}$, has C-H bending exhibit functional group alkane.
- Peak value 1633.71 cm -1 has C=C stretching exhibit functional group alkenes.
- Peak values15821.84cm $^{-1}$1373.32cm $^{-1}$1323.17cm $^{-1}$ have N-O stretching exhibit functional group Nitrocompounds.
- Peak values 1157.29cm $^{-1}$, 1033.85cm $^{-1}$have C-F stretch exhibit functional group fluro compounds.(Alkyl&Aryl Halides).
- Peak value860.25cm $^{-1}$ has C-H bend show functional group like Aromatic compound.
- Peak value775.38cm $^{-1}$ has C-Cl stretch exhibit functional group of Halocompounds.(Alkyl & Aryl Halides)
- Peak values 530.42cm $^{-1}$, 459.06cm $^{-1}$ has C-I stretching exhibit functional group of Halocompound (Alkyl &Aryl Halides)

FTIR instrumental analysis was done. The test drug was identified to have 12 peaks. They are the functional groups present in the trial drug *Aavaraipanchagachoornam*. The above table shows the presence of carboxylic acid, Alkanes, Alkenes, Nitro compounds, Flurocompounds, Halocompounds and Aromatic compounds.

Carboxylic acid
Carboxlic acid acts as Anti inflammatory [12], Antioxidant property [13]

Alkanes
Alkanes have (2, 3&4alkyl groups bonded to the carbon atoms of double bond are disubstituted, trisubstituted, exhibit high antimicrobial activity, anti-inflammatory activity.[2]

Alkene
This is used as a general anaesthetic. This is also used to prepare some organic compounds such as, ethyl alcohol [2]

Nitrocompounds:
Nitrocompounds have anti-inflammatory properties [9] [10], antioxidant property [11][6] and hypolipidemicactivity [10]

Fluorocompounds:
This group of substance has antimicrobial, antiseptic, anti tumor [7] and antioxidant activities.

AlkylHalides and Aryl Halides
Alkyl halides and aryl halides have little biological activity. They protect against bacteria and fungi. [3] [5]

Aromatic compounds
They have anti-inflammatory [8] anti diabetic and antioxidant activities. [4] Several aromatic chloro compounds are used as insecticides, fungicides and bactericides.

5. Conclusion

The instrumental analysis FTIR shows the presence of functional groups through their stretch and bends which are responsible for its functional activity. According to the presence of functional group, it can be said that they have anti diabetic, hypolipidemic, anti oxidant and anti microbial activities which has been mentioned in Siddha text books as indication for disease. It will be subjected to further many studies to validate its efficacy and safety through proper standardization procedure. Thus this drug can be taken to the next level of isolation of the active principles which is responsible for the therapeutic effect.

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