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Scientific Evaluation Of Presence Of Functional Groups  
And Metals In Herbo-Mineral Siddha Formulation  
“*Nagarasingadhi Chooranam*” Using Sophisticated  
Modern Techniques Such As FTIR And ICP-OES

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**Abstract**

Siddha medicines are safe scientific system of medicines. Herbals are mostly used in siddha medicines because of its high therapeutic potential. Though herbals are considered as safe, scientific validation is needed for its standardization and its proper use. Various herbal formulations were indicated in siddha literatures for the treatment of several diseases such as Tuberculosis, Bronchial asthma, Cancer etc., One of the herbo-mineral siddha formulation which was indicated for the management of Bronchial asthma is *Nagarasingadhi chooranam*. FTIR and ICPOES analysis was carried to characterize this formulation. Through FTIR analysis some functional groups such as Alcohols, Amide, Amine, Alkane, Acid, Alkyl Halide, Ether, Ester were identified in “*Nagarasingadhi chooranam*”. The presence of heavy metals such as mercury, lead, arsenic, cadmium in “*Nagarasingadhi chooranam*” are within the WHO permissible limits. This research work will help to carry out further molecular and clinical studies in future.

**Keywords:** FTIR, Herbal, *Chooranam*, Siddha medicine, Characterization.

**Introduction**

Siddha system is one of the ancient traditional systems of medicine of our country compiled by the Siddhars. The term “Siddha” is derived from the word “*Siddhi*” that is Attainment of Perfection or Achievement of Heavenly bliss<sup>(1)</sup>

Siddha medicine aims at the perfection of health. Siddhars simplify the concept of how a human body is exposed to various types of diseases. The main principle of siddha medicine is depend on three bodily vital humours such as *vatham*, *Pitham*, and *Kapham*.

The deranged *Vatha*, *pitha* and *kabam* are termed as “*kuttram*”<sup>(2)</sup>.

Siddha Herbo-Mineral formulations provide biosafe and relieve the broncho constriction and other symptoms by their fast acting properties. They do not possess any adverse drug reactions. One of the siddha herbo mineral formulation “*Nagarasingadhi Chooranam*” was subjected into characterization using FTIR and ICPOES analysis for standardization.

## Materials and Methods

### Details regarding the experiment:

#### Details regarding the sample:

The drug "**Nagarasingadhi Chooranam**" was prescribed in Siddha literature "*Anuboga Vaidhiya Navaneedham (Part 8)*"<sup>(3)</sup> for the treatment of Bronchial Asthma. The ingredients of the drug are

1. *Chukku (Zingiber officinale)*
2. *Milagu (Piper nigrum)*
3. *Thippilli (Piper longum)*
4. *Sadamanjil (Nardostachys jatamansi)*
5. *Siruthaekku (Clerodendrum serratum)*
6. *Karkadaga singhi (Rhus succedanea)*
7. *Koshtam (Costus speciosus)*
8. *Nelli mulli (Phyllanthus emblica)*
9. *Kadukkaithol (Terminalia chebula)*
10. *Thandrikkaithol (Terminalia bellirica)*
11. *Induppu (Sodium chloride impura)*
12. *Sengazhuneer kizhangu (Nymphaea alba)*
13. *Kandangatri vaerpattai (Solanum xanthocarpum)*
14. *Thoodulai vaerpattai (Solanum trilobatum)*
15. *Adathodai vaerpattai (Justicia adhatoda)*
16. *Siruvazhuthalai vaerpattai (Solanum melongena)*

#### 1. FTIR Analysis:

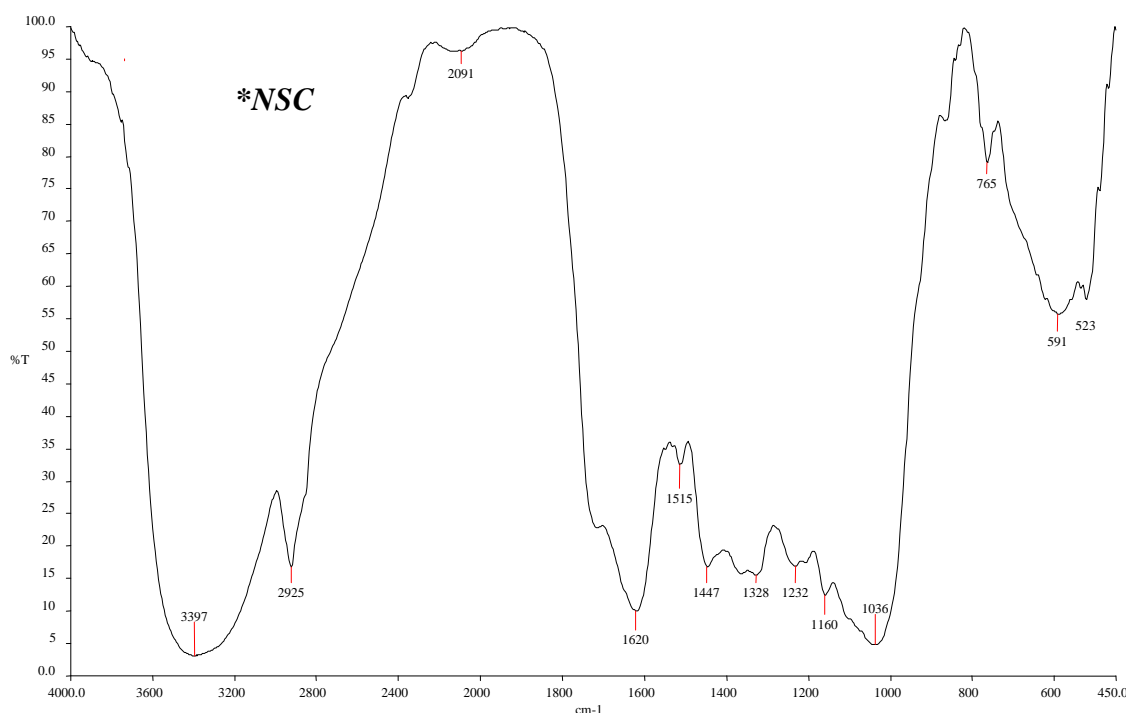
FT-IR spectra were recorded at SAIF, IIT Madras, India. The Perkin Elmer Spectrum One Fourier Transform Infrared (FTIR) Spectrometer was used to derive the FT IR Spectra of **Nagarasingadhi Chooranam** in Potassium Bromide (KBr) matrix with scan rate of 5 scan per minute at the resolution 4cm<sup>-1</sup> in the wave number region 450-4000cm<sup>-1</sup>. The samples were grounded to fine powder using agate motor and pestle and the mixed with KBr. They were then 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<sup>(4)</sup>. FT-IR Spectra were used to determine the presence of the functional groups and bands in the **Nagarasingadhi Chooranam**.

#### 2. ICP-OES Analysis :

The Inductively Coupled Plasma Optical Emission Spectrometric (ICP-OES) analysis was done at SAIF in IIT MADRAS, Chennai - 36 using Perkin Elmer Optima 5300 DV. The digestion sample was prepared by using 100 mg of **Nagarasingadhi Chooranam** added with 3 ml of Nitric acid and 25 ml of Distilled water<sup>(5)</sup>.

## Results

#### 1. FTIR Analysis



FT-IR Spectra of *Nagarasingadhi Chooranam*\* *Nagarasingadhi Chooranam*

Absorption peak $\text{cm}^{-1}$	Stretch	Functional group
3393	O-H(stretch, H- Bonded), N-H stretch, N-H stretch	Alcohols, Amide and Amine
2925	C-H stretch, O-H stretch	Alkane and Acid
1620	C=C stretch	Alkene
1515	C=C stretch	Aromatic
1447	-C-H stretch, C=C stretch	Alkane, Aromatic
1328	C-F stretch, C-N stretch	Alkyl Halide, Amine
1232	C-F stretch, C-N stretch, C-O stretch, C-O stretch, C-O stretch	Alkyl Halide, Amine, Ether, Ester and Acid
1160	C-N stretch, C-F stretch, C-O stretch, C-O stretch	Amine, Alkyl Halide, Ether, Ester
1036	C-F stretch, C-O stretch, C-O stretch	Alkyl Halide, Ether, Ester
765	C-Cl stretch, =C-H bending	Alkyl Halide, Alkene
591	C-Br stretch	Alkyl Halide
523	C-Br stretch	Alkyl Halide

## 2. ICP –OES Analysis:

S. no	Elements	Detected levels
1.	Potassium	210.881mg/L
2.	Calcium	12.150 mg/L
3.	Phosphorus	88.571 mg/L
4.	Iron	18.370 mg/L
5.	Sodium	13.180 mg/L
6.	Arsenic	BDL
7.	Mercury	BDL
8.	Nickel	BDL
9.	Lead	BDL
10.	Cadmium	BDL

ICP-OES reveals the concentration of many physiologically important minerals like Ca, Na, Fe, K & P in the drug *Nagarasingadhi Chooranam*.

### Discussion

In the FT-IR Spectra analysis, this sample *Nagarasingadhi Chooranam* exhibits the peak value shows in Table 1 at the wave number of 3393, 2925, 1620, 1515, 1447, 1328, 1232, 1160, 1036, 765, 591, 523 having O-H(stretch, H- Bonded), N-H stretch, C-H stretch, O-H stretch, C=C stretch, -C-H stretch, C-F stretch, C-N stretch, C-O stretch, C-Cl stretch, =C-H bending, C-Br stretch.. This indicates the presence of some organic functional groups such as Alcohols, Amide, Amine, Alkane, Acid, Alkyl Halide, Ether, Ester. The OH group has anti asthmatic effect. It has higher potential towards inhibitory activity against airway inflammation<sup>(6)</sup>. Amide has mucolytic activity. It makes

the mucus less thick and sticky and easier to cough up<sup>(7)</sup>.

In ICPOES analysis the heavy metals like As, Cd, Hg, Pb and trace element like Ni were observed at below detectable level. This reveals the safety of the drug. Hence the formulation *Nagarasingadhi Chooranam* is extremely safe. Phosphorus is an essential mineral which plays a wider role in the treatment of bronchial asthma used for growth & helps in the repairment of body cells and tissues<sup>(8, 9)</sup>.

The presence of iron in this herbo mineral formulation helps to enhance the oxygen level in the arteries and promotes the normal ventilation of the lungs thereby reducing dyspnea,. There is a huge relationship in potassium and calcium cell-signaling channel along the regulatory part of the respiratory system<sup>(10)</sup>. So this drug *Nagarasingadhi Chooranam* will stimulates normal respiratory mechanism.

## Conclusion

Some organic functional groups such as Alkane, Acid, Alkyl Halide, Ether, Ester, Alcohols, Amide, Amine were identified in siddha compound *Nagarasingadhi Chooranam*. These functional groups have more significance for its medicinal property. Through ICPOES analysis the presence of some metals and minerals such as Calcium, Potassium, Phosphorus, Iron, Sodium were confirmed in the siddha formulation *Nagarasingadhi Chooranam*. So Calcium, Potassium, Iron, Sodium and phosphorus found in this drug *Nagarasingadhi Chooranam* help to achieve its activity on bronchial muscles. If clinical trial and further research work would be carried out followed by these findings, it will be highly beneficial to the medical world.

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