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DEVELOPED INSTRUMENTAL EXPLORATION AND ASSESSMENT OF SIDDHA FORMULATION ELADHI CHOORANAM

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ABSTRACT

The main aim of the present investigation is to identify the functional group of Siddha formulation *Eladhi Chooranam* (EC) by FT-IR and also characterize the same by using sophisticated techniques like SEM and XRD. The information's obtained from the present analysis offers valuable information with respect to surface morphological features of the Siddha formulation EC with the size range of 5-1micron. FT-IR analysis of the sample EC reveals the presence of 9 prominent absorption peaks. Further it evident the presence of peaks corresponds to presence of free hydroxyl and phenolic functional group. The major diffraction peaks are identified in XRD analysis of EC shows that the particles are in the average size range of 33-76nm. The Size and surface of micro particles can be easily manipulated to achieve both passive and active drug targeting. They control and sustain the release of drug during the transportation and at the site of localization, alter the drug distribution in the body and subsequent clearance of the drug so as to achieve increased drug therapeutic efficacy there by it increases the bio-availability of the drug and reduced the side effects. Hence, EC which is prepared biologically contains micro particles to enhance the pharmacological action in the target site.

KEYWORDS: *Siddha*, *Eladhi Chooranam*, Standardization, FT-IR, SEM, XRD.

INTRODUCTION

Siddha medicine, a alleviate system of healing which emerged in Tamilnadu and is considered to be one of India's oldest systems of medicine. The Siddha system of medicine is based on a combination of ancient medicinal practices and spiritual disciplines as well as alchemy and mysticism. It is through to have developed during the Hindus civilization. Siddha medicines include a part of Tamil culture.

Nanotechnology is the ability to build materials, devices and systems with atomic precision. A brief and general definition of nanotechnology is the statement by the US National Science and Technology Council, which states: "The essence of nanotechnology is the ability to work at the molecular level, atom by atom, to create large structures with fundamentally new molecular organization. The aim is to exploit these properties by gaining control of structures and devices at atomic, molecular and supramolecular levels and to learn to efficiently manufacture and use the devices.".[1]

Siddha system of medicine contains a lot of hidden medical treasures that can be applied in treatment of various life threatening diseases. Validation and interpretation of Siddha Herbo-mineral medicines with modern nanotechnology will help to fill the gap areas of failure in other medical systems. Application and implementation of these siddha medicines in a wide range throughout the world will be a boon for diseased population and help in promoting healthy society.[2]

In this paper deals with the functional group of Siddha formulation Eladhi Chooranam (EC) by FT-IR and also characterize the same by using sophisticated techniques like XRD and SEM.

1. MATERIALS AND METHODS

1.1. Ingredients

The Siddha formulation *Eladhi Chooranam* comprises of the following ingredients

Elakkai (Elettaria cardamomum)	- 120 g
Thamarai poovithaz (Nelumbo nucifera)	- 120 g
Allipoo (Nymphaea nouchali)	- 120 g
Korai kizhangu (Cyperus rotundus)	- 120 g
Athimathuram (Glycyrrhiza glabra)	- 120 g
Kirambu (Syzygium aromaticum)	- 120 g
Ilanthai kottai paruppu (Ziziphus mauritiania)	- 120 g

Pachai karpooram (Dryobalanops aromatica)	- 120 g
Nerpori (Oryza sativa)	- 120 g

1.2. Source and authentication of raw drug

The raw materials of Elettaria cardamomum, Dry Cyperus rotundus, Glycyrrhiza glabra root, Syzygium aromaticum, Dry Ziziphus mauritiania, Dryobalanops aromatica and Oryza sativa were collected from the raw drug country shop at Parrys corner, Chennai, Tamilnadu, India.

The Petals of Lotus were collected at Sriperumbudur, Kancheepuram, Tamilnadu, India. The Petals of Lilly were collected at Kancheepuram, Tamilnadu, India.

All the raw drugs were identified and authenticated by the *Gunapadam* experts in Government Siddha Medical College, Arumbakkam, Chennai – 106. The specimen sample of all the herbs have been preserved in PG *Gunapadam* department individually for future reference. **Ref No: GSMC/PGGM/2016-2019.**

1.3. Purification of raw drugs

All the drugs mentioned here were purified as per the Siddha literature.[3] All the impurities are removed from *Elakkai, Korai kizhangu, Kirambu,* and fried at low flame. Impurities of *Pachai karpooram* and *Nerpori* were removed. The root of Indian liquorice was cleaned with water and cut into small pieces and then dried. *Ilanthai kottai paruppu* impurities are removed and the outer shell was breaked off. *Thamarai Poo* and *Allipoo petals impurities* were removed and dried in cool dark place.

1.4.Preparation of the drug

All the above-mentioned ingredients were purified and dried in the shade until complete evaporation of the moisture content. It was roasted and powdered and filtered individually. (Fine process). Then all are thoroughly mixed to make *Eladhi Chooranam* and kept in an air tight container. It was labeled as "***Eladhi Chooranam" (EC).***

1.5.Purification of the chooranam

Steaming process (Pittaviyal murai)

The ***Eladhi Chooranam*** was purified by *pittaviyal* method (steam cooking in milk) as per Siddha classical literature. A mud pot was taken and it was half filled by mixture of milk with equal quantity of water. The mouth of the pot was sealed by a cloth. This *Chooranam*

was placed over the cloth and tied firmly around the mouth of mud pot by another pot. The gap between mud pots was tied with a wet cloth to avoid evaporation. The mud pot was kept on fire and boiled until the cow's milk 3/4 reduced in the lower pot. The same drug was later dried and powdered then sieved again. It was used for the further study.[4]

1.6. Storage of the drug

The prepared test drug was stored in a clean, air tight glass container. The contents were inspected frequently to avoid moisture and insects.

1.7. Administration of the drug

Dose : 5.1 g twice a day

Adjuvant : Honey

1.8. Fourier transform- infra red spectroscopy study[5]

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. Triturate about 1 to 2 mg of the *EC* 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/ cm^2). 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 eg. If the standard shows a transmittance of 75%, the sample transmittance can be between 65% and 85%).

1.9.X-Ray diffraction method[6]

The XRD spectrum of test drug was Bruker discover D8 X ray diffractometer. Cu K Alpha radiation was used for recording the spectra. The range of diffraction angle 10-70 operating at 30kV and 20 mA. The Pattern was recorder from the angle 5 to 80 degree at a scanning rate of 3 degree/second.

1.10. Scanning electron microscopy[7]

Scanning Electron Microscopy uses a focused beam of high-energy electrons to generate a variety of signals at the surface of solid specimens. In most SEM microscopy applications, data is collected over a selected area of the surface of the sample and a two-dimensional image is generated that displays spatial variations in properties including chemical characterization, texture and orientation of materials. The SEM is also capable of performing analyses of selected point locations on the sample. This approach is especially useful in qualitatively or semi-quantitatively determining chemical compositions, crystalline structure and crystal orientations.

The EDS detector separates the characteristic X-rays of different elements into an energy spectrum and EDS system software is used to analyze the energy spectrum in order to determine the abundance of specific elements. A typical EDS spectrum is portrayed as a plot of X-ray counts vs. energy (in keV). Energy peaks correspond to the various elements in the sample. Energy Dispersive X-ray Spectroscopy can be used to find the chemical composition of materials down to a spot size of a few microns and to create element composition maps over a much broader raster area. Together, these capabilities provide fundamental compositional information for a wide variety of materials, including polymers. In scanning electron microscope high-energy electron beam was focused through a probe towards PP. Variety of signals was produced on interaction with the surface of the sample. This results in the emission of electrons or photons and it was collected by an appropriate detector.

2. RESULTS

2.1.Result analysis of ft-ir spectrum of siddha formulation ec

The results obtained from the FTIR instrumental analysis of the sample EC reveals the presence of 9 intense absorption peaks corresponds to the presence of hydroxyl and phenol functional. The table 1 shows the presence of alcohol, Phenols, Alkenes, Aldehyde, Carbonyls, Nitro compounds, Carboxylic acids, Esters, Ethers, Amine, Aromatic groups which represent the peak value. As shown in Table 1 and figure 1.

Table 1: Ftir-interpretation of *ec*.

Absorption peak cm^{-1}	Stretch	Functional group
3430	O-H stretch, free hydroxyl	Alcohols, Phenols
2921	C-H Stretch	Alkene
2521	H-C=O:C-H Stretch	Aldehydes
1787	C=O Stretch	Carbonyls (General)

1478	N-O asymmetric Stretch	Nitro compounds
1082	C-O Stretch	Alcohols, Carboxylic acids, Esters, Ethers
861	=C-H bend	Alkenes
712	N-H wag	1^0, 2^0 amines
699	C-H "oop"	Aromatics

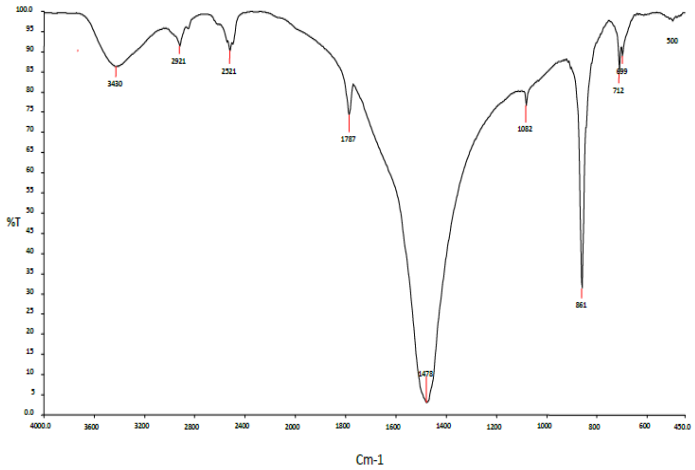

Figure 1: FTIR spectrum of Siddha formulation EC.

3.1. Result of xrd analysis of the siddha formulation ec

The crystalline structure, the size and shape of the particles are highly dependent on the route of synthesis and highlight the efficacy of the drug. The Nano particles may enhance bio absorption of the drug. XRD pattern of *EC* shows the good crystallinity after calcinations process. The major diffraction peaks are identified after XRD analysis *EC* concluded that Nano crystalline range 33-76nm is association with organic molecules probably plays an important role in making it biocompatible and nontoxic at therapeutic doses. Other elements present in *EC* act as additional supplement and possibly helps in increase the efficacy of the formulation. As shown in figure 2.

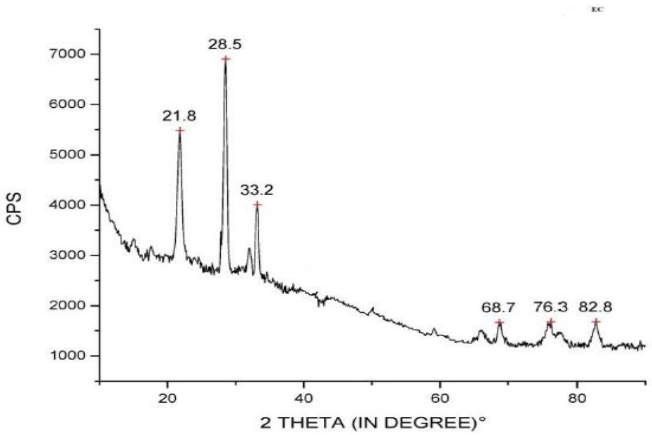

Figure 2: XRD analysis of the Siddha formulation EC.

3.2. Result of scanning electron microscope images of thesiddha formulation ec

The particle morphology can be identified through these SEM images of Siddha medicine *Eladhi chooranam*. The particles are not spherical in shape. The size of the particles was approximately identified between 5-1micron. As shown in Figure 3.

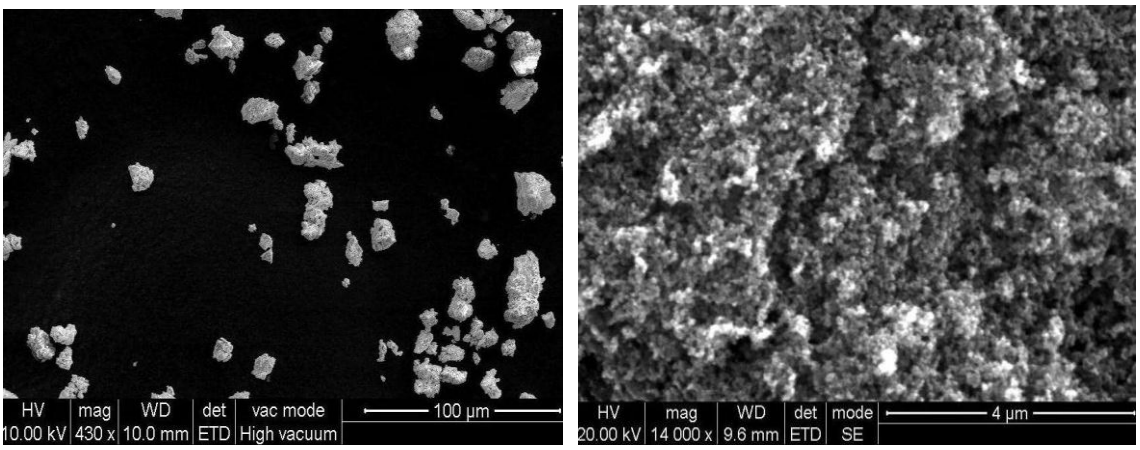

Figure 3: SEM analysis of the Siddha formulation EC.

3. DISCUSSION

The present study reveals the FT-IR analysis of the test drug identified to have 9 predominant peaks. They are the functional groups present in the trial drug EC. The table 1 shows the presence of alcohol, Phenols, Alkenes, Aldehyde, Carbonyls, Nitro compounds, Carboxylic acids, Esters, Ethers, Amine, Aromatic groups which represent the peak value.

The structure, size and shape of the particle plays significant role in bio absorption of the drug. With respect to surface morphological features of the Siddha formulation EC with the size range from 5-1micron. Micro particles are defined as particulate dispersion or solid particles with a size in the range of 100-1000 nm in diameter. Size and surface of micro particles can be easily manipulated to achieve both passive and active drug targeting. They control and sustain the release of drug during the transportation and at the site of localization, alter the drug distribution in the body and subsequent clearance of the drug so as to achieve increased drug therapeutic efficacy there by it increases the bio-availability of the drug and reduced the side effects. Hence, EC which is prepared biologically contains micro particles to enhance the pharmacological action in the target site.[8]

The crystalline structure, the size and shape of the particles are highly dependent on the route of synthesis and highlight the efficacy of the drug. The nano particles may enhance bio absorption of the drug. XRD pattern of *Eladhi chooranam* shows the good crystallinity after

calcinations process. The major diffraction peaks are identified after XRD analysis *EC* concluded that Nano crystalline range (21-33nm) is association with organic molecules probably plays an important role in making it biocompatible and nontoxic at therapeutic doses. Other elements present in *EC* act as additional supplement and possibly helps in increase the efficacy of the formulation.[9]

Nanoparticles have important properties that can be used to progress the drug delivery. Where larger particles would have been unequipped from the body, cells adopt these nanoparticles because of their size. Complex drug delivery mechanisms are being developed, together with the capability to get drugs through cell membranes and into cell cytoplasm. Efficacy is important because various diseases depend upon processes within the cell and can only be impeded by the drugs that make their way into the cell.[10]

4. CONCLUSION

From the results of the present study it was observed that the Siddha formulation EC contains biologically significant functional groups like Free hydroxyl and phenolic groups and further SEM and XRD analysis reveals the presence of particle with size which is prepared biologically contains micro particles to enhance the pharmacological action at the target site and improved bioavailability and penetrability of the drug in to the biological system.

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