



## Characterisation and Elemental analysis of a Siddha Herbo Mineral formulation – Vishnu Chakra Mathirai

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### Abstract

Siddha is one of the oldest indigenous system of medicine which is founded by Siddhars. The volumes of literatures in Siddha system of medicine describes about 4448 diseases and their management by herbal, herbo mineral and animal origin drugs. *Vishnu Chakra Mathirai* - a siddha herbo mineral formulation mentioned in Siddha literatures, indicated for various conditions like rheumatic and other neurologic disorders. The elemental analysis and characterization study of *Vishnu Chakra Mathirai* of UV-Vis, FTIR, Particle size analysis by Scanning Electron Microscope and EDAX, XRF study are presented in this paper.

**Keywords:** Siddha, herbo mineral, UV-Vis, FTIR, SEM, EDAX, XRF.

### 1. Introduction

According to Siddha system of Medicine all the objects in this world either living or non-living are composed of five elements (*Pancha bootham*) namely, Earth – *Man*, Water – *Neer*, Fire – *Thee*, Air – *Katru*, Ether – *Aahayam*. The universe is also make of up of these above *boothams*, so any changes in the universe will reflect in human body. According to siddha the health of human body is maintained by the three vital forces (*Uyir Thathukka*) namely; *Vatham*, *Pitham* and *Kabam* which are functioned by the influence of *Panchaboothams*. In Siddha the diseases of mankind are classified are classified into 4448 types on the basis of *Mukkutram*. According to Siddha system of medicine health is defined as the state of physical, psychological, social and spiritual component of a human being which has been given in this text Thirumanthiram as:

“One that cures physical ailment is medicine  
One that cures psychological ailment is medicine  
One that prevents ailment is medicine and  
One that bestows immortality is medicine”

The word “*Siddha*” literally means “Established truth”. “*Siddhi*” means as object to be obtained such as perfection in life or heavenly bliss. *Siddha* is a Science of life and it is a holistic medical system that given important to mental as well as physical well being of suffering humanity. Derangement of these *kutrams* produces diseases. Epilepsy is a condition mentioned in siddha literatures as *valippu*. Many herbal and herbo mineral formulations were mentioned in siddha literatures. *Vishnu Chakra Mathirai* (VCM), a herbo-mineral formulation, is used for many years in Siddha System of Medicine is taken for the present study. Pshychiatric conditions and other neuropsychiatric disorders were dealt in the Siddha text (*Agathiyar Manida Kirukku Nool*) had a scientific approach to understanding mental diseases and their management by internal and external treatment procedures. Epilepsy is one of the most frequent neurological disorders of man characterized by excessive provisional neuronal discharges ensuing in uninhibited convulsion. Epilepsy can be defined as a group of disorders characterized by

unusual electrical activity in the brain leading to altered behaviour which may manifest as a change in a person's consciousness, movement.

## 2. Materials and Methods

### 2.1 Ingredients:

The Ingredients of Vishnu Chakra Mathirai are; *Rasam* (Purified Mercury), *Lingam* (Purified Cinnabar), *Ganthagam* (Purified Sulphur), *Karu naabi* (Purified Aconite), *Palagarai* (Yellow orpiment), *Thalagam* (Purified Calamine), *Kantham* (Purified Lode stone), *Manosilai* (Purified Red Orpiment), *Veppam Pazha Saru* (Neem Fruit Juice) were obtained from raw drug store in Chennai.

### 2.2 Preparation of Vishnu Chakkara Tablet:

The raw drugs and other ingredients were authenticated and purified as per the methods prescribed in Siddha literatures. The purified *Rasam*, *Lingam*, *Kandhagam*, *Nabhi*, *Palagarai*, *Thuththam*, *Thalagam*, *Kantham* and *Manosilai* were powdered and ground with *Vepam pazha juice* to a rolling consistency. After grinding to a soft consistency of soft pill, it was rolled as pills of 130 mg (*One Kuntri*) and allowed to dry.

## 2.3 Procurement and Authentication of Raw Drugs

Raw drugs were purchased from Gopalan Asan stores, Nagercoil and the raw drugs were identified and authenticated by the Department of Gunapadam, National Institute of Siddha, Chennai-47.

## 3 Morphological characterisation studies by SEM:

Morphological characterization study was conducted by Scanning Electron Microscope (SEM). Scanning Electron Microscope (SEM) is one type of electron microscope that produces images of a test drug by scanning it with a focused beam of electrons. The information about the drug surface topography and composition were analyzed by the detection of secondary electrons emitted by atoms excited by the electron beam. The number of secondary electrons that can be detected depends on the angle at which the beam meets surface of the sample. SEM can measure the resolution better than 1 nanometer. By scanning the sample and collecting the secondary electrons that are emitted using a special detector, an image displaying the topography of the surface is created. The VCM sample was subjected to SEM analysis and the angle was measured from this angle, the size of the particles was calculated (Figure 1a, b).

Figure: 1(a) Scanning Electron Microscope picture of VCM

View field: 42.4  $\mu\text{m}$ , Magnification : 3

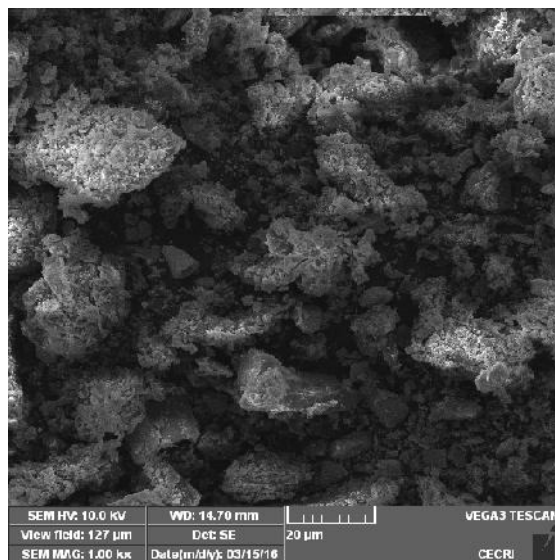
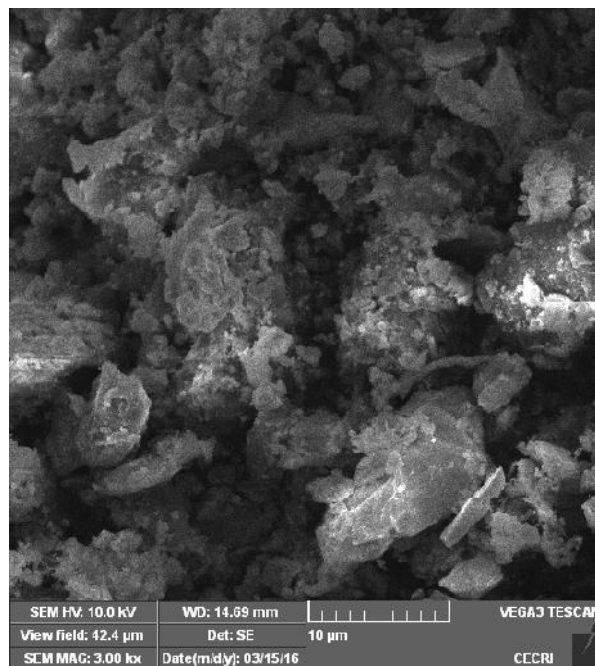


Figure: 1(b) Scanning Electron Microscope picture of VCM

View field : 25.5  $\mu\text{m}$ , Magnification : 5



#### 4 Spectral studies:

The *Vishnu Chakra Mathirai* was characterized by UV - visible spectrometry and FT-IR Spectroscopy.

##### 4.1 Ultra Violet-Visible spectra

UV absorption spectroscopy can characterize those types of compounds which absorb UV radiation. The compounds with unbonded electrons or those with the conjugated double bonded system such as aromatic compounds can be identified by such technique.

Identification is done by comparing the absorption spectrum and  $\lambda_{\text{max}}$  with that of known compound. In order to record UV absorption spectrum the usual practice is to measure the amount of radiation absorbed at various wavelengths. Then a curve is plotted between wavelength and absorption.

The spectrophotometer used for our experiment (UV-260 Shimadzu spectro-photometer) has a range of

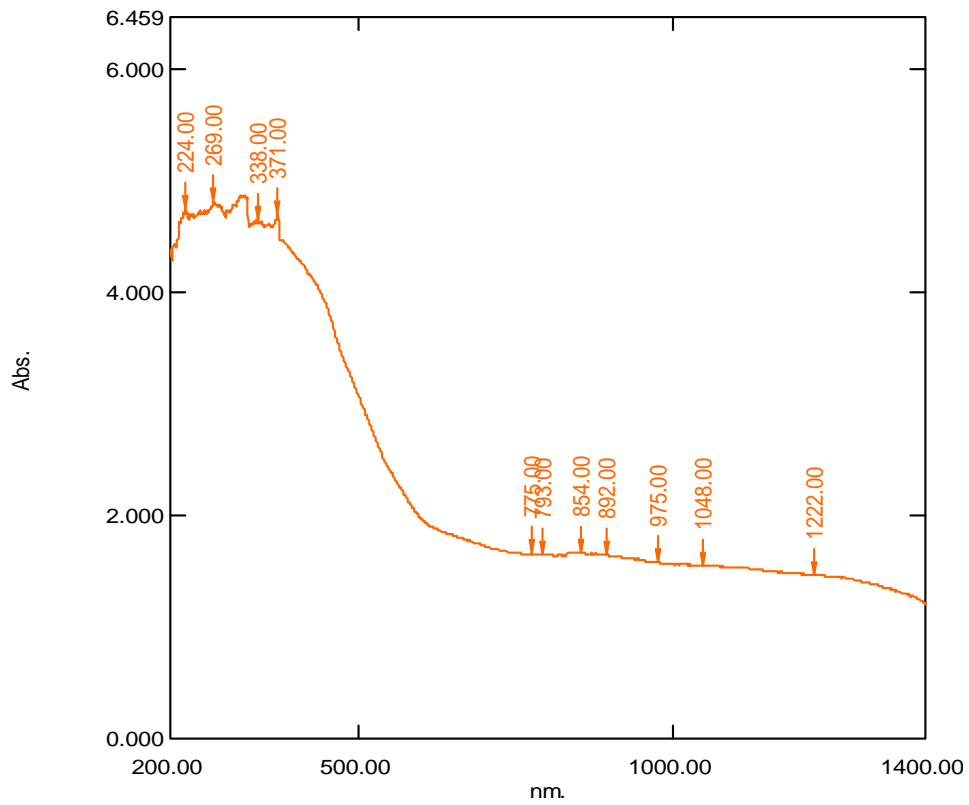
340 nm - 960 nm with tungsten halogen lamp as light source and silicon photo diode as detector. About 0.1 g of drug sample was dissolved in 100 ml of ethanol and the optical density was found out from 400 nm - 540 nm and the  $\lambda_{\text{max}}$  was observed to be at 470 nm.

Ultra Violet and Infra Red spectra of the drug were recorded. The absorbance and reflectance data were presented in the below presented table. The peak at 224 nm, 269 nm, 338 nm, 371 nm UV spectrum for absorbance and peak at 1216 nm, 1044 nm, 971 nm, 888 nm for reflection reveals the fact that it absorbs light only in the visible region of the electromagnetic radiation (Figure 2 a, b) . The IR spectra (Fig 3) shows peaks at various frequencies. The peak at  $3299\text{ cm}^{-1}$  shows the presence of alcoholic functional group and peak at  $2918\text{ cm}^{-1}$  indicates the presence of aldehyde group. The peak at  $2082\text{ cm}^{-1}$ , and  $1615\text{ cm}^{-1}$  are due to carbonyl stretching and peaks at  $1411\text{ cm}^{-1}$ ,  $1017\text{ cm}^{-1}$  and  $870\text{ cm}^{-1}$  indicates the C-H stretching.

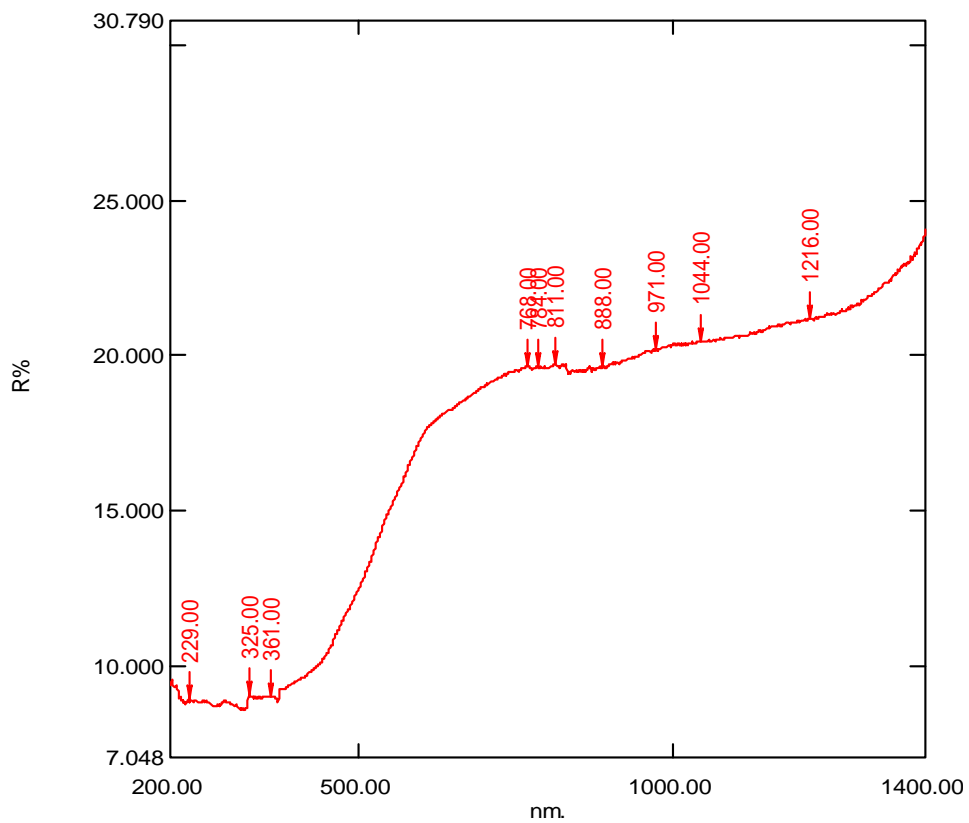
Table 1. Showing Ultra Violet and Infra Red spectra:

UV nm		Infra Red $\text{cm}^{-1}$
Reflectance	Absorbance	
1216	224	3299
1044	269	2918
971	338	2082
888	371	1615
		1411
		1017
		870

a. Absorbance in UV Spectra



b. Reflectance in UV Spectra



## 4.2 Infra Red Spectroscopy:

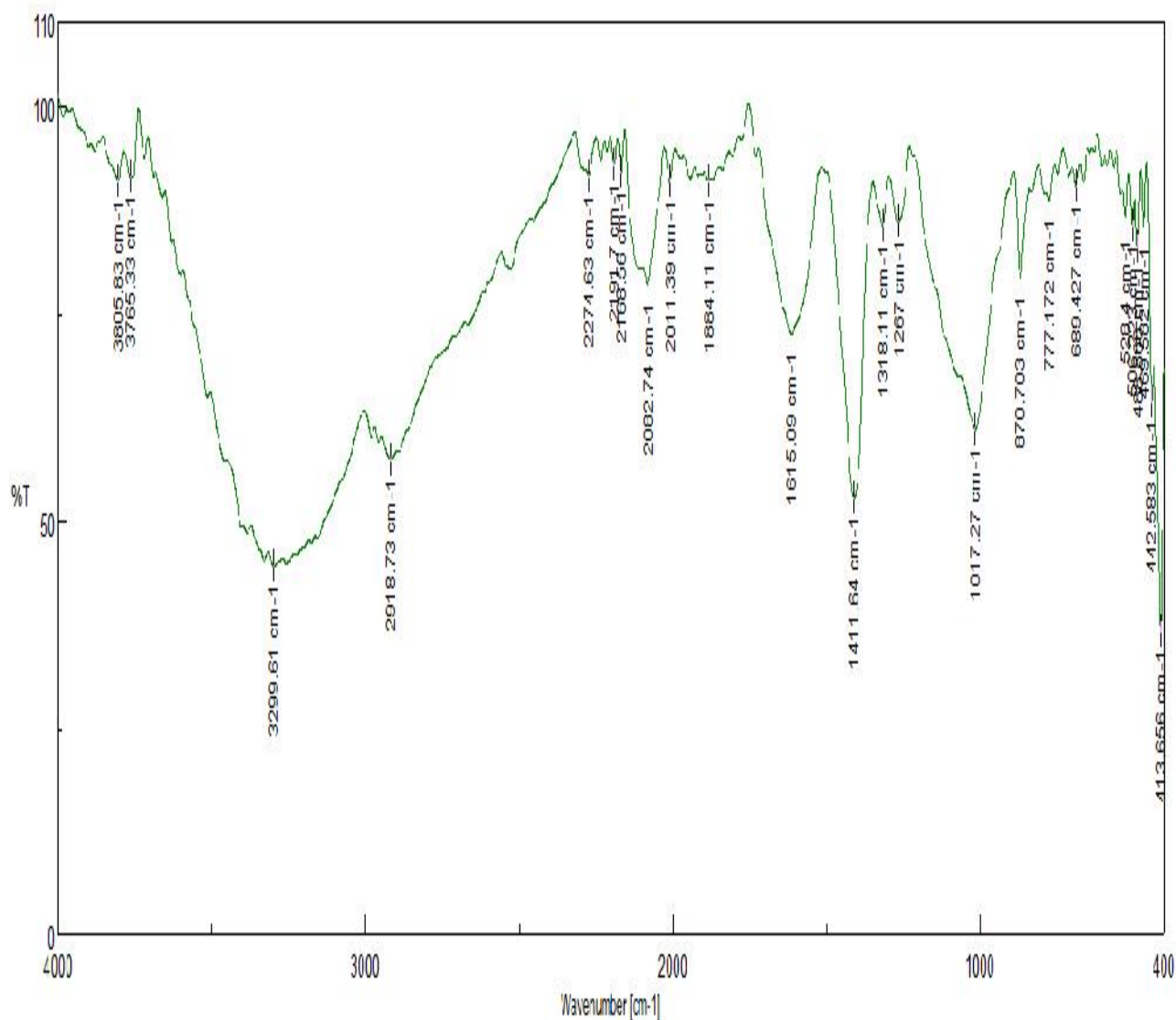
Infrared spectroscopy is one of the most powerful analytical techniques which offer the possibility of chemical identification. It provides useful information about the structure of molecule. The technique is based upon the simple fact that a chemical substance shows marked selective absorption in the infrared region. After absorption of IR radiations, the molecules of a chemical substance vibrate at many rates of vibration, giving rise to close-packed absorption bands, called an IR absorption spectrum which may extend over a wide wavelength range. Various bands will be present in IR spectrum which will correspond to the characteristic functional groups and bonds present

in a chemical substance. Thus, IR spectrum of a chemical substance is a fingerprint for its identification.

Band position in an infrared spectrum may be expressed conveniently by the wave number  $\text{cm}^{-1}$ , whose units is  $\text{cm}^{-1}$ . A Nicolet 5700 FTIR USA, instrument was used for recording the IR spectra with 2 - 3 mg of the sample as KBr pellet. IR spectra of the drug was recorded.

A small quantity of dry KBr was mixed with a little amount the sample and ground for homogenization. An IR lamp was used for drying during mixing. The mixture was then pressed in to a transparent thin pellet at  $5 \text{ ton/cm}^2$ . These pellets were used for IR spectral recording.

Figure: 3 Infra Red Spectrum of VCM



## 5. Elemental analysis

### 5.1 EDAX

Energy-dispersive X-Ray spectroscopy (EDAX) is an analytical technique used for the elemental analysis of a sample. It relies on an interaction of source of X-ray excitation and a sample. Its characterization capabilities are that each element has a unique atomic structure allowing unique set of peaks on its X-ray emission spectrum. To stimulate the emission of characteristic X-rays from a specimen, a high-energy beam of charged particles such as beam of X-rays, is focused into the sample being studied. The number and energy of the X-rays emitted from a specimen can be measured by an energy-dispersive spectrometer. From this the elemental composition of the specimen

can be found out. The powder of VC Mathirai was subjected to EDAX analysis and the elemental composition was found out (Table 2).

### 5.2 XRF

X-Ray Fluorescence (XRF) is the emission of characteristic fluorescent X-rays from a material that has been excited by bombarding with high-energy X-rays. The phenomenon is widely used for elemental analysis and chemical analysis, particularly in the investigation of metal based research and in geochemistry, forensic science, archaeology. The powder of Vishnu Chakra Mathirai was subjected to XRF analysis and the elemental composition was found out.

**Table 2 Elemental analysis of VCM**

Sl. No	Element	wt %	at %
1	Carbon	24.98	42.25
2	Oxygen	21.88	37.01
3	Magnesium	5.80	9.82
4	Sulphur	4.96	8.39
5	Calcium	1.50	2.54

## Summary

To study the particle size of VCM Scanning Electron Microscope (SEM) analysis was carried out. The particles are found to be spherical in shapes and sizes are in the range from 7 microns to 50 microns. When dispersed in an aqueous medium, these preparations form a negatively charged hydrophobic particle suspension. This hydrophobicity gives these particles a tendency to aggregate together to form larger particles. This sample exhibited larger sizes and agglomeration of the particles. Therefore, the comparatively larger size may be due to the agglomeration of the particles by repeated cycles of calcinations involved in preparation.

Ultra Violet and Infra Red spectra of the drug were recorded. In the UV the peak at 224 nm, 269 nm, 338 nm, 371 nm UV spectrum for absorbance and peak at 1216 nm, 1044 nm, 971 nm, 888 nm for reflection reveals the fact that it absorbs light only in the visible region of the electromagnetic radiation.

The IR spectra shows peaks at various frequencies. The peak at  $3299\text{ cm}^{-1}$  shows the presence of alcoholic functional group and peak at  $2918\text{ cm}^{-1}$  indicates the presence of aldehydic group. The peak at  $2082\text{ cm}^{-1}$ , and  $1615\text{ cm}^{-1}$  are due to carbonyl stretching and peaks at  $1411\text{ cm}^{-1}$ ,  $1017\text{ cm}^{-1}$  and  $870\text{ cm}^{-1}$  indicates the C-H stretching.

Energy Dispersive X-Ray analysis (EDAX) of VCM was carried out and the elements present like, Carbon, Oxygen, Magnesium, Sulphur and Calcium were estimated. From the spectra atom percentage of the elements are found to be as follows. Carbon = 42.25%, Oxygen = 37.01%, Magnesium = 9.82%, Sulphur = 8.39% and Calcium = 2.54%.

## Conclusion

Vishnu chakra mathirai is a commonly prescribing siddha herbo-mineral formulation used many years for neurological disorders, rheumatic diseases and other degenerative disorders. The standardization and elemental analysis of the siddha formulation were studied. The encouraging study reports showed that the prepared formulation would be adding evidence for the curative effect of prescribing this medicine since ancient years. This study outcome will be a boon for the young indigenous medical and herbal researchers. It will be initiative step in the field of standardization of siddha drugs for global acceptance.



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