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**Scientific validation of Herbo mineral formulation
Gandhaka chooranam through ICP-OES and
SEM analysis**

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Abstract

Siddha system has a lot of medicines like ocean and only drops of it are scientifically evaluated. There is a need for validation of Siddha drugs through scientific methods to prove the safety and efficacy of Siddha herbs. For that purpose evaluation of heavy metals and minerals present in the drug and study of particle size of the drug is necessary. ICP-OES and SEM analysis was carried for the Herbo-mineral formulation *Gandhaka Chooranam* to quantify the elements present in it. The heavy metals such as Mercury, Arsenic, Cadmium, Zinc are within the permissible limits as per WHO. SEM analysis shows that particle sizes present in range from 0.5 to 2 microns. These research findings regarding the siddha formulation *Gandhaka chooranam* will helps to identify the molecular structure of the drug. If further research will be followed in this formulation easily can explore its therapeutic potential.

Keywords: Gandhaka chooranam, ICP-OES, SEM, Siddha Drug, Herbomineral

Introduction

There are many traditional medicinal systems in the world of which Siddha system is unique. In Siddha system of medicine, drugs are classified into 32 internal medicines and external medicines. *Gandhaka Chooranam* is a powdered form of drug which belongs to internal medicines category. The use of herbal medicines has been gaining importance now a day. India is blessed with rich flora in which medicinal plants are also present. According to World Health Organization the herbal medicines have been defined as those containing plant parts or plant materials in raw state or processed form containing active principles.^[1] Phytotherapy is highly diffused in high-income countries, but the scientific medical model is more diffused in the developing countries. This contact between the two

models has raised the urgent need to compare the immense background of traditional knowledge with the scientific procedures of research and validation.^[2] The presence of rich phytochemicals and minerals provides medicinal property for herbs. Herbo mineral formulations have rich potency to cure various diseases. But there is a need to standardize herbal medicines in order to utilise its medicinal value safely and effectively.

Materials and Methods

Details regarding sample

The drug "*Gandhaka chooranam*" is mentioned in the Siddha literature "*Agathiyar vaithiya chinthamani*"

indicated for various skin diseases and vatha diseases.^[3] The ingredients of Gandhaka chooranam are

<i>Purified Gandhakam (Sulphur)</i>	-	175 gm
<i>Zingiber officinale</i>	-	70 gm
<i>Piper nigrum</i>	-	70 gm
<i>Piper longum</i>	-	70 gm
<i>Elettaria cardamomum</i>	-	70 gm
<i>Cinnamonum verum</i>	-	70 gm
<i>Cinnamonum tamala</i>	-	70 gm
<i>Messua nagassarium</i>	-	70 gm
<i>Terminalia chebula</i>	-	70 gm
<i>Embilica officinalis</i>	-	70 gm
<i>Terminalia bellerica</i>	-	70 gm
<i>Arachis hypogaea</i>	-	70 gm

Drug collection:

All the raw materials were obtained from Country drug shop, Ramaswamy chetti, Parrys, Chennai.

Identification and Authentication:

All the raw drugs were identified and authenticated at CRI, Chennai, and botany department, Govt Siddha Medical College, Chennai. The drug was prepared in the laboratory of *Gunapadam* in Govt.siddha medical college, Arumbakkam, Chennai.

Details regarding the experiment:

1. 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 *Gandhaka chooranam* added with 3 ml of Nitric acid and 25 ml of Distilled water.

2. SEM Analysis

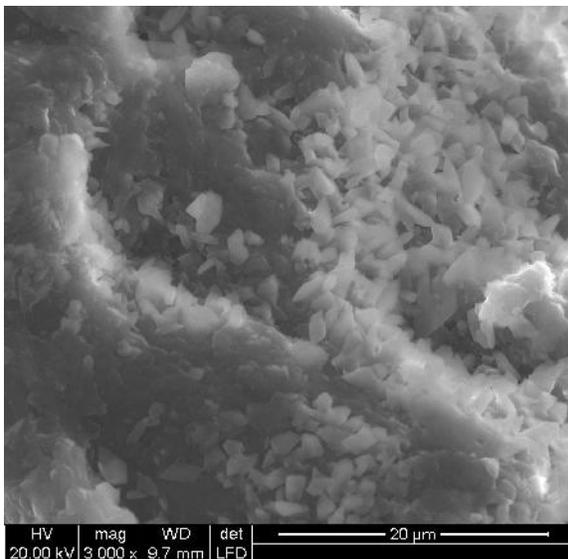
To evaluate grain size, particle size, distributions, material homogeneity and inner metallic distributions, SEM was carried out by using FEI quanta 200-high resolution instrument. The study was carried out in Sophisticated Analytical Instrumental Facility (SAIF) in IIT Madras.

Results

ICP-OES Analysis:

S.No.	Elements	Detected levels
1.	Aluminium	BDL
2.	Arsenic	BDL
3.	Calcium	12.180 mg/L
4.	Cadmium	BDL
5.	Copper	BDL
6.	Iron	21.376 mg/L
7.	Mercury	BDL
8.	Potassium	13.821 mg/L
9.	Magnesium	01.104 mg/L
10.	Sodium	14.320 mg/L
11.	Nickel	BDL
12.	Lead	BDL
13.	Phosphorus	86.341 mg/L
14.	Sulphur	401.254 mg/L

Scanning Electron Microscopy



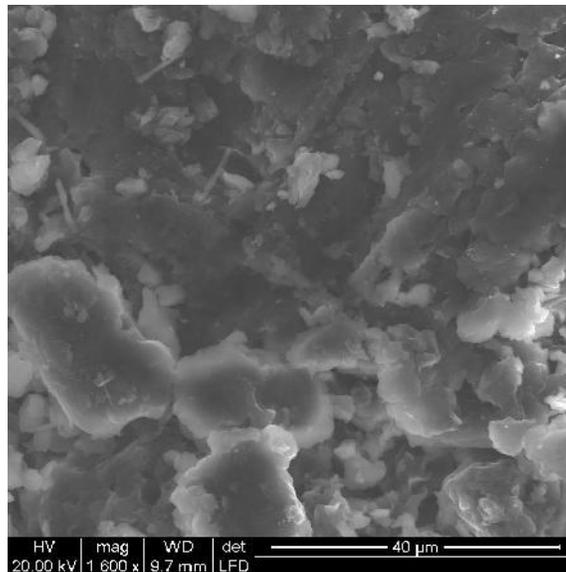
SEM analysis shows that the particles are irregular in shapes and sizes are in the range from 0.5 to 2 microns. Although the particle sizes of different batches showed similarity, it seems that these particles are aggregates of much smaller particles. When dispersed in an aqueous medium, these preparations form a negatively charged hydrophobic particle suspension.

Discussion

ICP-OES results revealed that heavy metals like Mercury Arsenic, cadmium, zinc are within the permissible limits as per WHO guidelines. This ensures the safety of the drug. The presence of calcium in this drug helps in the development of bones and teeth, release of calcitonin and blood coagulation.^[4] Due to the presence of iron which plays a major role in transport of oxygen to tissues and cellular oxidation metabolism this formulation can be used to increase oxygen level in the arteries.^[5]

Potassium present in this drug can help to regulate acid-base balance and for the transmission of nerve impulse. Phosphorus is an essential mineral for the formation of bone and teeth.^[6] Sulphur is the main constituent of this drug so that this drug can be effectively used for various skin disorders.^[7]

In SEM photographs the particles are spherical in shapes and sizes are also in range of about 200 to 300 nm. Although the particle sizes of different batches showed similarity, it seems that these particles are aggregates of much smaller particles. 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.

Gandhaka chooranam 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.

Conclusion

The present ICP-OES study reveals that the drug *Gandhaka chooranam* has Sulphur as chief constituent and other elements such as calcium, Phosphorous, Potassium and Magnesium. Heavy metals like Mercury Arsenic, cadmium, zinc are within the permissible limits as per WHO guidelines. SEM results show that the particles are spherical in shape and the sizes are in range from 0.5 to 2 microns. Though Sulphur, main constituent of drug can be used to treat various skin disorders according to Siddha literature, more scientific study should be done to give effective treatment for the mankind. The clinical trials have to be conducted for the benefit of the society.

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