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ICP-OES Analysis of Siddha Formulation Gandhi Mezhugu

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***Abstract*: *Background:* The Gandhi Mezhugu *(GM)* is a herbomineral formulation used for treating all types of skin diseases. *Objective:* The objective of the present study is to detect heavy metals (arsenic, lead, cadmium, mercury) and other elements within the permissible limits as per WHO guidelines present in the Siddha herbomineral Formulation "*Gandhi Mezhugu*". *Materials and Methods:* The ingredients were collected and purified and the drug was prepared as per Siddha literature *"The* Siddha Formulary of India (Tamil) *part-1".* Here, the drug was subjected to standardization by simultaneous ICP-OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV). *Result:* This paper revealed the therapeutic safer level of heavy metals and other elements present in *Gandhi Mezhugu,* as per WHO guidelines with the help of simultaneous ICP- OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV). *Conclusion:* From the ICP-OES analysis reveals that Gandhi mezhugu are free from toxicity there by proving the safety of its utilization in siddha system. This study forms the base for the pharmaceutical analysis of *Gandhi Mezhugu (GM*) which will be followed by safe and efficacy studies later.**

***Keywords*: Gandhi Mezhugu, Siddha medicine, ICP-OES, Skin diseases.**

1. Introduction

Siddha medicine is the traditional system of medicine that originated in South India and is considered to be one of India's oldest systems of medicine. The Siddha system is based on a combination of ancient medicinal practices and spiritual disciplines as well as alchemy and mysticism. Siddha system is the holistic and unique medical system based on principles for providing preventive, promotive, curative, rehabilitative and rejuvenative health needs.

Traditionally Sulphur in Tamil language, is synonymously known as Gandhagam, Kaarizhai Natham, Parainatham, Parai Veeriyam, Atheetha prakasam, Beejam, Selvi vindhu, Sakthi peesam, Chendhurathaathi, Theviuram, Natham, Natram, Ponvarni, Rasa sronitham...Gandhagam (sulphur) before it is used in medicinal preparation has to be purified by different methods of purification which are available in the Siddha system. It is an invariable component of majority of siddha formulations. There are 64 varieties of formulations of which 32 are internal medicines and 32 being used as external ones. Of those formulations, "Mezhugu" is an internal medicine which is defined to have waxy consistency with shelf life of 5 years.

Skin problems among Indians during 2020, are Dandruff (23.6 %), Acne (11.95%), Dryness (11.4%), Itching (10.5%), Rashes (5.4%), Ringworm (2.8%), Eczema (2.1%), Psoriasis (1.6%), Herpes (0.6%). In India approximately 40,723,288 people are reported to have hemorrhoids. 1 million new cases are reported annually, 47 per thousand and increases with age, age group of 45 to 65 years, it is estimated that 50- 80 % of people around the world have hemorrhoids and in India 75% of the population is estimated.

The herbomineral formulation Gandhi Mezhugu (GM) is a classic Siddha drug internal medicine used to treat Meganeer noigal like Vekumoothiram, Sori, Sirangu, Tholu noi and Eruvaimulai noigal.

For the development of a new drug the standardization of the traditional Siddha formulations is much more important. In Siddha system most of the medicines are effective but they lack of standardization. Many herbal based formulations also have presence of toxic elements, so there is a need to subject it with standardization for safety profile of drug and therapeutic utility. Here the drug was subjected to standardization by simultaneous ICP-OES analysis equipment (PERKIN ELMER OPTIMA 5300 DV) to detect heavy metals (arsenic, lead, cadmium, mercury) and other elements within the permissible limits as per WHO guidelines present in the Siddha herbomineral drug "*Gandhi Mezhugu*".

2. Materials and Methods

The Siddha drug Gandhi Mezhugu selected from a classical Siddha literature cited in The Siddha Formulary of India (Tamil) part I.

Ingredients of Gandhi Mezhugu

- Purified Gandhagam (Sulphur)
- Vellai venkayam (*Allium sativum*)
- Inji *(Zingiber officinale)*

ICP-OES analysis was done in *Sophisticated Analytical Instrument Facility IITM, Chennai-36*

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Collection, Identification and Authentication of the Drug:

The required raw drugs were purchased from a well reputed Siddha drug store. The drugs are identified and authenticated by the HOD, Department of Gunapadam, Government Siddha Medical College and Hospital, Palayamkottai, Tirunelveli.

Methods of Purification and Preparations:

The drugs were purified as per the evidence mentioned in the "The Siddha formulary of India (Tamil) part I". All the ingredients have been completely purified as per the Siddha literature in the presence knowledge of Guide/Faculty members.

Preparation of Medicine:

The purified drugs are prepared as per the procedure mentioned in siddha literature.

ICP-OES Study of Gandhi Mezhugu:

Principle of ICP Optical Emission Spectrometry (ICP-OES)

ICP, abbreviation for Inductively Coupled Plasma, is one method of optical emission spectrometry. When plasma energy is given to an analysis sample from outside, the component elements (atoms) are excited. When the excited atoms return to low energy position, emission rays (spectrum rays) are released and the emission rays that correspond to the photon wavelength are measured. The element type is determined based on the position of the photon rays, and the content of each element is determined based on the rays intensity. To generate plasma, first, argon gas is supplied to torch coil, and high frequency electric current is applied to the work coil at the tip of the torch tube. Using the electromagnetic field created in the torch tube by the high frequency current, argon gas is ionized and plasma is generated. This plasma has high electron density and temperature (10000K) and this energy is used in the excitation-emission of the sample. Solution samples are introduced into the plasma in an atomized state through the narrow tube in the center of the torch tube.

Equipment:

Equipment for ICP optical emission spectrometry consists of a light source unit, a spectrophotometer, a detector and a data processing unit. There are several types of equipment based on differences in the Spectrophotometer and the detector. The most common type is shown in Figure 1.

1) Sequential type

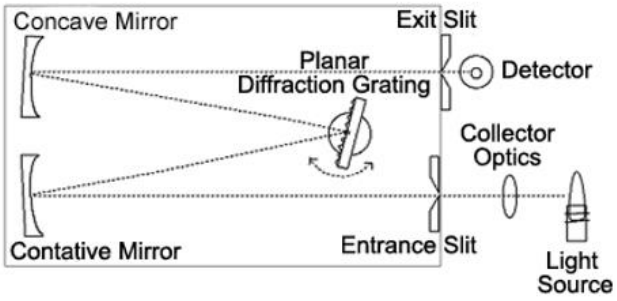

Fig. 1. Sequential type ICP-OES

A spectrophotometer with a Czerny-Turner monochrometor, and a detector with a photomultiplier is most common for this type. With this equipment, programmed wavelength of the spectrophotometer is consecutively varied to measure multiple elements. This causes rather long measuring time, however, with its high-resolution spectrophotometers, it is favorable for measurement of high-matrix samples.

2) Simultaneous Type

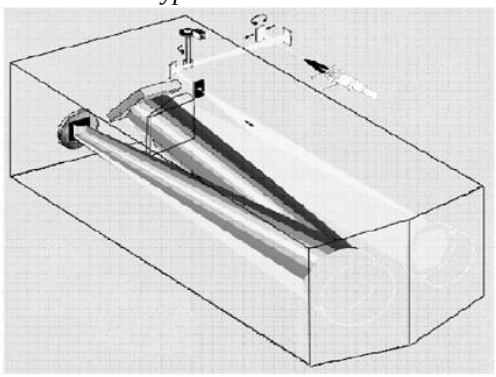

Fig. 2. Simultaneous ICP-OES

This type typically uses an echelle cross disperser in spectrophotometers and semi-conductor detector such as CCD for the detector. Echelle cross disperser disperses light of measurable wavelength range two-dimensionally by combining prism and echelle diffraction grating. Combination of echelle cross disperser and a CCD detector enables multi-element measurement at any wavelength. The most notable feature of this equipment is the high-speed measurement, providing information on all 72 measurable elements in measurements of 1 to 2 minutes normally.

Siddha drug analysis:

KBC drug has attracted attention because it is thought to contain a person's health history on some level and is thought to act as an excretory organ for heavy metal in the body. However, there are problems because there are few usable samples and knowledge about multiple elements is required. With simultaneous analysis equipment, we can collect useful information with a small amount of sample.

Equipment: Simultaneous ICP-OES, PERKIN ELMER OPTIMA 5300 DV

Sample preparation: 0.5g of GM drug is measured, and then dissolved in a decomposition vessel with nitric acid into 10ml solution. Partial spectral profile and analysis results shown in table 1.

3. Result

Gandhi Mezhugu ----------(wt:0.224520g)

Table 1
Elements of the Gandhi Mezhugu (GM)

S.No.	Elements	Wavelength	Concentration
1	Al	396.152	BDL
2	As	188.979	BDL
3	C	193.030	154.123mg/L
4	Ca	315.807	BDL
5	Cd	228.802	BDL
6	Cl	725.670	BDL
7	Cu	327.393	BDL
8	Fe	238. 204	BDL
9	Hg	253.652	BDL
10	Pb	220.353	BDL
11	P	213.617	56.341 mg/L
12	S	180.731	750.254 mg/L

*BDL – Below Detectable Limit

4. Discussion

Heavy metal Viz. arsenic (As), cadmium (Cd), mercury (Hg), lead (Pb), and other elements such as iron (Fe), potassium (K), magnesium (Mg), sodium (Na), phosphorus (P), sulfur (S), zinc (Zn) of *Gandhi Mezhugu* on table 1 was found to be within the permissible limits as per WHO guidelines.

5. Conclusion

From the ICP-OES analysis reveals that Gandhi Mezhugu are free from toxicity there by proving the safety of its utilization in siddha system. This study forms the base for the pharmaceutical analysis of *Gandhi mezhugu (GM*) which will be followed by safe and efficacy studies later. So, this study will be a step forward to scientific validation of Gandhi Mezhugu.

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