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Heavy metal analysis of herbo - mineral Siddha medicine *Poora Parpam* (mercurous chloride) using ICP-OES

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Abstract

Siddhars knowledge about various herbs, metals and minerals are still undiscovered by the scientific world. It is mystery to the scientific society to evaluate the exact action of a herbo - mineral formulation. Often medicines like *parpam* and *chendooram* in Indian system of medicine are frequently reported with heavy metal content above permissible limits by the western science. According to Siddha literature *Poora Parpam* is a herbo-mineral medicine used in the treatment of all kinds of *Vatha* disease, *Gunmam* (peptic ulcer), *Soothaga noigal*, *Neerilivu* (diabetes mellitus).It has been decided to standardize the *poora parpam* which is prepared as per the siddha literature *Veeramaamunivar Vagada thiratu*. The present study gains its own importance in the scientific society being focussed on analysis of heavy metals content in the siddha medicine *poora parpam* using Inductively Coupled Plasma Optical Emission Spectrometry (ICP-OES) carried out at SAIF LAB, IIT Guindy, Chennai

Keywords: *Poora parpam*, heavy metals, ICP-OES

Introduction

Siddha medicine means medicine that is perfect. Siddhars spend their lifetime in experimenting the gifts of Mother Nature the herbs, the minerals and the animals. As a result of their experiments, they could formulate so many valuable medicines which include small herbal preparations to the potent medicines made using metals and minerals. Siddha medicine is claimed to alleviate the root cause of the diseases by maintaining the ratio of *Vatham*, *Pitham* and *Kapham*. Siddhars use metals and minerals in medicine, because of their characters like longer shelf life, smaller the dose with greater efficacy and the therapeutic value is much higher compared to herbal formulations. Before getting into a prepared medicine siddhars follow numerous method of purification for every single metal and minerals used. Thereby it ensures the safety of medicines prepared in siddha system. Due to lack of standardization of the drugs in siddha system of medicine; the western countries worried of the presence of heavy metals that may be toxic for human consumption (1). This is probably due to lack of scientific studies to document the safety profile of drugs.

In siddha system a large number of formulations are made up of metals and minerals. One such herbo-mineral formulation is *poora parpam.* According to Siddha literature *poora parpam* is given to all kinds of *vatha* disease, *kiranthi noigal*, *putru noigal*, *keel vayu* (2). It is mystery to the scientific society to evaluate the exact action of herbo - mineral formation. Since modern society is against the usage of mercurial drug as medicine these study is more important for its own. Here, we take the opportunity to reveal the important of this medicinal preparation and its analysis of heavy metals with the help of ICP-OES.

Materials and Methods

Preparation of standardized poora parpam:

Poora parpam was prepared as per the methodology mentioned in the siddha text *VeeramaaMunivar Vagada Thiratu*. The raw drugs were procured from the country drug merchant shop in Chennai. The raw drugs were authenticated by Siddha Central Research Institute, Chennai. The raw drug was purified and *poora parpam* was prepared as per literature.

Detoxification / purification of *pooram*

Ingredients:

Pooram (raw) – 35 gm,
Vettrilai (*Piper bettle*) leaves – 8.75gm,
Milagu (*Piper nigram*) – 8.75gm,

Methodology

Piper beetle leaves and *Piper nigram* were ground together and made into a poultice. Then one litre of water was taken in a mud pot and the poultice was mixed in that water. The raw drug *Pooram* was covered with a piece of clean dry cloth, so that it was not exposed outside. One end of the cloth was tied to a bamboo stick and placed horizontally over the opening of the mud pot. The raw drug *Pooram* in cloth was suspended in the above decoction. The vessel was constantly heated till decoction reduced by three fourth of its volume. Finally the *Pooram* was taken out from the cloth, washed with clean water and dried in sunlight (3).

Ingredients:

Purified *Pooram* (Calomel) (13.65 gm), – ¾ *varaagan*
Erukkam paal (Latex juice of *Calotropis gigantia*) (490gm), – 14 *palam*
Vengayam (Juice of *Allium cepa*) (910ml) – 14 *palam*

Preparation of *poora parpam*:

Purified *pooram* was placed in a clean dry cloth, fully covered and tied together. In a mud pot the above mentioned quantity of *erukkam paal* was taken and *pooram* covered by cloth was placed inside the mud pot. The mud pot was constantly heated until latex juice remaining in the pot totally dried out. *Pooram* was removed from the cloth and washed with water. Then it was ground into paste with *vengayam* juice and made into a poultice. Small pills were made from the poultice and dried in shade. Pills were placed inside a mud plate and enclosed with similar size plate. Margins of the plate were covered with clay pasted cloth. Finally it was completely dried, kept in a pit under earth and *puddam* was made with 40 *palam* cow dung cakes approximately (1400 gms). Next morning on being cooled mud plate was removed and finished *poora parpam* was separated and ground into a fine powder. Later *parpam* was collected in a clean dry air tight container (4).

Inductively coupled plasma optical emission spectrometry (ICP-OES)

Inductively coupled plasma optical emission spectrometry (ICP-OES), is an analytical technique used for the detection of trace metals. It is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. The intensity of this emission is indicative of the concentration of the element within the sample.

Principle

A Perkin-Elmer Optima 5300DV ICP spectrometer with 40MHz RF generators was used for routine ICP-OES analysis. First a high-energy radio frequency field is impinged upon a stream of argon gas. Then a spark is used to ionize the argon gas which forms sustained plasma due to inductive coupling with the high energy radio frequency field and the continuous supply of fresh argon to the plasma torch. This plasma has solutions passed into it in the form of a fine aerosol. The aerosol is dried and the dried particles are broken apart and the individual elements are excited by interaction with the excited state argon in the plasma. As each atom returns to its ground state from the excited state, they emit light at wavelengths characteristic of the elements from which they originate. The emission intensity for each element is monitored for each standard solution and a calibration curve of emission intensity versus element concentration has been constructed.

Range: 165-782 nm; Detection limit: Up to ppb level using SCD detector

Sample preparation and microwave digestion

Test sample weigh of 0.25g was taken and transferred into a liner provided with the instrument. Slowly 9ml of nitric acid was added such that no piece of sample sticks onto the slides. Mixed thoroughly and allowed for few minutes. The liner was placed in the vessel jacket. The screw cap was closed hand-tight in clockwise direction. The vessel was sealed and placed in the rotor fixed in the microwave. The temperature was set to 180°C and heated for 5 minutes and repeated the same for 10 minutes. Then allowed to cool down to a vessel interior temperature below 60°C and to a vessel surface temperature (IR) below 50°C before removing the rotor. The digested sample was made up to 100ml with millipore water. The solution was filtered through Whatmann filter paper. Finally the digested solutions was transferred into plastic container and labeled properly.

S.no.	Elements	Wavelength in nm	Unpurified Pooram (ppm)	Purified *Pooram* (ppm)	*Poora Parpam* (ppm)
1.	Arsenic	As193.696	BDL*	BDL*	BDL*
2.	Calcium	Ca 317.933	18.654	16.425	15.856
3.	Cadmium	Cd 226.502	BDL*	BDL*	BDL*
4.	Mercury	Hg 253.652	204.175	98.251	3.187
5.	Iron	Fe 238.204	1.856	1.658	1.356
6.	Potassium	K 766.490	47.853	46.522	45.426
7.	Sodium	Na 589.592	20.689	19.853	17.952
8.	Phosphate	P 213.617	11.751	10.856	9.784
9.	Lead	Pb 230.204	BDL*	BDL*	BDL*

* BDL = below detection limit, ppm – Parts per million

Results and Discussion

In **ICP - OES** study, heavy metals like Arsenic, lead, cadmium were found below detection limit in purified *pooram*. Mercury, calcium, iron, potassium, phosphorous, sodium levels were decreased in its level from raw to purified *pooram* followed by the detoxification process. There was a drastic reduction in the level of mercury in raw *pooram* 204.175 ppm compared to purified *pooram* 98.251 ppm. Mercury was detected in minimal level in prepared medicine *poora parpam* 3.187 ppm. This indicates that all heavy metals in *poora parpam* were within normal range and near to permissible limit. This study clearly showed *poora parpam* is safe for human consumption.

In recent times there is growing and increasing interest in siddha medicine consequently they have greater attention as an alternative medicine leading to increased demand. A world health organization survey indicates that about 70-80% of the world's populations rely on nonconventional medicine mainly of herbal source in their primary healthcare. In spite of the widespread use very few scientific studies have been done to ascertain the safety and efficacy of traditional medicines. There by the heavy metal evaluation is necessary to determine whether the drug is safe for human use.

Conclusion

The present ICP –OES study reveals that *Poora Parpam* was non toxic and the heavy metal content was below detectable limits. The medicine is safe with trace of heavy metals which are within their permissible limits without losing their therapeutic efficacy. Further animal toxicity studies are suggested to give a valuable medicine to the society.

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