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Physicochemical Characterization of the Siddha Metallo Mineral Drug - Veera Aya Chenduram (VAC)

Sridevi J[*1], Madhavan R[2], Prasad V V P[3], Kanakavalli K[4]

[1]National Institute of Indian Medical Heritage, Hyderabad-500036, Telangana, India
[2]Department of Nanjumaruthuvam, National Institute of Siddha, Tambaram sanatorium, Chennai-600047, Tamil Nadu, India
[3]National Institute of Indian Medical Heritage, Hyderabad-500036, Telangana, India
[4]Central Council for Research in Siddha, Arumbakkam, Chennai-600106, Tamil Nadu, India

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ABSTRACT

Veera ayachenduram (VAC) is a metallo-mineral drug cited in Siddha text literature KannusamiyamparambaraiVaithiyam. The study aimed to standardises the VAC by evaluating its physicochemical characters such as colour, ash value, pH value analyses the heavy metal composition in modern instrumental techniques. Inductively coupled plasma optical emission spectrometry (ICP-OES) and to find out the particle size through scanning electron microscopy (SEM) and. The total ash value was found to be 7.7% w/w, acid-insoluble ash value is 1.25% w/w, water-soluble ash value is 25.32% w/w, and The pH value is 6.5. The ICP-OES reveals that heavy metals such as mercury, lead, arsenic, and cadmium are within the limit. High-resolution SEM analysis of the drug indicated the existence of nanoparticles.

*Corresponding Author

Name: Sridevi J
Phone: 9842134093
Email: Sridevi.jayamani@gmail.com

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INTRODUCTION

Siddha, an exclusive part of the integrated system of medicine in India, has a solid history of centuries beyond. The unique features lie in the metallo mineral formulations and the purification process by Siddhars, who are the proponents of the Siddha System of Medicine (Thiyagarajan and Sunderrajan, 1992). In this present scenario, Standardisationon of these compound formulations remains to be the global acceptance by which the drug is validated qualitatively and quantitatively (Mukherjee *et al.*, 2017). This study deals with the standardisation of metallo mineral formulation Veera AyaChendhuram mentioned in the Siddha classical literature Kannusamiyam parambarai Vaithiyam (Kannusami Pillai, 2006). The physiochemical characters like colour, ash values, PH value and it was evaluated in modern instrumental techniques like inductively coupled plasma optical emission spectrometry ICP-OES and scanning electron microscopy SEM.

MATERIALS AND METHODS

Selection of Drug

The drug VAC was selected from the classical Siddha literature, Kannusamiyam parambarai Vaithiyam (Kannusami Pillai, 2006).

Collection and Authentication of the Drug

The raw materials included in the formulation are

1. Ayapodi (Iron)
2. Gandhagam (sulphur)
3. Lingam (Red sulphide of mercury)
4. Veeram (Hydragyrum perchloride)
5. Vediuppu (Potassium nitrate)
6. Pooneeru (Fullers earth)

Which were purchased from the standard drug stores in Chennai. Drugs were identified and authenticated from Dept. of Pharmacognosy in Siddha Central Research Institute, Chennai and botanist in National Institute of Siddha, Chennai.

Purification of the Drug

The purification process was done according to the procedures mentioned in the classical Siddha literature.

Purification of Ayam (Iron)

The iron is soaked in lime juice for three days, and then it is washed and dried (Kannusamy Pillai, 2012).

Purification of Gandhagam (sulphur)

The leaves of Lawsoniainermis was grounded in a stone mortar and mixed with cow's curd. The above mixture is then placed in a mud pot. A cotton cloth with the sulphur above it was placed in the mud pot.

The same is closed with a similar lid and sealed with a seven-layered clay cloth. It is then kept underground with the cow dung cakes arranged over it.

The pot is subjected to pudam (set on fire), and the process is repeated seven times. Each time fresh curd is mixed with the processed sulphur (Thiyagarajan and Sunderrajan, 1992).

Purification of Lingam (Red sulphide of mercury)

The red sulphide of mercury is grounded with lemon juice; thereby, it gets purified (Anaivariananthan, 2008).

Purification of Veeram (Hydragyrumperchloride)

Bitter gourd is opened, and a hole is made. hydragyrumperchloride is placed in the centre of the hole and closed, tied with a rope. Tender coconut water is poured in the mud pot.

The above-tied material is suspended in the pot without touching the water and burnt for one hour (Thiyagarajan and Sunderrajan, 1992).

Purification of Veediuppu (potassium nitrate)

Potassium nitrate is soaked in lemon juice, and then it is dried (Anaivariananthan, 2008).

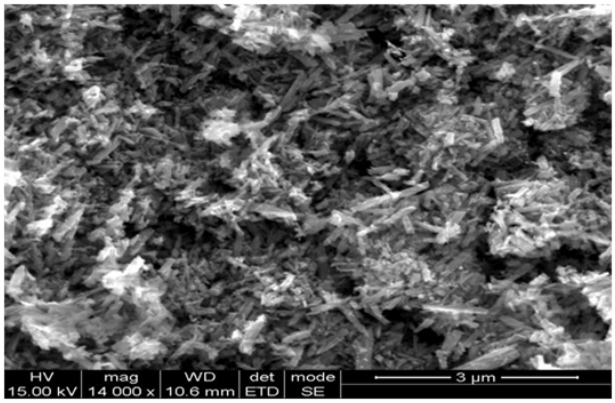

Figure 1: SEM

Purification of Pooneeru (Fullers earth)

Dissolve the fullers earth in water which amounts four times the weight of fullers earth and leave it for 4 -5 hours.Then collect the liquid above the sedimented part and dry it under the sunlight (Kannusamy Pillai, 2012).

Preparation of the Drug

From the above-purified drugs, the Ayam and Gandhagam are placed in kalvam and rubbed with lemon juice till it reaches waxy consistency (mezhugu) for about four samam(12 hours) and made it into a single pellet and dried under the sunlight. Then it is placed in the mud plate and closed. The margins are covered with seven layers of clay cloth, and it is dried. Then it is subjected to pudam with 15 cow- dung cakes—the finished product which is dark brown.

It is kept in kalvam along with other drugs and rubbed with lemon juice for 2-3 samam(6-9hours). Then it is made into a single pellet and pudam is done as mentioned. The whole process is repeated three times. Finally, dark brown colourchendhuram is obtained, which is stored in an airtight container (Kannusami Pillai, 2006).

Physicochemical Evaluation

The drug VAC was subjected to determine physicochemical characters such as colour, ash values, pH value, percentage yield, and solubility which were analysed according to the Standard Operating Procedures(SOPs) mentioned in the texts (Quality assessment of Ayurveda and Siddha drug, 2005).

Instrumental Analysis

SEM

Scanning electron microscope (SEM) one of the most valuable instruments available for the examination and analysis of the microstructure morphology and chemical composition characterisations (Zhou *et al.*, 2006). The SEM is carried out by using FEI-Quanta

Table 1: Physico- Chemical Parameters

No	Physico- Chemical Parameters	% in W/W (mg/g)
1	Loss on drying at 105° C	7.31
2	Total -ash	7.7
3	Acid insoluble ash	1.25
4	Water soluble ash	25.32
5	PH	6.5
6	Particle size by SEM	1-3 Micron

Table 2: ICP-OES

S.no	Elements	Wavelength in nm	Veera aya chenduram mg/L
1	Aluminium	Al 396.152	BDL
2	Arsenic	As 188.917	BDL
3	Calcium	Ca 315.805	14.210
4	Cadmium	Cd 228.802	BDL
5	Copper	Cu 327.393	BDL
6	Iron	Fe238.204	213.430
7	Sodium	Na 589.592	5.810
8	Phosphate	P 213.617	62.121
9	Lead	Pb 220.353	BDL
10	Magnesium	Mg 285.213	12.160
11	Mercury	Hg 253.652	3.081
12	Potassium	K766.491	20.961
13	Zinc	Zn206.200	1.315
14	Phosphorus	P213.617	62.121

FEG 200-High Resolution Instrument with a Resolution of 1.2 nm gold particle separation on a carbon substrate, and its Magnification is From a min of 12 X to greater than 1, 00,000 X. Its application is to evaluate grain size, particle size distributions, material homogeneity and intermetallic distributions. Hence the drug is subjected to SEM analysis at Sophisticated Analytical Instrument Facility (SAIF), Institute of Information Technology Madras(IIT Madras), Chennai.

ICP-OES

Inductively coupled plasma optical emission spectrometry (ICP-OES), an analytical technique used for the detection of trace metals. A Perkin-Elmer Optima ICP spectrometer is used for routine ICP-OES analysis.Obtaining qualitative information, i.e., what elements are present in the sample, involves identifying the presence of emission at the wavelengths characteristic of the elements of interest. Obtaining quantitative information, i.e., how much of an element is in the sample, can be accomplished using plots of emission 92 intensity versus concentration called calibration curves. The Procedure is done at Sophisticated Analytical Instrument Facility (SAIF), Institute of Information Technology (IIT Madras), Chennai-36 (Charles and Fredeen, 1997).

RESULTS AND DISCUSSION

The drug appears as a dark brown powder. The pH of the drug was 6.5. It denotes it is slightly acidic. Hence, in the oral administration of the drug, it may be absorbed quickly in the stomach. Loss on drying of Veera ayachendhuram at 105ºC is 7.31%. This reveals that drug will not lose much of its volume on exposure to atmospheric air at room temperature. It shows that the drug has more stability (Table 1).

SEM

Figure 1 shows the particle size of the drug VAC as 1-3 micron in a Scanning Electron Microscope(SEM). The particles were homogeneously distributed in thechendhuram. Hence the drug will have increased bioavailability.

ICP-OES

In ICP-OES As, Pb, Cd was found belowdetection level and the Hg around the permissible level in Veera AyaChendhuram(VAC). Hence, it may be safe

for human consumption. It also showsthe presence of calcium, iron, sodium, phosphate, magnesium, potassium,zinc and phosphorus in the Veera AyaChendhuram(VAC) (Table 2).

CONCLUSIONS

Various standardisation on studies have been carried out to evaluate the physicochemical characters, chemical compounds and particle size of the drug VAC through ICP-OES and SEM respectively. Hence it is concluded that the drug is more stable, and it also shows the presence of calcium, iron, sodium, phosphate, magnesium, potassium, zinc and phosphorus in the drug VAC. The particle size also concludes that it increases the bioavailability.

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Conflict of interest

The authors declare that they have no conflict of interest for this study.

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