



CHARACTERIZATION STUDY OF PUTRU PATHANGAM, A SIDDHA HERBO-MINERAL FORMULATION

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ABSTRACT

In Siddha system of medicine herbal, metal, mineral and marine products are being used as medicine. Siddhars are pioneer of the modern alchemy. Metals and mineral compounds plays predominant role in Siddha System of Medicine. Some unique form of medicines like pathangam, kattu etc., plays a specific role in siddha medicine. In Siddha Sysetem of Medicine Mercury and mercurial salts are completely converted into compounds as Bashmas or Chenduram or Pathanagam. Putru pathangam, One of the medicine, contains mostly mercurial compounds such as mercury, mercuric subchloride-pooram, red sulphide of mercury-lingam, padanam like arsenic, sulphur. The present study evaluated the characterisation of Putru Pathangam by sophisticated analytical instruments like ICP OES, SEM, EDAX, XRF. Each technique has its own advantages, and when techniques are used together, they can render complementary information on trial drug.

In ICP OES the heavy elements like Mercury, lead, cadmium and arsenic are found in BDL. SEM analysis of Putru Pathangam shows particle size ranges from 2 to 20 µm which reveals its better absorption and fast action in the body. The XRF analysis shows the presence of oxide forms of Fe, Cl, S and EDAX shows S, Ca, Mg, Cl and ICPOES shows below detective level of Hg. The study highlights the appropriate application of modern scientific methods for developing new insights into metal based Siddha drugs and it can be used as characteristic fingerprints study for the validation of the medicine.

KEYWORDS

EDAX, XRF, SEM, Pathangam, BDL, Siddha

Introduction:

Siddha system of medicine is one of the most antiquated traditional medicine systems. Siddha system activates and strengthens the inner sources of the body. Siddhars used metallic preparations apart from herbs. They convert the inorganic substances into atomic and ionic form which can be easily absorbed by the body when it is ground with herbal juices and put on fire. It exerts only therapeutic properties without leaving metallic traces

Since Putru pathangam is, a sastric preparation, being used to treat Putru(Cancer) for long time. This preparation contains purified inorganic compounds such as Rasam (mercury), lingam (cinnabar), Manosilai(Red Orpiment) (hydrargyrum per chloride), pooram (calomel), thalagam (arsenic trisulphide), gandhagam (sulphur), common salt (NaCl), Acalypha indica and Myristica fragrans¹

Standardization of herbo-mineral drug Putru pathangam is essential to assess the purity and safety of the drug. The scientific study on Siddha medicines to validate these chemical properties seems to be very minimal. Hence an attempt was taken to establish the chemical characterization of the Putru pathangam by using modern techniques.

MATERIAL AND METHODS**Procurement and Authentication of Raw Drugs****Ingredients of PUTRU PATHANGAM:**

1. Purified Rasam(Mercury)
2. Purified Gandhagam (Sulphur)
3. Purified Lingam (Red sulphide of Mercury)
4. Purified Thalagam(Yellow Arsenic Trisulphide)
5. Purified Manosilai(Red Orpiment)

6. Purified Vellai padanam(White Arsenic)
7. Purified Pooram(Hydrargyrum subchloride)
8. Purified Kantham(Megnetic oxide of Iron)
9. Jathikkai (Myristica fragrans)
10. Common Salt (NaCl)
11. Kuppai meni charu (Acalypha indica)- Required amount

Ingredients of putrupathangam were purchased from the raw drug stores and identification obtained from concerned expert and purified as per the procedure mentioned in Siddha system which has been in practice for many years.

Sublimation process:

First mercury was ground with sulphur and remaining ingredients were made it into fine powder individually, then all powders were mixed together and ground with Acalypha indica juice for 1 hr and pasted in a cloth, dried in sun light. Two equal parts of common salts were taken, one part of the common salt was placed in a pot, above processed cloth was placed over it and remaining part of the common salt was placed. The pot was covered with suitable another earthen pot having identical size of mouth and sealed with seven layers of mud pasted cloth. Then mud pot was heated for 12 hours. After it was allowed to cool itself, Then the cloth was removed and the pathangam which was found deposited on the upper mud pot was taken and made it powder by using mortar and pestle.

Characterisation Study**ICP-OES Analysis**

The ICP- OES study done at SAIF, IIT Madras using Perkin Elmer Optima 5300 DV. Sample was prepared by weight of 0.25 gm of Putru pathangam and 9 ml of Sulphuric acid was slowly added and mixed thoroughly, allowed it to react for few minutes. Quantitative analysis was achieved by measuring the intensity of specific

wavelength and after performing the calibration using known standards^{7,8}

SEM Analysis

Evaluation of topography (surface features), morphology (shape and size of the particles) of Putru Pathangam was done in Center for Electro-Chemical Research Institute (CECRI), Karaikudi. A small quantity of the Putru pathangam was sprinkled on a carbon tape mounted on a stub and sputter coated with gold for best images and to avoid charging of instances, in order to get a higher quality secondary electron image for SEM examination⁵.

XRF Analysis

XRF (X-Ray Fluorescence Spectroscopy) analysis of Putru pathangam was done at Sastra University, Tanjore, Tamilnadu. X-ray fluorescence was used to determine the chemical elements both qualitatively and quantitatively by measuring their characteristic radiation of the sample. The sample holder was filled with 2gm of boric acid and 1 gm of the Putru pathangam was topped over it for achieving better accuracy and precision. This was pelletized by a 25-tonne hydraulic press to achieve 34 mm diameter pellets⁶.

RESULTS AND DISCUSSION

ICP-OES

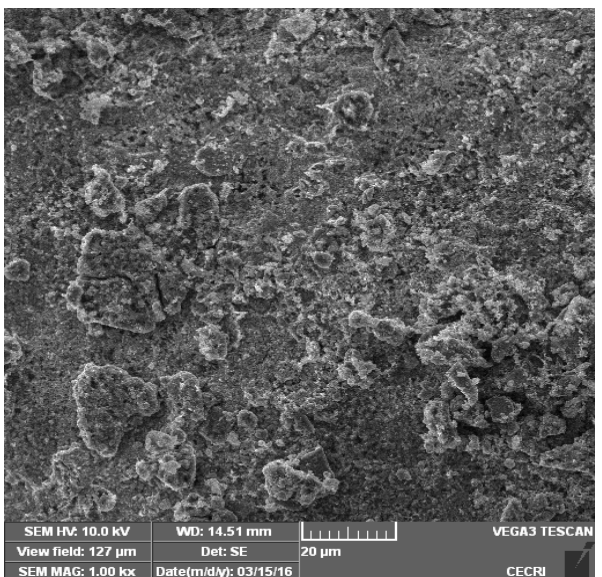
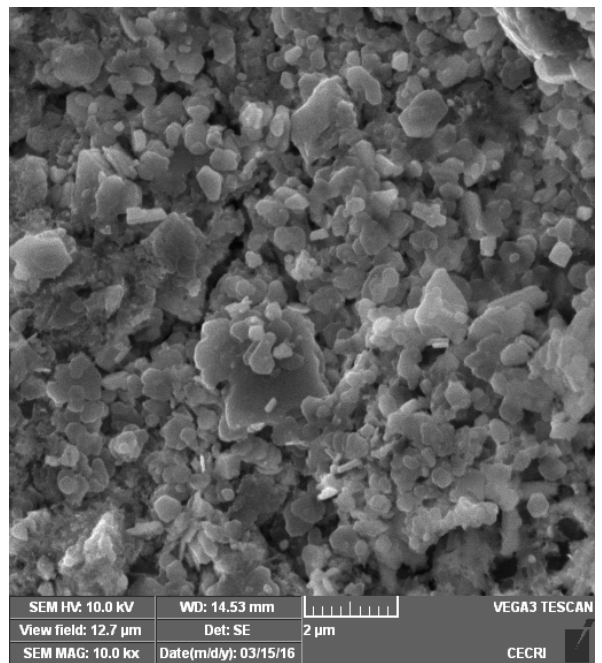
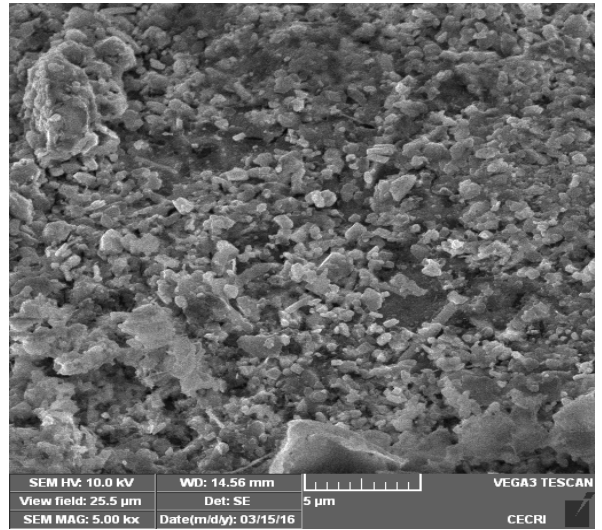
The drug Putru pathangam sample was analyzed by the Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) to detect the trace elements and other elements quantitatively. It contains 81.541 mg/L ppm of Sulphur and Mercury, cadmium, lead, Copper were present in below detectable limit showed in Table 2.

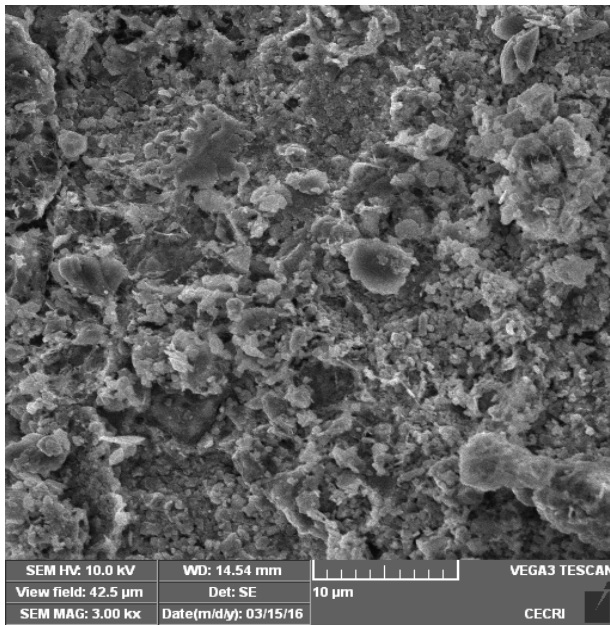
Table 2: Heavy Metals Analysis of Putru pathangam by ICP- OES

Sl.No	Elements (Inorganic)	Wave Length (nm)	Observation
1.	Al	396.152	BDL
2.	As	188.79	5.241 mg/L
3.	Ca	315.807	124.310 mg/L
4.	Cd	228.802	BDL
5.	Cu	327.393	BDL
6.	Fe	238.204	35.530 mg/L
7.	Hg	253.652	BDL
8.	K	766.491	120.551 mg/L
9.	Mg	285.213	02.170 mg/L
10.	Na	589.592	54.310 mg/L
11.	Ni	231.604	BDL
12.	Pb	213.617	BDL
13.	S	180.731	81.541 mg/L
14.	P	213.617	28.541 mg/L

SEM

The particle size was assessed by SEM. SEM analysis is one of the most widely used instruments in quantitative analysis. The SEM picture of Putru pathangam is below





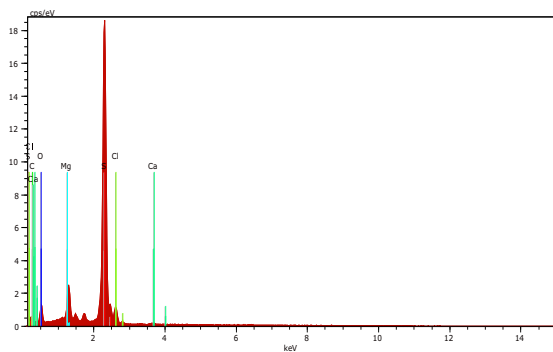
SEM analysis picture showed the presence of nano particles in Putru pathangam. The particle size of Putru pathangam is 2 to 20 µm. The small size of nano particles allow them to penetrate the cells and interact with cellular molecules.

EDAX

The elemental composition of the drug sample was analyzed by EDAX. EDAX provides a good estimate of the concentration of the main elements in the sample, is a significantly faster way compared to ICP-OES method. It is found that the mass % of S, C, O, Mg, Cl, and Ca present in Putru pathangam are 55.99, 17.8, 17.25, 4.55, 4.40, and 0.13 respectively. It can be seen that higher counts for Oxygen and Sulphur, further support of oxide and Sulphide form of medicine.

2468101214keV024681012141618 cps/eV C O Mg S S Cl Cl Ca Ca

Report of EDAX



El AN Series unn. C norm. C Atom. C Error (1 Sigma) K fact. Z corr. A corr. F corr.

	[wt.%]	[wt.%]	[at.%]	[wt.%]			
S 16 K-series	28.17	55.99	37.87	1.02	0.214	2.598	
1.000	1.006						
C 6 K-series	8.89	17.68	31.92	1.79	0.213	0.829	
1.000	1.000						
O 8 K-series	8.68	17.25	23.38	1.35	0.172	1.004	
1.000	1.000						
Mg 12 K-series	2.29	4.55	4.06	0.15	0.025	1.837	
1.000	1.011						
Cl 17 K-series	2.21	4.40	2.69	0.11	0.017	2.633	
1.000	1.005						

Ca 20 K-series	0.07	0.13	0.07	0.03	0.000	2.662
1.000	1.012					

Total: 50.30 100.00 100.00

XRF (X-RAY Fluorescence Spectroscopy)

XRF results of Putru pathangam shown in Table 3 below. The table showed the majority of the elements in oxide form.

XRF results of Putru pathangam

OXIDE FORM	
Formula	Concentration (%)
SO ₃	82.31
Hg	5.45
Cl	3.73
SiO ₂	2.66
Fe ₂ O ₃	1.68
As ₂ O ₃	1.66
Al ₂ O ₃	0.92
Br	0.52
MgO	0.50
CaO	0.18
K ₂ O	0.13
Sb ₂ O ₃	0.09
TiO ₂	0.05
P ₂ O ₅	0.04
PbO	0.03
MnO	0.02
SeO ₂	88PPM
Tl	58 PPM
NiO	50 PPM
ZrO ₂	35 PPM

XRF study has shown the presence of SO₃. Putru pathangam contains elements of Hg, Cl, SiO₂, Fe₂O₃, As₂O₃, Al₂O₃, Br, MgO, CaO, K₂O, Sb₂O₃, TiO₂, P₂O₅, PbO, MnO, SeO₂, Tl, NiO, ZrO₂. All the metallic forms of elements are converted into its oxide form by the heating process. The macro particle size of Putru pathangam by heating process was converted into its oxide form which shows there was no existence of natural raw material. The presence of oxide forms of sulphur, calcium, iron and other element elevates its therapeutic value

CONCLUSION

The results of ICP-OES, SEM, EDAX and XRF studies can be used as excellent finger prints for the validation of the medicine. In this present study, the chemical characteristics of Putru pathangam viewed through sophisticated instruments like ICP-OES, SEM, EDAX, XRF. In ICP-OES the heavy metals like Mercury, arsenic, cadmium, and lead were found in below detectable limits, which proves the ingredients of Putru pathangam were purified and prepared as per the sashtric text.

The SEM analysis showed the particle size ranges from 2 to 20 µm which proves the minimal dose of Putru pathangam can be used to treat Putru (Cancer). XRF study shows the absence of heavy elements and biologically important elements were found in oxide

form like, MgO, Fe₂O₃, SO₃, CaO and other elements were found only in minimal level. It is concluded that Putru pathangam by proper purification and preparation as per the literature and chemical evaluation shows it will exert therapeutic effect in minimal dose level and easy bio availability make it a therapeutically efficient medicine for Putru (Cancer).

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