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**Physico- chemical characterization of Putru pathangam,  
A Siddha herbo-mineral formulation**

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**Abstract**

Putru Pathangam, a herbo-mineral preparation has been used in treating Putru (Cancer). The major elements of Putru Pathangam are Rasam (Mercury), Gandham (Sulphur), Lingam (Red orpiment). A detailed study on the physico-chemical characteristics of Putru pathangam is required to allay fears on its toxicity owing to the presence of heavy metals. However, as per Siddha text, the toxic character of metallic ingredients is eliminated due to scrupulous purification and sublimation steps. Electron microscopy studies revealed that Putru pathangam contained particles in micron & sub-micron ranges. Energy dispersive X-ray Analysis too showed the presence of Sulphur.

**Keywords:** Putru pathangam, Total ash, Physico-chemical, Siddha, FTIR.

**Introduction**

Siddha System of Medicine, is believed to be in existence from time immemorial. There are evidences for the usage of drugs derived from minerals, vegetable and animal products<sup>1</sup>. Mercurial salts based drugs were prepared by transmutation of base mineral into noble ones along with the use of plant extracts meant to eradicate the toxic effects of metal<sup>2,3</sup>.

This herbo-mineral preparation has been used in treating Putru(Cancer), Madhumegam ( diabetes), Eeral noi (Liver disease), etc.,. Putru pathangam is indicated for various Putru noigal (Cancer).

In the present work, in addition to the physico- chemical analysis ,detailed information on structural and chemical characteristics of Putru pathangam has also been revealed by modern analytical instruments like Fourier transform infrared spectrometer (FTIR).

**Materials and Methods**

**Procurement and Authentication of Raw Drugs**

Raw drugs were collected from raw drug store in Chennai. Identified and authenticated from the department of Pharmacognosy in Siddha Central Research Institute, Chennai.

**Ingredients of Putru pathangam:**

1. Purified Rasam(Mercury)
2. Purified Ganthagam (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(Hydragyrum subchloride)
8. Purified Kaantham(Magnetic oxide of Iron)
9. Jathikkai (Myristica fragrans)
10. Kuppai meni charu (Acalypha indica)- Required amount
11. Common salt (NaCl) - 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 is being used in practice for many years.

#### Sublimation process:

Equal quantity of Purified rasam(Mercury), Purified Ganthagam(Sulphur) Purified Lingam (Red sulphide of Mercury), Purified Thalagam(Yellow Arsenic Trisulphide), Purified Manosilai(Red Orpiment), Purified Vellai padanam(White Arsenic), Purified Pooram(Hydragyrum subchloride), Purified Kaantham(Magnetic oxide of Iron), Jathikkai (Myristica fragrans) were mixed together and placed in the lower pot of Siddha sublimation apparatus mineral ingredients was closed by placing the mouth of upper pot on its mouth. Gap between the facing areas of both the mouth of the pot were sealed with a cotton cloth coated by clay plaster. Lower pot was subjected to heat by medium flame using gas stove for four hours The vapour formed inside the sublimation apparatus spread within the closed mud pots and got sublimated on the inner side of the upper pot Adequate cooling to collect sublimated drug was done by spreading cold water or/and wet cotton-cloth upon upper pot. The apparatus was allowed to cool after four hours of heat and the powder was carefully collected by using a brush.

#### Physico-chemical analysis:

##### Estimation of Total Ash

A suitable quantity of the sample was weighed accurately in a silica crucible. The sample was spread uniformly on the bottom of the crucible, incinerated, cooled and weighed. Difference between the empty crucible weight and crucible with incinerated ash gives the total ash value.

##### Estimation of Acid Insoluble Ash

The residue from total ash estimation was boiled with hydrochloric acid. The insoluble matter was washed with hot water, transferred to a crucible, dried and weighed. Difference between the empty crucible

weight and crucible with incinerated ash gives the acid insoluble ash value.

##### Estimation of Water Soluble Ash

The residue from total ash estimation was boiled with distilled water. The insoluble matter was washed with hot water, transferred to a crucible, dried and weighed. This weight was subtracted from the total ash taken which gives the water soluble ash content.

##### Determination of Loss on Drying (LOD)

The accurately weighed sample was dried in an oven at 105°C, cooled and weighed

##### Spectroscopic Analysis

###### FTIR

The Fourier Transform Infra Red (FTIR) spectra of the Putru pathangam was recorded between 4000–400 cm<sup>-1</sup> in a FTIR spectrometer (Spectrum 100, Perkin Elmer, USA). The samples were mixed with KBr and pelletized for analysis<sup>2</sup>.

##### Results and Discussion

It is important to understand the structure and composition of various constituents present in the Putru pathangam which suppresses its toxic effects and therapeutic effects. It has been hypothesized that sublimation of minerals with suitable raw material, change the inherent quality of the metal, which render them non-toxic and suitable for the treatment of chronic ailments

Initially, total ash of the samples was determined to check proper incineration of the metal. This is an important parameter as improperly incinerated mercurial salts have been reported to introduce deleterious effects like diabetes, jaundice, emaciation, anemia, skin disorders, and oedema

Accordingly the samples under investigation showed proper incineration of ingredients as evident (Table 1) from the total ash value (> 90%), less moisture content and lower solubility in acid (4.2%)

**Table-1** Physico-chemical analysis of Putru pathangam

Sl. no	Parameter	Result	Range
1.	Appearance	Grey colored fine powder	-
2.	Total ash	12.66 % w/w	1-25%
3.	Acid Insoluble ash	4.221 % w/w	0.1-10%
4.	Loss on Drying at 105°C	21.45% w/w	1-20%

In FTIR, assigning a band to a specific functional group in the fingerprint region (1500-500 cm<sup>-1</sup>) may be difficult, since many types of functional groups absorb at similar wave numbers in this region. The FTIR spectrum of graph shows the presence of

functional groups like alcohols, phenols, carboxylic acids, alkanes, alkynes, amines, aromatics, alkylhalides, aliphatic amines, alkenes, disulphides in Putru Pathangam reveals its easy bioavailability.

**Table-2** The FTIR spectrum of compounds

Frequency	Group	Compound
3409	NH stretch	Primary amine
3262	OH stretching	carboxylic acid
2210	C C stretching	alkyne, disubstituted
1622	C=C stretching	conjugated alkene
1422	OH in carboxylic acids	in-plane OH bending
1033	S=O stretching	sulphoxide
794	C-H bending	1,2,3 trisubstituted
576	C-C-CN	nitrile

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