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QUALITATIVE AND QUANTITATIVE ANALYSIS OF COPPER EXTRACTION FROM *THURISU* (COPPER SULPHATE) IN TRADITIONAL METHOD

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ABSTRACT

Siddha system of medicine is one of the ancient system of medicine in southern part of India. The medicine used in this system contains herbal, metals, minerals and animal products. Among them, copper (*Chembu*) is one of the metal used for Severe asthma, cancer, gastrointestinal ulcers, and eye disorders in the form of *Chembu parpam* or *chendooram* is used. Recent studies have demonstrated that elemental copper undergoes a variety of procedures described in the literature to transform into nanometal complexes that are non-toxic at low concentrations.The aim of the study, to extract copper from copper sulphate(*Thurisu*) by kadukkai powder(*Terminalia chebula*) traditional method. The result showed extracted metal contains major element Copper 74% and Octa carbon 26% and there is minimal amount of heavy metals like mercury, lead, cadmium and Arsenic. Extraction of Copper took period of 2 days and 470 gm of copper was extracted by *kadukkai* powder method from 1 kg of copper sulphate. This method is using by traditional healers to reduce toxicity of copper and which in increases the potency of medicine. This study is the preliminary analytic study for further explorative study on the extraction of copper from copper sulphate by *kadukkai* powder method.

Key word: Copper extraction, Siddha medicine, *Sattu, chembu*

INTRODUCTION

The traditional medicinal system practiced in South India for several centuries is well known as Siddha medicine.It is based upon the teachings of medico-philosophical adepts called Siddhas, which utilizes raw materials from natural resources comprising flora and fauna and also metals and minerals. Usage of herbomineral formulations is considered high ordered and around 220 minerals are being used in Siddha medicine (1). Among them, Copper is a soft, malleable, and ductile metal with atomic number 29 falls in group D (2). Copper (Cu) is an essential microelement required by all living organisms for proper growth, development, and survival (3). As far as human health is concerned, copper is involved in numerous body functions necessary for fundamental body processes like respiration, free radical eradication, energy production, formation of connective tissues, metabolism of oxygen and iron, maturation of extracellular matrix and neuropeptide, and neuroendocrine signaling (4).Copper plays a key role in the normal metabolic process, which is associated with amino acids and vitamins. It is the third most prevalent mineral in the body and is mostly carried by the blood plasma protein, ceruloplasmin(5). In Siddha system, Copper is known as "*Kunma kalan*," which emphasizes the effective role of copper in gastrointestinal diseases. Copper is considered to be one among the eight naturally occurring metals in Siddha medicine. Bogar Karasarathurai enumerates copper as heat element in *Panchabootham* (basic five elements) (1). Copper occupies an important position in the preparation of rejuvenated medicines and *Muppu* medicines, which improves longevity. The five-element theory is applicable to alchemy, copper being a heat predominant element; its role in alchemy is indispensable (6). Copper is used in the preparation of higher order medicines such as Parpam, Chenduram, Chunnam, Kalangu, Guru, and Satthu. Copper separated from copper sulfate have enhance the potency of the medicine and improves longevity. Hence the aim of the study to separate copper from different methods illustrated in Siddha classical literature,compare and analysis of extracted copper Qualitative and quantitatively by ICPOES AND XRD.

MATERIAL AND METHODS

Identification and Authentication

The purchased raw drugs were identified for its quality by comparing with the Raw materials kept in the Gunapadam lab, National Institute of Siddha. The herbal raw materials were authenticated by the Botanist of National Institute of Siddha, Chennai.

Ingredients

1. Copper sulphate(*Thurusu*)
2. Terminalia chebula (*Kadukkai*)
3. Borax(*Vengaram)*

Procedure

1 kilogram of copper sulphate (*Thurusu*) powder was taken and mixed with water in a iron pot. The iron pot is sealed with white cloth. Keep half kilogram of *kadukkai* powder (*Terminalia chebula*) above the cloth and made to dipped in the copper sulphate solution overnight. On next day, Cloth was removed, copper is sedimented in iron pot. The obtained copper was grind with

mercury and place in moosai and blow to heat it. Finally add *vengaram*(Borax) to separate the mercury to obtain pure copper extract. (Fig 1&2)

Characterization study

The test drug copper extract was subjected to analytical studies such as XRD and ICPOES using sophisticated instruments .Experiment was done in **SCRI,Chennai.**

Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES)

Siddha 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. 0.5g of *Extracted copper* is measured, and then dissolved in a decomposition vessel with nitric acid into 10ml solution.

X-Ray Diffraction (XRD) Analysis

The XRD powder diffraction pattern of *Extracted copper* can be recorded on X-ray diffractometer (Siemens D5005 Diffractometer) using CuKaradiation,Lamda = 1.5406 Angstrom] over the range 10.0-80.0[degrees].

Figure 1: Extraction of Copper from Copper sulphate

Figure 1 shows the Extraction of Copper from Copper sulphate

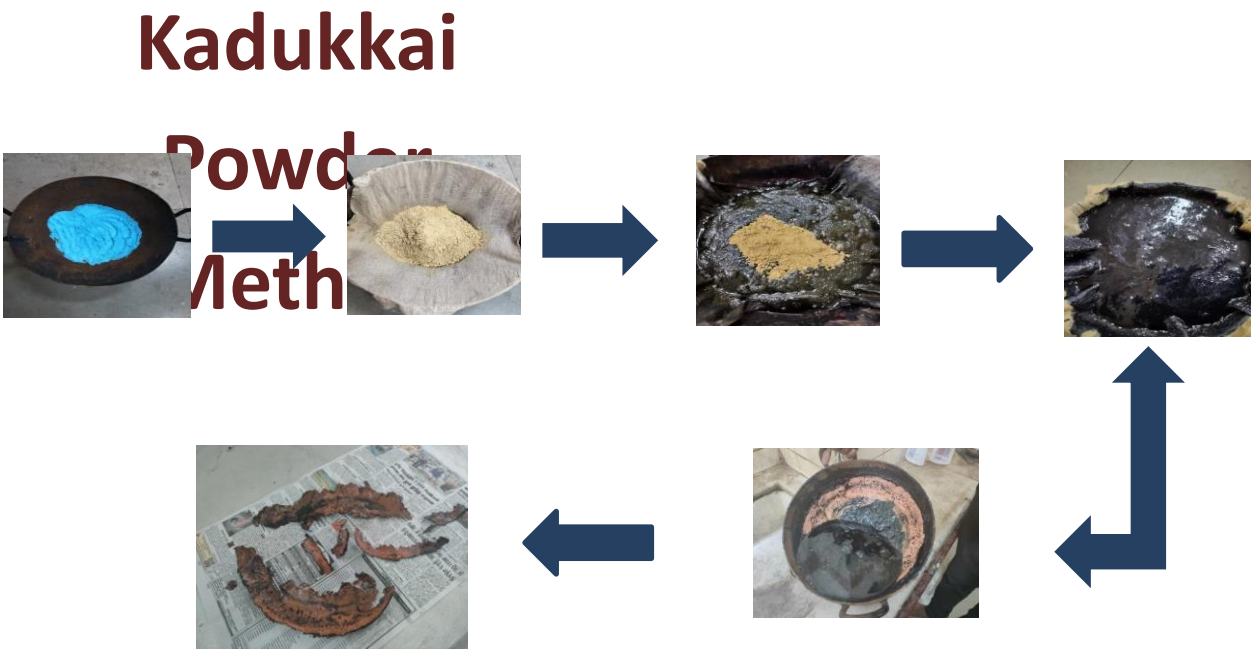
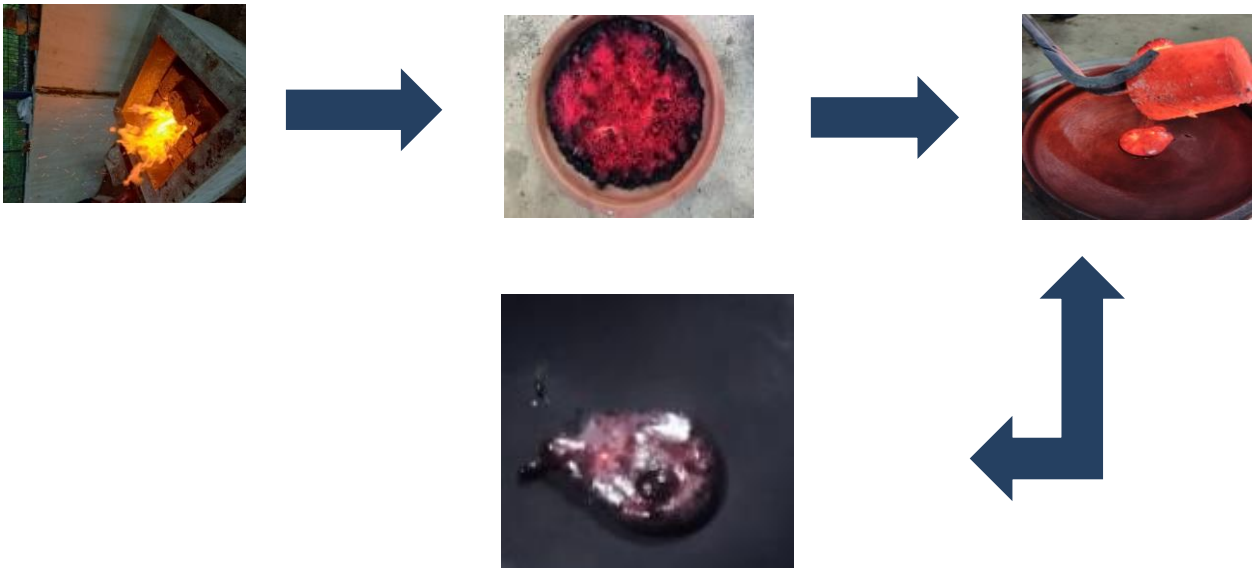


Figure 2: Extraction of Pure Copper

Figure 2 shows the Extraction of Pure Copper



RESULT

In order to understand the extraction of copper using XRD and ICPOES studies were performed. The presences of copper were tested by XRD studies (figure 3) XRD is used to determine the mineral composition of the raw material with its qualitative and quantitative analysis.XRD analyses were used to determine the structure of copper. Secondly, ICPOES used to identify the atomic composition of a particular sample. The composition for copper from thurusu (Table 4).

XRD

- **COPPER – 74%**
- **OCTACARBON – 26%**

Figure 3: XRD analysis of Extracted copper

Figure 3 shows the XRD analysis of Extracted copper

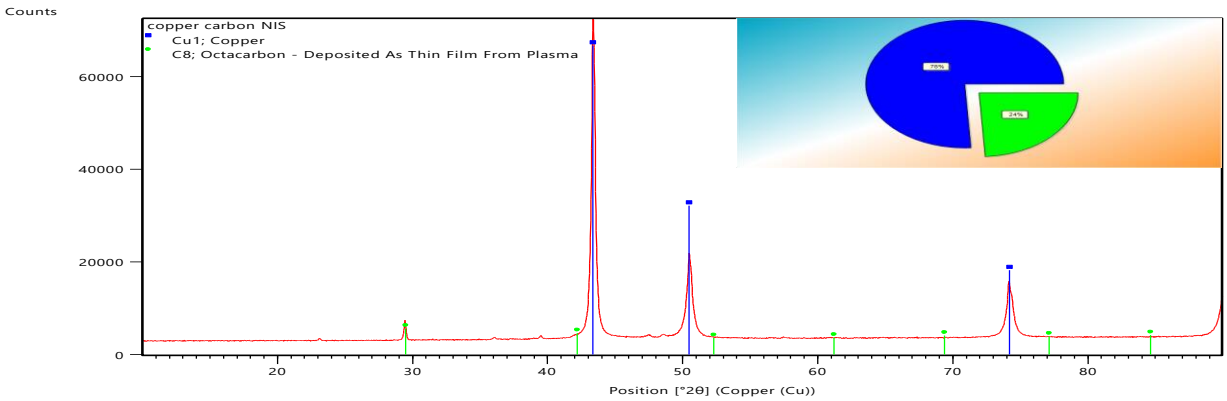


Table 1: ICPOES Analysis of Extracted copper

Elements	**Thurusu Chembu**
As	**BDL**
Cd	**17 ppm**
Cu	**65.01 %**
Fe	**929.10 ppm**
K	**BDL**
Mg	**17.99 ppm**
Mn	**1.3 ppm**
Mo	**BDL**
Ni	**28.84 ppm**
Pb	**682.93 ppm**
Sr	**0.55 ppm**
Zn	**240.64 ppm**
Ca	**79.43 ppm**
Na	**121.74 ppm**
Hg	BDL

Table 1 shows the ICPOES Analysis of Extracted copper

DISCUSSION

Siddha medicine has been using copper in various diseases for many years. Siddha possess a deeper comprehension of metals formulations, which have been shown to control body metabolism and lessen the condition. In Siddha medicine Sattu is one kind of formulation prepared from herbal, metals, minerals, and animal sourceswhich used in the medicine to make it more potent and improve longevity. Copper occupies an important position in the preparation of rejuvenated medicines and *Muppu* medicines. The five-element theory is applicable to alchemy, copper being a heat predominant element; its role in alchemy is indispensable(6).In Siddha literature various Sattu(extraction) method was mentioned. For example *Ayasatthu obtained* from metal iron, *Chembu satthu obtained* from copper-containing herbs and the metal, *Mayura Satthu obtained* from peacock feathers, and *Poonaga satthu obtained* from a type of earthworm. A polymineral formulation named *Thurusu ayachembu,*finds its usage in alchemy to yield gold and in *Kayakarpam and* to cure diseases and to

rejuvenate body(7). The copper performed many functions in human i.e.; it is a cofactor for many enzymes involved in neuropeptides synthesis, the regulator of cell signaling pathways, antioxidant defense, and involved in the functions of human immune cells which are responsible for the killing of pathogens(8). Copper is both essential and toxic to living systems. As an essential metal, copper is required for adequate growth, cardiovascular integrity, lung elasticity, neovascularization, neuroendocrine function, and iron metabolism(9). From the results, extracted metal contains major element Copper 74% and Octa carbon 26% and there is minimal amount of heavy metals like mercury, lead, cadmium and Arsenic. As traditional healers said that it is easiest method and less expensive method when compared with modern extraction of copper from copper sulphate.Extraction of Copper takes period of 2 days and 470 gm of copper is extracted by kadukkai powder method from 1 kg of copper sulphate. Traditional healers used these extracted copper from copper sulphate for medicinal use because it has minimal amount of impurity when compared with commercial one.

CONCLUSION

According to Siddha literature, copper is extremely useful in curing intestinal and ocular ailments. It plays an equal part in alchemy as well as in the production of higher order medications.From this method of extraction of copper from copper sulphate by kadukkai powder reduces toxicity of copper, improves the potent of the medicine. The main aim of these alchemical processes is to slow down aging process, minimize the risk of diseases, and finally attain spiritual enlightenment.

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CONFLICT OF INTEREST

The authors have stated no conflict of interest.

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