

Chemical Analytical Study of Thaalakam Used In Siddha Medicine by the Suththi Methods

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Abstract: Heavy metals such as Arsenic, lead, mercury are used in Siddha Medicine to prepare some high quality medicines from ancient time. They used in very small dose with particular anupaanam(vehicle) for a short period. According to Siddha Pharmacology most of these metals and minerals produce toxic effects in human body when they used without suththi . Suththi is the technical method to reduce or remove the toxic effect of these minerals. There are several suththi methods mentioned in Siddha literatures for a single drug. It may or may not be a single process. No medicinal preparation is done without prior Suththi process. This paper deals with the chemical changes of Thaalakam (Yellow Arsenic Trisulphide) by different suththi methods. Atomic percentage of arsenic was decreased by all the suththi processes in this study.

Keywords: Heavy metals, Siddha Medicine, Thaalakam, Suththi, arsenic

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I. INTRODUCTION

Plants (*Thaavara Varkam*), metals and minerals(*Thaathu Varkam*) and animals(*Jeeva Varkam*) are extensively used in Siddha Medicine for drug preparation. The drugs of *Thaathu varka* origin are used alone or in combination with herbs (herbo – mineral combination) or other metallo-mineral combination for therapeutic purposes. Among the above substances there are some highly poisonous substances used for preparation of drugs. The technical expertise of neutralization of the poisonous quality of them is highly advanced and marvelous. After neutralizing by various antidotal processes, they are used orally for treatment (Kusumaratne.K.L.S, : 2005 ; 4). M. Visweswara Sastry (1953: 253) said that medicines should be prepared only after the respective *thaathus* are well purified. If they prepared from unpurified drugs they may cause ill-health, disease or even death. Recently, some scientists reported about heavy metals present in Indian Medicines. (Rob Gair (2008), Health Canada (2018), Edzard Ernst (2015), WebMD (2004).

Agarwal Princy and others stated that according to the principles of Ayurvedic medication, heavy metals possess considerable therapeutic properties and can be administered to the patients after being processed properly as mentioned within the Rasashastra, in prescribed quantities. However, improper manufacturing processes might lead to higher levels of heavy metals remaining in the final product which may be dangerous (Agarwal Princy, Vaishnav Rajat, Goyal Anju:2018:13)

In Siddha medicine heavy metals like mercury, lead, arsenic also used in some preparations. The Siddhars – the ancient Indian scientist and alchemists had been introduced special technical methods known as *Suththi* to reduce or remove the toxic and unwanted effects of these substances before preparing the medicine. It is clearly stated in Siddha texts (Thiyakarajan.R, ; 2008, Kannusamy Pillai.S,;1997, Ponnaiah.I,1927). According to Siddha Medicine all the poisonous substances undergo *Suththi* processes before manufacture medicine. In the case of herbo - mineral and metallo - mineral drugs some ingredient(s) used to neutralize the poisonous quality additionally. During the oral administration very small amount of these drugs are given with particular *anupaanam*(vehicle). Some *anupaanams* also reduce or neutralize the poisonous effects. Metallic preparations are very rarely used in pediatric purposes. Anyhow, scientific approach of each and every steps of drug preparation (including *suththi*) will conform to safety use of Siddha medicines. In this back round *Thaalakam* was selected for this study.

Metallic arsenic and its oxide, As_4O_6 were known to the early alchemists. Compounds of arsenic were introduced into medicine by Paracelsus in the sixteenth century (Frederick Prescott ;1952; 590). Even though , arsenic is used in Siddha Medicine from ancient time. Arsenic and arsenical compounds are called *Paashaanam* or *Paadaanam* (Winslow.M, : 2001: 753). *Thaalakam* (Yellow Arsenic Trisulphide or Arsenic orpiment) is one of the arsenical compounds categorized under *Paashaanam* (Thiyakarajan (2008), Thambimuthu Pillai.S, (1928), Chadrasekar.S,(1916)). *Arithaaram* is one of the synonyms of *Thaalakam*. According to the colour, appearance and properties the *thaalakam* has been classified into four types – (1) *Sivappu arithaaram*(Red

orpiment) (2) *Madal Arithaaram*, (3) *Pon Arithaaram* (Gold/yellow *Arithaaram*), (4) *Karttu Arithaaram*. Yellow *thaalakam* is also called *Pon arithaaram*. It is commonly used in Siddha medicines. *Thaalakam* is used to prepare several medicines including *Thaalaka paspam* and *Thaalaka chenthooram* in Siddha Medicine. Like most of the *Thaathu/* minerals *Thaalakam* also produce toxic effects in human body (Ponnaiah.I, : 1927: 73). The toxic and side effects of *thaalakam* are clearly mentioned in Siddha literatures. ((Murukesa Muthaliyar.KS, 1998 : 28).

“Yellow Arsenic trisulphide if not prepared properly or impure form is used, the preparation will be quite toxic. The following signs and symptoms may be seen – burning pain of the stomach, gastritis, hoarseness of voice, change of voice, nasal bleeding, bleeding from the nail buds, loss of appetite, loss of smell, indigestion, itching over the head, redness in the tip of the hairs, mental changes, lower abdominal discomfort, and throbbing pain in the lumbar region” Because of its toxic effects it is used for internal administration in very small quantities (Thiyakarajan.R,2008: 270). The aim of this analytical study was to identify the chemical changes of *thaalakam* by different *suththi* process. The present work uses analytical techniques such as qualitative, quantitative and XRF(X-Ray Fluorescence) to study the *thaalakam* due to *suththi* process.

II. MATERIAL AND METHODS

The required raw drug (*Thaalakam*) was purchased from well reputed Siddha pharmacy. It was identified and authenticated from Gunapaadam section, Unit of Siddha Medicine, University of Jaffna. Commonly used three purification methods of *Thaalakam* by Sri Lankan Siddha physicians were selected for this study. These methods are also found in Siddha Literatures. The raw drug was *purified* at the Pharmacy practical Section, Unit of Siddha Medicine.

Method – I - Small pieces of Arsenic trisulphide is bundled in a double layer cloth. It is kept in a double layer cloth. It is kept immersed in cow’s urine and heated for three days. The same process is repeated with the rice cleaned water , vinegar individually to get purified form. (Siddha Materia Medica pp272). This *suththi* process is called *Tholaa yanthira method*.

Method – II - Urine – 1.3 litre, *Acalipha indica* juice – 325 ml., Limestone - 325 gm. Arsenic trisulphide is bundled and kept immersed in the above mixture and heated to get purified. (Siddha Materia Medica pp272-273)

Method – III - Small pieces of Arsenic trisulphide is bundled in a double layer cloth. It is kept in a double layer cloth. It is kept immersed in cow’s dung water and heated for three days. The same process is repeated with milk, the rice cleaned water , and lime water individually to get purified form. (Vaidya Vilakkam ; 1927 :75). This *suththi* process is also called *Tholaa yanthira method*.

Thaalakam was finely powdered by using mortar and pestle. A part of finely powdered raw *thaalakam* sample was placed in XRF analytical microscope for quantitative determination of elements. The rest of the *thaalakam* raw sample was dissolved in HCl and analyzed by using routine qualitative analysis method to interpret cations, anions and rare anions. The above procedure was repeated with all purified samples.

Qualitative analysis:

Qualitative analysis was carried out in the laboratory to separate and identify the components of a selected drug sample. Ions were separated mainly based on their different solubility. Further, verification of their identity was carried out by a confirmatory test. Unique response such as solution colour change or the formation of precipitate confirms the presence of that ion.

XRF (X-Ray Fluorescence) analysis:

HORIBA scientific XGT-5200 X-Ray analytical microscope was used in the XRF analysis. A 50kV volume X-Ray tube, P2 processing time, 200s live time and X-Ray guide tube with 100 µm diameter was used. Samples were mounted on the sample stage using double tapes. Six different places of each mounted samples were analyzed. The relative mass percentage, atomic percentage and intensity were determined for each element. The abundant atomic percentage of element in selected minerals were analyzed by this method.

III. RESULTS AND DISCUSSION

Table – I (Before *Suththi*)

Raw Material	Colour (before <i>Suththi</i>)	Routine Test	XFR analyses
<i>Thaalakam</i>	Golden yellow colour	Only S was identified	Fe, As, S & Si were found. Atomic percentage of As & S were higher than other elements. As – 39% S – 58%

Table – II(After Suththi – Method - I)

Material (after suththi)	Colour (after Suththi)	Routine Test	XFR analyses	Remarks
Thaalakam	Black	Only S was identified	As, K, Cu, S & Si were found. Atomic percentage of As & S were higher than other elements. As – 37% S – 59%	Atomic percentage of As was reduced & atomic percentage of S was increasing after suthi process

In this purification method atomic percentage of As decreased from 39% to 37%. Atomic percentage of S was increased from 58% - 59%. In this purification method As, K,Cu,S and Si were identified by XFR analyses.

Table – III (After Suththi – Method - II)

Material (after suththi)	Colour (after Suththi)	Routine Test	XFR analyses	Remarks
Thaalakam	Black	Only S was identified	As, S & Si were found. Atomic percentage of As & S were higher than other elements. As – 38% S – 60%	Atomic percentage of As was reduced & atomic percentage of S was increasing after suthi process

In this purification method atomic percentage of As decreased from 39% to 38%. Atomic percentage of S was increased from 58% - 60%. As, S and Si were identified by XFR analyses.

Table – IV (After Suththi – Method - III)

Material (after suththi)	Colour (after Suththi)	Routine Test	XFR analyses	Remarks
Thaalakam	Yellowish black	Only S was identified	As, S & Si were found. Atomic percentage of As & S were higher than other elements. As – 37% S – 59%	Atomic percentage of As was reduced & atomic percentage of S was increasing after suthi process

In this purification method atomic percentage of As decreased from 37% to 38%. Atomic percentage of S was increased from 58% - 59%. As,S and Si were identified by XFR analyses.

IV. CONCLUSION AND RECOMMENDATIONS

This study revealed that different chemical changes occur by different *suththi* / purification methods. Atomic percentages of *Thaalakam* were decreased in all three methods. As a general rule low concentration of the heavy metals and minerals are less harmful to the human body. Therefore 1st and 3rd *suththi* methods may be considered as the best. There are some other *suththi* methods also mentioned in Siddha texts for *thaalakam*. They should also be studied in future. As said earlier, *Thaalakam* is usually used as an ingredient of some Siddha drugs. They may be herbomineral drugs or mineral drugs. . The preparations of these drugs are not usually a single process. They may involves processes like cleaning, frying, soaking and grinding with herbal juices until reach the proper stages. Their fore, the chemical changes of *Thaalakam* after preparation of particular drug should also be investigated in future.

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