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Physico-Chemical Analysis of Siddha Drug *Poora parpam* - A Comparative Evaluation between Natural and Synthetic Source

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ABSTRACT

Siddha Medicine is one of the oldest Traditional system of Medicine in world existed separately in early times. In Siddha, Mercurial compounds namely Panchasootham are widely used to cure complicated and chronic disease. Pooram is one among the five compounds. Pooram is called as MERCUROUS CHLORIDE (CALOMEL). The mercurial compound has been in use in Siddha since many centuries and it is identified and indicated for the treatment of many diseases in ancient Siddha literature. The objective of the present study was to evaluate the physio-chemical analysis of Siddha preparation Poora parpam.

Keywords: *Poora parpam*, Panchasootham, Siddha, Mercury, Ancient

INTRODUCTION

Siddha system has flourished well in South India especially Tamil speaking area for many centuries. Although this system has lost his charm in later years, due to change of life and food and modern medicine, it continues to sustain its influence on the masses because of its incomparable intrinsic merits. Siddha medicine can cure all types of diseases, especially the chronic diseases, which baffles and eludes even the modern sophisticated medicine. Medicinal ingredients in Siddha medicines are classified into three main groups: *Mooligaigal* (medicines derived from plants), *Vilangugal* (those derived from animals including marine animals) and *Uloogangal* and *kanimangal* (those derived from earth and organic toxins). *Mooligaigal* includes the thousands of whole plants and plant products. The National Siddha Formulary of India lists more than 10,000 well practiced Siddha formulations described in Gunapadam (Siddha pharmacology) [1,2].

Siddha system has enormous texts written by various Siddhars on that period containing vegetable, animal and mineral products. *Uloogangal* and *kanimangal* drug usage should be viewed before and after Bogar's period. All Siddhars are well versed in preparing the high end Medicines using *Uloogangal* and *kanimangal* drugs [3]. Among the *Uloogangal* and *kanimangal* Silver, gold, zinc, copper and other metals which are mostly used in modern medicines are wonderful life saving drugs against all chronic and infectious diseases. The same was used for thousands of years without any adverse effects in the Siddha system [4].

Pooram is one among the Panchasootham (five mercurial compounds) which is widely used in Siddha preparation for many years by Siddhars. The main component of the Pooram is Mercury and Chloride. Mercury is well thought-out as Eesan in Siddha practice, i.e., Lord Siva who performs all the three actions of Aakkal, Kaaththal and Azhiththal (Creation, Preservation and Destruction) through his different incarnation. Mercury cures almost all the diseases of mankind. The mercurial compound has been in use in Siddha since many centuries. Pooram is identified and indicated for many diseases in ancient Siddha Literatures [5-15].

Siddha system also has described in detail about the poisonous effects of mercury and its compounds. But it also has explained in depth about the measures for purification and detoxification of the same. Moreover, before it is being prepared as a medicine, it undergoes a series of processes which change the total physical and chemical nature of the medicine and make it a much safer than the raw drugs of the same medicine. And when given as per the dose, adjuvant and duration as mentioned in the texts, it is a completely safe medicine for the treatment of many chronic

diseases like arthritis, Gastric ulcers and also effective in treating acute and chronic inflammatory diseases. The present study was to evaluate the physio chemical [3] analysis of natural and synthetic *Poora parpam* [16].

MATERIALS AND METHODS

Procurement and genuine of raw drugs

The Natural and Synthetic Pooram were properly collected from country/Chemical drug merchant shop, Chennai and Department of Geology, V.O. Chidambaram College, Tuticorin, Tamil Nadu has certified that the above drugs were genuine one according to the physical and chemical nature of the compound [6,7].

Purification of Pooram

Pooram (raw-purified) – 35 g

Vettrilai (*Piper betle*) leaves – 8.75 g

Milagu (*Piper nigrum*) – 8.75 g

Method of purification

Piper betle leaves and *Piper nigrum* seeds were taken separately and cleaned the raw drugs. Then *Piper betle* leaves and *Piper nigrum* seeds ground together and made into a poultice. Then one liter of water was taken in a medium size mud pot with a capacity of three liter water and the poultice was mixed in that water. Pooram (raw) was covered with a piece of clean dry cloth, so that it was not exposed outside [5]. The good twine was taken and tied the cloth with Pooram with one end and another end was tied with the bamboo stick and which was placed horizontally over the opening of the mud pot. The raw drug Pooram in cloth was dipped in the above mixture of water and poultice. The vessel was constantly heated till mixture of water reduced by three fourth of its volume. Finally the Pooram was taken out from the mud pot and wait for some time to cool the raw drug. After that, the Pooram was taken out from the cloth, washed with clean water and dried in sunlight and stored in the container [8].

Preparation of *Poora parpam*

Ingredients

Purified Natural Pooram/Synthetic Pooram (Calomel).

Method of preparation

Take 50 g of the purified natural Pooram and put in the stone black kalvam. Ground for seven days continuously. Then collect into the container. This was the study drug "Natural *Poora parpam*".

The above method of preparation was also followed for synthetic Pooram (Calomel).

Route of administration

Oral.

Dosage

1/2 ulundu edai (32 mg) to 3 ulundu edai (195 mg).

Anubanam

Karumbu vellam (Cane sugar).

Duration of treatment

Two times a day for 7 days morning and night after food.

Physicochemical analysis

Organoleptic features

Color [1]

About 5 g of *Poora parpam* was taken in a clean glass beaker and tested for its color by viewing against a white opaque background under direct sunlight [9,10].

Odour

About 5 g of the *Poora parpam* was placed in a 100 ml beaker and tested for its odour by wafting the air above the beaker.

pH [1]

The pH of the *Poora parpam* was calculated as per the method prescribed in the Indian standard (IS) – 6940 (1982). 1.0 g of the *Poora parpam* was taken into a 100 ml graduated cylinder containing about 50 ml of water and filled up to the mark with water. The cylinder was stopped and shaken vigorously for 2 min and the suspension was allowed to settle for an hour at 25 to 27°C. About 25 ml of the clear aqueous solution was transferred into a 50 ml beaker and Thiagarajan [7] tested for pH using DIGISUN digital pH meter (DIGISUN electronics, Hyderabad, India) [11].

Physical evaluation

Determination of ash value

2 g of *Poora parpam* was weighed accurately, added in tarred platinum or silica dish and incinerated at a temperature not exceeding 450°C until free from carbon, then cooled and weighed. The percentage of ash is calculated with reference to the air dried drug [12].

Water soluble ash

To the Gooch crucible containing the total ash, added 25 ml of water and boiled for 5 min collected the insoluble matter in a sintered glass crucible or on ash-less filter paper. Washed with hot water and ignited in a crucible for 15 min at a temperature not exceeding 450°C. The weight of the insoluble matter is subtracted from the weight of the ash and the difference of the weight represents the water soluble ash. The percentage of water soluble ash was calculated with reference to the air dried drug.

Acid insoluble ash [11]

The ash was boiled for 5 min with 25 ml of 1:1 dil HCl. The insoluble matter was collected in Gooch crucible on an ash-less filter paper and washed with hot water and ignited. Cooled in desiccators and weighed. The percentage of acid insoluble ash is calculated with reference to the air dried drug [1].

Loss on drying [1]

5 g of *Poora parpam* was heated in an oven at 105°C to constant weight and the percentage of loss on drying was then calculated from it [13-21].

Determination of flow property [22]

Angle of repose

The angle of repose can be defined as the constant three dimensional angle measured relatively to the horizontal base, assumed by a cone-like pile of material formed when the powder is passed through a funnel-like container. The angle of repose has been used in several [20] branches of science to characterize the flow properties of solids. Angle of repose is a characteristic related to inter particulate friction or resistance to movement between particles [22]. Fixed quantity of synthetic and natural *Poora parpam* was allowed to flow through a funnel, whose tip is adjusted at 2 cm form a horizontal surface beneath, so that the apex of the heap just touch the lower tip of the funnel. Funnel was removed after the formation of repose (Pyramid like structure). By using measuring scale mark the height of the repose and diameter of the heap to calculate the radius [14,15].

Formula for calculating Angle of repose [4]

$\theta = \tan^{-1} (h/r)$

The height of the heap that is the distance between the horizontal surface and the lower tip of the funnel is called (h), r=Radius of the base of the pyramid.

Reference value

Angle of repose (In degree)	Flow behavior
25-30	Very free – flowing
30-38	Free – flowing
38-45	Fair – flowing
45-55	Cohesive
55	Very cohesive

Microscopical evaluation [2]

Natural and Synthetic *Poora parpam*, including before/after purification of Natural and Synthetic Pooram was subject to microscopical analysis for evaluation of morphological variance on the bases of size, color and shape of the drug for genuinity and purity [16].

RESULTS AND DISCUSSION

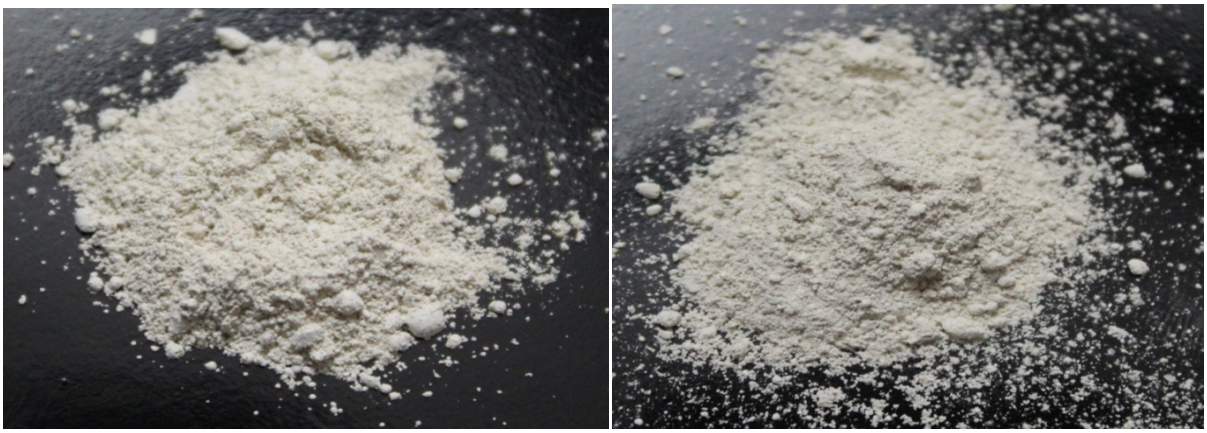
A. Natural Pooram before purification

B. Natural Pooram after purification

C. Synthetic Pooram before purification

D. Synthetic Pooram after purification

Figure 1: Raw drug Pooram before and after purification



A. Natural *Poora parpam* (Final formulation)

B. Synthetic *Poora parpam* (Final formulation)

Figure 2: *Poora parpam* final formulation

Table 1: Organoleptic property of Pooram and *Poora parpam*

S. No.	Drugs	Color	Odor	pH
1	Natural Pooram Before Purification	Creamy brown	Odorless	5.5
2	Natural Pooram After Purification	Wheaties brown	Odorless	5
3	Synthetic Pooram Before Purification	White	Odorless	5.5
4	Synthetic Pooram After Purification	Creamy white	Odorless	5.9
5	Natural *Poora parpam* (Final formulation)	Whitish Grey	Odorless	6.2
6	Synthetic *Poora parpam* (Final formulation)	White	Odorless	6.6

Table 2: Physical property of Pooram and *Poora parpam*

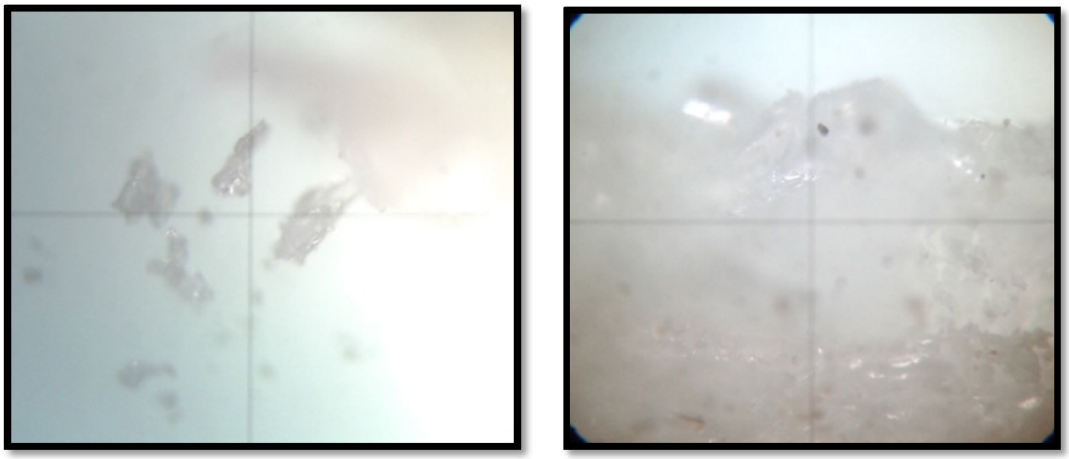
S. No.	Drugs	Total Ash (% w/w)	Water soluble Ash (% w/w)	Acid Insoluble Ash (% w/w)	Loss on Drying (% w/w)
1	Natural Pooram Before Purification	8.3	7.5	0.62	7.4
2	Natural Pooram After Purification	9.12	6.2	0.55	7
3	Synthetic Pooram Before Purification	9.51	5.5	0.7	6.6
4	Synthetic Pooram After Purification	9.25	5.2	0.85	6.9
5	Natural *Poora parpam* (Final formulation)	9.64	6.5	0.82	5.4
6	Synthetic *Poora parpam* (Final formulation)	9.8	5.8	0.74	6.8

Table 3: Determination of angle of repose of natural and synthetic *Poora parpam* [2]

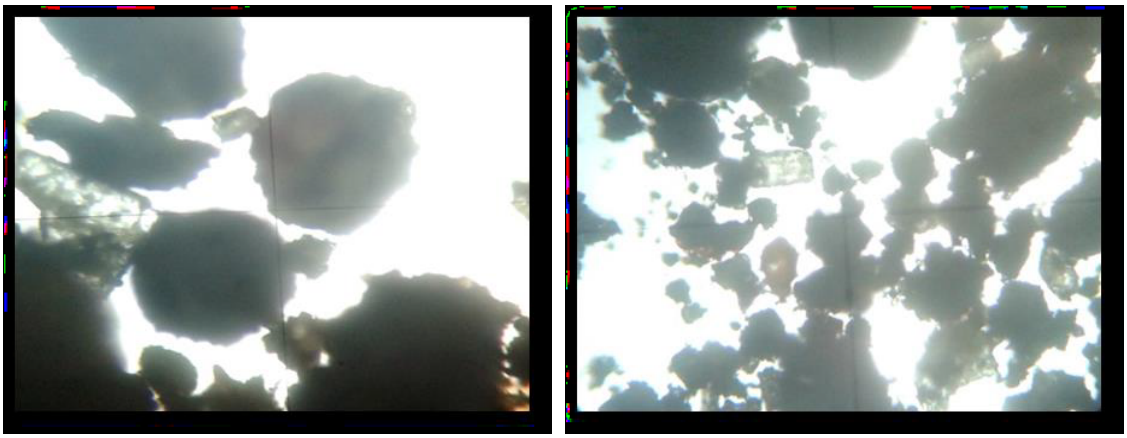
Properties	Calibration		
Angle of Repose	**Range Degree**	**Mean**	**Range SD**
Natural *Poora parpam* (Final formulation)	44.7-50.9	46.77	3.580
Synthetic *Poora parpam* (Final formulation)	33-35.8	34.07	1.514

A. Natural *Poora parpam* (Final formulation) B. Synthetic *Poora parpam* (Final formulation)

Figure 3: Angle of repose of natural and synthetic *Poora parpam*

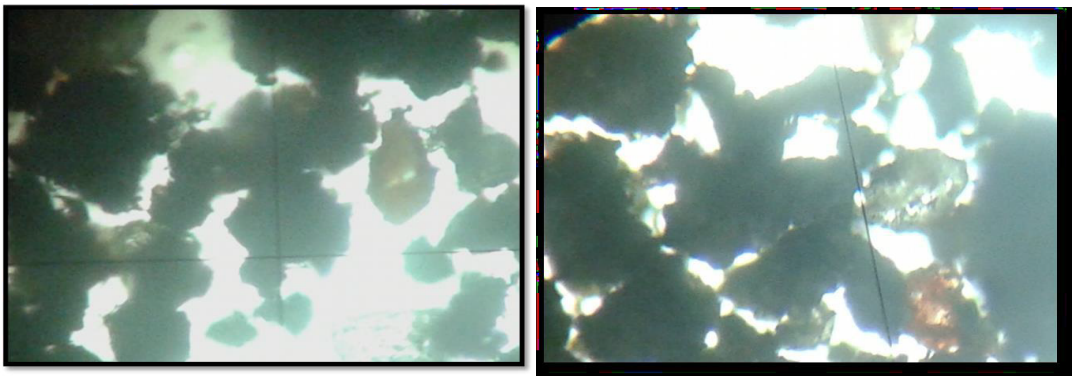


A. Natural Pooram before purification B. Natural Pooram after purification



C. Synthetic Pooram before purification D. Synthetic Pooram after purification

Figure 4: Microscopical evaluation of natural and synthetic Pooram (Mag. 10x)



A. Natural *Poora parpam* (Final Formulation)

B. Synthetic *Poora parpam* (Final Formulation)

Figure 5: Microscopical evaluation of natural and synthetic *Poora parpam* (Mag. 10x)

Physicochemical property of natural and synthetic Poora parpam

Organoleptic property of the Pooram (before and after purification) and *Poora parpam* justified the genuinity of the raw drug and finished formulation with respect to its color, shape, texture, pH and identity. The results were tabulated in Table 1 and illustrated in Figures [1-3].

The results obtained from qualitative chemical identification test showed that Pooram and *Poora parpam* have significant identity for the presence of mercury and chloride compounds.

The total ash value of Natural Pooram before and after purification was found to be 8.3 and 9.12% w/w [17]. Similarly for synthetic Pooram before and after purification the values are 9.51 and 9.25% w/w, respectively. The total ash value of natural and synthetic *Poora parpam* (Final formulation) was found to be 9.64 and 9.8% w/w. The results were tabulated in Table 2.

The water soluble ash value of natural Pooram before and after purification was found to be 7.5 and 6.2% w/w. Similarly for synthetic Pooram before and after purification the values are 5.5 and 5.2% w/w, respectively. The water soluble ash value of Natural and Synthetic *Poora parpam* (Final formulation) was found to be 6.5 and 5.8% w/w. The results were tabulated in Table 2.

The acid insoluble ash value of Natural Pooram before and after purification was found to be 0.62 and 0.55% w/w. Similarly for synthetic Pooram before and after purification the values are 0.7 and 0.85% w/w, respectively. The acid insoluble ash value of natural and synthetic *Poora parpam* (Final formulation) was found to be 0.82 and 0.74 %w/w. The results were tabulated in Table 2.

The loss on drying at 105°C of natural Pooram before and after purification was found to be 7.4 and 7%, w/w. Similarly for synthetic Pooram before and after purification the values are 6.6 and 6.9% w/w, respectively. The loss on drying value of Natural and Synthetic *Poora parpam* (Final formulation) was found to be 5.4 and 6.8% w/w. The results were tabulated in Table 2.

Microscopical evaluation of natural and synthetic Poora parpam

Microscopic evaluation of natural Pooram before purification showed the presence of fibrous Calomel elongated under parallel nicols, colorless to yellow and feebly pleochroic (change of color) from colorless to yellow. Large and small grains were seen. Relief (visibility of the mineral boundary) - moderate to high. The results were illustrated in Figure 4A.

Evaluation of natural Pooram after purification showed the presence of large fibrous calomel grain under parallel nicols, colourless to grey and at places yellow; moderate relief; tabular, feebly pleochroic. The results were illustrated in Figure 4B.

Microscopic evaluation of synthetic Pooram before purification reveals the presence of elongated, tabular twinned

crystals of grey, yellow, brown and black. Feeble colour change on rotation of the microscopic stage-weak pleochroic. The results were illustrated in Figure 4C.

Evaluation of synthetic Pooram after purification showed the presence of tabular tetragonal Calomel not showing interference color (observed under the crossed nicols) due to the masking effect of the black color. But yellow and brown Calomel are also showing the same original color. The results were illustrated in Figure 4D.

Microscopic evaluation of Natural *Poora parpam* (Final formulation) showed the presence of twinned crystals of Calomel was well seen. The crystals were in grey, brown and black in color. The results were illustrated in Figure 5A.

Microscopic evaluation of Synthetic *Poora parpam* (Final formulation) showed the presence of platy, tabular Calomel crystals of black, brown and grey color. Interference color not seen due to strong absorption of original color by Calomel. They were showing parallel extinction. The results were illustrated in Figure 5B.

Angle of repose of natural and synthetic Poora parpam (final formulation)

From the results it was clear that the angle of repose for Natural *Poora parpam* (Final formulation) within the range of 44.7-50.9° so it was concluded that flow behavior of this formulation seems cohesive. The angle of repose for Synthetic *Poora parpam* (Final [18] formulation) within the range of 33-35.8° so it was concluded that flow behavior of this formulation seems free flowing. The results were tabulated in Table 3 and illustrated in Figure 3.

The Siddha system of medicine is the oldest Traditional Medical system with meticulously documented medicines and being practiced by a large population in south India especially Tamil speaking area. The development of this traditional system of medicines with perspectives of safety, efficacy and quality will help not only to preserve the traditional heritage but also to rationalize the use of natural products in health care. According to WHO guidelines, an herbal product needs to be standardized with respect to safety before releasing it into the market.

Physicochemical parameters help to a greater extent for the purpose of Standardization. Identification of herb is based on macroscopical, microscopical and qualitative analysis. Macroscopical feature involves odor, taste, color, size, shape and special feature of plant and microscopically involves leaf content, trichome, stomata, etc. Certain microscopical features and chemical test comes under evaluation and standardization of herbal drug. Identification of components by its characteristic color change, exertion of fluorescence, precipitation reactions in chemical test renders valuable information on presence of chemical group which may be responsible for the pharmacological action of particular formulation [19]. Evaluation of drugs means confirmation of its identity and determination of its quality and purity and detection of adulteration.

The study of organoleptic property of the Pooram and *Poora parpam* justified the genuinity of the raw drug and finished formulation with respect to its color, shape, texture, pH and identity. Preliminary qualitative analysis indicated the presence of mercury and chloride. The information obtained from physicochemical screening will be useful in finding out the genuity of the drug. The percentage of total ash, acid insoluble ash and water soluble ash were carried out for raw drug as well for finished formulation. Ash values of a drug gave an idea of the earthy matter or the inorganic composition and other impurities present along with the drug.

Today sophisticated modern research tools for evaluation of the plant drugs are available but microscopic method is still one of the simplest and cheapest methods to start for establishing the correct identity of the source of materials [22]. In the present work microscopy of raw drug and finished formulations were carried out. Morphological studies revealed the presence of fibrous elongated grain with characteristic color that enable the identity of the crude and finished formulations.

The angle of repose or the critical angle of repose of a granular material is the steepest angle of descent or dip relative to the horizontal plane to which a material can be piled without slumping [21]. At this angle, the material on the slope face is on the verge of sliding. The angle of repose can range from 0° to 90° [18-23].

The angle of repose has been used in several branches of science to characterize the flow properties of solids. Angle of repose is a characteristic related to inter particulate friction or resistance to movement between particles [4]. Determination of angle of repose of the formulations [15] like parpam is not been attempted so far, data obtained from this study is considered as an added mile stone in the process of evaluation of parpam. The angle of repose for Natural *Poora parpam* within the range of 44.7-50.9°, so it was concluded that flow behavior of this formulation seems

cohesive. Similarly angle of repose for Synthetic *Poora parpam* Final formulation within the range of 33-35.80, so it was concluded that flow behavior of this formulation seems free flowing.

CONCLUSION

The physiochemical analysis of natural and synthetic *Poora parpam* showed that the results of all the parameters were within normal limits. It proves that the above trial drug was safety drug even though it contains mercurial compounds to use as internal medicine

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