

Chemical Analysis of Gomutra Silasathu Parpam

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Abstract

Gomutra Silasathu is one of the ingredients in many herbo-mineral formulations. It tonifies the activity of the seven body constituents (Saptha Thathus) namely plasma, blood, muscle, fat, bone, bone marrow and reproductive fluids of the body. In Siddha system of Medicine, it is used to treat Nabunjagam (Erectyle dysfunction), to improve spermatogenesis, impotence and sexual desire. Silasathu parpam is prescribed for sopana skalitham [Nocturnal emission], megam [Veneral disease], premegam [Gonorrhea], koruku [Contagious ulcers], kiranthi [Glandular swelling]. In the present study Physico chemical analysis and siddha specification for Gomutra silasathu parpam was studied as a step forward to standardization. ICP-OES elemental analysis and the presence of carbon through CHN analysis were studied to support the spermatogenic activity and the therapeutic potential of the medicine.

Keywords: Spermatogenic, dhatura, antiepileptic, fulvic acid, gonadotropin, cancer.

Introduction

Iron Shilajit is also commonly known as Gomuthra shilajit and blackish brown in colour. It is an exudation from the rocks of Himalayan ranges of India. Also found in Nepal, Tibet, Bhutan and China [1]. It is the largely used natural mineral [2]. Common names are vegetable asphalt, rock juice, mineral pitch, mountain oil, mountain sweat. Shilajit consists of 60-80% organic matter, 20-40% mineral matter and 5% of trace elements [3]. Main active principles are benzoic acid and benzoates which is responsible for the urinous odour. Crude and purified shilajit have this odour [4]. The primary and key active components is the fulvic acid and humic acid [5].

Tamil language implies that it is the 'essence from the mountain'. Gomutra silasathu smells of cow's urine. It has the properties to potentiate the effect of other drugs given along with. In Siddha system of Medicine it is used to treat Nabunjagam (Erectyle dysfunction), to improve spermatogenesis, impotence and sexual desire [6]. It effects the nerve and reproductive tissues. Has specific action on the endocrine system. It mixes fine with ashwagandha for seminal debility. In male and female infertility, it can be taken in high doses of 1 tsp twice per day [7].

Shilajit is referred to dathuras and dathusara. The word 'dhatu' is being used as a synonym of shilajit which means 'body tissue' to put emphasis on its potential as rasayana. Rasayana tonifies the activity of the Saptha Dhatus (seven body constituents) that is plasma, blood, muscle, fat, bone, bone marrow and reproductive fluids of the body. In many herbo-mineral formulations shilajit is the one of the ingredients. Shilajit enhances the bioavailability of other herbs in the body [2]. It has immunomodulator, anti-inflammatory, analgesic, antifungal [8] and antioxidant properties [9].

Spermatogenic activity is reported and the serum testosterone level was found to be significantly high in rats treated with Shilajit. In oligospermic patients there was distinct improvement in the quality of semen [10]. Administration of Shilajit to male rats showed a remarkable increase in the number of sperm of the epididymis [11].

Silasathu parpam is prescribed for sopana skalitham [Nocturnal emission], megam [Veneral disease], premegam [Gonorrhoea], koruku [Contagious ulcers], kiranthi [Glandular swelling]. In the preparation of silasathu parpam kashuneer kadi is used for trituration [12]. Kashuneer kaadi is rice water with sour taste due to fermentation [13]. Rice is rich in antioxidative phenolic compounds viz., tocopherols, tocotrienols and γ -oryzanol [14]. Cow's urine is used to purify silasathu [6]. Cow's urine is compared to the nectar in vedas. It prevents the free radical formation [15]. It is rich in sodium, potassium, calcium, phosphorus, chloride, sulphur, nitrogen, iron, copper, lactose, vitamin-A,B,C,D,E, phenols, estrogen, urinary proteins, gonadotropin [16]. It promotes and augments the bioavailability in combination therapy and reduces the dose and duration of treatment [17]. It is capable of curing blood pressure, diabetes, asthma, blockage in arteries, cancer, AIDS, fits, piles, prostrate thyroid, arthritis, ulcer and constipation [18]. It has immunomodulatory, cardio respiratory and hypoglycemic effects [19].

In this study an attempt has been made to bring forth the physicochemical characters as a step forward to standardization, ICP-OES elemental analysis to support the spermatogenic activity and the presence of carbon through CHN analysis which increases the therapeutic potential of the medicine

Materials and Methods



Raw Drug

Raw drug [Figure. 1] was procured from SKM, Tamil Nadu, India. Identified and authenticated by Prof. V. Ram Mohan, Department of Geology, University of Madras, Chennai. Purification of raw drug and preparation of parpam were carried out as per the methods detailed in standard siddha text [6, 12].

Methods

Purification of Gomutra silasathu

Gomutra silasathu was mixed with cow's urine [Figure. 2] and filtered by using a thick cloth and dried in the sun shade; a layer was formed over the filtrate [Figure. 3] which was removed and dried. This procedure was repeated till no more layer is formed.

Preparation of silasathu parpam



Figure 1: Gomutra Silasathu



Figure 2: Cow's urine



Figure 3: Layer formation during purification



Figure 4: Kazhuneer kaadi



Figure 5: Pellets

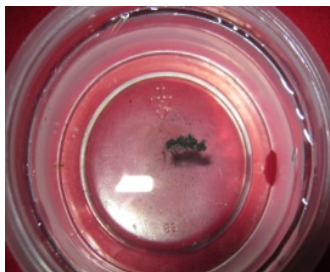


Figure 6: Floating on Water



Figure 7 : Lines of the thumb Finger

Siddha specification for parpam

Siddha specifications specific to parpam were carried out as per parameters given in the standard siddha text [20]. The parpam was observed for any luster in daylight. There should not be any lustre as per siddha text. It was rubbed in between the thumb finger and index finger. It should enter the furrows of finger. Sprinkled over the still water taken in a beaker. It should float on the surface of the water. Small amount was kept on tongue and it should be tasteless.

Physico-chemical parameters

The physico-chemical parameters were analysed following standard procedure at Siddha Central Research Institute [CCRS], Arumbakkam, Chennai [21].

35 g [1 palam] of purified silasathu was soaked in fermented rice water (Pulitha arisi kazhuviya neer, pulitha kazhuneer, kazhuneer kaadi - Figure. 4). At the end of every 24 hours, the silasathu was taken out and re-soaked in fresh fermented rice water for three days. On the fourth day, it was put on the Mortar and triturated with pulitha kazhuneer for 12 hours (four saamam). Pellets [Figure. 5] were made and dried. After drying, pellets were placed in between earthen pots placed one above the other. Joint of both the pots were sealed with cotton cloth smeared with fuller's earth and then dried in sun light. Pellets were put in to Pudam (oxidation process) with 25 cow dung cakes. After ignition, it was allowed to quench itself. The final products were taken out of the earthen pot, pulverized and stored in airtight containers.

ICP-OES

This study was carried out at the Sargam Laboratory, Chennai, India. About 0.5 g of the drug was accurately weighed in a 250 ml beaker. 15 ml of concentrated nitric acid and perchloric acid mixture (2:1 ratio) and microwave digested to get a clear solution. The solution was filtered through Whatmann No.41 filter paper into a 100 ml standard flask and made upto the mark using de-ionized water. This solution was used for analysis of the elements present in the sample. PerkinElmer ICP-OES Optima 5300 DV equipped with an AS-93 auto sampler using WinLab32 software was used for the analysis. Nitrogen was used for the optical purge gas at a flow rate of 1.4 L/min and at a pressure of 365 kPa [22].

Particle size



Particle size were analyzed as per standard procedures [23] at the Sargam Laboratory, Chennai, India.

CHN Analysis

CHN analysis was studied in the Department of Chemistry, Indian Institute of Technology, Chennai, India. Elemental analysis was studied in a PE 2400 series II CHNSO analyzer (Perkin Elmer, USA).

Table 1 Siddha specification for Gomutra Silasathu Parpam

S.No	Textual Specification	Inference
1.	Colour	Dark colour
2.	Luster	Lusterless
3.	In the lines of the finger	Entered in to the lines of the index and thumb finger
4.	Over the surface of water	Floats
5.	Taste	Tasteless
6.	Smell	Odourless

Physico-chemical parameters

The Gomutra silasathu parpam was analyzed in duplicates for physico-chemical parameters such as loss on drying at 105°C, total ash, water soluble ash, acid insoluble ash and pH of 10% solution. All the physico-chemical parameters are listed in the Table 2.

Table 2: Physico-chemical parameters of Gomutra Silasathu Parpam

S.No	Parameter	I	II	Mean
1.	Loss on Drying at 105 C, % w/w	2.30	2.20	2.50
2.	Total Ash, % w/w	77.30	77.60	77.45
3.	Water soluble Ash, % w/w	23.6	23.9	23.75
4.	Acid insoluble Ash, % w/w	21.6	20.3	20.45
5.	pH	6.04		

ICP-OES analysis

The ICP-OES analysis revealed the presence of potassium, calcium, magnesium, iron, sodium, manganese, zinc, copper, chromium and nickel. Their content was found to be 156261, 32039, 21739, 17318, 12470, 320, 185, 107, 28.6 and 19.2. Selenium, tellurium and cadmium were found to be absent which are presented in Table 3.

Results

Siddha Specifications

The colour, luster, fineness, floating property over still water, taste and smell are mentioned as siddha properties for a parpam. The observed siddha specifications of this parpam are listed in the [Table 1].

Table 3: ICP-OES analysis of Gomutra Silasathu parpam for trace elements

Parameters	Quantity (in ppm)
Potassium as K	156261
Calcium as Ca	32039
Magnesium as Mg	21739
Iron as Fe	17318
Sodium as Na	12470
Manganese as Mn	320
Zinc as Zn	185
Copper as Cu	107
Chromium as Cr	28.6
Nickel as Ni	19.2
Selenium as Se	BDL (D.L.1.0)
Tellurium as Te	BDL (D.L.1.0)
Cadmium as Cd	BDL (D.L.1.0)

BDL: Below Detection level. D.L: Detection Limit

Particle Size Analysis

The particle size analysis was carried out in three sieve sizes, viz., 150 micron, 75 micron and 45 micron. The results are presented in Table 4.



Table 4: Particle size of Gomutra silasathu parpam

Sieve size	Result
In 150 micron IS sieve	Completely passes
In 75 micron IS sieve	82.46 %
In 45 micron IS sieve	68.79 %

CHN analysis

The CHN analysis of gomutra silasathu parpam is shown in Table 5. It shows the percentage of carbon as 12.31, that of hydrogen as 0.55 and that of nitrogen as 1.21.

Table 5: CHN analysis of Gomutra silasathu parpam

Parameters	Result
Carbon	12.31 %
Hydrogen	0.55 %
Nitrogen	1.21 %

Discussion

Siddha Specifications

The siddha specifications are presented in Table 1. Colour was dark colour and is due to the principal ingredient Gomutra Silasathu. Generally parpam are white in colour. Sometimes will change according to the main drug [20]. It is odorless and lusterless. When rubbed between the thumb and index finger it was observed that the parpam entered into the lines of the finger [Fig. 7] and was not easily washed out from the cleavage of the lines. When sprinkled over the still water taken in a beaker, parpam particles floated over the surface of the water [Figure. 6]. When a small amount was kept on the tongue it was found to be tasteless. All these inference on the siddha specification shows that the parpam has been properly processed and prepared.

Physico-Chemical Parameters

The parpam contained lower percentage of moisture as evident from loss of drying value of 2.50 %. Generally, in the siddha classical literature, the shelf life of parpam are mentioned as 100 years [6] the tested parpam also may have similar shelf life. The total ash of the parpam was determined as 77.45 % which means that the parpam contains 22.55 % total combustible organic matters. The water soluble ash of 23.75 % and acid insoluble ash of 20.45 % reveal that 30.7 % of the total inorganic content of parpam are water soluble in nature and 26.4 % of total inorganic content are acid insoluble in nature. The pH of 10 % solution was

found to be 6.04 showing the slightly acidic nature of parpam (Table 2).

ICP-OES analysis

Fe, Ca, Cu, Zn, Mg, Mn, Mo, P are the trace elements present in unprocessed Shilajit [5]. The content of the trace elements in Gomutra silasathu parpam are revealed in Table 3. The content of potassium was found to be high among the trace elements. Iron, calcium, magnesium and sodium were comparatively in moderate amount. Presence of trace elements such as zinc, copper, manganese, nickel, chromium were found to be in lesser amount. Selenium, cadmium and tellurium were found to be below detection limit. For Successful reproduction zinc, vitamin A, B12, B9, E, D, folate, selenium, nickel, manganese, chromium, copper, fatty acid, protein, arginine and carnitine are required. There is substantial evidence that Mg, Ca and Cu are involved in sperm motility [24]. Zinc, selenium, copper and calcium plays role in spermatogenesis [25]. Iron plays an essential role in spermatogenesis and in normal function of the testis [26]. Concentration of zinc is so high in male sex organs like testicles, prostate, and in the spermatozoa itself and hence its important role in reproduction is undeniable. It enhances maturation of spermatozoa, preservation of germinative epithelia, increases sperm activation, regulator of enzyme activity in the semen by mediating metabolic regulation of sperm, highly concentrated in the tail of mature spermatozoa and is involved in sperm motility. Nickel deprivation causes defects in reproductive function, diminishes the sperm production in testis, sperm counts in the epididymis, efficiency of spermatozoa epididymal transit, and sperm motility. Administration of $MnCl_2$ at 25 mg/kg dose in male rats accelerated spermatogenesis. Mn is suggested as a stimulator of pubertal development. Calcium ion is crucial for the initiation of sperm motility, capacitation and its level is found to be proportional to the sperm of the caudal epididymis. Calcium, copper and magnesium are bound in ionic form in human semen. Abnormal levels of these elements may affect spermatogenesis with respect of sperm production, maturation, motility, and fertilizing capacity. Mg in seminal plasma significantly affects sperm concentration, but not motility. Copper concentration within normal physiological range is essential in enzymatic activities. NKCC1-deficient animals shows abnormalities in spermatogenesis. Defects were mostly striking during the final phases of spermatogenesis, the period when spermatids acquire the structural features of spermatozoa [27]. Cadmium was found to be in below detection level in the parpam. It is strongly associated with reproductive toxicity in both animal and human culminating in infertility and cancers of the reproductive tissues. Acute Cd poisoning produces testicular injury and spermotoxicity. A single carcinogenic dose of cadmium will cause significant testes pathology (haemorrhage, atrophy and calcification) [28]. Presence of Iron, calcium, magnesium, sodium, potassium, zinc, copper, manganese, nickel, chromium in the parpam are attributing to the spermatogenic activity.

Particle Size Analysis



The particle size analysis [Table 4] revealed that the parpam fulfills the fineness.

CHN analysis

Shilajit is quite literally “carbon footprint” of earth’s ancient ecosystem [29], organic matter (60-80%), mineral matter (20-40%) and 5% trace elements [3]. At high temperature during the process of parpam, the chance of organic compounds are rare [30]. According to CHN analysis the content of carbon in gomutra silasathu parpam is 12.31% [Table 5] which shows that the organic molecules derived from the raw silasathu remains in the parpam. The content of nitrogen may be due to the presence of amino acids in the parpam. Shilajit act as synergistic enhancer of other drugs. Organic components of shilajit also play a role in transporting different mineral substances to their cellular targets [8]. The presence of the macro molecule carbon linked with the parpam

surely play an significant role in increasing the efficacy and in making these drugs biologically assimilable [30].

Conclusion

Siddha specifications for parpam were studied to confirm the proper processing of the raw drug to final drug. The particle size analysis revealed that the parpam fulfills the fineness. Presence of macro molecule carbon identified in the parpam certainly play an important role in increasing the efficiency and in making these drugs biologically assimilable. The practical clinical application of the drug may be due to the presence of different trace elements. Data obtained through physico-chemical evaluation may be helpful for further standardization of Gomutra silasathu parpam.

Conflict of interest – Nil

Author’s contribution

	Contributor 1	Contributor 2	Contributor 3
Concepts			
Design			
Definition of intellectual content			-
Literature search		-	
Clinical studies	-	-	-
Experimental studies		-	
Data acquisition		-	-
Data analysis	-	-	
Statistical analysis	-	-	-
Manuscript preparation		-	-
Manuscript editing			
Manuscript review			
Guarantor		-	-

Acknowledgement

The authors are thankful to M/s. Sargam Laboratory Pvt. Ltd, Chennai and SAIF, Indian Institute of Technology, Chennai for the instrumental facilities.

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