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AN ATTEMPT TO UNVEIL THE PHARMACEUTICAL ASPECTS OF SHWETA PARPATI AND ITS BROAD-SPECTRUM CLINICAL UTILITY – A SHORT REVIEW

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ABSTRACT

Chaturvidha rasayana are the four different pharmaceutical procedures explained in Rasashastra employed to convert mercury into a therapeutically potent compound form accompanied with or without gandhaka (sulphur). Parpati rasayana is one among them with unique operative procedures. In contrary to the general method Shweta parpati is one such formulation that is devoid of mercury and sulphur and is still named after parpati rasayana owing to similar method of preparation. Few references of Shweta parpati in different names with slight variations in the ingredients may be cited in classical literatures. Pharmaceutical study to evaluate their differences have been taken up. Researches, both invivo and invitro, have been carried out to elicit its utility in various ailments.

Keywords: Chaturvidha rasayana, parpati, Shweta parpati, Indian iatrochemistry, SOP, therapeutic utility

INTRODUCTION

Alchemy was formerly explained as a branch of natural philosophy which was prevalent in China, India, Europe and Arab countries. Though often considered beneficial for chrysopoeia, the major aims of alchemy included creating the elixir of

immortality and also formulate many disease curing therapeutic recipes. Alchemy advocated both exoteric or practical applications of metals or minerals and their esoteric or spiritual power. *Rasashastra* emerged, in India, as a science upholding the principles of alchemy for the transmutation of lower metals into higher metals especially gold (*dhatu vada, dhatu* means metal) **[1]**. It was, in the beginning, related to religious mysticism and considered to be a tool to attain salvation (*moksha*). But later it began to find importance in the field of medical alchemy or iatrochemistry (*deha vada, deha* implying body) **[1]** which was the usage of alchemy for medical purposes which included processing of metals and minerals to convert them to bioavailable therapeutically potent form with desirable physical and chemical properties and utilize them for prevention or cure of diseases and to attain longevity.

In Indian iatrochemistry metals and minerals, including Mercury, are subjected to many pharmaceutical procedures before they find way as ingredients into different metallic, mineral or herbo-mineral formulations in Ayurveda. Mercury was considered as elixir of immortality in Indian iatrochemistry. Purified metals and minerals with or without mercury combined in different proportions to formulate newer medicines of varied therapeutic ability. Few conventional methods have been explained in Rasashastra to convert the liquid metal mercury into different solid dosage forms with specific disease curing properties which are explained under the broad head of *Moorchana* **[2]** and *parada bandha* **[3]**. The therapeutic property can be enhanced by combining purified mercury with herbal drugs and *bhasmas* (nano particles of metals or minerals) by different pharmaceutical procedures. Hinging on the method of preparation they are classified as *Kupipakwa rasayana, Parpati Rasayana, Potali Rasayana* and *Khalwiya Rasayana*. All these four methods popularly known as *chaturvidha rasayana* have very unique operating procedures.

Parada bandha are explained as methods incorporated to convert liquid mercury in to its compound / solid form to overcome its *durgrahatwa* **[3]** (inability to hold) and *chanchalata* **[3]** (mobility) with the addition of purified and /incinerated metals or minerals along with herbal drugs. Though twenty-six different methods have been explained not all of them make mercury therapeutically useful. *Pota bandha* **[4]**, explained as one among them is as a method to convert the liquid metal mercury in to a solid form in which the homogenous mixture of the purified/incinerated powdered ingredients are melt at optimum temperature in the presence of ghee and immediately poured to a cool surface to obtain an end product with the consistency

of thin fragile flakes which is then powdered, stored and administered in prescribed doses along with specific adjuvants according to the disease, season, patient's strength and age. These fragile flakes are called *Parpati*. The *parpati rasayana* explained under *moorchana* is same as the one explained under the concept of *pota bandha.*

According to Monier-William Parpaṭa is a Sanskrit word referring to a kind of thin cake made from either rice or peas-meal, which is then baked in grease **[5]**. Papadum **[5]** is an Indian deep fried dough of black gram bean flour, either fried or cooked with dry heat until crunchy. Papad **[5]** is likely derived from the Sanskrit word *parpaṭa*, meaning a flattened disc described in early Jain and Buddhist literature. According to *Naisadhacarita* **[5]** *of Sriharsa* it is a small, round sheet made of flours of certain corns using spices, and kept dried, which is used for taste, after frying in oil. Thus the above references clarify the nomenclature of *parpati rasayana* apt as it is a flattened crunchy form of pharmaceutical preparation which involves agni samskara.

The first reference of *Parpati* dates back to 8th century explained in the context of skin disorders but the foremost ones are available from a 11th century treatise that emphasizes its use mainly in gastrointestinal disorders **[6]**. Some examples of *parpati rasayana* include *Loha parpati* **[7]**, *Panchamruta parpati* **[8]**, *swarna parpati* **[9]**, *Rasa parpati* **[10]** etc. with change in the main ingredients of the formulation after which they are named. A critical review of the various references of *parpati* revealed that the standard operating procedure of all parpati were more or less same except for *Shweta parpati Malla Parpati* and Bhallataka parpati **[11]**, wherein some unique changes in the method of preparation, ingredients and indications stood out. An attempt is being thus made to critically review the different aspects of *Shweta parpati* starting right away from its literary review to its clinical utility to appraise the judicious and safe use of *Shweta parpati* in ailments otherwise not referred in classical references.

Shweta parpati

Generally, processed Mercury is accompanied by purified Sulphur in most of the formulations which makes long term use of *parada* safe **[11]**. But there are mercury containing formulations devoid of sulphur. *Parpati* can be *sagandha* (with sulphur) or *nirgandha* (without sulphur) based on the presence or absence of sulphur respectively. Shweta parpati **[12-14]** neither contains mercury nor sulphur. However, it is named as *parpati* due to the similarity in the method of preparation and the appearance of the end product. *Shweta* **[15]** *parpati* as the name suggests is white in colour due to the complete difference in the ingredients

(Table 1) compared to other *parpatis like Rasa parpati*, which have darker shades due to the presence of kajjali **[16]** as an ingredient. During preparation unlike other parpati, mud vessels **[17]** are opted for preparation of *shweta parpati* in place of iron **[18]** vessels to prevent the reaction of alkaline ingredients with the vessel. Ghee **[19]** which is preferred in other *parpati* are seldom used, as the ingredients do not stick to the vessel. Usually the molten ingredients of *parpati* is poured on to a banana leaves kept on wet disc of cow dung to initiate sudden cooling of ingredients and to obtain the thin fragile flakes **[20]**. In *shweta parpati* the molten ingredients owing to their comparatively high melting point is poured on to a cool surface like marble or a steel vessel anticipating the *kadalipatra* (banana leaves) getting charred due to the heat which may contaminate the end product. *Shweta parpati* is also unique in its indications. While most of the *parpati* find their utility in gastric disorders **[21]**, *shweta parpati* is indicated in urinary tract disorders **[21]**.

Review of ingredients

Shweta parpati is explained in different contexts by various ancient authors under different names with some deviations in the ingredients and their quantities **(Table 1)**.

Table 1: Ingredients of Shweta parpati according to various references

S. No.	*Ingredients*	*Siddhayoga sangraha* [12] *(method 1)*	*Rasoddhara tantra* [13] *Method 2*	*Siddhabheshaja manimala* [14] *(method 3)*
1.	*Surya kshara*	*1 part*	*20 karsha*	*48 g*
2.	*Sphatika*	*1/8 part*	*5 karsha*	-
3.	*Navsadara*	*1/16 part*	*3 karsha*	-
4.	*Tankana*	-	*3 karsha*	-
5.	*Karpura*	-	*3 karsha*	-
6.	*Gandhaka*	-	-	*750 g*

SURYA KSHARA

Surya kshara is chemically potassium nitrate (KNO_3) **[22]**, generally named as Indian salt petre or nitrate of potash. In literatures of Ayurveda *Suryakshara* finds other synonyms **[23]** like *soraka*, *mrtkshaara, vahni kshara* etc. It is explained to have salt and pungent taste, exothermic, carminative **[24]**. It is interesting to note the reference of suryakshara as an explosive आग्नेयास्त्रार्थसिधिक्रत **[24]** (used in guns) in classical literatures. The references for its use as ingredient of firework recipes or gun powder are available in chinese and european classics also. It is indicated in gastric and urinary tract disorders.

Properties of Potassium nitrate [25]

Studies prove that potassium nitrate is an oxidant, harmful if swallowed, inhaled, or absorbed through skin and causes irritation to skin and eye area. The LD50 is 1901mg/kg (oral rabbit) and 3750 mg/kg (oral rat). Its Solubility in water **(Table 2)** is temperature dependent. The solubility increases with temperature and it recrystallizes on cooling and unlike other

salts it is not hygroscopic. The pH of KNO3 is neutral or slightly acidic (pH7 to pH6) and pH > 7, which is indicative of presence of impurities like potassium hydroxide, sodium hydroxide, potassium carbonate and ammonium nitrate. Other types of impurities are insoluble such as clay, sand and small pebbles.

Uses [26]

Though not scientifically proven KNO3 was in use earlier times to cause impotence. Owing to its use in sensitive teeth it is used as an ingredient of tooth pastes. With proven effects against Cystitis, pyelitis, urethritis etc. potassium nitrate is an ingredient of kidney tablets and is also found to be Hypotensive in nature.

Table 2: Temperature dependance of solubility of KNO_3 in water

S. No.	Solubility/1000g water	Temperature in ^{0} c
1.	133g	0 ^{0} c
2.	316	20 ^{0} c
3.	383	25 ^{0} c
4.	2439	100 ^{0} c

The classical texts of *Rasashastra* has explained two different processes with regard to purification of *suryakshara* (potassium nitrate). They are *nirmaleekarana* and *shodhana*. Both the terms basically indicate purification. Though there are no direct references, there are opinions to include *nirmaleekruta surya kshara* for external use and *shodhita surya kshara* for internal administration.

Purification (nirmaleekarana) of surya kshara for external use

First method [27]: 1 pala (48 g) *surya kshara* **is** dissolved in 4 *pala* (192 ml) water and filtered through cloth **and the filtrate is** heated until little water remains. Further the vessel is removed from fire **and the** powder like purified *suryakshara* is collected.

Second Method [28]: 1 part *suryakshara* is dissolved in half part of hot water and filtered through cloth and the filtrate is left to cool to obtain the *shalakaakaara* (rod shaped) *suryakshara*.

Purification (shodhana): for internal use [29]

The process explained is *Bhavana* (levigation) of *suryakshara* with *ela toya* (water extract of cardamom seeds) for three times. *Ela* has proven antimicrobial effect, Diuretic effect and sedative effect. It is also found to help in enhancing sodium and potassium excretion from the body. The Dose of *suryakshara* after this process is 250 mg-1.25 g.

SPHATIKA

Sphatika **[30]** is Potassium aluminium sulphate (a double salt compound, K2SO4(Al2SO4)3 24H2O) usually known as Potash Alum. Though a weak irritant to skin with a pH: 4.5-5.5, acharyas have

mentioned the purification of *sphatika* by heating in a vessel to remove the water of crystallization. In contemporary science **[31]**, Potash alum when heated upto 365 K it melts and and form molten state. On further heating to 475K they lose water of hydration and swell up to form burnt alum. Burnt alum has potential anti-microbial activity and is tested effective against Proteus mirabilis which causes UTI.

NAVASADARA

Navasadara is explained as one among the *sadharana rasa* in *Rasashastra* **[32]**. It is explained to be digestive, carminative and expectorant in action and is indicated in hepatic disorders and *jalodara* (ascites) **[33]**. Chemically Ammonium chloride (NH_4Cl), a white coloured crystalline salt. It is generally known under the names Sal ammoniac, Salmiac, Sal Armagnac or Salt ammoniac **[34]**.

Need for Purification

In *Rasashastra* classics two methods have been mentioned for the purification of *Navasadara*.

Method 1 **[35]**: The first method is based on its solubility in water wherein 1 part of *Navasadara* is dissolved in three times water and filtered. The filtrate is heated to remove water and obtain purified *Navasadara*. This method is useful to remove insoluble impurities from *Navasadara*.

Method 2 **[36, 37]**: The other method is based on the concept of sublimation. The main adulterant of *Navasadara* is common salt. The former sublimes on heating while the later don't. So this method helps to remove common salt from *Navasadara* which cannot be removed by the first method as common salt is soluble in water.

STUDIES DONE ON SWETA PARPATI

Different aspects of *Shweta parpati* viz, pharmaceutical, toxicological, in vivo, in vitro and clinical utility have been studied so far.

Pharmaceutical study

A study **[38]** was done to evaluate the organoleptic characteristics of *Shweta parpati* prepared by different classical references. *Shweta parpati* prepared by method 1, 2, and 3 were white in colour, with sour and astringent taste and wafer like in appearance with a difference in the smell and texture. *Shweta Parpati* prepared by method 3 and method 2 smelt like sulphur and camphor due to their presence in the respective methods while *Shweta parpati* prepared according to method 1 was odourless. Also the texture of Shweta *Parpati* prepared by method 2 was rough compared to other two methods which were soft and unctuous.

Another study **[39]** was done to prove the effect of purification of ingredients on the physical and chemical properties of the end product. The study showed changes in the

colour, melting point and pH of *shweta parpati* prepared by impure and purified ingredients.

Toxicity study

Acute toxicity **[40]** of *shweta parpati* was studied on mice at a dose of 13 mg / 20 gm (10 TD) of body weight and observed for mortality and behavioural changes for 14 Days. No alarming signs or symptoms were observed and proved *shweta parpati* to be safe for use.

Anti-microbial study

In vitro antimicrobial study **[41]** was done on strains of E. coli, Staphylococcus aureus, Proteus mirabilis and Candida albicans but the effect couldn't be established.

Clinical studies **[42, 43]** were done to prove the antimicrobial effect on uncomplicated urinary tract E. coli infection. The pre and post-test studies done showed marked changes in the routine urine report and Urine culture test and its sensitivity for *E. coli*. There was a steady increase in the pH of urine.

Other studies

The clinical studies done on urinary Calculi **[44]** proved effective irrespective of the *doshic* (humours) predominance and there was highly significant or significant relief from associated complaints. In three groups with *kulatha* (Horse gram), *Shweta partpati* and combination of both the test group which received both the medications gave more results and the group intervened with *Shweta parpati* alone gave comparatively lesser effect. In clinical studies done on ascites **[45]**, Diabetic nephropathy **[46]**, Hypertension **[47]** and intracranial hypertension **[48]** the interventions included *Shweta parpati* in combination with other formulations which refrains the claim of *Shweta parpati* alone as a drug of choice.

DISCUSSION

In market the *shweta parpati* prepared as per method 1 is available and the reason could be the easiness in preparation compared to the reference that contain borax and camphor. The melting point **[49]** of borax is 743^0 c. At this temperature there are chances that KNO_3 will dissociate **[50]** to KNO_2 and oxygen, and NH_4Cl may dissociate to NH_3 and HCl. Also camphor is volatile in nature and chances are there for it to get fire at higher temperature **[51]**.

The inability to prove the antimicrobial effect in laboratory conditions is indicative that the prevalent research protocols are not enough to test Ayurvedic formulations. The calculation of minimum inhibitory concentration of Ayurvedic medicines for anti-microbial study is debatable. It may also be stated that Ayurvedic formulations behave differently in laboratory environment and host environment. Potassium is a major ingredient of many alkalysers **[52]** available in market. Surya kshara and sphatika in *Shweta parpati* are sources of potassium ions that acts as an

alkalyser which increases the alkaline load of urine to increase the pH of urine. *E. coli* survives in an acidic pH of 4-4.5. So when the urine turns alkaline E. coli cannot survive **[53]** and this could be the probable mode of action in UTI. All the studies undertaken against Urinary calculi gave significant results but most of them had multiple formulations and therefore it is difficult to claim it as the effect of *shweta parpati* alone. Similar is the case with ascites and diabetic nephropathy. Potassium **[54]** increases insulin secretion in body which metabolises glucose and thus prevents type 2 diabetes. So *shweta parpati* which is a source of potassium may be useful in diabetes. In diabetic nephropathy **[55]**, the kidney function is already compromised which may cause electrolytic imbalance as excretion of potassium is not taking place. So in this condition prescription of *shweta parpati* which is a source of potassium should be done with utmost care. In ascites also there are stages with hyperkalaemia **[55]** (as kidney and liver are affected) and hypokalaemia **[55]** due to dialysis, anorexia and effects of various drug intake. Thus it may be assumed that in patients of ascites *shweta parpati* can be a drug of choice only in conditions were potassium supplementation is necessary. Potassium is found to be effective against hypertension as it accelerates sodium excretion but should be supplemented only in adequate amounts **[56]** and shweta parpati can be a drug of choice but should only be prescribed in strict doses.

CONCLUSION

More studies with only *shweta parpati* as an intervention is required to back up the claims made about the formulation without any interventional bias. The indications of the ingredients of *shweta parpati* individually gives an idea that other than urinary tract disorders they do have role in digestive and respiratory system also. The chemical analysis of *Shweta parpati* prepared with purified and impure ingredients along with their in vivo and in vitro toxicological studies are to be done to justify their use internally. Further studies are to be undertaken in those directions too, to prove the broad spectrum uses of the drug.

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