

PHARMACEUTICO – ANALYTICAL STUDY OF SHANKHODARA RASA

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ABSTRACT

Pottali Rasayana is one of the preparation which is potent to treat Sannipathaja rogas with minimal dose. Shankhodara rasa is very unique preparation which is prepared by poorana method told in Rasa Prakasha Sudhakara. Kajjali along with Shu. dattura and Shu. chitraka should be filled in shuddha shankha and further heating and bhavana should be done to prepare shankhodara rasa. This is the only formulation which is told in pottali kalpana under shankha poorana method and it is indicated in Grahani, Shvasa, Kasa, Arshas etc. 4 samples of Shankhodara rasa were prepared considering mode of heat, form of dravyas to be filled in shankha. Prepared formulations are subjected for instrumental analysis like FTIR, SEM-EDX, ICP-MS and results are analysed in this study. Results: Functional groups of all samples were found to be same but in 4th sample there was addition of OH group. Percentage of calcium was more in all samples compared to other elements, relatively Calcium was more in 4th sample. Elemental analysis says all samples were containing Calcium, Carbon, and Silica in maximum amount. Shu. Dattura, shu. chitraka and Kumari were used as mardana or bhavana dravyas helps in reduction of particle size. Due to presence of Calcium in more percentage and other elements in very minimal quantity, formulation can be indicated in many diseases. Based on pharmaceutical and analytical study, 4th sample of shankhodara rasa can be considered best. Such a rare formulation which is apt for present burning issues has not been explored till date, and also not available in market. Hence it is felt that there is a need to conduct *Pharmaceutico-analytical study of Shankhodara Rasa*.

KEYWORDS: Shankhodara rasa, Pottali, Rasaprakasha Sudhakara, Shankha Poorana, Calcium.

INTRODUCTION

Pottali kalpanas are considered more unique because of their different appearance and alike method of preparations. These are developed to prevent loss in quantity of medicines during preparations, to improve the gunakarmata and also to ease the storage of medicines during transportation and to attract patients by its colour and appearance.^[1] Pottalis are known for its faster action with minimal dosage even in acute and chronic conditions and also in complications.^[2]

Recent authors have categorized pottali kalpana into 3 types based on their method of preparation for easy understanding. They are, Putapaka vidhi, Gandhakapakavidhi and bhavana vidhi. In Putapaka vidhi it is again divided into poorana method and mushapaka method. In putapaka method dhatus are kept in midst of kaparda, shankha or musha or sharava and agni is supplied. In gandhaka drava paka dhatu dravyas

are made into pottali form and paka is done in midst of gandhaka. In bhavana method in midst of kashtoushadhi mardana of dhatudravya is done. Shankhodara rasa is only a type of shankha poorana method pottali kalpana where dhatudravys are filled in the udara of shankha and paka is given. There are 6 different references for Shankhodara rasa which are compiled in Rasayogasagara text book.^[3] Each reference is different from one another in method of Preparation, indication, anupana etc. Here in this study Shankhodara rasa from Rasaprakasha Sudhakara reference is prepared and subjected for ICP-MS, SEM-EDX and FTIR to evaluate particle size, functional groups and also elements present.

MATERIALS

In this study reference of Shankhodara Rasa is taken from the Rasaprakasha Sudhakara treatise. Ingredients and Quantity of Shankhodara rasa is mentioned in table 1.

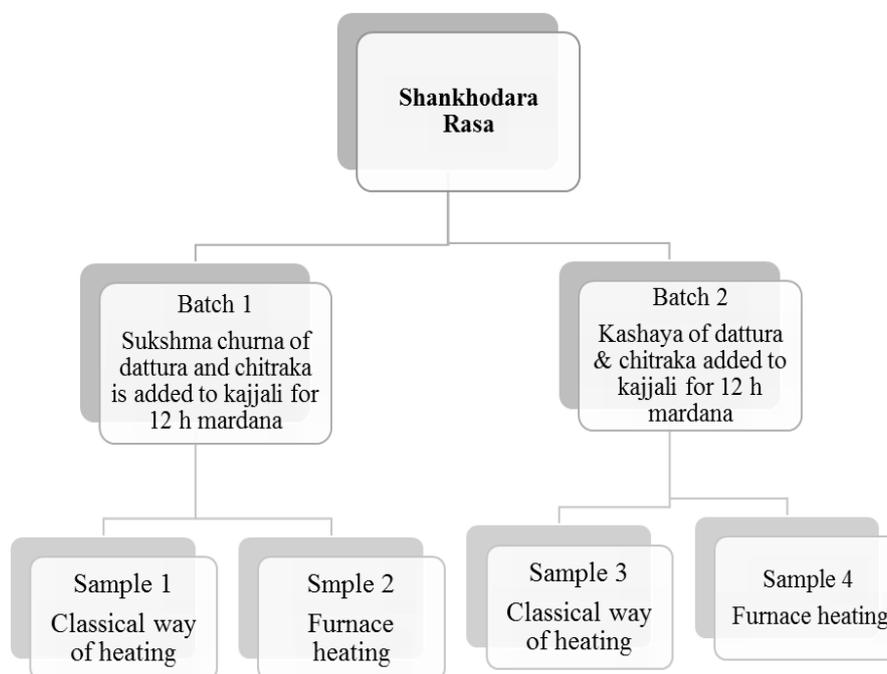
Table 1: Ingredients of Shankhodara Rasa.

SL. NO	INGREDIENT	QUANTITY
1.	Shudha Parada	1 Part (12g)
2.	Shudha Gandhaka	1 Part (12g)
3.	Shudha Vatsanabha (<i>Aconitum Ferox</i> Wall.)	1 Karsha (12g)
4.	Shudha Shankha	Q.S
5.	Shudha Chitraka (<i>Plumbago Zeylanica</i> Linn.)	Q.S
6.	Shuddha Dhatura (<i>Datura Metel</i> Linn.)	Q.S
7.	Kumari (<i>Aloe Barbadensis</i> Mill.)	Q.S

METHADODOLOGY

Ingredients of Shankhodara rasa are procured from Amrut Kesari Raw material depot, K.R Market, Bangalore and preparation is carried out in Drug preparation lab, Rasashastra and Bhaishajya kalpana department, Sri Sri College of Ayurvedic science and research centre, Bangalore. Shankhodara Rasa is

prepared in two batches. In batch one visha dravyas like chitraka and datura which are told for mardana along with kajjali are added in the form of sukshma churna and in second batch kashaya of chitraka and datura is prepared and it is used for bhavana along with kajjali. Details of Two batches of formulation is mentioned in Figure no. 1.

**Figure 1: Details of batches of Shankhodara Rasa**

Preparation of Shankhodara rasa can be divided into three stages

1. Purva karma

Kajjali was triturated with shodhita Sukshma churna of chitraka mula and datura panchanga for 12 hours in batch 1 and kajjali was subjected for bhavana with chitraka and datura kashaya in batch 2 for 12 hours. Later mardita kajjali was filled into garbha of shankha in both the batches. Filled shankhas were placed in sharava and 5 layers of sandhibandhana were done to sharavas using Cora cloth and multani mitti.

2. Pradhana karma

Agni was supplied in two ways in each batch. They are Classical way of heating and Furnace heating.

Temperature was maintained same in both the ways of heating.

Classical way of heating

Valuka was half filled in iron vessel and sharava was placed and again valuka was filled in such a way that only upper surface of sandhi bandhita sharava was exposed. Pyro meter was placed inside the valuka yantra in such a way that pyrometer was in contact with sharava. This whole apparatus was placed on stove and thivragni was given to reach 700°C. Once it reached the temperature again agni was increased and maintained around 900°C for 24 hours (8 yamas) and the kept for swanga sheeta.

Furnace Heating

Temperature was initially set to 700°C later it was raised to 900°C and maintained the same for 24 hours and later sharavas were kept for swanga sheetata.

3. Pashchat karma

After swanga sheeta 4 sharavas were opened and Shankhas were pounded and 12 g of shodhita vatsanabha

sukshma churna was added to each sample. All 4 samples were subjected to bhavana with kumari Swarasa and chakrikas were prepared and kept under sunlight for bhanu paka. 3 bhavana and bhanupaka were done to each sample. Quantity of kumari Swarasa required, weight of each sample, and other observations were noted and mentioned in table.

Table 2: Showing Details of Shankhodara rasa preparation.

Sample	Weight of Shankha before heating	Observation after heating for 8 yamas	Weight of chakrika in 1 st bhavana	Weight of chakrika in 2 nd bhavana	Weight of chakrika in 3 st bhavana	Observations
S1	129	Greyish in colour along with black powder, One side of shankha was broken. 3/4th of shankha was intact. Shankha was breaking easily when it was touched. Shankha and its nabhi got powdered easily and took 45minutes for powdering.	89G	85G	83G	Varitara, unnamma, rekha purnata present Colour- greyish black powder
S2	129	Shankha was completely in white colour and no kajjali was seen. Cream colour powder was present in very little amount. It was braking on touch. Pounding shankha and nabhi was very easy. Particles were very fine after pounding and dusting of particles were there	75G	82G	82G	Varitara, unnamma, rekha purnata was positive Colour – white powder
S3	141	Light greyish in colour along with greyish colour in some parts and grey powder was present in little quantity. No shining particles were present. Shankha was intact to look. Shankha was breaking easily when it was touched.	77G	81G	89G	Varitara, unnamma rekha purnata was present Colour-grey
S4	141	White colour and no kajjali was seen. Cream colour powder was present in very little amount. Shankha was breaking on touch. Pounding shankha and nabhi was very easy compared to all other samples.	77G	79G	81G	Varitara, unnamma rekha purnata was present Colour- Pure white

RESULTS**a) Classical parameters & organoleptic characters**

All 4 samples were positive for Varitara, Unnama and Rekha purnata. Organoleptic test was done and mentioned in table no. 3

Table 3: Showing Classical parameters & organoleptic characters of 4 samples of Shankhodara Rasa.

Parameter	Sample 1	Sample 2	Sample 3	Sample 4
Varitara	+	+	+	+
Unnama	+	+	+	+
Rekha Purnata	+	+	+	+
Form	Bhasma form	Bhasma form	Bhasma form	Bhasma form
Colour	Greyish Black	White	Grey	Pure white
Consistency	Solid	Solid	Solid	Solid
Taste & Odour	No characteristic odour and taste			

b) Instrumental analysis➤ **ICP-MS^[4]**

Inductively coupled plasma mass spectrometry (ICP-MS) is a type of mass spectrometry that uses an inductively coupled plasma to ionize the sample. It atomizes the sample and creates atomic and small polyatomic ions,

which are then detected. It is known and used for its ability to detect metals and several non-metals in liquid samples at very low concentrations. It can detect different isotopes of the same element, which makes it a versatile tool in isotopic labelling. ICP values of final samples are shown in table no. 4

Table 4: Showing ICP-MS values of all the samples.

SL. NO	SAMPLE IDENTIFICATION	SULPHUR MG/KG	CALCIUM (Ca) MG/KG	MERCURY(Hg) MG/KG
1	S1	32850.00	364000.00	BDL (Below detectable Level)
2	S2	172730.00	410000.00	BDL (Below detectable Level)
3	S3	35360.00	380000.00	BDL (Below detectable Level)
4	S4	122990.00	444000.00	BDL (Below detectable Level)

➤ **FTIR^[5]**

Fourier-transform infrared spectroscopy (FTIR) is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. FTIR spectrometer simultaneously collects high-resolution

spectral data over a wide spectral range. This confers a significant advantage over a dispersive spectrometer, which measures intensity over a narrow range of wavelengths at a time. Functional groups present in each sample are mentioned in table.

Table Showing functional groups of 4 samples.

S1	Methylene C-H asym./sym stretch; Methoxy, methyl ether O-CH ₃ , C-H Stretch; Alkyl Carbonate; Calcium Carbonate, Secondary amine, C-N Stretch; Organic siloxane or silicone (Si-O-Si); Thiol or thioether CH₂-S, C-S stretch; C-H Stretch; Alcohol, OH out of plane bend
S2	Methylene C-H asym./sym stretch; Methoxy, methyl ether O-CH ₃ , C-H Stretch; Alkyl Carbonate; Calcium Carbonate, Secondary amine, C-N Stretch; Organic siloxane or silicone (Si-O-Si); Thiol or thioether CH₂-S, C-S stretch; C-H Stretch; Alcohol, OH out of plane bend
S3	Non bonded hydroxy group, OH Stretch; Methylene C-H asym./sym stretch; Methoxy, methyl ether O-CH ₃ , C-H Stretch; Alkyl Carbonate; Calcium Carbonate, Secondary amine, C-N Stretch; C-H Stretch; Alcohol, OH out of plane bend
S4	Non bonded hydroxy group, OH Stretch; Methylene C-H asym./sym stretch; Methoxy, methyl ether O-CH ₃ , C-H Stretch; Alkyl Carbonate; Calcium Carbonate, Secondary amine, C-N Stretch; C-H Stretch; Alcohol, OH out of plane bend

➤ **SEM-EDAX^[6]**

It is used for elemental analysis or chemical characterization of a sample. It relies on an interaction of some source of X-ray excitation and the sample. It runs on the fundamental principle that each element has a unique set of peaks on its electromagnetic emission spectrum. Elements present in each sample are mentioned in detail in tables.

Table Showing Elements present in Sample 1.

SPECTRUM	S1	S2	S3	S4
	WT %	WT %	WT %	WT %
	ATOMIC %	ATOMIC %	ATOMIC %	ATOMIC %
C	27.24	27.71	33.21	23.32
	39.61	38.19	46.98	35.36
O	34.42	50.21	33.89	42.64
	37.58	51.94	35.99	48.53
F	3.23	-	1.31	-
	2.97	-	1.17	-
Na	3.55	0.82	2.19	-
	2.70	0.59	1.62	-
Al	1.57	-	0.75	-
	1.01	-	0.48	-
Si	18.95	2.79	9.50	3.97
	11.78	1.64	5.75	2.57
S	0.89	-	1.45	0.86
	0.48	-	0.77	0.49
Cl	0.44	-	0.89	-
	0.22	-	0.43	-
K	5.23	0.66	1.92	1.22
	2.3	0.28	0.83	0.57
Ti	1.09	-	-	-
	0.40	-	-	-
Zn	3.41	-	1.94	-
	0.91	-	0.50	-
Ca	-	17.81	12.95	-
	-	7.36	5.49	-
Mg	-	-	-	0.07
	-	-	-	0.05
Total	100.00	100.00	100	100

DISCUSSION

Shankhodara rasa is only formulation which comes under shankha poorana method of pottali kalpana. And in one of the references we get direct reference of telling present formulation is pottali rasa. Reference of shankhodara rasa mentioned in Rasaprakasha Sudhakara and Rasayoga sagara differs in the form of dravya which to be filled into shankha. In Rasa prakasha Sudhakara author has told to fill the churna which was prepared out of kajjali, shu.chitraka and shu.dattura. Hence sukshma churna of shodhita chitraka and shodhita dattura is prepared and mardana is done along with kajjali. Where as in rasayoga sagara author has mentioned to prepare gola out of kajjali, chitraka and dattura hence to prepare gola, drava dravya is required and so kashaya out of shu.chitraka and shu.dattura was prepared and mardana of kajjali was done. But as pinda form cannot be filled into whole shankha as such hence bhavana was done continuously till paste became dry and then it was filled into the shankha. Intense heat was supplied to all samples of shankhodara rasa as there is reference of giving teekshna agni for 8 yamas.^[7] Shankha is mainly composed of aragonite form of calcium carbonate which is thermodynamically unstable.^[8] Hence to convert unstable form of aragonite to stable form calcite, temperature should be above 750°C hence temperature

was maintained to reach the same. In ICP-MS it shows Samples which were prepared using classical method of heating pattern and shu.dattura and shu.chitraka added for mardana in churna form consist low level of calcium concentration than muffle furnace heating method and kashaya added for mardana. This is may be because of variation in heating pattern. Concentration of free elemental mercury was noticed to below detectable level in all samples due to supply of high heat during the procedure and mercury might have got evaporated as its boiling point is 356.7° C.^[9] FTIR results shows presence of varieties of functional groups present in all the samples as kashtoushadhis used in all 4 samples are similar that is shu.chitraka, shu.dattura, shu.vatsanabha, kumari, and Nisha functional groups of all groups are similar. But Alcohol, OH out of plane bend is seen extra in samples 3 and 4. In elemental analysis it is confirmed that all samples of shankhodara rasas have high percentage of calcium compound, carbon, oxygen and silica and other elements in minimum percentage which probably might be the reason behind the various indications mentioned for the yoga.

CONCLUSION

Shankhodara rasa is the only reference which comes under shankha poorana method of pottali kalpana which

has shankha, parada and gandhaka as rasa dravyas, Vatsanabha, Shu.chitraka and shu, dattura as visha dravyas along with kumari as kashta dravya. On pharmaceutical analysis shankhodara rasa prepared in muffle furnace was found to be easier than one which is prepared in the classical paka method. Kashta dravyas like shu.chitraka, shu.dattura, kumari are used as mardana and bhavana dravya in the formulation which helps in binding the particles with each other and in reduction of particle size. Role of Visha dravyas like shu.Vatsanabha, shu.Dattura and shu.Chitraka can be highlighted in treating acute as well as chronic conditions of GI infections like Shula, Grahani and Atisara. Based on the Analytical parameters carried out, it was observed that shankhodara rasa has high percentage of calcium compound and other elements in minimum percentage which probably might be the reason behind the various indications mentioned for the yoga. On Pharmaceutical and analytical parameters shankhodarasa 4 can be considered best.

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