



## Research Article

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### PHARMACEUTICO-ANALYTICAL ASSESSMENT OF SNUHI KSHARA OF UPAVISHA SNUHI (*EUPHORBIA NERIIFOLIA* LINN.)

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#### ABSTRACT

In Ayurveda, substances of natural origin, including whole plant or their parts, animal parts and minerals, are used for drug formulations alone or in combination. Kshara, one such formulation, is an alkaline preparation used since ancient times to cure many external and internal diseases. Rasatarangini and Ayurveda Sara Sangraha have described Snuhi kshara, a single drug formulation of Upavisha Snuhi (*Euphorbia nerifolia* Linn.), which possesses udaravinashana, vanhidipana, shophanashana etc. properties. As market preparation of the formulation was unavailable, revalidation of standardization of herbal formulation is essential for its quality and purity. Thus, an attempt has been made to formulate Snuhi kshara. The present study evaluates the Standard Manufacturing Process and analytical profile of Snuhi kshara by comparing two batches of Snuhi kshara. Snuhi kshara was prepared according to Sharangdhara Samhita, and the analytical profile was evaluated as per Ayurvedic Pharmacopoeia of India by organoleptic, physicochemical and thin layer chromatography parameters. The study's findings may enrich referential information on Snuhi kshara preparation and its analytical assessment.

**Keywords:** *Euphorbia nerifolia* Linn., Upavisha, Snuhi Kshara, Analytical assessment

#### INTRODUCTION

Agadtantra, the main branch of Ashtanga Ayurveda, is the Ayurvedic perspective of modern toxicology. According to Rasatarangini, visha (poisons) is divided into sthavara and jangama visha. <sup>1</sup> Sthavara visha is subdivided into visha and upavisha. <sup>2</sup> Rasatarangini has described 11 upavisha. <sup>3</sup> Upavisha are the group of less toxic drugs. According to Acharya Charaka, even a poison becomes an excellent drug if appropriately administered; similarly, even a drug, if not administered properly, becomes a poison. Snuhi (*Euphorbia nerifolia* Linn.) is a upavisha with toxicological and medicinal properties. <sup>4</sup>

Taxonomically Snuhi is identified as *Euphorbia nerifolia* Linn. and belongs to the Euphorbiaceae family. <sup>5</sup> It is a glabrous erect branched succulent xerophytic tree or shrub, 20 ft or 1.8- 4.5 m high with jointed cylindrical or obscurely 5-angled branches. <sup>4</sup> It is a well-known drug available throughout India with various synonyms like sehunda, sinhatunda, vajri, vajradruma, sudha, samantadugdha, snuk, guda etc., which describe its morphological as well as pharmacological characteristics. <sup>6</sup> Snuhi possesses katu rasa, katu vipaka, ushna virya, laghu-tikshna guna, kaphavatahara, vedanasthapana, lekhana, tikshnavirechaka, raktashodhaka, shothahara, kaphanissaraka, twakadoshahara karma. Snuhi has been indicated for shoola, aamadosh, ashthilika, aadhmana, gulma, udara, arsha, dushivisha etc., and parts used are kshira, patra, kanda, and moola. <sup>5</sup> Its fatal dose is uncertain (25 -30 ml of latex), and its fatal period is also uncertain (3 days). <sup>7</sup>

Conversion of the raw drug into a formulation helps in increasing the clinical efficacy and renders it feasible to administer to a patient. kshara kalpana is one such formulation, where the

alkaline crystals present in the ash of the selected plants are extracted and given the shape of a formulation. Dravya, which possesses ksharana and kshanana properties, is called kshara. <sup>8</sup> Kshara is superior in shastra and anushastra because it has chedya, bhedyo, lekhyo properties and it is indicated in diseases which are difficult to treat. <sup>9</sup> Vivid descriptions regarding the preparation of kshara are available in the classics, whereby many differences of opinions are also evident. Kshara is indicated in garavisha, arsha, bhagandara, ashmari, gulma, udararoga, arbuda. <sup>10</sup>

Several kshara have been explained in Ayurveda, and Snuhi kshara is one among them. Snuhi kshara is a derivative of ash of Snuhi obtained in the form of alkaline crystals. Snuhi kshara possesses tikshna guna, udaravinashana, vanhidipana, shophanashana etc. properties. <sup>11</sup> Snuhi kshara is given in the dose of 2- 4 ratti with anupana, namely madhu, ushnajala, triphalakwatha. <sup>12</sup> Preparation of Snuhi kshara varies with classical references such as Sushruta Samhita, Sharangdhara Samhita, Rasatarangini, Ayurveda Sara Sangraha and Ayurveda Prakasha. <sup>13-17</sup> Standardization is vital for quality assurance, Standard Manufacturing Process, authenticity, purity, safety and efficacy of the product.

Charaka has described various evaluative procedures to judge the quality of pharmaceutical products, which are based on the physical qualities of the final product. <sup>18</sup> With the advent of the recent advancements in science there evolved many procedures and tests which can help in the proper judgement of the properties and quality of the ayurvedic drugs mentioned in Ayurvedic Pharmacopoeia of India. These tests express the drug's qualitative and quantitative properties and assure Ayurvedic practitioners, pharmacists and consumers about the quality, safety and efficacy.

Keeping this in mind, the pharmaceutical formulation and analytical assessment of Snuhi kshara were done along with comparing the previously prepared Snuhi kshara.<sup>19</sup> Present article serves the Standard Manufacturing Process, Analytical profile and comparative pharmaceutico-analytical data of Snuhi kshara for revalidation.

## MATERIALS AND METHODS

In the present article, the study was done in the following three steps-

1. The pharmaceutical formulation of Snuhi kshara (SK) was manufactured in four attempts (SK-1, SK-2, SK-3 and SK-4) in Dec. 2021, i.e., Batch-2.
2. Analytical study of SK manufactured in Dec. 2021 (Batch-2)
3. Comparison of SK manufactured in Dec 2021 (Batch-2) with previously prepared SK manufactured in Feb 2021 (Batch-1).<sup>19</sup>

### Equipment

1. For sample collection: axe, knife, bag
2. For kshara preparation: weighing machine, iron container, steel containers, measuring jars, pipe, cotton cloth, gas stove, ladle, glass container
3. For analytical study: beaker, oven, crucible, petri dish, evaporating dish, burner, conical flask, balance, suction pump, desiccators, spectrophotometer, stirrer, pipette, filter paper, test tubes, test tube holders, test tube stand
4. For TLC: developing solvents, iodine, TLC staining agent, TLC plates, guillotine paper trimmer, diamond tipped glass cutter, glass pasture pipettes, TLC chamber, tweezers, heat gun, UV lamp, Iodine chamber, filter paper, TLC spray cabinet, sprayer, hot plate

### Procedure

1. Procurement of Snuhi kashtha
2. Authentication of Snuhi kashtha
3. Drying of Snuhi kashtha
4. Standardization of Snuhi kashtha churna
5. Preparation of Ash
6. Preparation of Ksharajala
7. Preparation of Snuhi kshara
8. Standardization of Snuhi kshara

## PHARMACEUTICAL STUDY

### Pre-Preparation of Snuhi kshara

Procurement of raw drugs: Fresh Snuhi kashtha was obtained from the field and weighed. As bahukantaka Snuhi is best, it is taken for drug formulation, which was not affected by krimi, visha, shastra, aatapa, pavana etc.<sup>20-22</sup>

Authentication of the raw drug: Authentication was done at the Dravyaguna Department of the Institute and also at the Department of Botany (Rashtasanta Tukdoji Maharaja Nagpur University, Nagpur, India, Herbarium No. 10563).

Drying of the raw drug: Fresh Snuhi kashtha was cut into small pieces approx. 2-4 inches, then dried in sunlight for 18 days and weighed.

### Preparation of Snuhi kshara

Preparation of Ash: Dried Snuhi was burnt in a big iron container. Ash was collected after self-cooling and weighed with proper care.

Preparation of Kshara Jala: Ash was collected in a steel container, and water was added to it four times. The mixture was macerated well thoroughly with hands and left undisturbed overnight. The following day, the clear supernatant liquid was decanted carefully with a thin pipe and filtered through four-layered cotton cloth three times, i.e., until obtaining clear Kshara Jala. The residual ash was again mashed with four times water and kept undisturbed for the next overnight, followed by a collection of the second filtrate. A similar method was followed for the third and fourth time to collect the third and fourth filtrate, respectively.

Preparation of Kshara: All four filtrates of kshara jala were individually subjected to heat to evaporate the water content. After the complete evaporation of water content, the white-coloured solid salty substance was obtained at the bottom of the container and pounded into a fine powder known as Snuhi kshara (SK-1, SK-2, SK-3 and SK-4). Snuhi kshara was then collected, weighed and preserved in an airtight glass container.

The procedure was done with obtained ash (solid form) for SK-1 of Batch-2. Again, the same process was repeated with the obtained residual ash (semisolid form) for SK-2, SK-3 and SK-4 of Batch-2, respectively.

## ANALYTICAL STUDY

Analytical study of a raw drug (Snuhi kashtha churna) and finished product (Snuhi kshara) was done at authorized standard laboratories, i.e., Qualichem Laboratories, Gokulpeth Market, Nagpur, India and Sheetal Analytical Laboratory, Sadashiv peth, Pune and Central Research Laboratory, Shri Ayurved Mahavidyalaya, Nagpur, India.

### Parameters assessed for dry Snuhi kashtha churna

1. Organoleptic parameters- Colour, odour, taste
2. Physicochemical parameters- Foreign matter, total ash, acid-insoluble ash, alcohol-soluble extract, water-soluble extract.<sup>23</sup>

### Parameters assessed for Snuhi Kshara

1. Organoleptic parameters- Colour, odour, taste
2. Physicochemical parameters- Loss on drying at 110 °C, acid-insoluble ash, pH
3. Assay: Sodium, Potassium, Iron
4. TLC (Thin Layer Chromatography)

SK-1 of Batch-2 was assessed for organoleptic and physicochemical parameters, assay and TLC parameters. However, SK-2, SK-3 and SK-4 of Batch-2 were assessed for organoleptic and physicochemical parameters.<sup>24</sup>

## RESULTS

Table 1: Parameters of dry Snuhi kashtha churna

Parameters	Batch 1	Batch 2
<b>Organoleptic parameters</b>		
Colour	Faint brown-cream colour	Yellowish brown
Odour	Strong pungent	Pungent
Taste	Bitter	Bitter
Appearance	Coarse powder	Coarse powder
<b>Physicochemical parameters</b>		
Foreign matter	-	0.24%
Total ash	7.02%	3.91%
Acid-insoluble ash	Nil	0.27%
Water soluble extractive	26.47%	16.77%
Alcohol soluble extractive	11.69%	17.25%

Table 2: Data of Ash preparation

Observations	Batch 1	Batch 2
Weight of fresh Snuhi	23 Kg	26 Kg
Weight of dry Snuhi	2.3 Kg	2.6 Kg
Loss after drying	20.7 Kg	23.4 Kg
% Loss after drying	90 %	90%
Weight of ash obtained	352 g	415 g
% of ash obtained from dry Snuhi	15.30%	15.96%
% of ash obtained from fresh Snuhi	1.530%	1.596%
Time required for complete burning	20 min.	30 min.
Time required for self-cooling	3 hrs.	3 ½ hrs.

Table 3: Data of Kshara Jala preparation

Parameters	Batch 1	Batch 2			
		SK- 1	SK- 2	SK- 3	SK- 4
Weight of ash taken	352 g	415 g	-	-	-
The volume of water added	1408 ml	4 times (1660 ml)	4 times	4 times	4 times
Kshara Jala obtained after filtration (ml)	1208	1100	1200	1380	1250
Kshara Jala obtained after filtration (% v/v)	85.79	66.26	72.28	83.13	75.30
Time required for preparation	12 hours	Overnight	Overnight	Overnight	Overnight

Table 4: Data of Snuhi Kshara obtained

Parameters	Batch 1	Batch 2				Total
		SK- 1	SK- 2	SK-3	SK-4	
Volume of Kshara Jala taken	1208	1100	1200	1380	1250	-
Time required for preparation	3 hours	1 hour 50 minutes	2 hours 30 minutes	2 hours 35 minutes	3 hours 10 minutes	-
Kshara obtained	118 g	66 gm	68 gm	35 gm	14 gm	183 gm
Kshara obtained from dry Snuhi (% w/w)	5.13 %	2.53%	2.61%	1.34%	0.53%	7.01%
Kshara obtained from fresh Snuhi (% w/w)	0.51%	0.25%	0.26%	0.13%	0.05%	0.70%

Table 5: Organoleptic parameters of Snuhi Kshara

Parameters	Batch-1	Batch-2			
		SK-1	SK-2	SK-3	SK-4
Colour	Faint brownish creamy colour	Off white colour	Off white colour	Off white colour	Off white with a Light grey tinge
Odour	Kshara odour	Faint odour ++	Faint odour +	Faint odour	Faint odour
Taste	Faint saline	Saline taste ++	Saline taste +	Saline taste	Saline taste

Table 6: Physicochemical parameters of Snuhi Kshara

Parameters	Batch-1	Batch-2			
		SK-1	SK-2	SK-3	SK-4
pH	10.95	10.30	11.01	10.92	10.86
Loss on drying at 110 °C	0.98 %	2.64 %	2.85 %	1.98 %	1.99 %
Acid insoluble ash	1.14 %	1.84 %	1.85 %	1.23 %	1.44 %

**Table 7: Assay of Snuhi Kshara**

Assay	Batch-1	SK-1 (Batch 2)
Sodium	2.09 %	3.51 %
Potassium	41.08 %	37.92 %
Iron	40.07 ppm	294 ppm

**Table 8: TLC analysis of Snuhi Kshara**

Observed at	Batch 1		SK-1 (Batch 2)	
	Rf value	Band colour	Rf value	Band colour
Eye observed	0.88	Yellow	0.12	Yellow
254 nm	0.88	Yellow	0.12	Yellow
365 nm	0.88	Yellow	0.12	Fluorescent yellow
	0.83	Yellow	0.79	Fluorescent yellow
	0.22	Yellow	0.99	Fluorescent yellow
	0.15	Yellow	-	-
	0.13	Yellow	-	-
Iodine chamber	0.88	Brown	0.12	Brown
	0.83	Brown	0.79	Brown
	0.22	Brown	0.99	Brown
	0.15	Brown	-	-
	0.13	Brown	-	-

**Collection and drying of Snuhi Kashtha**



**Fresh Snuhi kashtha**



**Semi-dried Snuhi kashtha**



**Dried Snuhi kashtha**

**Preparation of Snuhi kashtha ash**



**Burning of dried Snuhi kashtha**



**Snuhi kashtha ash**

**Preparation of Kshara Jala**



**Snuhi ash and water**



**Added water to Snuhi ash**



**Soaked overnight**



Decantation of kshara jala



Kshara jala filtration via folded cloth

#### Preparation of Snuhi Kshara



Kshara jala on a burner



Evaporation of water



Continuous stirring with a ladle



Visible granules of Snuhi Kshara



Snuhi Kshara

## DISCUSSION

The present article revealed the pharmaceutical formulation and physicochemical and chromatographical analysis of SK (Batch-2, Dec 2021), along with a comparison to previously prepared SK (Batch-1, Feb 2021).<sup>19</sup>

### Pharmaceutical study of SK

SK is a single herbal formulation of Snuhi (*Euphorbia neriifolia* Linn.) obtained in the form of kshara. The exact method of preparation of SK has not been mentioned in the text; hence general guidelines of kshara preparation given in Sharangdhara Samhita, Madhyama khanda, Dhatushodhanamarana kalpana, Verse 103-106 were followed. As market preparation of the formulation was not available thus, the formulation SK was prepared at Rasashastra Evum Bhaishajya Kalpana department in the Institute, following all the standard operating procedures and achieving all the testing criteria. The SK preparation method of both batches was the same, and both were conducted at the same Institute.

The raw material Snuhi kashtha collected from the field was authenticated and standardized before the preparation of SK. Snuhi kashtha was weighed and cut into small pieces, nearly 2-4 inches, for quick and proper drying, thus preventing bacteria, yeast or fungi from growing on them. Therefore, Snuhi kashtha sundried earlier, i.e., in 18 days in Batch-2 compared to Batch-1.

Dried Snuhi kashtha was burnt entirely in a big iron container to prevent contamination, spillage and accessible ash collection. Once the fire started, Snuhi kashtha pieces were added gradually for proper burning to obtain ash. Greyish white ash with some coal particles and whitish ash with minor coal particles was obtained in Batch-2 and Batch-1, respectively may be due to sudden cold and cloudy weather and incomplete combustion of Snuhi kashtha while the self-cooling process.

Water is added to collected ash in the deep steel container and macerated adequately with both hands for better mixing, then kept undisturbed overnight. Floating carbon particles were removed carefully, and the container was kept slightly tilted for maximum collection of supernatant Ksharajala without disturbing the sediment. The next day, Ksharajala was decanted with a small opening rubber pipe by creating negative pressure. Ksharajala was filtered via 3-4 times folded cotton cloth to remove sedimentary particles. Destarched cotton cloth should be used for the filtration process for effective/rapid filtration. Ksharajala obtained after filtration was light brownish in Batch-2 as compared to Batch -1 may be due to less alkali concentration.

Ksharajala was then subjected to evaporation on low flame. Aggregation of small particles and change in consistency was observed with the progression of time. After complete water evaporation, powdered crystalline light brown coloured Snuhi kshara was obtained. It is advisable to stir intermittently at the beginning and continuously at the end to avoid sticking kshara to

the edges and base of the vessel and to give indirect heat at the end of the evaporation process.

As kshara is considered a water-soluble extract, but all of the extracts cannot be obtained with a single wash, some of them may remain as a residue; thus, Batch-2 was subjected for three more consecutive attempts with obtained residual ash. Hence, soaked ash was again processed as per the above-stated procedure four times which yielded 66 gm, 68 gm, 35 gm and 14 gm, respectively, in each attempt (Table 4). Thus, being a peculiar formulation, it can be inferred that residue after the first wash should never be discarded and to be processed further to obtain as much kshara as possible. 26 kg of fresh Snuhi kashtha yielded a total of 183 gm of Snuhi kshara, which is significantly more in Batch-2 than in Batch-1.

#### Analytical assessment of raw drug Snuhi kashtha

The analytical profile of Snuhi was followed as per API. An analytical study of a raw drug (dried Snuhi kashtha powder) was evaluated by organoleptic and physicochemical parameters. Organoleptic parameters of a raw drug have proved the colour, odour, taste and identity of Snuhi (Table 1). Physicochemical parameters proved the purity and strength of Snuhi (Table 1). The results of all stated parameters of Batch-2 were comparable with Batch-1 and API. Mild changes in results may be due to variations in the collection of the year, climatic change and individual differences in collected plants.

#### Analytical assessment of final product SK

Reference of SK is not available in API or AFI. Thus, being first explained kshara, the parameters of Apamarga kshara were followed for an analytical profile of SK. Organoleptic, physicochemical and chromatographical parameters are evaluated analytical study of a finished product (SK). Organoleptic and physicochemical parameters proved the colour, odour, taste, appearance, purity and strength of Batch-2 (SK-1, SK-2, SK-3 and SK-4). A preliminary analytical assessment of Batch-2 (SK-1) and Batch-2 (SK-2, SK-3, SK-4) has revealed no significant changes in parameters. Thus, multiple attempts with obtained residual ash can be made for maximum extraction of Kshara. Results of all stated parameters of Batch-2 were comparable with Batch-1 (Tables 5, 6 and 7).

In Thin layer chromatography (TLC) of Batch-2- under 254 nm, only one peak was revealed with an Rf value of 0.12, whereas under 365 nm and Iodine exposure, three peaks were revealed with Rf values of 0.12, 0.79, 0.99, respectively. As per previous review articles, the stem of Snuhi showed five phytoconstituents such as euphol, friedelan-3, D: B-friedolan-5-(10)-en-1-one, glut-5(10)-en-1-one, taraxerol. Thus, the presence of three phytoconstituents can be inferred in the present study. The band colours and Rf values under 254 nm, 365 nm, and the Iodine chamber of Batch-2 were comparable with Batch-1 (Table 8). Thus, TLC analysis also revalidated the standardization of Snuhi kshara in the context of quality and purity.

#### CONCLUSION

Snuhi kshara is an invaluable single drug preparation of Snuhi, which was prepared following Sharangdhara Samhita. In the present study, the first attempt yielded only 66 gm, whereas three more yielded a total of 183 gm of Snuhi kshara from 26 kg of fresh Snuhi. Hence, the residue after the first attempt should never be discarded and should be processed further for maximum kshara extraction. After four consecutive attempts, maximum of 0.70% kshara was obtained from fresh Snuhi. The results of the

standardization of SK of Batch-2 were comparable with Batch-1. This pharmaceutico-analytical assessment revalidates the standardization of Snuhi kshara in the given standard conditions of the study. However, the dimensions may vary as per the quantity and quality of the raw material. Further standardization and phytochemical screening are advantageous for the revalidation of Snuhi kshara.

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