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PHARMACEUTICAL STANDARDIZATION OF *SNUHI* (*EUPHORBIA NERIIFOLIA LINN.*) *KSHARA*

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ABSTRACT

Snuhi Kshara is derivative of ash of *Euphorbia neriifolia Linn.* obtained in form of alkaline crystals. Standardization of Ayurvedic formulations is essential for establishing the quality, safety and efficacy of finished product which can be achieved by adopting Standard Manufacturing Process (SMP). Standardization of *Snuhi Kshara* is not attempted till date. The present research has been carried out to establish the Standard Manufacturing Process and preliminary analytical profile for *Snuhi Kshara*. *Shuhi Panchanga* was procured from Sundar Ayurved Pharmacy, J. S. Ayurved Mahavidyalaya, Nadiad. *Kshara* was prepared by method mentioned in the text Ayurved sara Samgraha with modification in soaking duration and preliminary analytical profile was developed. In this study, we attempted repeatedly (three times) washes of obtained ash to extract the maximum yield. It is found that maximum *Kshara* can be extracted by three consecutive washes. The final yield of *Kshara* was 18.47% w/w, 9.0% w/w and 2.18% w/w in three subsequent washes of obtained Ash. The preliminary analytical profile does not show any significant remarks in *Kshara* which obtained through three subsequent washes. Hence, multiple washes should be done to extract maximum amount of *Kshara*.

Keywords: *Euphorbia neriifolia Linn.*, *Snuhi Kshara*, Ayurved Sara Samgraha, Standardization

INTRODUCTION: The Ayurvedic pharmaceutics is well developed discipline in the field of drug formulation. The manufacturing of medicaments involved various techniques such as heating, evaporation, pounding, churning and extraction. The active pharmaceutical ingredient (API) is a part of any drugs/formulations that produces its therapeutic effect. These API can be obtained by various extraction techniques. *Kshara Kalpana* is one among them to extract the alkalis from the ashes of plant. *Kshara* is indicated in diseases which are difficult to treat.[1] It also minimizes complication and reduces recurrence of diseases.

There is a wide range of description available about *Kshara* in many of classical texts such as *Sushruta Samhita*[2], *Chakra Datta*[3], *Sharangadhara Samhita*[4], *Rasatarangini*[5], *Dravyaguna Vigyana*[6], *Ayurveda Sara Samgraha*[7], *Ayurved Prakasha*[8], *Rasa Tantra Sara & Siddha Prayoga Samgraha*[9] and *Bhaishajya*

Ratnavali[10]. In context to this description, different opinions exist regarding ratio of ash and water, duration of socking and filtration pattern.

Snuhi Kshara has been mentioned first time in *Sushruta Samhita*[11]. An attempt has been made to standardize *Snuhi Kshara* prepared by repeated washes and developed its preliminary analytical profile.

AIM AND OBJECTIVES:

1. To establish the Standard Manufacturing Process and preliminary analytical profile for *Snuhi Kshara*.

MATERIALS AND METHODS:

The dried *Shuhi Panchanga* was procured from the Sundar Ayurvedic Pharmacy, J. S. Ayurved Mahavidyalaya, Nadiad. **[Table 1]**

Table 1 Detail regarding collection and drying of *Snuhi Panchanga*

Details	**Batch I**	**Batch II**	**Batch III**
Date of collection	22/09/2017	18//01/2018	16/03/2018
Date of starting	13/11/2017	10/03/2018	10/05/2018
Duration require for drying	53 days	52 days	56 days

Table 2 Equipments with their specifications

Sr. No.	**Name of equipment**	**Specification**
1	Weighing balance	Tula Digi Scale, MAT5093, **Power supply** – 230AC±10% 50Hz **Capacity**: 20 g to 10/30 kg, **Accuracy** – 1/5 g, **Pan size** – 9 ½ ” * 12”
2	Measuring jar	**Material**: Plastic, **Capacity**: 2 L
3	Vessels	**Used for soaking**: **Material** – Stainless steel, **Depth**: 15”, **Diameter**: 10”, **Capacity**: 20 L **Used for *Kshara* preparation**: **Material** – Stainless steel, **Depth**: 8”, **Diameter**: 12 ½ ”, **Capacity**: 15 L
4	Ladle	**Material** – Stainless steel, **Size**: 11” * 2”
5	Heating device	Gas cook top (Single burner made of cast Iron), **Fuel**: Gas line – GSPC Pvt. Ltd., **Burner Size**: 3” * 3”
6	Thermometer	LEMDA, Glass tube filled with Mercury, **Capacity**: 0ºC to 250 ºC
7	Cloth	**Material**: Cotton, **Size** : 24” * 24”

Preparation of *Snuhi Kshara*

Shuhi Kshara has been prepared by following method mentioned in the text *Ayurveda Sara Samgraha*[12] with modification in soaking duration at the Postgraduate Department of Rasashastra evam Bhaishajya Kalpana, J. S. Ayurved Mahavidyalaya, Nadiad. The entire process was divided into three phases.

(1) Preparation of Ash

The fresh *Snuhi Panchanga* was collected and dried completely in sunlight. It was burnt completely in a big iron pan. After the self-cooling, grayish white ash was collected **[Figure 1]**.

(2) Preparation of *Kshara Jala*

The prepared ash and R.O. (Reverse osmosis) water were taken in cylindrical S.S. vessel with ratio of 1:8 (v/v). The mixture was macerated well thoroughly with hands and kept undisturbed for overnight 12 h soaking. After that, next morning the clear supernatant liquid was decanted carefully and filtered seven times through four folded cotton cloth. The residual ash was again mashed with 10 L & 8 L of R.O. water and kept undisturbed for 12 h soaking followed by a collection of 2nd and 3rd filtrate respectively **[Figure 2]**.

(3) Preparation of *Kshara*

The obtained filtrate (*Kshara Jala*) was subjected to heat at 98^{0}C to evaporate the water content. After complete evaporation of water portion, the obtained *Kshara* was collected from the inner surface of S.S. vessel by scraping and stored in air tight glass container. Total three batches (3 washes of each batch) of *Snuhi Kshara* were prepared by following this method **[Figure 3]**.

Preliminary Analytical profile of *Snuhi Kshara*

To develop analytical profile, various parameters were assessed for *Snuhi Kshara* as per standard guidelines prescribed in API[13].

OBSERVATIONS AND RESULTS:

Snuhi panchanga burnt quickly and easily as it was completely dried. The grayish white colored ash with a characteristic taste was obtained. 90.53 % Weight loss was observed after drying of *Snuhi Panchanga* and average 9.33 % ash was obtained from dried *Panchanga* **[Table 3]**. The prepared *Kshara Jala* was clear, yellowish and salty. Average time required for preparation of *Kshara Jala* of three consecutive washes was 13 h, 12 ½ h, and 12 ½ h respectively. Average final yield was 74.83% v/v, 84.33% v/v and 88% v/v for three consecutive washes **[Table 4]**. During evaporation of filtrate at 98 ^{0}C, the yellowish liquid was gradually turned to brownish semisolid mass with aggregation and popping sounds. The first wash yielded an average of 18.47% *Kshara*, while second and third washes yielded 9.0% and 2.18% respectively **[Table 5]**.

Table 3 Detail of Ash of Dry *Snuhi Panchanga*

Parameters	Batch I	Batch II	Batch III	Average
Weight of fresh *Snuhi Panchanga* (Kg)	100	100	100	100
Weight of dry *Snuhi Panchanga* (Kg)	9.4	10	10	9.8
Weight loss of *Snuhi Panchanga* after drying (Kg)	91.6	90	90	90.53
% loss of *Snuhi Panchanga* after drying	91.6	90	90	90.53
Weight of ash obtained (g)	1106	852	770	909.33
% of ash obtained (Dry *Snuhi Panchanga*)	11.76	8.52	7.70	9.33

Table 4 Detail of *Kshara Jala*

Parameters	1st Decant			2nd Decant			3rd Decant			Average
	I	II	III	I	II	III	I	II	III	
Weight of Ash taken (g)	1056	802	720	--	--	--	--	--	--	1st Decant : 859.33

Volume of Ash taken (L)	3.1	2.5	2.3	--	--	--	--	--	--	1st Decant : 2.63
Volume of R.O. water taken (L)	24.8	20	18.4	10	10	10	08	08	08	1st Decant : 21.07 2nd Decant : 10 3rd Decant : 8
Kshara Jala obtained after filtration (L)	18.6	16	12.8	8.6	8.2	8.5	6.9	7.1	7.2	1st Decant : 15.8 2nd Decant : 8.43 3rd Decant : 7.07
% of *Kshara Jala* obtained in v/v	75	80	69.5	86	82	85	86	88	90	1st Decant : 74.83 2nd Decant : 84.33 3rd Decant : 88
Time required for preparation of *Kshara Jala* (h)	13	13	13	12 ½	12 ½	12 ½	12 ½	12 ½	12 ½	1st Decant : 13 2nd Decant : 12 ½ 3rd Decant : 12 ½

Table 5 Detail of *Snuhi Kshara*

Parameters	**1st Decant**			**2nd Decant**			**3rd Decant**			**Average**
	I	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**	
Volume of *Kshara Jala* taken (L)	18.6	16	12.8	8.6	8.2	8.5	6.9	7.1	7.2	1st Decant : 15.8 2nd Decant : 8.43 3rd Decant : 7.07
Time required for *Kshara* preparation (h)	9.6	7.2	5.8	4.2	4.0	4.2	3.5	3.6	3.6	1st Decant : 7.53 2nd Decant : 4.13 3rd Decant : 3.57
Kshara obtained in w/w (g)	170	184	118	88	65	76	30	14	14	1st Decant : 157.33 2nd Decant : 75.33 3rd Decant : 19.33
Weight of Ash taken (g)	1056	802	720	--	--	--	--	--	--	859.33
% of *Kshara*	16.09	22.94	16.39	8.33	8.10	10.56	2.84	1.75	1.94	1st Decant

obtained in w/w (in comparison to dry *Snuhi* ash)										: 18.47 2nd Decant : 9.0 3rd Decant : 2.18

Preliminary analytical profile of *Snuhi Kshara*.

Organoleptic characters of *Snuhi Kshara*:

All the parameters revealed same in all the batches of *Snuhi Kshara* such as having off white color, rough touch, characteristic odor and salty taste.

Physico-chemical parameters of *Snuhi Kshara*:

Table 6 Physico-chemical parameters of *Snuhi Kshara*;

Parameters	1st Decant			2nd Decant			3rd Decant			Average		
Batch	I	II	III	I	II	III	I	II	III	1st Dec.	2nd Dec.	3rd Dec.
pH	10.86	10.30	10.32	10.65	10.36	10.58	10.58	10.51	10.68	10.49	10.53	10.59
LOD (%)	1.0	1.09	1.05	0.98	1.40	1.12	0.32	0.98	0.79	1.04	1.16	0.69
Ash value (%)	97.76	91.61	98.47	98.7	96.45	91.5	97.5	97.94	92.5	95.94	95.55	95.98
Acid insoluble (%)	0.25	0.30	1.2	0.21	0.32	1.0	0.29	0.31	1.32	0.56	0.5	0.6
Water Soluble Extractive (%)	96	98.4	97	95.8	97.5	97.9	94.2	96.5	96.3	97.1	97.06	95.66
Alcohol Soluble Extractive (%)	25.48	32	40	18.78	22.3	33.92	10.5	12.02	10.64	32.49	25.0	11.05

Table 7 Ion estimation of different batches;

Sample	SPD			SPA			KJ									SK								
Batch / Ion	I	II	III	I	II	III	1st Decant			2nd Decant			3rd Decant			1st Decant			2nd Decant			3rd Decant		
							I	II	III	I	II	III	I	II	III	I	II	III	I	II	III	I	II	III
Na	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Cl	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
K	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

Mg	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ca	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

SPD: *Snuhi Panchanga Dry*, **SPA:** *Snuhi Panchanga Ash*, **KJ:** *Kshara Jala*, **SK:** *Snuhi Kshara*,

Table 8 Preliminary Phytochemical Analysis of different batches;

Sample	**SPD**			**SPA**			**SK**								
Batch / Parameter	**I**	**II**	**III**	**I**	**II**	**III**	**1st Decant**			**2nd Decant**			**3rd Decant**		
							I	**II**	**III**	**I**	**II**	**III**	**I**	**II**	**III**
Glycoside	-	-	+	-	-	+	-	-	-	-	-	-	-	-	-
Amino acid	+	+	+	+	+	+	-	-	-	-	-	-	-	-	-
Protein	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+
Carbohydrate	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Flavanoid	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-
Tannin	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Steroid	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Saponin	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Alkaloid	+	+	-	+	+	-	+	+	+	+	+	+	+	+	+
Fixed oil	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

DISCUSSION:

Shrushti et al. revealed in her research paper that alkalinity, quality and economy method prescribed in Ayurveda Sara Sangraha could be considered as better among the five methods[14]. So, here, preparation of *Snuhi Kshara* has been carried out as per reference of Ayurved Sara Samgraha with modification in duration of ash soaking in water because in original reference 2-3 days are mentioned for soaking of ash which is time consuming. Overnight soaking is sufficient for sedimentation of ash and proper extraction of alkalies.

Dried *Panchanga* should be made into small pieces for better drying. The material should be burnt in a big vessel to avoid physical contamination during burning and for easy collection of Ash at the end. It should be burnt in pieces instead of coarse form for easy, proper and complete burning. As the bulk density of Ash is low, ash and water is advisable to take volumetrically for better yield of *Kshara Jala*. R.O. water having pH nearer to 7 was used to avoid any interference of inorganic salts present in tap water. Stainless steel or a suitable nonreactive vessel should be used to prevent possible chemical reactions.

Ash should be properly macerated in water for proper mixing and allowed to settle down for overnight at least 12 h to get maximum quality *Kshara* at the end. *Kshara Jala* should be prepared in cylindrical shaped earthen, steel or plastic vessel for easy and convenient collection of supernatant liquid. It should be decanted very carefully through the outlet without disturbing vessel to avoid entry of other Ash particles in it. Filtration of *Kshara Jala* should be done by clean cotton cloth and measures should be taken to avoid the entry of sediments. The concept of filtration through multi-folded cloth may be existed in classics to overcome this issue.

Initially, *Kshara Jala* was yellowish colored clear liquid. Aggregation, vapors

and popping sounds were increased proportionally with temperature. Color was changed from yellowish to brownish gradually as the temperature arose. *Kshara* was started sticking to the vessel in the final stage and bumping was observed. It was stirred carefully to prevent bumping and sticking at this stage. *Kshara* can be considered as water soluble extractives from the ashes of plants, but maximum quantity of *Kshara* cannot be extracted within a single wash, some of them may remain in residue. Considering this, total three washes were done to get maximum yield. Average *Kshara* obtained in the first wash was 18.47%, while at the end of the third wash the total *Kshara* was obtained 29.65% average. This denotes that the sediments at the end of first wash need not to be discarded and should be washed repeatedly so as to get maximum yield. But the attempt of 4th wash was failed to yield significant amount of *Kshara*. Thus, current method should adopt and apply in commercial pharmaceutical industries to obtain superior and maximum yield of *Kshara*.

Organoleptic characters of SK do not show any difference in all the batches. The pH of substance is indicator of its acidic or alkali nature. The observed alkali pH of SK (each wash) proves action of the drug **[Table 6]**. *Kshara* is hygroscopic in nature and absorbs moisture which may affect the quality of drug. Although the weight loss in the samples is principally due to water, small amount of other volatile materials would also contribute to the weight loss. There was considerable difference observed in a loss on drying in SK (each wash) **[Table 6]**. Total ash is important and indicates to some extent the amount of care taken in the preparation of the drug. In the determination of total ash value, the carbon must be removed at as low temperature (450°C) as possible because alkali chlorides, which may be volatile at high temperature, would otherwise be lost.

Analysis of *Ayurvedic* medicines reveals a great deal about their elemental composition. The Ion estimation and preliminary phyto-chemical analysis of all the samples revealed that sodium, chloride and potassium ions are the main component while carbohydrate, protein, alkaloid, saponin, fixed oil and natural steroid are primary constituents of *Snuhi Kshara* **[Table 7, 8]**.

CONCLUSION:

The residues after a first wash should never be discarded; they are to be processed further twice not more than this to obtain maximum *Kshara*. The current observations can be considered as SMP for *Snuhi Kshara* and lead for future studies.

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PREPARATION OF *SNUHI KSHARA*

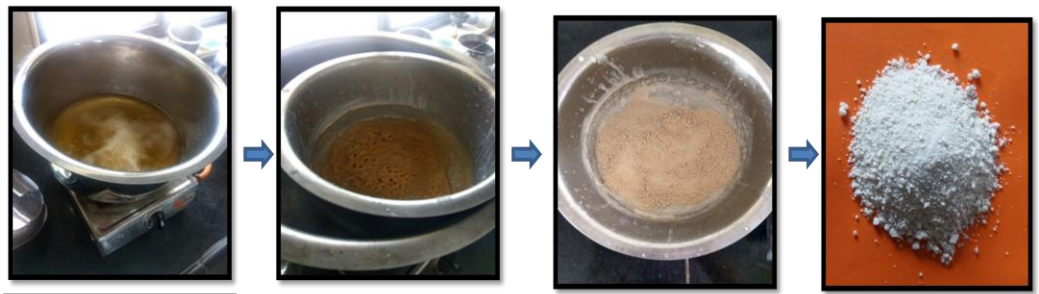
Figure 1 Preparation of Ash (SPA)

Snuhi Panchanga Dry (SPD) | Burning of SPD | *Snuhi Panchanga* Ash (SPA)

Figure 2 Preparation of *Kshara Jala* (KJ)

SPA + R.O. water | Kept soaked for overnight (12 hrs.) | Decantation of *Kshara Jala* | *Kshara Jala* (KJ) Before & After filtration

Figure 3 Preparation of *Kshara* (SK)



Heating of *Kshara Jala* | Evaporation of Water | *Snuhi Kshara* (SK)

SK (1st Decant) | SK (2nd Decant) | SK (3rd Decant)