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COMPARATIVE PHYSICO-CHEMICAL ANALYSIS OF *SNUHI KSHARA* AND *APAMARGA KSHARA* - AN EXPERIMENT STUDY

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ABSTRACT

Acharya Sushruta is the pioneer of *Kshara Kalpana*, as he introduced *Kshara Kalpana* (*Ayurvedic* formulation) in one of the specific chapters. These alkaline preparations have many therapeutic usages and even proved to be effective in treating many disorders through external use as well as internal use. External applications of these preparations have replaced many surgical procedures. *Kshara* is alkaline substance obtained from the ash of herbal drugs. *Kshara* is a substance that has *Ksharan* (corrosive) nature means which removes *Dusta Tvagmansadi* (vitiated debris of skin, flesh etc.) or vitiated *Dosha, Dhatu, Mala*. Now a days *Kshara and Ksharasutra* is routinely prepared by *Apamarga Kshara*. *Acharya Susruta* has mentioned 23 plants from which we can make the *Kshara*. So, we need more plants to explore for *kshara* preparation. We selected *Snuhi* for *Kshara* preparation and comparative physico-chemical study is done with standard *Apamarga Kshara.*

Keywords: *Ayurveda, Kshara*, *Snuhi Kshara*, Physico- Chemical analysis.

INTRODUCTION

Bhaishajya Kalpana, the science of *Ayurvedic* pharmaceutics primarily aims at the protection of the medicaments and preparations thereby growing their potency by showing them to different *Samskara*[1]. Conversion of the raw drug into a formulation helps in increasing the clinical efficacy as well as it renders it feasible for the administration to a patient. *Kshara Kalpana* is one such formulation, where the alkali present in the ash of the selected plants is extracted[2]. *Kshara* are the substances obtained from the ashes of drugs of plants (*Muaaka*; Raphenus sativus Linn., *Snuhi*; Euphorbia nerifolia Linn., *Arka*; Calotropis gigantea Linn. *Apamarga (*Achyranthes aspera Linn etc.) animals (conch shells, Cypraea moneta,coral etc.),and minerals (borax, salt petre, mixture of potassium salts etc.) origin, where alkaline portion is extracted from the ashes of these substances[3]. We selected two plants *Apamarga* and *Snuhi* for preparation of kshara and comparative physico-chemical analysis.

Materials and Methods

Sample were carried out following method used by *Acharya Sushruta* in *Sushruta Samhita* for preparation of *Snuhi* and *Apamarga Ksharas*[4]. These two samples were analyzed on these parameters like physical character, PH, water solubility, alcohol solubility, total ash contents, moisture, water soluble ash and acid soluble ash etc.

Preparation of *Kshara* –

1. **Collection of raw drugs-** *Apamarga* and *Snuhi Panchanga* (whole plant) required for the study was collected from locally Jaipur rural area during the month of December 2020. Preparation of both *Ksharas* in *Ksharasutra* lab of PG department of Shalya Tantra National Institute of Ayurveda deemed to be university Jaipur. *Snuhi* and *Apamarga Panchanga* were authenticated in the department of Pharmacognosy of NIA Jaipur.
2. **Preparation of *Snuhi* And *Apamarga* Ash-** First of all, 40 kg dry *Snuhi* whole plant and 20 kg dry *Apamarga Panchanga* was collected. After collection of plants dried *Panchanga* was taken in a big iron pan and burned completely. After self-cooling, of both ashes was collected separately. After completely burned we found 2.080 kg *Apamarga* ash and 4.320 kg *Snuhi* ash.
3. **Preparation of *Ksharajala* -** In classic *Ayurveda*, process is mention during preparation of *Kshara-Jala* the ratio of water and ash of the plant is 6:1. So 1 kg *Snuhi* ash and 1 kg *Apamarga* ash dissolved with 6 time water in an earthen pot and rubbed with hands properly for 10 minute. Then, these contents are kept as it is without any disturbance for one night. Next day, the clean supernatant liquid was decanted through the outlet of specially prepared vessel with open the tap. Then, it was filtered through eight folded cotton cloth that 1st dissolving. The same producer repeated total 21 times. After 21-time filtrations we found clear *Gomutra Varani* (light Gold) *Ksharajala* (alkaline solution).
4. **Preparation of *Kshara-*** All the 21 times filtrates of *Ksharajala* were individually subjected to heat to evaporate the water content from *ksharajal* and to obtain *Kshara*, and by following this method; applied both *ksharas*. Prepared both *Ksharas* collected in airtight glass container

Fig.1. Snuhi Panchanga (whole plant).

Fig.2. Firing *Snuhi Panchanga.*

Fig.3. Ash collected

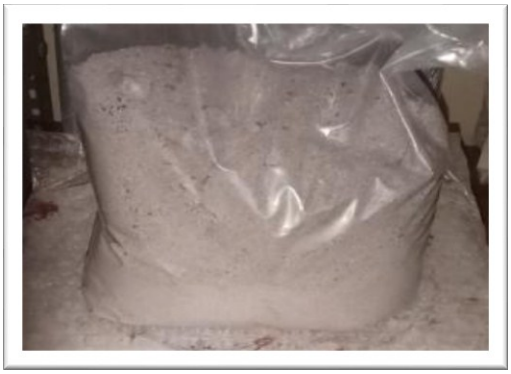


Fig. 4. Ash kept in a Stainless-Steel Vessel (6 time water)

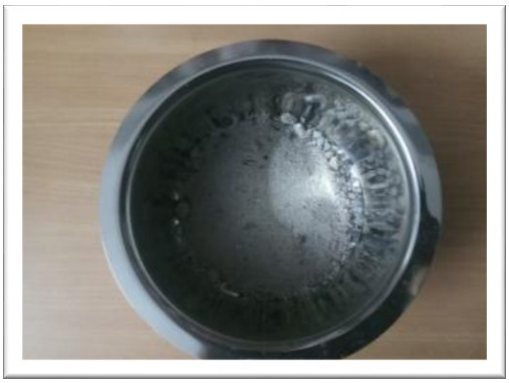


Fig.5. Filtration.

Fig.6. Boiling.

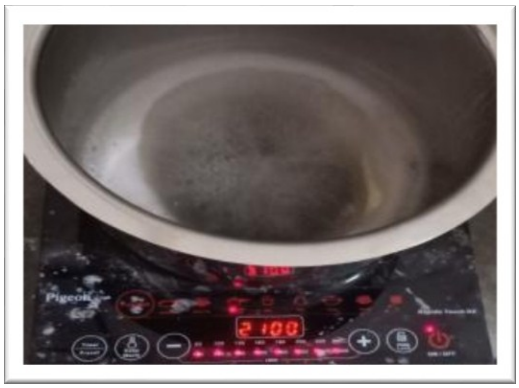
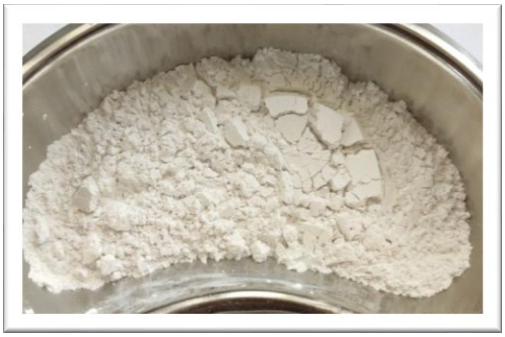


Fig.7. Prepared *Snuhi Kshara*



PHYSICO-CHEMICAL ANALYSIS OF BOTH PREPARED *KSHARAS* Physicochemical parameters macroscopic study (Color, Odor, Test) moisture content, PH, Total Ash Acid insoluble Ash water soluble Ash TLC, solubility were carried out at pharmaceutical chemistry laboratory, National Institute of Ayurveda Deemed to be University Jaipur.

Sample type – Fine powder

Procedure and Observation

1. Macroscopic study[5]:

The collected sample was studied organoleptically, with naked eye & magnifying lens, with the help of Pharmacognostical procedure i.e. Appearance, size, shape, colour, and odour and findings were recorded.

Table 1: Macroscopic study.

S. No	Macroscopic study	*Apamarga Kshara*	*Snuhi Kshara*
1	Color	White	White
2	Odor	Odorless	Odorless
3	Taste	Characteristic	Characteristic

2. Determination of Moisture Content/ Total Soluble Solids[6]:-

Moisture content is a water holding capacity of sample, higher moisture content in sample shows that it may decrease stability.

Moisture content was determined by placing weighed sample of 5gm of drug in oven at 105º for 5 hours, and calculated weight of sample for every 30 minute, until the weight of the sample came out to be constant, no variation of weight was recorded. This sample was allowed to cool at room temperature in a desiccator for 1 hour before weighing.

Weight of the empty petridish = W_1gm

Weight of the drug sample = X gm

Weight of the petridish with drug before drying (W_3) = (W_1 + X)

Weight of petridish after drying = W_2gm

Loss on drying in % = W_3-W_2x100/X

Table 2: Moisture Content

S. No	Sample	Weight of sample	Weight of container	Weight after drying with container	Weight after drying without container	Value %
1	*Apamarga kshara*	5.1502gm	31.5530gm	36.3710gm	0.5132gm	9.96%
2.	*Snuhi kshara*	5.0392gm	41.5530gm	46.1627gm	0.4295gm	8.52%

3. Determination of pH[7]: The pH value of an aqueous liquid may be defined as the common reciprocal of the hydrogen ion concentration expressed in gram per litre. It practically means the quantitative indication of the acidity or basic nature of a solution.

- The pH of a given solution is measured by using digital pH meter.
- First Standardized the pH meter. Tablets of different pH were taken, and each tablet was dissolved in 100 ml of distilled water to prepare solutions of different pH.
- The instrument was switched on and left for some time until required different pH solutions appeared.
- Buffer solution was taken in the beaker and the electrode was dipped in it. Same procedure was repeated for the other buffer solution after washing the electrode thoroughly with distilled water.
- The sample was taken (10% aqueous solution) and electrode was dipped in it and the value of pH was noted.

Table 3: Determination of pH

S. No	Sample	pH
1	***Apamarga Kshara***	10.4
2	***Snuhi Kshara***	10.3

4. Determination of Total Ash[8]:- Ash is a quantity analysis technique for determining siliceous material and inorganic substance in sample. Acid Insoluble Ash shows siliceous material and heavy metals. Water Soluble Ash shows quantity of water inorganic Substance. The total ash method is designed to measure the total amount of material remaining after ignition. This includes both physiological ash which is derived from the plant tissue itself and non-physiological ash which is the residue of the extraneous matter (e.g. sand and soil) adhering to plant surface. Silica Crucible was cleaned, dried well, labelled with glass pencils and then weighed to constant weight. 5 grams of powdered drug sample was put in the Silica crucible. The drug was spread evenly into a thin layer. This crucible was placed in a muffle furnace and ignited at a temperature of 450°C for about 6 hours or more until the ash was totally free from Carbon. The crucible containing the ash was allowed to be cooled in desiccators and subsequently weighed to constant weight. The percentage of ash with reference to the air-dried drug was calculated.

Calculation:

Wt. of Empty Silica Crucible = A_1 gm

Wt. of Sample (X) = X gm

Wt. of the Crucible with Ash = A_2 gm

Percentage of Total Ash = $[A_2 - A_1 / X] \times 100$

Table 4: Total Ash content.

S. No	Sample	A_1	X	A_2	Total Ash (%)
1	***Apamarga Kshara***	30.2862gm	4.9791gm	34.8014gm	90.68%
2	***Snuhi Kshara***	39.7964gm	5.0163gm	44.4915gm	93.59%

5. Solubility[9]:- Solubility is defined as the amount of substance that passes into solution to achieve a saturated solution at constant temperature and pressure. Solubility are expressed in terms of maximum volume or mass of the solute that dissolve in a given volume or mass of a solvent. Pharmacopoeias give solubility's in terms of the number of parts by volume of solvent required to dissolve one part by weight of a solid, or one part by volume of a liquid.

Table 5: Solubility

Descriptive term (gm)	Approximate volume of solvent in milliliters per gram of solute (ml)
Very soluble	less than 1
Freely soluble	from 1 to 10
Soluble	from 10 to 30
Sparingly soluble	from 30 to 100
Slightly soluble	from 100 to 1000
Very slightly soluble	from 1000 to 10,000
Insoluble or practically insoluble	more than 10,000

S. No	Sample	Descriptive term	Approximate volume (ml)
1	***Apamarga Kshara***	Soluble	10 To30
2	***Snuhi Kshara***	Soluble	10 To 30

6. Determination of Acid Insoluble Ash[10]:- Acid insoluble Ash value determined as per Pharmacopoeia of India, 1996. Boiled the total ash with 25 ml of 2M hydrochloric acid for 5 minutes, collected the insoluble matter in a Gooch crucible or on an ash less filter paper, washed with hot water, ignite, cool in a desiccator and weighed. Calculate the percentage of acid - insoluble ash with reference to the air - dried drug.

Calculation:-
Wt. of drug sample - X gm
Wt. of Crucible = G1 gm
Wt. of Crucible with insoluble Ash = G2 gm
Wt. of insoluble ash (G3) = G2-G1
Percentage of acid insoluble ash = G3/X×100

Table 6: Acid Insoluble Ash

S. No	Sample	X	G1	G2	G3	Acid insoluble ash %
1	***Apamarga Kshara***	5.0398gm	32.8033gm	32.9079gm	0.1046gm	2.07
2	***Snuhi Kshara***	5.1151gm	33.1624gm	33.2738gm	0.1114gm	2.17

7. Determination of Water–soluble Ash[11]:- Water – soluble ash value determined as per Pharmacopoeia of India 1996. Boiled the total ash for 5 minutes with 25 ml of water; collected the insoluble matter in a Gooch's Crucible or on an ash less filter paper, Washed with hot water and ignite for 15 minutes at a temperature not exceeding 450 C. Subtract the weight of the insoluble matter from the weight of the ash; the difference in weight represented the water – soluble ash. Calculate the percentage of water – soluble ash with reference to the air - dried drug.

Calculation: -
Wt. of drug sample - X gm
Wt. of total ash – A gm
Wt of Crucible - G1 gm
Wt. of Crucible with insoluble Ash - G2 gm
Wt. of insoluble ash (G3) = G2-G1
Water soluble ash (G4) = Wt. of total ash Agm- Wt. of insoluble(G3)
Percentage of water-soluble ash = A – [(G3)/X] x 100

Table 7: Water–soluble Ash:

S. N	Sample	X	A	G1	G2	G3	G4	Water soluble ash %
1	***Apamarg Kshara***	4.9791gm	90.68	30.2862gm	30.5946gm	0.3084gm	4.2068gm	84.49
2	***Snuhi Kshara***	5.0163gm	93.59	39.7964gm	41.0038gm	1.2074gm	3.4877gm	69.53

DISCUSSION

The physico-chemical analysis of the two samples were conducted at pharmaceutical chemistry laboratory, National Institute of Ayurveda Deemed to be University Jaipur.

Macroscopic study like colour, odour, and taste were recorded along with the evaluation of the parameters like loss on drying, total ash, water soluble ash, acid insoluble ash, pH, water soluble extractive value and alcohol soluble extractive value by following standard procedures[12] .

The quantity of AK (*Apamarga Kshara*) and SK (*Snuhi Kshara*) samples obtained were 240g and 160g respectively. The less quantity of SK sample suggests that the west solids contents present more in *Snuhi Panchang*a. The colour of both samples were whitish. The taste of both samples was Characteristic. The Characteristic taste suggests the presence of alkali contents. Both samples were odorless. The macroscopic characters of the two samples are shown in Table 1.

Loss on drying is an important parameter to be measured for the *Kshara*. As it's hygroscopic in nature due the presence of alkaline composites and hence the loss on drying values means the limit to which the sample has absorbed moisture. The lesser the value of loss on drying the stable the *Kshara* is measured. The values of loss on drying for AK and SK samples were found to be 9.92% and 8.52% separately. These values suggest that SK sample is less hygroscopic and hence more stable. Table no 2 shown moisture contents.

PH shows the relative acidity or alkalify of any sample. The pH for AK and SK samples were found to be 10.4 and 10.3 which clearly suggests about the alkaline nature of the *Kshara.* Table no. 3 shown PH Value of both samples.

The total ash values denoted the amount of inorganic material existing in the given sample. For example, *Kshara* is obtained after complete burning of the organic matter of the drug and hence ash values should be higher. Total ash values for AK and SK were found to be 90.68% and 93.59% separately. The lower value in AK samples denotes that some amount of organic matter was also present in the sample. table no.4 shown total ash value of both samples.

The alcohol solubility extractive value for AK and SK were 10 to 30 and 10 to 30 separately. The result obtained from the test depict that both the samples had no elements which are insoluble in the alcohol or water. Table no 5 shown solubility of both sample in the water and alcohol.

The values obtained for acid insoluble ash for AK and SK were 2.07% and 2.17% separately. Acid insoluble ash indicates about the ash obtained from the matter which are not soluble in water for example silica. This value should be less for a standard product. The values obtained for the two samples indicate the quality of the two samples. Table no. 6 and 7 shown acid insoluble ash contents.

The water-soluble ash for AK and SK were 84.49% and 69.53% separately Water-soluble extractive value for both the samples was found to be 100%. The results obtained from the test depicts that both the samples consisted of the elements which are completely soluble in water. This is in perfect compliance with the classics where it is been told that *Kshara* is extracted from the ash of the plant after saturated it in water. So, the 100% value of water-soluble extractives is justified.

The result of physico-chemical analysis study has advocated both samples with standard parameters. the present study it could be concluded that pharmaceutical processing imparts specific qualities to a formulation which helps in the protection of the clinical efficacy. *Snuhi Kshara* sample can be considered to be an alternative of *Apamraga Kshara*. which may also have therapeutic activity of their own.

CONCLUSION

Now a days *Kshara and Ksharasutra* is routinely prepared by *Apamarga Kshara*. It is known as standard *Apamarga Kshara and Ksharasutra* and is known device for the treatment of Fistula-in-ano, *Arsha*, *Arbuda, Nadivrana* etc. But we cannot depend always on single type of *Kshara* and *Ksharasutra*. There is a need to explore other drugs which can be used in the preparation of *kshara* and *Ksharasutra* in accordance

with the references made by our *Acharyas* at different places in their treatises. This Physico-chemical analysis study proves that *Snuhi Kshara* can be best alternative of *Apamarga Kshara*. A clinical study may further clarify comparative clinical efficacy of the two samples of *Kshara.*

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