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ROLE OF DIFFERENT VESSELS IN THE PREPARATION OF APAMARGA KSHARA TAILA

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Abstract

Apamarga (*Achyranthes Aspera*) Kshara taila (AKT) is a unique preparation indicated in *badhira* (deafness). AKT is prepared from Apamarga Kshara, Tila Taila (sesame oil) and Jala (water). The study was tried to establish the ratio of dravadravyas with kshara, besides addressing the type of vessels appropriate in such preparations. Vidika paribhasha pradeepa was taken for Siddhi lakshana of AKT as *Phena nishpatti* (subsiding of froth) and *Nastadugda samakruti* (appearance of spoiled milk). Observations revealed during preparation copper vessel were found appropriate in comparison to iron and mud pot. After the pharmaceutical process each sample was subjected to analytical study using relevant analytical parameters to find out any difference. The analytical report of samples prepared in different vessels revealed no much difference in the parameter except pH as 4.6, 9.0 and 8.1 in the vessel of copper, iron and mud pot respectively. Both Iodine and Saponification value was more in case of AKT prepared in mud pot. The particle size of Apamarga Kshara was in between 176.4nm to 197 nm under 15.00KV magnification 20.00 KX and EDAX report of Apamarga Kshara assessed in 200 µm, the report shows that the concentration of Potassium % by wt was 43.35 and oxygen was Wt% 37.21. Less than 40 µm oxygen was Wt% 31.53 and potassium was Wt% 49.17. Less than 50 µm Potassium was Wt% 46.65 and oxygen was Wt% 35.86. Finally, it was found that AKT prepared in copper vessel was better and also the assessment of siddhi lakshana (Completion of process) is also easy.

Key words: *Sneha Kalpana, Kshara, Taila, siddhi laxana, Apamarga Kshara Taila (AKT), Ratios, froth, Vessel, preparation.*

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INTRODUCTION:

From Ancient texts Kshara is considered as Anu shastra in Shalya. The same Kshara can be used to treat different disease through different pharmaceutical dosage forms like Kshara sutra, Kshara taila, Kshara Ghrita, Kshara vati/varti etc. The pharmacological action of drug also depends on dosage form in which it is administered^[1]. The medical use of Kshara is seen from Garuda purana and till today it is used as a component in many pharmaceutical preparations. The detail explanation of Kshara preparation along with it's property is seen in Sushruta Samhita ^[2]. Whereas the pharmaceutical aspect of Kshara sutra, Kshara taila or ghrita mentioning is obscure. In Charaka Samhita under *Gulma-Chikitsaadhikara* the reference of the word ksharatantra^[3] indicates, a specialized person used to prepare all Kshara related preparation. This might be one of the reason for non-availability of these pharmaceutical preparations.

Preparation of Apamarga Kshara taila(AKT) is explained in Cakradatta, for karna badirya (deafness), Karna nada (tinnitus) ^[4]and also used in traumatic condition ^[5]To prepare AKT is a challenge in pharmaceutics itself. The pharmaceutical aspect of AKT is not mentioned in Samhita, but later in the post medieval period some authors have included it

in their works^[5]. During pharmaceutical process fats are hydrolyzed by the alkali and resulting into crude soap. The froth which appears during process causes obstruction to assess the completion of pharmaceutical process. If routine *Sneha Kalpana vidhi* is followed by excepting the Sneha siddi lakshana, then it ends with salt formation. The ratios of components like Kshara, sneha and drava-dravya used are not specified in any of the texts for Kshara taila preparation. A pilot study was carried with different ratios to deduce the possible ideal proportion for such pharmaceutical preparation. Bhajana is regarded as crucial entity for pharmaceutical preparation to enhance and to retain ideal qualities. Bhajana figures out in samskara of Paradi Guna of Charak samhita and also in the Bhisajya sampat. Hence to find out ideal Bhajana (vessel) in pharmaceutical process i.e Starting from preservation of drug, till the end product preservation the study was carried out in different bhajanas mentioned for pharmaceutical preparation. According to Abhinava Chintamani ^[6]copper, Iron and mud pot is considered as best, better and good for sneha kalpana respectively. Considering the above aspects taken into account, the study is designed to prepare AKT and also the influencing variables of vessel in scientific method were presented.

Materials and Methods:

Aims and objectives:

1. To compare the different samples of AKT prepared by using different vessels through analytical parameters.
2. To decide the ideal ratio of *Kshara* and *jala* and suitable vessel for the preparation of AKT.

MATERIALS AND METHODS:

The drug Apamarga is collected by considering all the criteria's explained in the classical reference like *agnayarutu*, *jangaladesha* (summer season and dry land). Sesame oil is extracted (cold press oil extraction) by collecting sesame seeds from market after its

standardization. Soft water is used for the pharmaceutical process.

Standardization of raw materials and apparatus used:

Before taking raw materials (*Apamarga*, *tila* and *taila*) for pharmaceutical process, they were analyzed as per Standard operative standardization guidelines and compared with API standards. The samples taken for the preparation passed all the parameters mentioned in API. The materials used were wide mouthed mud pot/ copper/ iron vessel, measuring cylinder, weighing balance, stainless steel spoon and glass container to preserve the end product.

Table 1. Results of standardization parameters of *Achyranthes aspera* (Whole plant)

Parameter	Results n = 3 %w/w	
	<i>Achyranthes aspera</i> (Whole plant)	
Loss on drying	7.71±0.01	
Total Ash	7.83±0.14	NMT 12.0
Acid Insoluble Ash	1.89±0.29	NMT 2.5
Water soluble Ash	4.91±0.25	
Alcohol soluble extractive value	2.18±0.24	NLT 6.0
Water soluble extractive value	12.38±0.40	NLT 11.0

Table no 2. Standardization parameter of Tila taila

Parameter	Results n = 3 %w/w
	<i>Tilataila</i> (Project sample)
Refractive index	1.4695±0.00012
Specific gravity	0.9361±0.000186
Acid value	12.62±0.4189
Saponification value	169.00±10.5039

Iodine value	198.96±12.73
Unsaponifiable matter (%)	8.06±0.0033
Peroxide value	0.4±0.0
Viscosity	56.46±0.0
Rancidity	Fat is not oxidized (No pink color)

Establishing the ratio:

The references for *AKT* are available in the Cakradatta, Gadanigraha, Vangasena and Yoga ratnakarthe, but the ratio of *kshara*, *sneha* and *ksharajala* is not clear. The ratio between *kalka* (paste), *sneha* (Oleaginous material) and *drava-dravya*(liquid media) in *Sneha kalpana* (Oleaginous preparation) is 1:4:16. [7] By following the same for *kshara-taila* preparations like *Ksharakalka*, *sneha* and *KsharaJala* (1 part of *Kshara* and 6 parts of water) in the ratio of 1:4:16 will lead to precipitate the combination and the fail to appreciate *siddhi lakshanas*. After many pilot studies the ratio of *kalka*, *sneha* and *drava-dravya* is 1:4:16 for *kshara*, *sneha* and *jala* respectively. During pilot study the quantity of *tila taila* used in the process was 50ml. This ratio may differ in large scale preparation.

Vessel:

As per rules of *anuktha paatra grahana* (wherever it is not specified), mud pot should be used in pharmaceutical process by default. [8] In initial stage of *AKT* preparation wide mouthed mud pot was used and more froth appeared, hence made difficult to assess the *siddhi lakshana* during the processes. The text

Abhinna Chinitamani has used copper vessel, iron vessel and mud pot for the purpose of *sneha kalpana* and grades them as best, better and good respectively [6] Considering such reference, the study was taken up in copper vessel, Iron vessel and mud pot to elicit the best suitable vessel for *sneha kalpana* having *kshara* as one of the major ingredient.

Pharmaceutical process:

As there were no direct references about the pharmaceutical preparation of *AKT*, the general method of preparation of *Sneha kalpana* was followed as per Sharangadhara [7]. Here *kshara*, *taila* and *jala* are used for the preparation of *AKT*. The *kshara* of *Apamarga* was prepared as per *Kshara vidhi nirmana* according to *SusruthaSamhita* [6]. The obtained *Apamarga Kshara* was taken for the preparation of *AKT*. All the three ingredients were taken together for the process [9]. Instead of the general *sneha siddhi lakshanas* the *Kshara taila siddhi lakshanas* as found in *vidika paribhasha pradeepa* was taken as a reference for preparation.

AKT is prepared in 3 different samples by changing the vessel for the process.

- AKT prepared in copper vessel.
- AKT prepared in Iron vessel.
- AKT prepared in mud pot.

Procedure: Vessels and all the apparatus were cleaned before As per Good manufacturing practice guidelines in the pharmaceutical process. Even the place of preparation was cleaned. The clean and dry glass container was kept ready to collect the end product. Whereas the new-mud pot was filled with dry leaves and burnt. It was washed with tap water and put to use. The procedure in all the three preparations remained same i.e., kshara as kalka form, gritha as sneha and jala as drava was used in 1:4:16 ratio (50gms:200 ml: 800ml). *Mrudu-agni* (mild fire) was maintained by keeping it on low flame of a domestic gas stove.

The vessel is kept on the fire to remove moisture content. Later tila taila is heated up to froth formation and left to self cool. Kshara, tila taila and water all are taken together for the process. The vessel is kept on the fire till the Kshara taila siddi lakshana. Kshara taila siddi lakshana is followed as per the reference of Vaidika Paribhasha Pradeepa. Wherein, he states *nasta-dugda-sama-akruthi* (like spoiled milk appearance) and at the end point

phenodaya-nishpathi (the froth that generated shall settles down) were taken as *siddhi lakshana*.

Observation during pharmaceutical preparation:

During pharmaceutical process, all the three vessels show the *phena-utpathi* (rising of froth) in the beginning, bubbles starts appearing at the periphery of the vessel. At the time of its end point, *phena-nishpathi* along with *nasta-dugda-sama-akruthi* was observed. If vessel is kept on fire excepting the general sneha siddi lakshana, presence of froth obstruct the assessment and only salt will remain at the end.

But froth was more in mud pot when compare to other two vessels. Taila separation was seen properly in both the iron and copper vessels, but in mud pot it was hard to identify the separation. It implies the superiority of both iron and copper vessels in the *Kshara taila kalpanas* (pharmaceutical process). At the endpoint, the bubble size and number will increase, later it subsides and Curdling of kshara is observed. Immediately the vessel must be removed from the *agni* (fire) and *taila* (AKT) is decanted to a glass container.

Table 3- Showing different stages of Apamarga Kshara taila preparation.

Copper vessel	Iron vessel	Mud Lid
		
<p>Boiling with big bubbles Appearance of oil Fumes reduced Foam increased(more) Sound started.</p>	<p>Amount of big bubble increased. Oily appearance increased.</p>	<p>Foam increased with more bubbles</p>
		
<p>- observed spoiled milk appearance. -Pindeebhuta of kalka Well Separation of oil. -Also oil coming from periphery of the vessel.</p>	<p>White foam appearance increased. Oil appearance +++</p>	<p>observed inward boiling</p>
		
<p>Stage of completion</p>	<p>Stage of completion</p>	<p>Stage of completion</p>

Standardization:

Raw material authentication as per the pharmacopoeia standards raw material, authentication was done by Organoleptic and other parameters like Macroscopic and Microscopic identification. Foreign matter, total ash, acid-insoluble ash, water soluble ash, alcohol-soluble extractive, water - soluble extractive, moisture content(loss on drying), high-performance thin layer chromatography(HPTLC) are the other parameters analyzed. The report obtained of the crude raw materials used comply with the pharmacopoeial standard values. Analytical parameters of extracted oil complies with the standards.

Microbial load: As a part of standardization the raw drug *Apamarga* was given for microbial load estimation. But, it was more than the acceptable value. The reason behind this was the procured drug was dried under the sunlight in open place. In this study, the drug was used in the form of ash to extract the alkaline material, thus microbial load was not having any major role here.

Standardization of end product:

pH Value: The pH of *Apamarga Kshara* is 10.92 whereas, pH value of AKT prepared in copper vessel shows acidic and AKT which was done in iron and mud pot was slightly alkaline in nature.

Table no. 4. pH percentage in different samples (products) prepared in different vessels

<i>Apamarga Kshara</i> pH- 10.92			
Sl.no	Vessel	pH Value	%
1	Prepared in Copper vessel	4.6	42.12%
2	Prepared in Iron vessel	9.0	82.04%
3	Prepared in Mud vessel	8.1	74.17%

Physico-chemical parameters of *Apamarga Kshara taila*

There was no much significant change in Refractive index, Acid value, Specific Gravity, Viscosity and Unsaponifiable matter in all the samples (prepared in different vessel). The

Saponification value of *Apamarga Kshara taila* was found more in Mud pot preparation. The iodine value was also found more in case of mud pot prepared *Apamarga Kshara taila* indicating more in unsaturated form in comparison to copper and iron vessel.

Table 5. Physico-chemical parameters of Apamarga kshara Taila

Parameters	Results n=3 %w/w		
	Apamarga kshara taila (Copper)	Apamarga kshara taila (Iron)	Apamarga kshara taila (Mud pot)
Refractive index	1.47062	1.47112	1.47012
Specific gravity	0.884±0.00	0.935±0.0	0.8914±0.0
Acid value	0.56±0.003	0.56±0.003	0.55±0.006
Saponification value	297.43±0.006	261.05±0.003	312.27±0.000
Iodine value	118.67±0.006	116.88±0.003	123.75±0.003
Peroxide value	6.37±0.003	0.99±0.006	2.77±0.006
Unsaponifiable matter	1.72±0.003	3.10±0.03	1.83±0.003
Viscosity	88.00±0.01	88.02±0.01	88.02±0.00

Particle size assessment

EHT- Accelerating Voltage, WD- Working distance (Distance between objective and lens and a sample), Mag- Magnification.

Table 6: Particle size assessment Apamarga Kshara

Sample assessed in	EHT	WD	Magnification	Particle size
1µm	15.00KV	9.0mm	20.00 KX	176.4 nm-197.1 nm
1µm	15.00KV	6.5mm	25.00 KX	187.5 nm-198.9 nm
1µm	15.00KV	7.0mm	18.00 KX	190.5 nm- 221.4 nm

EDAX report EDAX: Elemental analysis of *apamarga kshara* Weight % telling about the relative concentration of the element in the sample (because all the elements analyzed are normalized) Ash of the plant mainly contains Potassium. The EDAX report of *apamarga kshara* shows more of potassium and oxygen. Apamarga Kshara Sample was assessed in 200 µm, the report shows that the concentration of Potassium Wt% is 43.35 and oxygen is Wt% 37.21. Less than 40 µm oxygen was Wt% 31.53 and potassium was Wt% 49.17. Less than 50

µm Potassium was Wt% 46.65 and oxygen was Wt% 35.86.

DISCUSSION:

Preparation of Kshara was done as per the reference of Acharya Sushruta in which volumetric measurement was taken for ash and water in the ratio of 1:6 respectively. The Kshara obtained was taken for the preparation of AKT. The reference of AKT and its indication is mentioned in many granta, but pharmaceutical aspect is not clear. Here *kshara* is considered as kalka and instead of

the *ksharajala* the soft water was used. In many of the references *ksharajala* is indicated for usage use as *dravadravya*, but if *ksharajala* is taken along with *ksharakalka*, the quantity of *kshara* will increase and leads salting out effect. After many pilot studies, the ratio has been fixed as 1:4:16 (*kshara:sneha:jala* respectively). In place of anukta (not specified) of vessel Acharya Sharangadhara has mentioned to use earthen pot, but in case of sneha kalpana it is not stated. The Abhinna Chintamani recommends using either of copper, iron or mud pot. Further he also says that copper vessel is best as best suited, iron the better and the least is the mud pot. The same was found true in this study. The mud pot, where in the separation of the sneha is not clear in comparison to other two vessel. Also the froth was more in mud pot when compare to other two vessels. Either the use of iron or copper vessel does yield a good amount of sneha when compared to mud pot. In the copper vessel, the assessment of end product is easy to find, which was clearly appreciated during preparation. The general sneha siddhi lakshana^[10] cannot be accepted in case of Kshara taila. The vaidhika paribhasha pradeepa is taken as a reference for Kshara taila siddhi lakshana as *phena-nishpathi* and *nasta-dugda-sama-akruthi*. Besides these two lakshana, any other sneha siddhi lakshanas are considered unacceptable.

In case of Kshara taila preparation, taila is mixed with alkaline solution. When alkalis are heated along with esters, orthoester will be formed as soon as hydroxide anions attacks the carbonyl group of the ester. Later expulsion of the alkoxide generates a carboxylic acid. *At this stage more fume will be observed*. Carboxylic acid and salts having alkyl chains longer than six carbon exhibit unusual behavior in water due to the presence of both hydrophilic (CO₂) and hydrophobic (alkyl) region in the same molecule. Depending on the nature of the hydrophilic portion these compounds may form monolayers on the water surface or sphere- like cluster, called micelles in solution. *At this stage spoiled milk appearance will be observed*. Immediately the vessel must be removed from fire and oil is separated. If heating is continued, the lipid form micelles the hydrophobic tails interact with each other and this interaction releases water from the hydrophobic tail and hence Sneha siddhilakshana cannot be expected.

Analytical parameters of all the three samples were of not much difference except pH. The pH value of Apamarga Kshara Taila prepared in Copper vessel shows acidic. The sample which is prepared in Iron and Mud pot is alkaline in nature. The main use of Apamarga Kshara Taila is in Karna Roga (Ear problems). Ear canal skin has pH of 2.89 to 7.83. Most of the topical ear drops preparations (2/3rd) were of acidic

and remaining 1/3rd were alkaline in nature. So, as far as the vessel is concerned Apamarga Kshara Taila can be prepared in copper vessel. The saponification value is not showing significant difference in the results obtained when prepared in copper, iron and mud pot. The iodine value is more in case of mud pot prepared AKT indicating it is in unsaturated form. As per EDAX report of *Apamarga Kshara* shows more of potassium and oxygen in its elemental composition.

CONCLUSION:

- *Kshara tantra* was a specialization at the time of Acharya Charaka. Place of collection of herbal drug plays an important role during Kshara preparation.
- Even though *Kshara taila* comes under *taila prakarana* (concept), we cannot accept any of taila siddhi lakshanas to assess its completion.
- *Kshara as kalka, gritha as sneha* and *jala as drava-dravya* should be taken in the ratio of 1:4:16 respectively prepared in small quantity.
- pH value of Apamarga Kshara Taila prepared in Copper vessel acidic signifies the area of its application- Otic preparations. The sample which is prepared in Iron and Mud pot is alkaline in nature. Considering pH parameter copper vessels is best suitable for end point

assessment Copper vessel is better for both pH and assessment of end point.

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