

PHARMACEUTICAL STANDARDIZATION OF ASTERCANTHA LONGIFOLIA KSHARA

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ABSTRACT

Objective: The present study was aimed for establishment of SMP (standard manufacturing procedure) of *Astercantha longifolia* (*A. longifolia*) *kshara* and to develop its quality control parameter.

Methods: The *kshara* was prepared as per the AFI (Ayurvedic Formulary of India) guideline and for the purpose of standardization three batches were prepared and its mean and standard deviation was calculated.

Results: In the present study it was discovered that the average percentage yield of 3 batches of *A. longifolia kshara* obtained from a completely dried whole plant 0.81% w/w. Physico-chemical analysis of powder showed foreign matter to be less than 1% w/w, loss on drying 27.5 % w/w, total ash less than 9%, acid insoluble ash to be less than 1%, water soluble extractive value and alcohol soluble extractive value as 10.78% w/w and 5.45 % w/w respectively and pH to be 7.3 which is in accordance with quality standards to be preserved, also Physico-chemical parameters applied to *kshara* reveals loss on drying as 13.35% w/w and pH to be slightly basic in nature i.e., 7.93.

Conclusion: Many references in the classics are mentioned regarding the preparation of *kshara*; however, as per the findings of the present study, it might be concluded that this method is the standard method to get the maximum yield of *A. longifolia kshara*.

Keywords: Ash, *Astercantha longifolia*, *Kshara*, Standardization, Whole plant

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INTRODUCTION

Kshara is alkaline in nature. It is derived from certain plants as well as minerals and animal products which contain more alkaline substances by an evaporation method, which may be used as single, or compound, or mixture form. *Panchavidha kasaya kalpana* (five basic preparations) are fundamental preparation in *Ayurveda* pharmaceuticals. Various dosage forms are derived from these fundamental preparations over time, having long shelf life, stability and strong action like *guti* (pills), *vati* (tablets), *syrup*, *asava-arishta* (fermented preparations), *sneha kalpana* (oil based preparations), *kshara* (Alkali) etc. *Kshara Kalpana* (alkaline preparations) is one of them. The process of preparation of *Kshara* involves the extraction of 'alkalis' from ash of dried plants, minerals and animal products. *Acharya Charaka* has mentioned 18 parts of herbal plants which can be used in medicinal purpose and *Kshara* is one among them [1]. *Sushruta* has narrated *Kshara* in scope of *Shalyatantra* due to its qualities like *chedan* (excision), *bhedan* (incision), *lekhana* (scraping) etc. [2] *Acharya Sharangadhara* [3] *Acharya Yadavaji Trikamaji* [4] has mentioned varieties and method of preparation of *Kshara* and *Rasataranginikar* [5] have described the method of preparation, varieties, properties, application, and doses of *Kshara*. It is said that diseases which are difficult to treat can be cured by *Kshara* therapy [6]. *Kshara* therapy not only minimizes complications but also reduces the recurrence of diseases. *Kshara* can reduce the chances of post-surgical infections due to its alkalinity. *Kshara* has the top most place in all surgical and para-surgical measures [7]. It can be used externally and internally according to the ailments of the body.

According to *Chakrapanidatta kshara* of *A. longifolia* is administered internally along with *gomutra* (cow's urine) or water in case of *shotha* (edema). The whole plant *kshara* of *A. longifolia* is used in case of *Mutraashmari* (urinary stones), *pittaashmari* (gall bladder stones), *shotha* (edema), *mutrakrichha* (reduced micturition) and *udararoga* (digestive complaints) [8].

At present herbal remedies are having a vital role in health care systems because these drugs are easily available at low cost, safe

and people have belief in them. As the usage of these herbal medicines has increased, issues regarding their quality, safety, and efficacy have raised up.

Hence, keeping the current trend in mind, an attempt was made to develop a Standard Manufacturing Process (SMP) for *A. longifolia kshara* and evaluate to evaluate its quality control parameter.

MATERIALS AND METHODS

Collection, identification and authentication of raw drug

The fresh drug sample was collected in bulk amount from the outskirts of Junagadh (21.5° N, 70.4° E). After collection, first of all the sand and foreign material was removed and then washed thoroughly with running water, dried in shade and used for study. The sample was verified by Dr. C. R. Harisha, Head, Department of Pharmacognosy, ITRA and verified voucher specimen has been kept in the Pharmacognosy laboratory, Vide no: Ph. M. 6330/2020-21. Whole plant of *A. longifolia* was collected in month of February.

Preparation of plant powder material for preliminary study

After washing and complete drying of *A. longifolia* whole plant, it was blended into a coarse powder using a mechanic blender. The powder was subjected to various organoleptic and physicochemical analysis such as colour, Odour, taste, texture, Foreign matter, pH. [9], ash value [10], acid insoluble ash [11], water-soluble ash [12], loss on drying [13]. For the purpose of standardization, all the parameters were run thrice to obtain accurate and precise results and reduce the chances of error.

Method of preparation of *kshara*

For the purpose of standardization, three batches of *kshara* were prepared and its mean and standard deviation (SD) value were calculated.

Initially, the *kshara* preparation process was divided into three main steps i.e. *purvakarma* (pre-operative), *pradhankarma* (operative) and *paschatkarma* (post-operative) [14].

In *purvakarma* (pre-operative) the ash was prepared from the drug. The freshly collected whole plant of *A. longifolia* was cleaned, chopped into small pieces and dried thoroughly in the shade. It was then exposed to fire in a big iron pan and on a shelf cooling, the ash was collected and filtered through sieve no. 40.

Now comes the *pradhankarma* (operative) that includes the preparation of *ksharajala* (water containing alkali), in which the ash was taken and dissolved in six parts of water w/v. the mixture was blended properly and allowed to stand for overnight in an undisturbed condition. Next day, the supernatant liquid was

decanted carefully and filtered through a four-folded cotton cloth till clear filtrate was obtained.

At last, the final step, *paschatkarma* (post-operative) comprises of evaporation of *ksharajala*. The *ksharajala* obtained was taken in a stainless steel vessel and heated over gas stove at low to mild flame till all the water portion gets evaporated. A white coloured substance deposited at the bottom of the vessel was observed as *kshara*, which was collected by scrapping the surface of the vessel and then stored in an air-tight glass container. Plate showing the whole process of *Kshara* preparation was pictured in fig. 1.

METHOD OF PREPARATION OF *A. LONGIFOLIA* *KSHARA*



Fresh *A. longifolia* wholeplant



Dried pieces of *A. longifolia*



Burning of *A. longifolia* plant



Ash of *A. longifolia*



Ksharajala



In process *Ksharajala* evaporation



Complete evaporation of
Ksharajala



A. longifolia Kshara

Fig. 1: Step by step preparation of *A. longifolia* Kshara

RESULTS AND DISCUSSION

The result concerning to organoleptic and physicochemical parameter of *A. longifolia Kshara* has been detailed in table 1 and table 2, respectively. The physicochemical standards tends to serve as a preliminary test for the standardization of any formulation. Ash value and acid-insoluble ash is useful in determining the authenticity and purity of the drug. Analysing the foreign matter helps in reducing the chances of adulteration of drug as much as possible. Water extractive

and alcohol extractive values provides idea about the percent of different active constituents present in them and also, these values can serve as important quantitative standards. Percent weight loss on drying (LOD) or moisture content was found to be 27.5% w/w in powder and 13.53% w/w in the case of *kshara* as plant powder and *kshara* both were naturally hygroscopic in nature tend to give higher LOD values, but the less value of moisture content, it could prevent bacterial, fungal or yeast growth and therefore care should be taken while storage of such kind of drugs that can easily caught moisture.

Table 1: Organoleptic characters

Characters	<i>A. longifolia</i> whole plant powder	<i>A. longifolia kshara</i>
Colour	Green	Off white
Odour	None	None
Taste	Astringent	Salty and Astringent
Texture	Rough	Smooth

Table 2: Physicochemical parameters of *A. longifolia* whole plant powder and *kshara*

Parameters	<i>A. longifolia</i> whole plant powder			mean±SD
	1 st	2 nd	3 rd	
<i>A. longifolia</i> whole plant powder				
Foreign matter (w/w)	1.003	0.579	0.645	0.74±0.22
Loss on drying at 105°C (% w/w)	27.30	27.10	28.10	27.5±0.52
Ash value (% w/w)	6.7	6.4	6.6	6.56±0.15
Acid insoluble ash (% w/w)	0.3	0.5	0.3	0.36±0.11
% (w/w) Water soluble extractive	10.28	11.28	10.80	10.78±0.50
% (w/w) Alcohol soluble extractive	4.68	5.80	5.88	5.45±0.67
pH	7.5	7.0	7.5	7.3±0.28
<i>A. longifolia</i> whole plant <i>kshara</i>				
	Batch-1	Batch-2	Batch-3	mean±SD
Loss on drying at 105°C (% w/w)	13.2	13.9	13.5	13.53±0.35
pH	8.0	7.8	8.0	7.93±0.12

Data are expressed as mean±SD, n=3

Table 3: Ash formation to % yield of *A. longifolia* whole plant *kshara*

Observations	Batch-1	Batch-2	Batch-3	mean±SD
Weight of fresh <i>A. longifolia</i> whole plant (kg)	20.30	19.96	20.13	20.13±0.17
Weight of dry <i>A. longifolia</i> whole plant (kg)	9.49	8.98	9.24	9.23±0.25
Weight loss after drying (kg)	10.81	10.98	10.89	10.89±0.085
% (w/w) of loss after drying	46.75	44.98	45.90	45.87±0.88
Weight of ash obtained (g)	875	820	848	847.66±27.50
% (w/w) of ash obtained	4.310	4.108	4.122	4.18±0.11
Weight of ash taken (g)	875	820	848	847.66±27.50
Volume of water taken (ml)	5250	4920	5088	5086±165.01
<i>Ksharajala</i> obtained after filtration (ml)	3320	3150	3310	3260±95.39
pH	8.2	8.5	8.0	8.23±0.25
% (v/v) yield of <i>Ksharajala</i>	63.25	64.02	65.05	64.10±0.90
% (v/v) loss of <i>Ksharajala</i>	36.76	35.97	34.94	35.89±0.91
Time required for preparation of <i>Ksharajala</i> (hrs)	18	17	18	17.66±0.58
Volume of <i>Ksharajala</i> taken for evaporation (ml)	3320	3150	3310	3260±95.39
Time required for evaporation (mins.)	150	120	150	140±17.32
Yield of <i>Kshara</i> (g)	167	158	164	163±4.58
% (w/w) yield of <i>Kshara</i>	0.822	0.792	0.815	0.810±0.016

Data are expressed as mean±SD, n=3

The above table 3 depicts data pertaining to preparation of *A. longifolia* whole plant *kshara* from weight of fresh drug to % yield of *kshara*.

Asteracantha longifolia Nees, Acanthaceae, is a source of the Ayurvedic drug, *A. longifolia* and the Unani drug, *Talimakhana*. It is mentioned in Ayurvedic treatise like *Sushruta Samhita* and *Charak Samhita* as *Rasayan* or rejuvenator. *A. longifolia* is described in Ayurvedic literature as *Ikshura*, *Ikshugandha* and *Kokilasha* i.e., having eyes like the *Kokila* or Indian Cuckoo [15].

Kshara is the alkaline substances obtained from plant ash. It is prepared by water-soluble ash of dried plant through special procedure known as *kshara kalpana*. According to *Shushrut*, *kshara*

of plant source origin causes *Ksharana* (removes) of *mamsa dhatu* (body fat) by excision, cutting, scraping, mitigates of all three *Doshas* (*Vata*, *Pitta*, *Kapha*) [16]. Generally, *kshara* has properties like *chedan* (excision), *bhedan* (incision), *lekhana* (scraping), *krimighna* (anti-helmenthic), *shodhana* (cleaning), *ropana* (healing), *pachana* (digestive) [17], because of which it is being used to treat various ailments.

Despite the advent of modern technology in standardization of Ayurvedic formulations, only a few are standardized so far. There are various methods of preparation of *Kshara*, mentioned in classical texts. The method of preparation of *kshara* may vary from each other in the different classical text on the basis of ratio of water and

ash, duration of soaking of ash with water, type of vessel and filtration pattern, in this study the preparation of *A. longifolia Kshara* has been carried out by classical method described in AFI [14]. Here, an attempt was made to prepare *A. longifolia Kshara* and to develop its SMP (Standard manufacturing procedure) and its physico-chemical evaluation was done. In this study three batches were prepared for the pharmaceutical standardization and the whole process was divided into three stages.

Approximately 20.13 kg fresh and matured *A. longifolia* whole plant was collected, cleaned and dried. The whole plant was made into small pieces for better drying. After complete drying about 9.23 kg dried whole plant was obtained which is 45.87 % w/w loss. The reason behind such a big loss is due to loss of water content. It was burnt in a vessel (not on open ground) to prevent contamination during burning. For proper burning, dried whole plant was added little by little into the fire. After burning of *A. longifolia* whole plant, the total ash obtained was 847.66 g, which is 42.10 % w/w of fresh *A. longifolia* whole plant.

The ash obtained was mixed with 6 times [14] of distilled water and soaked overnight in an undisturbed condition for the preparation of *ksharajala*. Precautions were taken while obtaining *ksharajala* to

avoid the entry of sediments. For this *Acharyas* had specified to filter the contents through multi- folded cloth and hence the *ksharajala* was filtered through 4 folded cotton cloth till a clear filtrate was not obtained [4]. i.e. it did not contain macro particles of ash and enough time duration was provided for complete sedimentation of undissolved macro particles of ash to get clear *ksharajala*. The average percentage of *ksharajala* obtained was 64.10 % v/v and the loss observed was 35.89 % v/v, it may be due to the soaking of water in ash which cannot be separated. De-mineralized water was used to avoid any intrusion of inorganic salts present in tap water that may lead to false results.

Time, temperature and drop in water level during evaporation of *ksharajala* was noted table 4. The minimum temperature recorded was between 26 °C to 27 °C while maximum was 100 °C. At first, *ksharajala* appears to be transparent and clear liquid. As heating started and temperature increases aggregation, vapours and crackling sound were also increased. Now the colour was changed from white to yellowish to brownish gradually along with rise in temperature. Moving towards the final stage *kshara* starts sticking to the vessel and bumping was observed. At this stage continuous stirring was done to avoid bumping and sticking of *kshara* to the vessel. Finally a white coloured *kshara* was obtained.

Table 4: Time, temperature and inference of dropping water level during evaporation of *ksharajala*

Time (min)	Temperature °C				Observations
	Batch-1	Batch-2	Batch-3	Average	
Initial	27 °C	28 °C	27 °C	27.3 °C	Yellowish colour liquid with characteristic smell and salty taste
0-30	75 °C	73 °C	73 °C	73.6 °C	Aggregation and Vapour started
30-60	85 °C	80 °C	84 °C	83 °C	Creaking sound, Aggregation and Vapour increased
60-90	90 °C	95 °C	90 °C	91.6 °C	Slowly boiling started from center
90-120	100 °C	100 °C	100 °C	100 °C	Vigorous boiling, <i>kshara</i> started adherence to wall of the vessel, color changes from Brownish to dark brown
120-150	100 °C	100 °C	100 °C	100 °C	Brownish white <i>kshara</i> was obtained

Above table 4 portrays the changes observed during the final stage of *kshara* preparation

kshara is considered as a water soluble ash, but all water soluble content cannot be obtained within a single wash and some of them may remain as residue. The solubility of *kshara* increases with increase in amount of water and therefore, the yield also increases with increase in number of washings [18]. With the current standardization procedure, we get substantial information for proper identification of drug and the ultimate purpose of standardization is to quality and ensure therapeutic efficacy of drug.

CONCLUSION

In this study, an attempt has been made to generate the SMP (standard manufacturing procedure) of *A. longifolia kshara* and to develop its quality control parameter. The maximum percentage yield from average of 3 batches of *A. longifolia* whole plant *kshara* was found to be 0.81w/w. The limitation of this study was that the properties and quality of *kshara* of *A. longifolia* whole plant may vary according to the place of collection of plant.

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AUTHORS CONTRIBUTIONS

Dr. Mukesh B. Nariya presented a significant contribution by conscripting the manuscript and extensively reviewed to improve quality of the manuscript and Dr. B. J. Patgiri helped in providing the space for the preparation of *kshara* and also involved in drafting the manuscript as per the need of the journal.

CONFLICT OF INTERESTS

No conflict of interest

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