

Standard Manufacturing Procedure of Chincha Kshara Prepared from Fruit Bark of Chincha (Tamarindus Indica Linn.)

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Abstract—Introduction: Systemic knowledge of medicine, including their identification, acquisition, processing, preservation and distribution is highly valued in Ayurveda. Ayurveda has long explored the therapeutic potential of various natural substances, including metals, minerals, plants and animal products. It has been classified into several groups. Among them, Chincha Kshara (alkali preparation made with different parts of *Tamarindus indica* Linn.) is a type of Kshara, which is useful in various diseases. Chincha Kshara constitutes a vital component in renowned Ayurvedic formulations like *Shankhavati* and *Mahashankhavati*. But till date identification and authentication criteria of Chincha Kshara has been not published. Aim: To develop a standard manufacturing procedure (SMP) of Chincha Kshara prepared from fruit bark of Chincha (*Tamarindus indica* Linn.) and also to develop preliminary analytical profile of it. Materials and Methods: Chincha fruit bark was collected, dried and burned. Kshara was prepared as per the reference of *Rasa Tarangini* with three washes. Preliminary physicochemical parameters i.e. pH, loss on drying at 105°C, total ash (%w/w), acid insoluble ash (%w/w) and water soluble extractive (%w/w) were carried out. Results: An average of 19.09% Chincha Kshara was obtained in context to ash and 0.71% in context to dry fruit bark. An average pH, loss on drying at 105°C, total ash, acid insoluble ash and water soluble extractive of Chincha Kshara were 12.22, 2.33%, 88.14%, 0.003%, 99.50% respectively. Conclusion: The current observations and results can be considered as a lead for future studies.

I. INTRODUCTION

Systemic knowledge of medicine, including their identification, acquisition, processing, preservation and distribution is highly valued in Ayurveda. Ayurveda has long explored the therapeutic potential of various natural substances, including metals, minerals, plants and animal products. Rasashastra and Bhaishajya Kalpana, the pharmaceutical branch of Ayurveda, meticulously document the utilization of these resources for medicinal purposes. Kshara, an alkaline substance derived from the ash of plants, animal products or minerals, stands out as a prominent example. Kshara preparation involves extraction of the alkaline components from the ash of dried plants. Ayurvedic classics recommend using various plant parts, such as stem, stem bark or whole plant for Kshara preparation. But in the *Rasaratnasamuchchaya*, Chincha Kshara derived from *Kavacha* (fruit bark) is utilized as a component in *Rasendra Nagarasa*, which is indicated in diseases like *Meha* (Diabetes) and *Kushtha* (Skin diseases). It means Chincha Kshara can also be prepared from fruit bark. Fruit bark is abundantly available annually and often discarded as waste material, this implies the feasibility of preparing Chincha Kshara from fruit bark. In contrast, extracting Kshara from stem bark, stem or the entire plant could adversely affect the tree.

Various perspectives on Kshara preparation methods, encompassing the ash-to-water ratio, soaking duration, cloth folding, filtration methodology and vessel specifications are evident across various Ayurvedic classics such as *Sushruta Samhita*, *Ashtanga Samgraha*, *Ashtanga Hridaya*, *Chakradatta*,

Sharangadhara samhita, *Ayurveda Prakasha*, *Rasa Tarangini*, *Ayurveda Sara Samgraha* etc. Notably, Chincha Kshara constitutes a vital component in renowned Ayurvedic formulations like *Shankhavati* and *Mahashankhavati*. The reliability of Chincha Kshara in the market is questionable due to challenges related to the absence of robust identification and authentication criteria. Furthermore, the Ayurvedic Pharmacopeia of India (API) lacks of established standards for Chincha Kshara.

Previously only two research works have been carried out on Chincha Kshara derived from fruit bark and one on Chincha Kshara derived from stem. After reviewing them, it was found that Chincha Kshara derived from fruit bark has higher yield in compare to stem. In light of these considerations, this study seeks to establish a standard manufacturing procedure for Chincha Kshara derived from the fruit bark of Chincha and also to develop preliminary analytical profile of it.

II. MATERIALS AND METHODS

A. Collection of raw material:

Fresh fruit bark of Chincha was collected from the campus of Government Ayurved Pharmacy, Rajpipala, Gujarat, India in the month of May 2022 by adopting Good Collection Practices guidelines. The drug was identified and authenticated in the pharmacognostical laboratory of Upgraded Department of Dravyaguna, Government Ayurved College, Vadodara, Gujarat.

B. Preparation of Chinch Kshara:

To develop standard manufacturing procedure (SMP), 3 batches of *Chinch Kshara* (CK) were prepared as per the reference of Rasa Tarangini with slight modification.

The whole process is divided into 3 steps:

1. Preparation of ash
2. Preparation of *Kshara Jala*
3. Evaporation of *Ksharajala*

1. Preparation of ash

Completely dried fruit bark was ignited and allow to burn completely in an open iron pan. After self-cooling, ash was collected. [Figure no. 1(a) to 1(c)]

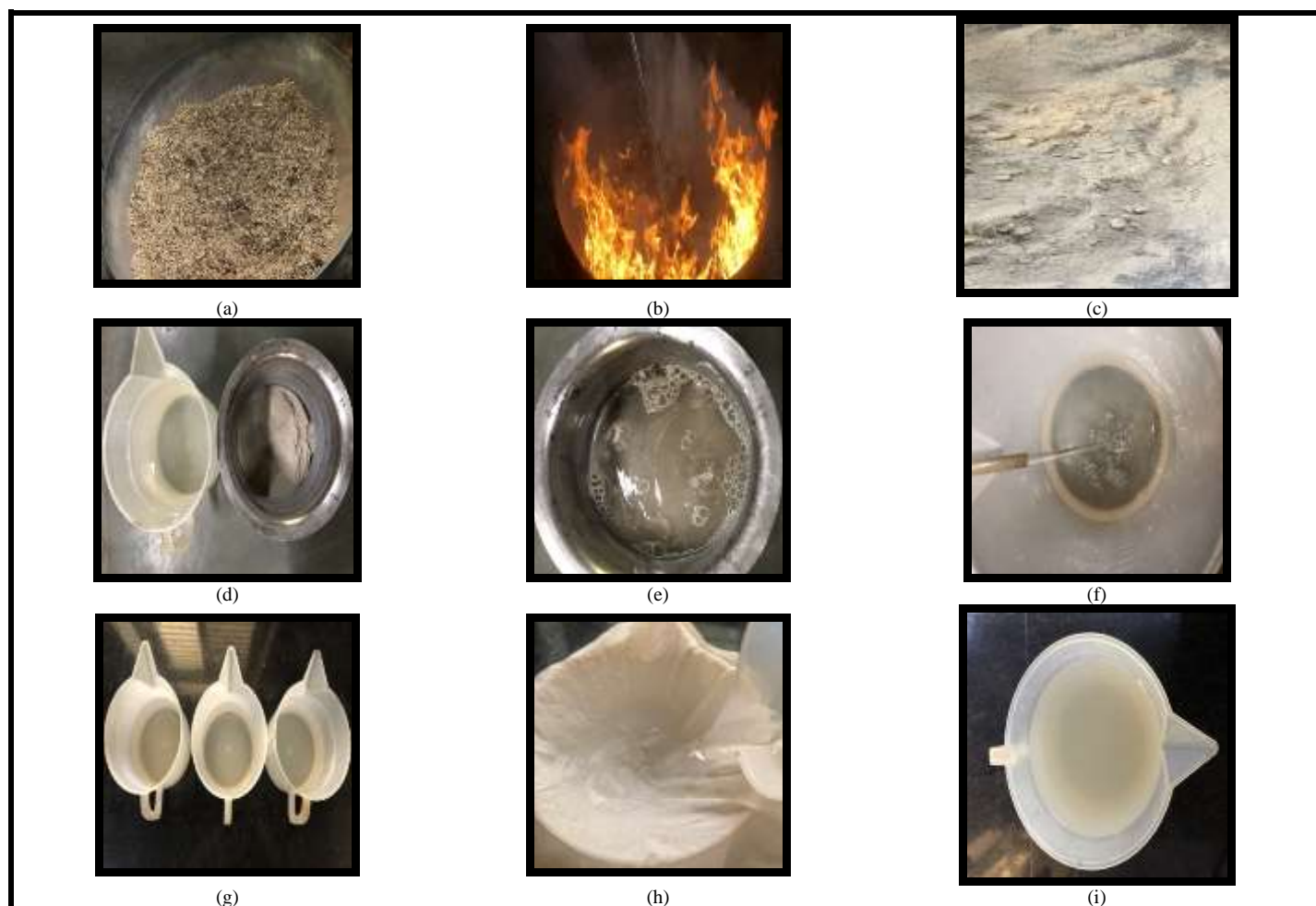
2. Preparation of *Ksharajala*

To develop SMP, 3 batches of *Ksharajala* were conducted containing 500 ml of ash in each batch from obtained total ash. 500 ml ash was taken in a stainless steel vessel and four times of demineralized (DM) water was added. Contents

were mashed thoroughly with hand and left undisturbed for three hours. After three hours, the supernatant layers were decanted by rubber tube into another vessel. This was labelled as *Ksharajala-1*. Residual ash was again added with DM water as same quantity of previously decanted filtrate and kept undisturbed for three hours. Clear liquid was drained and labelled as *Ksharajala-2*. Further, the residue obtained at the end of second wash was again added with DM water and repeat process to obtain *Ksharajala-3*. After being combined and filtered seven times over three layers of folded cotton cloth, all three *Ksharajala* were given the same label. [Figure no. 1(d) to 1(i)]

3. Evaporation of *Ksharajala*

Ksharajala was taken in steel vessel and heated over the gas stove till the entire water portion gets evaporated completely. *Kshara* was stored in an air tight glass container. [Figure no. 1(j) to 1(m)]



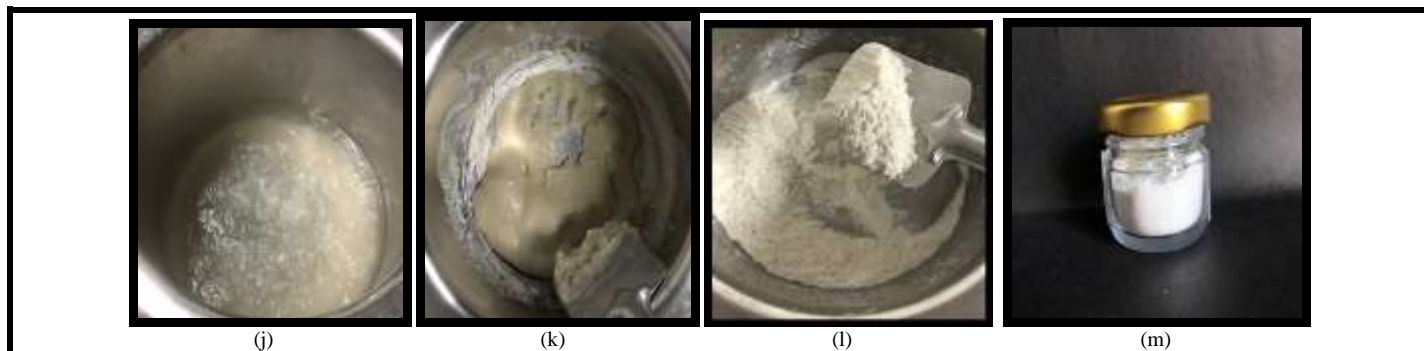


Figure 1: Unit operative procedure for *Chincha Kshara* prepared from fruit bark

(a) Dried fruit bark of *Chincha*. (b) Burning of fruit bark in big iron pan. (c) *Chincha* ash from fruit bark. (d) Ash and water. (e) Effervescent during addition of water in ash. (f) Decantation of *Ksharajala*. (g) *Ksharajala* 1, *Ksharajala* 2 and *Ksharajala* 3. (h) Filtration of *Ksharajala*. (i) *Ksharajala* after 3 washes. (j) Heating of *Ksharajala*. (k) Semisolid form of *Kshara*. (l) Last stage of *Kshara* preparation (m) Prepared *Kshara* stored in airtight glass container.

C. Preliminary analysis

Organoleptic characteristics like colour, odour, taste, texture and appearance were carried out. Preliminary physicochemical parameters including pH, loss on drying, total ash, acid insoluble ash and water soluble extractive were carried out at quality control laboratory, upgraded department of Rasashastra & Bhaishajya Kalpana, Government Ayurved College, Vadodara.

III. OBSERVATIONS AND RESULTS

Chincha fruit bark was dried completely in 08 days. As material was completely dried, it burnt quickly. After self-cooling, greyish white coloured ash was obtained with a characteristic odour. Results obtained during preparation of *Chincha* fruit bark ash are mentioned in table no. 1

Table No. 1: Results obtained during preparation of *Chincha* fruit bark ash

Sr. No.	Parameters	Results
1	Total quantity of Fresh <i>Chincha</i> fruit bark(kg)	50
2	Total quantity of Dry <i>Chincha</i> fruit bark (kg)	45.71
3	Total time taken for drying (Days)	8
4	Total time taken for preparation of ash (Hr:min)	27:20
5	Final weight of ash (kg)	1.70
6	Final weight of ash (l)	2.07
7	Final weight of ash (%)	3.72
8	Loss from dry <i>Chincha</i> fruit bark (kg)	44.01
9	Loss from dry <i>Chincha</i> fruit bark (%)	96.28
10	Loss from fresh <i>Chincha</i> fruit bark (kg)	48.3
11	Loss from fresh <i>Chincha</i> fruit bark (%)	96.6
12	Reason of loss	Due to burning of organic part of the material

An average 1252 ml *Ksharajala* was obtained in first wash followed by 1293 ml and 1376 ml in second and third wash respectively. When adding water to the ash during the *Ksharajala* preparation, effervescent was seen. After some times, ash was settled down at the bottom of the vessel and few ash particles were floating on the upper surface of the vessel. The color and flavor of *Ksharajala* were reduced with

every wash. Results obtained during preparation of *Chincha Ksharajala* are mentioned in table no. 2.

Table No. 2: Results obtained during preparation of *Chincha Ksharajala*

Sr. No.	Parameters	Results			
		Batch 1	Batch 2	Batch 3	Average
1	Volume of ash taken (ml)	500	500	500	500
2	Weight of ash taken (g)	410	407	409	408.67
3	Volume of water taken (ml)	4545	4558	4530	4544.33
4	Volume of total <i>Ksharajala</i> obtained after 3 washes (ml)	3915	3940	3905	3920
5	<i>Ksharajala</i> (%)	86.14	86.44	86.2	86.26
6	<i>Ksharajala</i> loss (%)	13.86	13.56	13.8	13.74
7	Times taken for preparation of <i>Chincha Ksharajala</i> (Hr:Min)	09:21	09:26	09:22	09:23
8	Reason of loss	Due to decantation and filtration			

The obtained *Ksharajala* had salty taste, characteristic odour, yellowish colour and slimy touch. During the phase of evaporation, temperature of liquid media and flame were recorded at regular intervals. [table no.3]

Table No. 3: Temperature of flame and liquid media at different interval during evaporation of *Ksharajala*

Time (Min)	Temperature (°C) of liquid media				Observation
	Batch 1	Batch 2	Batch 3	Average	
00	28.2	27.3	27.9	27.8	Yellowish coloured liquid with slight salty taste
0-30	61.3	62.4	60.5	61.4	Vapor started
30-60	93.4	94.2	92.3	93.3	Vapor increase and bubbling started
60-90	98.2	98.7	97.7	98.2	Crackling sound, <i>Kshara</i> starts to adhere to the wall of vessel
90-120	95.9	96.3	95.2	95.8	Vigorous boiling
120-150	97.1	96.2	96.9	96.7	Consistency became thick
150-180	79.7	78.2	79.1	79	The colour changed to brown from yellow, Brown coloured semisolid mass
180-188	73.9	73.6	73.1	73.5	White coloured solid <i>Kshara</i>

At the time of evaporation, the yellowish *Ksharajala* was gradually turned to light brownish semisolid mass with aggregation and crackling sounds. Finally a white coloured *Kshara* was obtained. Results obtained during evaporation of *Ksharajala* are mentioned in table no. 4.

Table No. 4: Results obtained during evaporation of *Ksharajala*

Sr. No.	Parameters	Results			
		Batch 1	Batch 2	Batch 3	Average
1	Volume of <i>Ksharajala</i> (ml)	3915	3940	3905	3920
2	Time taken for evaporation of <i>Ksharajala</i> (Hr:Min)	03:06	03:03	03:08	03:06
3	Final weight of <i>Kshara</i> (g)	78	79	77	78
4	Final weight of <i>Kshara</i> (%)	19.02	19.41	18.83	19.09
5	Reason of loss	Due to evaporation of water			

Organoleptic characteristics

Organoleptic characteristics of different samples *Chincha* fruit bark are mentioned in table no. 5

Table No. 5: Organoleptic characteristics of powder, ash and *Kshara* of *Chincha* fruit bark

Sr No.	Characters	Fruit bark powder	Fruit bark ash	Fruit bark <i>Kshara</i>
1	Colour	Dark brown	Light brown	White
2	Odour	Characteristic	Characteristic	Odourless
3	Taste	Astringent	Salty	Salty
4	Texture	Rough	Smooth	Smooth
5	Appearance	Solid	Powder	Powder

Preliminary physicochemical parameters

Preliminary physicochemical parameters of *Chincha* fruit bark powder and ash are mentioned in table no. 6

Table No. 6: Preliminary physicochemical parameters of *Chincha* fruit bark powder and ash

Sr. No.	Parameters	Results	
		fruit bark powder	fruit bark ash
1	pH (1% aqueous solution)	6.13	11.83
2	Loss on drying at 105 °C (% w/w)	4.12	1.20
3	Total ash (% w/w)	3.29	95.88
4	Acid insoluble ash (% w/w)	4.19	2.34
5	Water soluble extractive (% w/w)	14.10	24.61
6	Alcohol soluble extractive (% w/w)	9.10	2.65

Preliminary physicochemical parameters of different batches of fruit bark *Kshara* are mentioned in table no. 7.

Table No. 7: Preliminary physicochemical parameters of *Chincha Kshara*

Sr. No.	Parameters	Results			
		Batch 1	Batch 2	Batch 3	Average
1	pH (1% aqueous solution)	12.18	12.27	12.23	12.22
2	Loss on drying at 105 °C (% w/w)	2.57	2.31	2.10	2.33
3	Total ash (% w/w)	87.37	88.12	88.93	88.14
4	Acid insoluble ash (% w/w)	0.00	0.00	0.01	0.003
5	Water soluble extractive (% w/w)	99.91	98.83	99.76	99.50

IV. DISCUSSION

Chincha is well known herb used for different therapeutic since *Samhita* period. All most all parts of this plant are found

to be useful for therapeutic purposes. For preparation of *Chincha Kshara* different parts of *Chincha* as like *Kashtha* (stem), *Twak* (stem bark), *Kavacha* (fruit bark) are mentioned in classics. *Kshara*, integral to Ayurvedic therapeutic practices for centuries and it is also used in many pharmaceutical processes. Despite its historical prominence, classical literature has different opinion regarding method for *Kshara* preparation, as variations in ash and water proportions, soaking durations, and filtration procedures. For instance, *Acharya Sushruta* prescribes six times water and 21 filtrations, *Acharya Sharangadhara* suggests four times water with an overnight soak, and the author of *Rasa Tarangini* advocates four times water, maceration for three hours, and filtration through a three-folded cloth. Different recommendations also extend to the duration of keeping the contents undisturbed, ranging from overnight to 2-3 days.

Remarkably, classical texts are silent on the repetition of washings, yet contemporary research demonstrates a tendency toward adopting this practice. A comprehensive review of studies on *Chincha Kshara* revealed a prevailing preference for the *Rasa Tarangini* method. Notably, a previous study on *Chincha Kshara* from fruit bark, employing five repetitions, indicated an increment in yield with each wash. However, yields from the fourth and fifth washes were notably lower (2.12% and 0.68%, respectively) compared to the initial washes (11.15%, 9.33%, and 5.52% for the first, second, and third washes, respectively). In light of these findings, the present study opts for the *Rasa Tarangini* method with three washes, acknowledging the balance between tradition and empirical observations.

For preparation of ash, collected fresh material should be cleaned properly. Foreign particles, soil, mud, and other sticky material should be removed meticulously and dried in sunlight. To avoid contamination with soil, a controlled open-pan burning approach is adopted, facilitating the periodic repositioning of the material within the container. Incremental burning of dried material is advocated, with the gradual addition of material into the fire to ensure complete combustion. Intermittent stirring aids in achieving thorough incineration. Ash should be collected after self-cooling. 3.72% ash was obtained from dried fruit bark.

In the washing steps, the use of demineralized (DM) water is emphasized to prevent the addition of inorganic salts from tap water. The maceration of ash in water is executed for efficient mixing and maximal dissolution of contents, promoting optimal yield. After that, the contents should be allowed to settle for three hours without being disturbed. During the evaporation of *Ksharajala*, a non-reactive stainless steel vessel is employed to mitigate potential chemical reactions. Consistent mild to moderate heat is applied, and continuous stirring is implemented during the final stages to prevent burning and adhesion. The reason for the decline in *Ksharajala*'s color and taste after each wash was the ash's dilution with water. *Kshara* should be kept in airtight glass containers to avoid atmospheric reactions because it is hygroscopic in nature. An average 78 g (19.09%) *Kshara* was obtained in context to ash.

The degree of acidity or alkalinity of a sample solution is expressed by the sample's pH value. pH of fruit bark powder was 6.33 while pH of fruit bark ash, CK1, CK2 and CK3 were 11.83, 12.18, 12.27 and 12.23 respectively. Higher pH value indicates alkaline nature of material. The acid-insoluble ash (AIA) is used to estimate the amount of silica present, which is the indication of contamination with earthy material. In present study, AIA value was nearer to 0.01% in all batches of *Kshara*. It indicates that, these samples are free from contamination of earthy material.

This research explores the feasibility of utilizing fruit bark as a primary raw material for the preparation of *Chincha Kshara*, leveraging its abundant availability and frequent abandonment as waste. Preparation of *Chincha Kshara* from fruit bark can establish a sustainable and economically viable alternative to *Chincha Kshara* from stem, stem bark and other parts of *Chincha*. The findings contribute to the advancement of eco-friendly practices in the manufacturing of *Chincha Kshara*, utilizing an easily accessible and often overlooked resource.

V. CONCLUSION

The residues after a first wash should be processed further to obtain more *Kshara*. The current observations and results can be considered as a lead for future studies. The preliminary physicochemical parameters identified in this study can be regarded as a valuable reference point.

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