



## Research Article

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### PHARMACEUTICO-ANALYTICAL EVALUATION OF KADALIKANDA PANEEYA KSHARA

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#### ABSTRACT

As demands for various Ayurvedic herbo - mineral preparations increase in the market, manufacturers may be tempted to compromise on the quality of the product. Standardization of herbal drugs is essential to prove their quality and purity. In the present study, preparation of kadalikanda kshara (trial drug) has been carried out by classical method described in rasatarangini is not attempted till date. Pharmaceutical study is aimed to make the standard operative procedure for kadalikanda kshara (trial drug) & the preliminary physico-chemical profile was developed by analytical study. In the pharmaceutical study the method of preparation varies from other classics on the basis of ratio of water and ash, duration of soaking and filtration pattern. So, an attempt is made to prepare kshara (phyto-alkali) & to estimate the presence of trace elements in kshara (phyto-alkali) through analytical techniques to set a standard. After preparation white powder of kshara obtained was 64g, shows 37.20 % yield. This indicates the presence of ksharatwa (alkalinity) with quality and purity. The analytical parameters tested like physico-chemical parameters and quantitative inorganic analysis shows the preliminary standard for kadalikanda kshara (trial drug). Based on the output of analytical study it can be said that the drug has presence of elements like sodium, potassium, chloride, carbonate in traces and pH of kshara (phyto-alkali), which shows supportive effect to the study. The physico-chemical parameters and quantitative inorganic estimation of kadalikanda kshara (trial drug) can be taken as preliminary standards of the formulation.

**Keywords:** Ashmari, Kadalikanda Kshara, *Musa paradisiaca* Linn., Pharmaceutico-analytical evaluation

#### INTRODUCTION

Pharmaceutical technique is one which converts the natural substances into therapeutically potent dosage form which is easily absorbable and assimilable in the biological system by different methods of techniques, it can be termed as pharmaceutical processing. In pharmaceutical science, the main aim is to convert the raw material to finished product. Proper documentation of procedure must be done for the replication of the product. Ayurveda utilizes different forms of herbs in therapeutics. Because in present era plant derived products are gaining importance as medicinal products<sup>1</sup>. Kshara (Phyto-alkali) is one among such dosage form. Ksharas (phyto-alkali) are alkaline substances obtained from the water-soluble ashes of herbal drugs. Several ksharas (phyto-alkali) have been explained in ayurveda and kadalikanda kshara (trial drug) is one among them. Kadalikanda kshara (trial drug) is mentioned in authoritative books of ayurveda (susruta samhita and ayurveda formulary of india). Regarding the method of preparation different opinions exist regarding the specifications of nature of vessels used, proportion of water, time for sedimentation, cloth with different folding, etc. In the present study, preparation of kadalikanda kshara (trial drug) was carried out by classical method described in rasatarangini. In this method, the preparation varies from others on the basis of ratio of water and ash, duration of soaking and filtration pattern. Due to difference in method of preparation, there will be variations in the physico chemical parameters as well as the elements present in kshara (phyto-alkali).

#### MATERIALS AND METHODS

##### Pharmaceutical Study

The pharmaceutical study is divided into following sections: Collection of the drug; Authentication of the raw drug & Preparation of kadalikanda kshara (trial drug)

##### Collection of the drug

The raw drug (kadalikanda – rhizome of *Musa paradisiaca* Linn.) required for the preparation of medicine were procured from Koratty, Thrissur (Dist.) Kerala, in the month of February 2016.

##### Authentication of the drug

The authentication of the raw drug (kadalikanda – rhizome of *Musa paradisiaca* Linn.) was done at the Department of Dravyaguna, Sri Dharmasthala Manjunatheshwara College of Ayurveda and Hospital, Hassan

##### Preparation of Kadalikanda Kshara

##### Method of data collection

The kadalikanda kshara (trial drug) was prepared as per the reference of Rasatarangini. Here the drug and water ratio of 1:4 parts as per the kshara nirmana vidhi<sup>2</sup>. (Table 1)

Place of pre-processing of the drug like cleaning, drying was done at Department of RSBK, SDMCAH, Hassan.

#### Equipments Used

Iron vessel, Stainless steel spatula, clean cotton cloth (3 folded), Bucket (2), Porcelain Beaker (1000ml), Water, Heating Device, Airtight glass container

#### Selection of Raw Materials

- The Rhizome of the plant was procured
- Genuinity of all the drugs were tested and approved by the experts, Dept. of PG studies in Dravyaguna – ((Voucher no.-SDM/MD(Ayu)/01/2016))
- Properly cleaned for extraneous matter & rinsed in water for separating dust, mud, etc.

#### Method of Preparation

Kadalikanda (rhizome of *Musa paradisiaca* Linn.) wet drug (22.5kg) was taken and chopped into small slices, then dried completely under the sun light for 7 days. The dried slices about 1.185kg were taken and arranged in a heap in windless place, then it was ignited at 11.21am on 26/02/16. When the fire got extinguished, burned fully at 12.25pm and was allowed for swangasheeta (self-cooling) and completely cooled at 4.47pm. The ash obtained was 171gm (1300ml – volumetrically), pH of ash was 10.20. Later it was dissolved in 5200 ml water; i.e., 1 part (ash): 4 parts (water) macerated and kept undisturbed for 3hours. Then it was filtered till clear fluid (8 times filtration) was obtained by using a 3-folded cloth. After filtration the ksharodaka (alkaline water) was measured and it was 4000ml. The weight of residue left was 92g. After that, the filtrate was treated on fire in an iron vessel, on specific temperature, while it was slowly stirred with a ladle, till all the water content was evaporated. sweta varna kshara (white coloured phyto-alkali) was obtained weighing 64g. It was taken into glass container and preserved in air tight container. It was not exposed to moisture because of its hygroscopic nature.

#### Precaution

Drug should be dried properly before burning. It should not be covered during swangasheeta (self-cooling). Madhyamagni (moderate temperature) was maintained. Stirring was done at regular intervals. The vessel was kept open during the process. The kshara (phyto-alkali) obtained was kept into glass container.

#### Storage

The kshara (phyto-alkali) was measured and stored in air tight glass bottle. It should not be exposed to moisture because of its hygroscopic nature.

#### Observation & Results

The observations and results of the pharmaceutical study analytical study are given in sequential order. Observations of Preparation of kadalikanda kshara (trial drug) mentioned in Table 2.

#### Weighing of drugs

Weight was checked before and after drying, prior to burning the drug. Weight was checked after burning and after getting the residue. Drug ash and kshara jala (alkaline water) was weighed

by volumetric method. Proper weighing and measurement of drugs help in standardization.

#### Selection of vessel

For burning and boiling of drug Iron vessel was taken in order to avoid reaction of the drug with the vessel. For filtration porcelain beaker and plastic bucket was used for the pouring and collection of filtrate. For stirring, Stainless steel ladle was used to avoid any undesired reaction (Figure 1).

#### During drying of raw drug

Dried completely under natural sun light for proper burning for 7 days (Table 3 & Figure 2)

#### During burning

Burning was done in an iron vessel and was in uniform nature. Drug was fully burned and turned to ash form (Figure 3).

#### During and after soaking

Whole ash was immersed in water, no particles floated over the water surface. After maceration with hand, it turned finer and mixed completely in water. After soaking the whole ash was completely mixed and the liquid was black in colour (Figure 4).

#### During filtration of burned ash

Filtration of ksharodaka (alkaline water) was done with 3 folded cloth, till it attains clear fluid (Table 4 & Figure 5 & 6) obtained quantity after complete filtration is 4,000ml. Total time taken for filtration was 1hour and 12 min. The residue obtained after filtration was 92g. pH of ksharodaka (alkaline water) after filtration was 10.5.

#### During boiling and complete evaporation of ksharodaka

Boiling of ksharodaka (alkaline water) was done on mild heat till the complete evaporation of water and obtaining the kshara (phyto-alkali) (Table 5 & Figure 7 & 8). Total obtained quantity of kadalikanda kshara (trial drug) obtained was 64g. Total time taken for the preparation was 2hrs and 20 min.

#### After completion of boiling

Water portion evaporated completely and formed as white solid particles and can be assessed with certain qualities (Table 6 & Figure 9)

### RESULT

**Sample:** 64 g kadalikanda kshara (trial drug) was obtained.

#### Analytical Study

The present study was carried out to evaluate the physico-chemical and chemical parameters of kadalikanda kshara (trial drug). The sample of kadalikanda (rhizome of *Musa paradisiaca* Linn.) was procured and authenticated pharmacognostically. The kshara (phyto-alkali) of the kadalikanda (rhizome of *Musa paradisiaca* Linn.) was prepared and used for the present study. The analysis of the sample was carried out by using different organoleptic characters, physical and chemical tests.

Physical tests like organoleptic evaluations, pH analysis, loss on drying, total ash, acid insoluble ash, water soluble ash, refractive

index, specific gravity, microbial contamination was done in S.D.M Centre for Research in Ayurveda and Allied Sciences, Udupi, Karnataka.

The chemical parameter like quantitative estimation of sample was done at National Institute of Technology Karnataka, Surathkal.

**Organoleptic characters** such as colour, taste, odour, appearance and touch has shown in limits (In Table 7).

**Physico-chemical parameters**

Standardization parameters of kadalikanda kshara (trial drug) such as loss on drying, total ash, acid insoluble ash, water soluble ash, refractive index, specific gravity, pH analysis is based on standard protocol for kshara (phyto-alkali) shown the physico – chemical parameters (Table 8)<sup>3-9</sup>

**Quantitative inorganic estimations**

Percentage of Sodium, Potassium, Magnesium, Calcium, Sulphate, Alkanity CaCO<sub>3</sub>, Carbonate and Bicarbonate such as shown the presence of elements with % in kshara (In Table 9)<sup>10,11,12,13,14</sup>

**Equipments used:** Measuring cylinder, beakers, stirrer, crucible, china dish, conical flask.

**Instruments Used:** pH meter, Pycnometer, Water bath, Hot plate, Desiccator, Abbe’s refractometer, Atomic absorption spectrometry, Flame photometry

**Reagents Used:** Buffer solution, Distilled water, HCl, Nitric acid, Phenolphthalein, Methyl orange, Barium chloride

**Microbial load:** Total bacterial count, Microbial load has shown no growth of bacterial colonies in the sample of kadalikanda kshara (In Table 10)<sup>15</sup>

**Table 1: Details of the Raw Drug used**

Sl. no	Common name	Latin name	Part used	Quantity
1	Kadali	<i>Musa paradisiaca</i> Linn.	Kanda	1.185 kg (After Drying)

**Table 2: Preparation of Kadalikanda Kshara**

Sl. No	Feature	Duration & Result	
1.	Date (from drying till the obtaining of Kshara)	14/02/16 – 27/02/16	
2.	Drugs Quantity	In wet state	22.5 kg
		After complete drying	1.185 kg
		After complete burning - Ash obtained	170g in weight 1300ml in volume
3.	Duration for Drying	Date of commencement	09/02/16
		Date of complete drying	17/02/16
4.	Duration for burning of drug	Starting Date & Time	26/02/16,11.21am
		Complete cooling (Swangasheetta)	26/02/16, 4.47pm
5.	Total quantity of water taken (soaking and Filtration)	5200ml	
6.	Drug and water ratio	1:4	
7.	Soaking time	3 hours	
8.	Filtration Time	Starting Date & Time	26/02/16, 2.35pm
		Ending Date & Time	26/02/16, 4.01pm
9.	Kshara jala obtained After complete filtration	4000ml	
10.	Weight of Residue	92g	
11.	Time of boiling and Complete evaporation	Starting Time	27/02/16, 4.20pm
		Ending Time	27/02/16, 6.40pm
12.	Starting time- temperature	70°C	
13.	After boiling- temperature maintained	96°C	
14.	Total Kshara obtained	64g	
15.	Duration of preparation	For filtration	1hr,12 min
		To obtain Kshara-after boiling	2hrs,20 min

**Table 3: Observation during Drying of Kadalikanda**

Sl. No	Time	Changes Observed
1 <sup>st</sup> Day (14/02/16)	11.00am - 5.00 pm	Partially dried, thickness reduced slightly, watery portion in stem reduced
2 <sup>nd</sup> Day (15/02/16)	10.00am – 5.00 pm	Drying started, turned soft like creeper, Colour – Changes to green to slight brownish colour
3 <sup>rd</sup> Day (16/02/16)	10.00am – 5.00 pm	Smell – drying smell of Kadali Colour – slight brownish
4 <sup>th</sup> Day (17/02/16)	10.00am – 5.00 pm	Drying observed in inner part of skin Colour – brownish
5 <sup>th</sup> Day (18/02/16)	10.00am – 5.00 pm	Dried partially, crackling sound on breaking- not present, Colour – brownish
6 <sup>th</sup> Day (19/02/16)	10.00am – 5.00 pm	Dried completely, crackling sound on breaking slightly present
7 <sup>th</sup> Day (20/02/16)	10.00am – 5.00 pm	Dried completely, with crackling sound on breaking Colour – brownish

**Table 4: Observation during Filtration of Burned Ash**

No. of filtration	Colour	Obtained quantity	Time taken
Before filtration	Blackish colour	5,200ml	---
After 1 <sup>st</sup> filtration	Dark brown with slight blackish, Slimy +++	4,400ml	21minutes (2.35pm -2.56pm)
After 2 <sup>nd</sup> filtration	Dark brown with slight blackish, Slimy ++	4,295ml	14minutes (2.58pm – 3.12pm)
After 3 <sup>rd</sup> filtration	Light brown with slight blackish, Slimy +	4,225ml	8minutes (3.14pm – 3.22pm)
After 4 <sup>th</sup> filtration	Light brown colour, blackish colour reduced Slimy +	4,170ml	8minutes (3.24pm – 3.32pm)
After 5 <sup>th</sup> filtration	Slight brown colour, slight particles -, Slimy +	4,120ml	6minutes (3.34pm – 3.40pm)
After 6 <sup>th</sup> filtration	Started golden yellow colour, Slimy – reduced	4,070ml	6minutes (3.42pm – 3.48pm)
After 7 <sup>th</sup> Filtration	More presence of clear fluid with golden yellow colour with slight particles, Slimy – reduced	4,025ml	5minutes (3.50pm – 3.55pm)
After 8 <sup>th</sup> filtration	Clear fluid, No particles present, Slimy – reduced completely	4,000ml	4minutes (3.57pm – 4.01pm)

**Table 5: Observation during Boiling and Complete Evaporation of Kshara Jala**

Time	Temperature	Changes Observed
4.20pm - Kept for boiling	32 <sup>o</sup> C	Clear Kshara jala without any fumes
4.34pm	70 <sup>o</sup> C	Appearance of fumes (1 <sup>st</sup> time -800ml added)
4.36pm	72 <sup>o</sup> C	White froth – all over the surface
4.38pm	84 <sup>o</sup> C	Boiling started
4.40pm	70 <sup>o</sup> C	2 <sup>nd</sup> time Ksharodaka added (800ml)
4.43pm	90 <sup>o</sup> C	White froth over the surface
4.46pm	94 <sup>o</sup> C	Boiling started
4.51pm	94 <sup>o</sup> C	Boiling- smell of Kadalikanda
4.55pm	70 <sup>o</sup> C	3 <sup>rd</sup> time Ksharodaka added, (800ml)
4.58pm	88 <sup>o</sup> C	White froth seen over the surface
5.01pm	94 <sup>o</sup> C	Boiling started
5.04pm	70 <sup>o</sup> C	Reduced half and added Ksharodaka 800ml (4 <sup>th</sup> time)
5.07pm	88 <sup>o</sup> C	White froth appearance over the surface
5.11pm	94 <sup>o</sup> C	Boiling started
5.15pm	70 <sup>o</sup> C	Added Ksharodaka 800ml (5 <sup>th</sup> time)
5.18pm	92 <sup>o</sup> C	White froth appearance over the surface of Ksharodaka
5.21pm	94 <sup>o</sup> C	Boiling started
5.32pm	96 <sup>o</sup> C	Reduced to half
5.55pm	96 <sup>o</sup> C	Reduced to 1/4 <sup>th</sup>
6.05pm	96 <sup>o</sup> C	Started forming of white particles on the side of iron vessel
6.15pm	96 <sup>o</sup> C	Ksharodaka portion reducing and white colour observed during boiling
6.25pm	96 <sup>o</sup> C	Started forming of white particles at the centre of iron vessel
6.40pm	96 <sup>o</sup> C	Complete water portion reduced-white colour powdery Kshara obtained

**Table 6: Assessment criteria of Kshara**

Criteria	Observation
Sparsha	Cold, Smooth and slimy
Rupa	White
Rasa	Katu, Lavanaadi rasa
Gandha	Visra Gandhi
Karma	Ksharana

**Table 7: Organoleptic characters of Kadalikanda Kshara**

Colour	White
Odour	Characteristic
Taste	Salty
Appearance	Powder
Touch	Slimy

**Table 8: Standardization Parameters for Kadalikanda Kshara**

pH	12.0
Loss on drying	3.38
Total ash	97.03
Acid insoluble ash	0.2
Water soluble ash	96.53
Refractive index	1.33417
Specific gravity	1.0368

**Table 9: Quantitative Inorganic Estimation of Kadalikanda Kshara**

Sl.No	Parameters	Result
1.	Sodium as Na wt%	0.25
2.	Potassium as K wt%	2.87
3.	Magnesium as Mg wt%	0.08
4.	Calcium as Ca wt%	0.61
5.	Alkanity as CaCO <sub>3</sub> ppm	199501
	Phenolphthalein	187032
	Methyl orange	187032
6.	Sulphate as So <sub>4</sub> wt%	5.27
7.	Carbonate as CaCO <sub>3</sub> ppm	243391
8.	Bicarbonate as CaCO <sub>3</sub> ppm	Nil

**Table 10: Total Bacterial Count of Kadalikanda Kshara**

Sl. No.	Dilutions	Number of Colonies (NOC)			CFU/g
1	1/10 (10 <sup>1</sup> )	0	0	0	0
2	1/100 (10 <sup>2</sup> )	0	0	0	0
3	1/1000 (10 <sup>3</sup> )	0	0	0	0

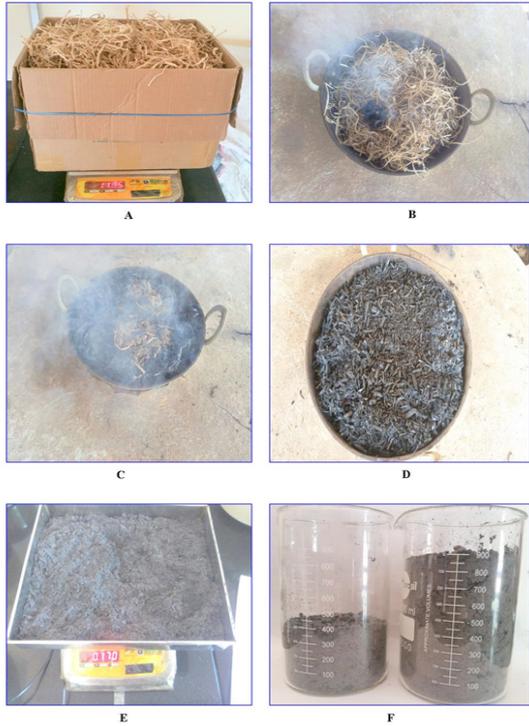
CFU-Colony Forming Units



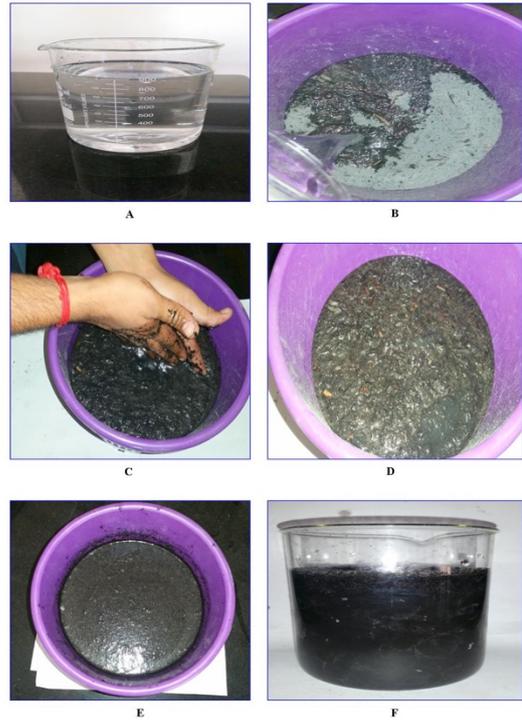
**Figure 1: Equipments used for the method of preparation of Kshara**  
 A - 3 folded cloth, B - Plastic bucket, C - Iron vessel, D - Stainless steel ladle, E - Temperature rod, F - Heating device (gas stove)



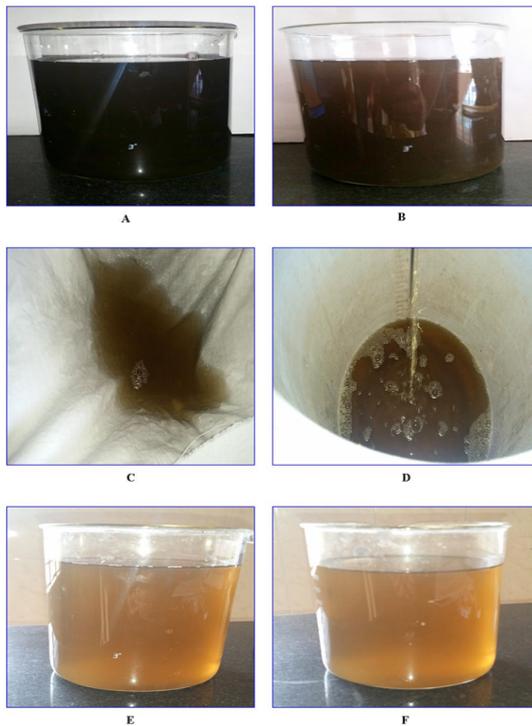
**Figure 2: Collection and Drying of Kadalikanda**  
 A - Kadali plant, B - Stem of Kadalikanda, C - After cutting;  
 D - Drying in Sunlight, E - After complete drying,  
 F - Test for perfectness of drying



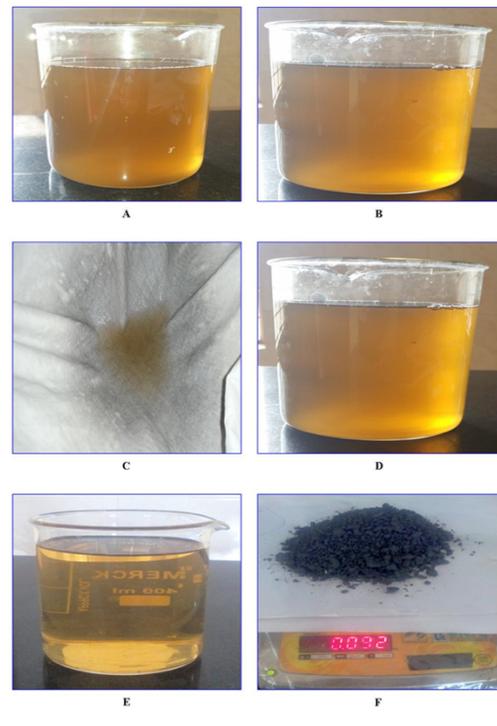
**Figure 3: Preparing Ash of Dried Kadalikanda**  
 A -Weight after complete drying - 1.185kg, B -Burning of dried drug, C - During burning; D - complete burning; E – Weight - After complete burning - 170g; F – Weight - Volumetrically - 1300ml



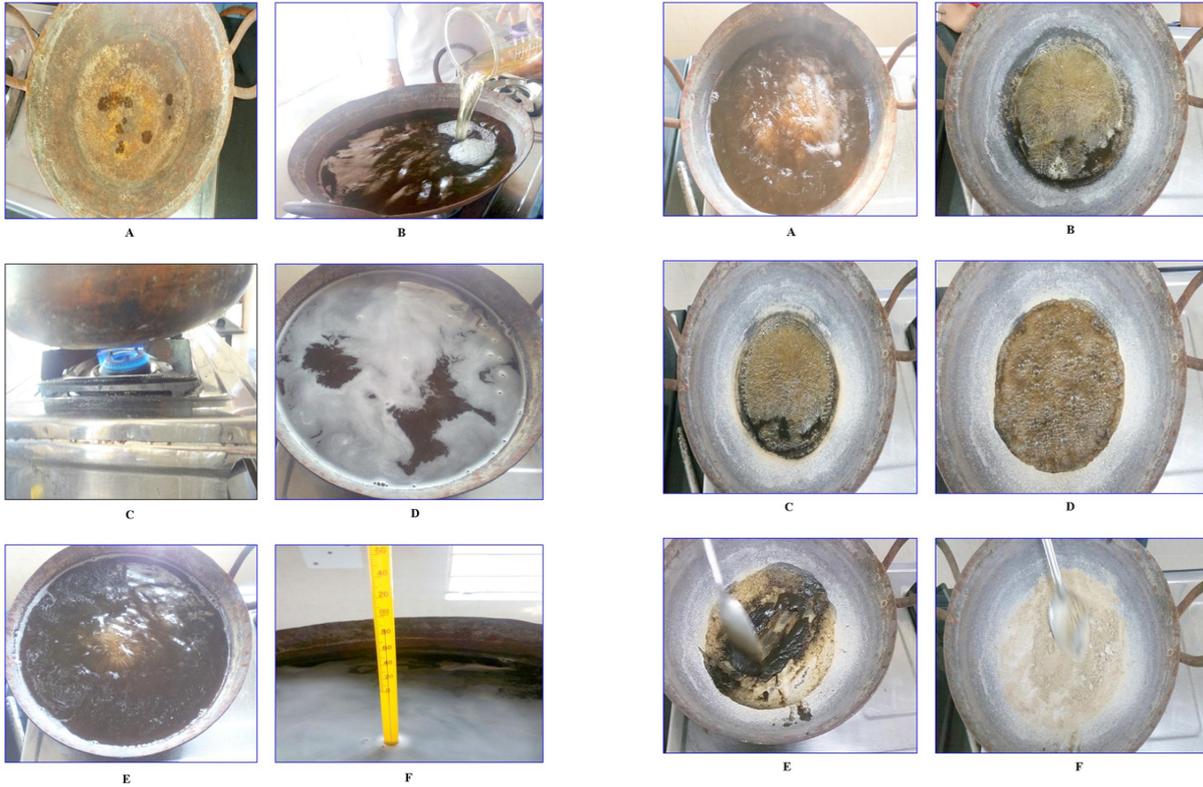
**Figure 4: Adding Water and Soaking of Ash**  
 A - Weight of water - Volumetrically - 5200ml, B - Adding of water to ash, C - During maceration, D - Kept for soaking - For 3hours, E - After complete soaking of 3 hours; F - Kshara jala - Before filtration - Blackish in colour



**Figure 5: Filtration of Obtained Ash**  
 A - After 1<sup>st</sup> filtration - Dark brown with slight blackish in colour, B - After 2<sup>nd</sup> filtration - Dark brown in colour, C - During filtration, D - Collection - During filtration, E - After 3<sup>rd</sup> filtration - Light brown in colour, F - After 4<sup>th</sup> filtration - Light brown in colour



**Figure 6: During Completion of Filtration**  
 A - After 5<sup>th</sup> filtration - Slight brown in colour, B - After 6<sup>th</sup> filtration - Slight golden yellow Colour, C - Kshara jala become clear during filtration, D - After 7<sup>th</sup> filtration - Presence of clear fluid with golden yellow colour; E - After 8<sup>th</sup> filtration - Clear fluid obtained quantity - 4000ml, F - Weight of residue – 92g



**Figure 7:- Boiling of Kshara Jala**  
 A - Iron vessel – empty, B - Reduction adding of kshara jala - For boiling, C - Kept on moderate heat, D - White layer over the surface, E - Slight boiling started of ksharodaka, F - Temperature recording during preparation

**Figure 8:- Boiling and Evaporation of Kshara Jala**  
 A - Started continuous boiling, B - Reduction of water portio,; C - Appearance of white particles in the sides of the vesse,; D - Ksharodaka become thick consistenc,; E - Black colour consistency - Continuous stirrin, F - Turning to slight brownish kshara with solid particles



**Figure 9: Obtaining the Final Product**  
 A - Becomes slight whitish solid particles after the complete evaporation of moisture, B – White coloured kshara, C - Obtained quantity of kshara – 64, D - Final product - Stored in glass bottle

## DISCUSSION

In case of pharmaceutical study, the whole process is divided into different stages as follows;

### Size of drug

Kadalikanda (rhizome of *Musa paradisiaca* Linn.) about 22.5 kg fresh and matured was collected and it was made it into slices to reduce the size. The reason behind the size reduction is to make easy and uniform drying and helps for further process like burning and preparation of ash.

### During drying

22.5 kg fresh and matured kadalikanda (rhizome of *Musa paradisiaca* Linn.) was collected, cleaned and dried for 7 days. After complete drying about 1.185 kg was obtained this shows 94.73% w/w loss. Because the fresh part of kadali consist profuse water content, when it is kept for drying all the water content will get evaporated and turns dry. Possessing brown colour on stem denotes proper drying and produces cracking sound on breaking.

### Preparation of ash

1.185 kg of dried kadalikanda (rhizome of *Musa paradisiaca* Linn.) was taken and burnt uniformly for an hour and obtained 172g (1300ml- volumetrically) greyish ash; it shows 14.51% yield and 85.49% loss. Compared to drug and ash, all the contents got burnt fully and the ash was obtained from drug kadalikanda (rhizome of *Musa paradisiaca* Linn.). Drug is burnt in open air to get more oxidation which prevents the ash to form blackish discoloration.

### Proportion of ash & water

In the present study, 1 part of ash 172g (1300 ml – volumetrically) was added to 4 parts of water 5200 ml - volumetrically. The soaking of drug in the water aids in the dissociation of the kshara (phyto-alkali) into the water to obtain the ksharatwa (alkaline extract) property of the drug.

### Maceration and duration of soaking

The ash on adding in water was floating as it is light. On contact with water it immersed in water. It was macerated to facilitate the dissociation of the active principles in water. After completion of maceration with hand, it turned finer and mixed completely in water. The whole liquid turns blackish colour. Maceration also helps to separate particles and become finer. In this study, duration of soaking is 3 hours, which helps for proper dissociation in water and helps to extract the more active principles from drug.

### Preparation of kshara jala (alkaline water) during filtration

Before filtration the liquid obtained was 5200 ml. After completion of eight filtrations it turns to 4000 ml with clear fluid of golden yellow colour. It shows 76.92 % yield of *kshara jala* (alkaline water) and 23.08 % loss. In every filtration, reduction is found. Because in every filtration few particles also will be removed, and some amount of liquid adhere to the cloth. Colour changes in each filtration means all carbon particles were reduced in every filtration. Colour was appreciated, from blackish to dark brown to become clear with golden yellow colour. Residue that was obtained after filtration is blackish colour due to carbon particles left out after filtration.

### Evaporation of kshara jala (alkaline water) during boiling

Obtained kshara jala (alkaline water) was boiled on moderate temperature till the complete evaporation of water and obtaining of kshara (phyto-alkali). Initially the clear kshara jala (alkaline water) was added to the iron vessel. Iron vessel was selected to avoid the reaction with kshara jala (alkaline water). Fumes appeared after 15 minutes of heating and they occurred due to the boiling process. As boiling continued the appearance of white froth over the surface of kshara jala (alkaline water) was observed. This could be due to the hardness of water. Pure water pH is 7, hard water is > 8.5 that indicates the presence of dissolved bicarbonate minerals in hard water. In kshara jala (alkaline water), the presence of dissolved bicarbonate minerals and inorganic salts largely, like calcium carbonate and other carbonates being mostly in a combined form. Boiling promotes the formation of carbonate from bicarbonate and precipitates calcium carbonate out of the solution.

Reduction of liquid is seen during the boiling as the water portion evaporates. White particles on the side of the iron vessel are observed as kshara (phyto-alkali) turns forming. This may due to the evaporation of water molecules. After the water portion completely evaporates white powder kshara (phyto-alkali) (64 g) is obtained. It shows 37.20 % yield of kadalikanda kshara (trial drug). This indicates the presence of ksharatwa (alkalinity).

In analytical study the parameters tested are organoleptic characters, physico chemical parameters like loss on drying, total ash, acid insoluble ash, water soluble ash, refractive index, specific gravity, pH and microbial load.

Quantitative inorganic analysis reveals the percentage of sodium, potassium, calcium, magnesium, sulphate, alkalinity as CaCO<sub>3</sub>, carbonate and bicarbonate.

### Organoleptic characters

**Colour** - Colour of kadalikanda kshara (trial drug) was greyish white in colour. Colour may be due to the evaporation of water portion during boiling the sediments which possess the greyish white colour.

**Taste** - The taste was pungent and salty, which indicates the presence of inorganic salts in kshara (phyto-alkali).

**Odour** - Odour was characteristic and slightly pungent because of the property of kshara (phyto-alkali).

**Touch** - In touch kshara (phyto-alkali) was amorphous and slimy nature, due to its hygroscopic nature.

### Physico-chemical parameters

#### Loss on drying

Loss on drying indicates the presence of moisture content in drug. Loss on drying in kadalikanda kshara (trial drug) was found 3.38. It gives an understanding that the drug becomes hygroscopic when it comes in contact with the atmosphere.

#### Total ash

Total ash figure is of importance and indicates to some extent the amount of care taken in the preparation of the drug. In the determination of total ash values 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. Total ash of kadalikanda kshara (trial drug) was 97.03.

#### Acid insoluble ash

Acid insoluble ash was carried out to evaluate the percentage of insoluble inorganic content of the sample in dilute acid. Since a drug must first pass into solution before it can be absorbed, so the acid insoluble ash test for drug is therapeutically very important. It is intended to provide a step towards the evaluation of the physiological availability of the drug. Acid insoluble ash of kadalikanda kshara (trial drug) was 0.2.

#### Water soluble ash

Water soluble ash indicates the percentage of solubility of contents of the sample soluble in water. Also, the solubility of ash finds out the impurities. Water soluble ash of kadalikanda kshara (trial drug) was 96.53.

#### Refractive index

Refractive index of a substance is defined as the ratio of the velocity of light in vacuum or air, to that in the substance. Refractive index is a fundamental property of a substance which helps to identify a substance confirms its purity and measures its concentration. It is directly proportional to density (consistency of the media and solutes present in the media). Refractive index of kadalikanda kshara (trial drug) was 1.33417.

#### Specific gravity

Specific gravity is the weight for a given volume of substance when compared with same amount of water at given temperature. It indicates the presence of solutes in a solvent. Here the solutes refer to the extracted active principles of kadalikanda kshara (trial drug). Here the Specific gravity of kadalikanda kshara (trial drug) was 1.0368.

#### pH value

pH Value of an aqueous liquid may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration expressed in gram per liter. The pH value of kadalikanda kshara (trial drug) was 12. It shows that the drug is alkaline in nature due to presence of alkali salts. Absorption, efficacy, and irritability of a medicine will depend on the pH value also. If the medicine is very acidic or very alkaline it will cause irritation to the tissues.

#### Quantitative inorganic analysis

Inorganic salts in the kadalikanda kshara (trial drug) revealed percentage of sodium, potassium, calcium, magnesium and carbonate. The presence of sodium 0.2%, potassium 2.87%, calcium 0.61%, magnesium 0.08%, sulphate 5.27% and carbonate 243391ppm. Bicarbonate was found to be absent. The alkalinity of the drug indicates the site of absorption and action of the drug. Alkalinity as  $\text{CaCO}_3$  is 199501ppm with phenolphthalein and 187032 with methyl orange.

#### Microbial load – Total bacterial count

Medicinal plant material normally carries a great number of bacteria and moulds, often of soil origin and environment. Current practice of harvesting, handling and production often causes additional contamination and microbial growth. Adherence to strict hygienic conditions during production of

medicinal preparations is required for effective reduction of the number of possible bacterial species and of individual organism.

Total bacterial count in the sample of kadalikanda kshara (trial drug) was nil. It shows that the medicine was prepared in aseptic condition and the kshara (phyto-alkali) was freshly prepared one and stored in sterilized bottle.

#### CONCLUSION

The drug kadalikanda (rhizome of *Musa paradisiaca* Linn.) used in the present study is cost effective and available throughout India. Proper drying prior to the burning of the drug and proper filtration of ksharodaka (alkaline water) through the three-folded cloth, increased the quality and quantity of the drug to prepare kshara. Based on the output of analytical study it can be said that the drug has presence of elements like sodium, potassium, chloride, carbonate in traces and pH of kshara (phyto-alkali), which shows supportive effect to the study.

The physico-chemical parameters and quantitative inorganic estimation of kadalikanda kshara (trial drug) can be taken as preliminary standards of the formulation.

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