



PHARMACEUTICAL AND ANALYTICAL EVALUATION OF *TALAPATRA KSHARA* (BORASSUS FLABELLIFER LINN).

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Article Received on 20/07/2021

Article Revised on 10/08/2021

Article Accepted on 30/08/2021

ABSTRACT

Bhaishajya Kalpana is the branch of *Ayurveda* which deals with the source, description and the art of producing various pharmaceutical preparations by following several processes by which it becomes easily digestible, therapeutically more effective and stable for long period. Among them *Kshara Kalpana* is one of important preparation which is to extract alkaline substances from ash of plant, animal or mineral origin. It is extensively used in many disorders. The present study is concerned with the formulation *Tala Patra kshara* mentioned in *Yogatathnakara Uttara khanda* in *Medo Roga chikitsa*. Till now no scientific studies have been carried out with respect to its preparation and analysis. Hence special emphasis given to convert ash of dried *Tala* leaves to *Kshara* form according to standard preparation methods and its analytical study was done. Here *Kshara* is prepared by *samanya kshara nirmana vidhi* mentioned by Acharya Sharangadhara by taking ash water proportion 1:4. After preparation greyish white *kshara* obtained was about 68g, shows 24.72% yield. The analytical parameters tested like physico-chemical parameters, elemental analysis by XRD and heavy metal analysis by ICP-OES done. The values have been obtained through this analysis serve as the standard parameters of genuine preparation of the *Tala Patra Kshara*.

KEYWORDS: Pharmaceutical study, *Kshara Kalpana*, *Tala Patra*, Analytical Study.

INTRODUCTION

Kshara Kalpana is important *Kalpana* mentioned in *Ayurveda* Classics. *Ksharas* are the alkaline substances obtained from the ash of drugs.^[1] Acharya Charaka, Sushruta Vagbhata has described about importance of *kshara*. The substance which removes the vitiated debris etc or the substance which detoxify the *dosha*, *dhatu*, *mala* because of its *ksharana guna* known as *kshara*.^[2]

Properties of *kshara*

Kshara having *katu lavana rasa*, *ruksha*, *teekshna guna*, *ushna virya*, *katu vipaka*, *agni* and *vayu mahabhuta pradhana* hence gives quick action, *tridoshaghna*, has superior qualities like *chedana*, *bhedana*, *lekhana* etc^[3] and *kshara Karma* is treatment of choice in *arsha*, *arbuda dusta vrana* etc where surgical treatment contraindicated. It is best among *shastra* and *anushastra*.^[4]

Ksharas can be used internally as well as externally. Acharya Charaka, Acharya Sushruta and Vagbhata have given wide account of *Kshara* and classified as *Antahparimarjana* and *Bahiparimarjana*^[5] or *Paneeeya* and *Pratsaraniya Kshara*. *Paneeeya kahara* was administered internally and *Pratsaraniya kshara* applied externally.^[6] It is also classified as *mridu*, *madhyama*, *teekshna kshara* by sushruta.^[7]

The drug *Tala* (*Borassus flabellifer* Linn), family- Palmaceae is used in many disease ailments from *Samhita kala*. Different parts of plant ie fruit, root, inflorescence, leaves used in diseases like *mutraghata*, *mutrakrichra*, *swasa*, *kasa*, *amlapitta*, *sthoulya* etc.^[8]

Rasa Panchaka of Tala^[9]

Rasa-Madhura
Guna-snigdha, guru
Veerya- Sheetta

Vipaka- Madhura

Karma-vatapitta samaka, sleshmakara, dhatu vardraka.

Considering all these facts effort is made *Tala Patra kshara* which is mentioned in the context of *medoroga chikitsa* of Yogathnakara is taken for study.^[10]

MATERIALS AND METHODS

Pharmaceutical Study; The pharmaceutical study divided into following sections.

Collection and Authentication of raw drug, Drying and burning into Ash, and Preparation of *Tala Patra Kshara*. (trial drug)

1. COLLECTION OF RAW MATERIAL (Leaves of Tala)

Fresh matured *Tala Patra* was collected from genuine source in the month of November 2020. Authentication done on the basis of Pharmacognostical standards.

The collected drug cleaned properly, cut into pieces and well dried under sunlight for two weeks.

2. PREPARATION OF TALA PATRA KSHARA

A) Method of data collection

The *Tala Patra Kshara* (trial drug) was prepared as per the reference of Sharangadhara Samhita. Here the drug and water ratio 1:4 parts as per the *kshara nirmana vidhi*.^[11]

Place of preprocessing of the drug like cleaning, drying was done in Department of RSBK, KAMC, Mangalore.

B) Equipments required: An iron vessel for incinerating the drugs, stainless steel vessel, a piece of cloth, measuring glass, stirrer, gas stove, weighing balance, air tight container.

C) Method of Preparation of Kshara

Collected leaves cut into pieces and dried properly under sunlight. Then dried Leaves of *Tala* was taken in big iron vessel in open place, subjected to fire till completely burnt into ash. The ash allowed to cool completely and then collected. Then this dried ash is weighed and taken in a vessel. Then add 4 parts of water macerated thoroughly with hand. After proper mixing liquid kept undisturbed overnight. Next day morning supernatant water is collected carefully. This liquid filtered through a

cloth until clear liquid without carbon particle obtained. This *kshara jala* taken in a vessel heated in *mandagni* until water evaporates and white ash obtained at bottom is known as *Kshara*. It is scraped from bottom of vessel, collected, weighed and stored in air tight container.

Precautions

- Proper care taken during cutting procedure.
- Contamination with foreign material was prevented at each and every step.
- Every day before keeping for drying sample was ruffled properly so that all the particles may exposed to sunlight and get dried completely.
- Leaves added to fire little by little so as to each particle burnt properly
- Stirring and maceration should be done properly.
- Filtration should be done with utmost care so as to prevent any chance of spillage and loss of the *Kshara*.
- Heating should be done in a proper manner. Whole process *mandagni* should be maintained. Sudden increase in the temperature should be prevented.
- Continuous stirring facilitates the process.
- Care should be given when process is about to complete.
- If not removed from fire at proper time then the sample may get burnt and get converted into black charred mass.
- The vessel should be washed properly before and after processing. *Kshara* being alkali may corrode the vessel if not washed properly.

Storage: The *kshara* was measured and stored in airtight glass bottle. It should not be exposed to moisture because of its hygroscopic nature.

OBSERVATIONS AND RESULTS

A) Pharmaceutical study of *kshara*

Table 1: Showing Result of cutting and drying of *Tala patra*.

Process	Result/ observation
Initial weight	14kg
Final weight	8kg
Initial colour	Dark green leaves
Final colour	Light brown
Loss observed	6kg
Total days required for drying	15days(15/11/2020-30/11/2020)
Percentage of loss in wt after drying	42.85% w/w

Table 2: Showing Result of Burning of Tala patra.

Procedure	Result/observation
Initial weight of Talapatra	8kg
Final weight of ash	275 grams(2000ml weighed volumetrically)
Initial colour of tala patra	Light brown
Final colour of ash	greyish
Loss of weight	7.725 kg
Percentage of ash obtained from dried Tala Patra leaves	3.43% w/w
Percentage of loss from dried leaves	96.56% w/w
Percentage of ash obtained from fresh leaves	1.96%
Total time taken leaves to burn	30 min
Total time taken ash to cool	7hrs

Table 3: Showing procedure and results of dissolving ash in water.

Procedure	Results
Quantity of Ash	275g(2000ml Volumetrically)
Quantity of water added	8000ml
Process of maceration time taken	30min
Duration kept undisturbed	12hrs

Table 4: Showing observations during filtration of liquid.

No. of filtration	Colour	Liquid obtained	Time taken
before	Black in colour	8000ml	9.AM
After 1 st filtration	Blackish with particles+++ , slimy+++	7200ml	9-9.15AM
After 2 nd filtration	Slight blackish with little particles++, slimy++	7000ml	9.15-9.25AM
After 3 rd filtration	Very light blackish with particles+, slimy+	6900ml	9.25AM-9.35AM
After 4 th filtration	Light yellowish with little particles, slimy	6750ml	9.35AM-9.40AM
After 5 th filtration	Light yellow with particles, reduced slimy	6500ml	9.40AM-9.45AM
After 6 th filtration	More clear liquid with no particles, very little slimy	6350ml	9.45AM-9.50AM
After 7 th filtration	Clear fluid with no particles, no sliminess	6150ml	9.50AM-10AM

Table 5: Showing observation and result of filtration.

Procedure	Result and observation
Total filtration	7times
Initial colour of liquid	Slight blackish with little particles
End colour liquid	Clear liquid Yellowish colour without particles
Initial quantity of liquid	8000ml
Quantity of liquid obtained after filtration	6150ml
Total time required for filtration	One hour
% of kshara jala obtained	76.87%

Table 6: Showing observation and result of obtaining Kshara.

Procedure	Result/ observation
Initial weight of ash taken	275g
Total weight of kshara obtained	68gms
Initial colour of Ash	Greyish
Final colour of ash	Greyish white
Total heating time	5 hrs
Percentage of kshara obtained from ash	24.72% w/w
Percentage of loss	75.28% w/w

B) Analytical study

Analytical study was carried out to evaluate the physico-chemical and chemical parameters. The sample Leaves of Tala was procured and authenticated pharmacognostically. A test drug kshara was subjected to different Analytical tests like organoleptic properties, complete chemical analysis of Tala Patra Kshara

included identification of the constituents by the qualitative analysis and determination of their relative amounts present by quantitative analysis. Analytical Study was carried out in SDM College of Ayurveda Chemistry Laboratory and XRD, ICP-OES performed at National Institute of Technology Karnataka, Surathkal.

1. Organoleptic characters such as *varna*, *gandha*, *rasa*, *sparsha* was shown in Table 7.

Table 7: Showing ayurvedic parameters-Organoleptic Evaluation.

Features	<i>Tala Patra Kshara</i>
<i>Varna</i>	Greyish white
<i>Gandha</i>	characteristic
<i>Rasa</i>	Pungent salty
<i>Sparsha</i> or Texture	Amorphous, smooth

2. Physico-chemical parameters

Standardisation parameters of *Talapatra kshara* such as loss on drying, total ash, acid insoluble ash, water soluble ash, alcohol soluble extractive, water soluble

extractive, pH analysis is based on standard protocol of kshara(phyto-alkali) shown in physico chemical parameters.^[12] (Table-8)

Table 8: Showing results of Physico-Chemical parameters of *Tala Patra* and *Kshara*.

Parameters	Results n=3 %w/w (Avg ± SEM)	
	<i>Tala patra</i>	<i>Kshara</i>
Loss on drying	6.98 ± 0.02	0.0 ± 0.00
Total ash	4.18 ± 0.50	91.86 ± 0.81
Acid insoluble ash	1.39 ± 0.00	7.91 ± 0.01
Water soluble ash	2.27 ± 0.02	83.48 ± 0.02
Alcohol soluble extractive	7.27 ± 0.01	3.03 ± 0.01
Water soluble extractive	19.49 ± 0.01	92.19 ± 0.01
pH	-	8.0

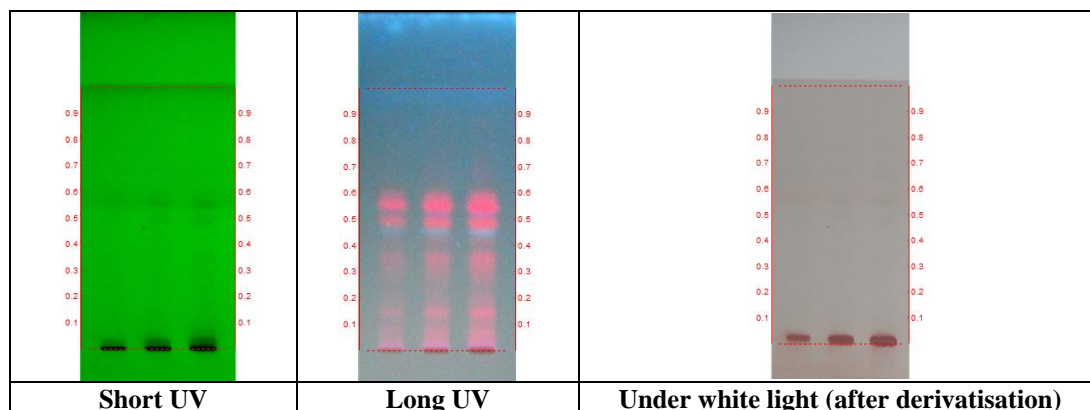
3. HPTLC of *Talapatra*(leaves)

HPTLC leaves of *Tala* was done in solvent system Toluene:Ethyl acetate(9:1).

under short UV 4Rf values, long UV 7 Rf values, under white light no Rf values seen.

HPTLC -of leaves of *Tala* shows maximum peaks at 245nm, 366nm, 620nm. It showed highest Rf values ie

Densometric scan of *Tala patra* shows 7 peaks, highest peak was at 550nm.



Track 1- *Tala patra*– 3µl

Track 2- *Tala patra*– 6µl

Track 3- *Tala patra*– 9µl

Solvent system – Toluene: Ethyl Acetate (9:1)

Figure 1: Showing HPTLC photo documentation of ethanolic extract of *Tala patra*.

Table 9: Showing Rf value of *Tala patra* at short UV, long UV and white light.

Short UV	Long UV	Under white light (after derivatisation)
-	0.08 (F. red)	-
-	0.14 (F. red)	-
0.36 (Green)	0.36 (F. red)	-
0.42 (Green)	0.42 (F. red)	--

-	0.45 (F. ash)	-
0.49 (Green)	0.48 (F. red)	-
0.56 (Green)	0.56 (F. red)	-

*F-0 fluorescent; D-dark; L-light

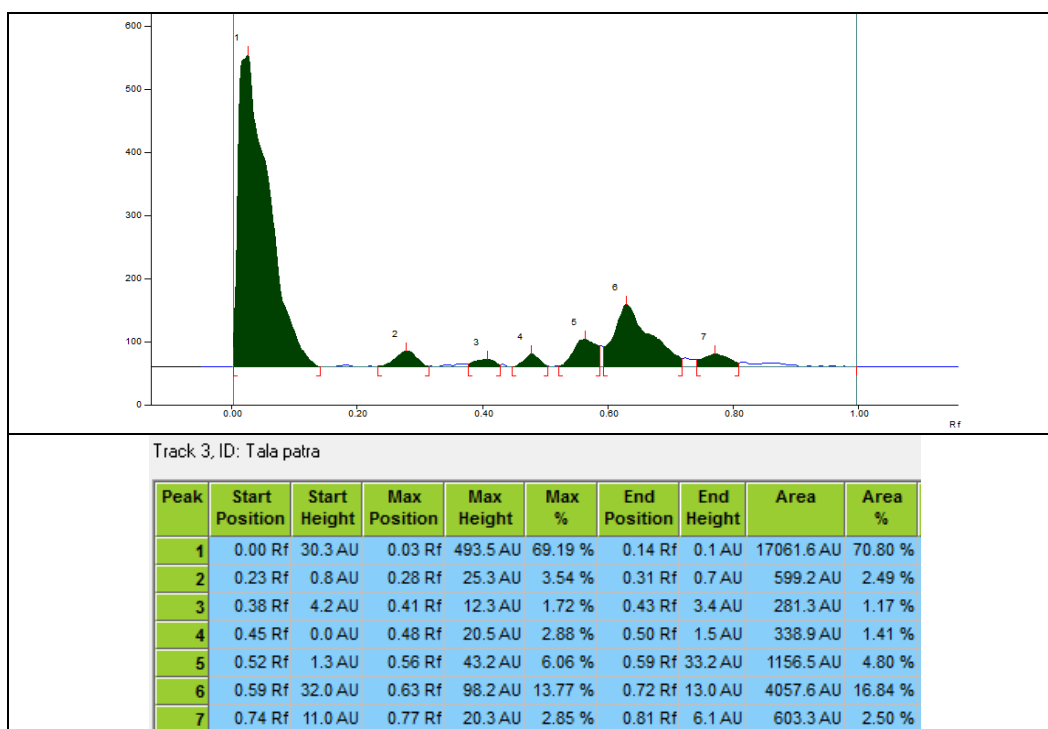


Fig 2a. At 254nm

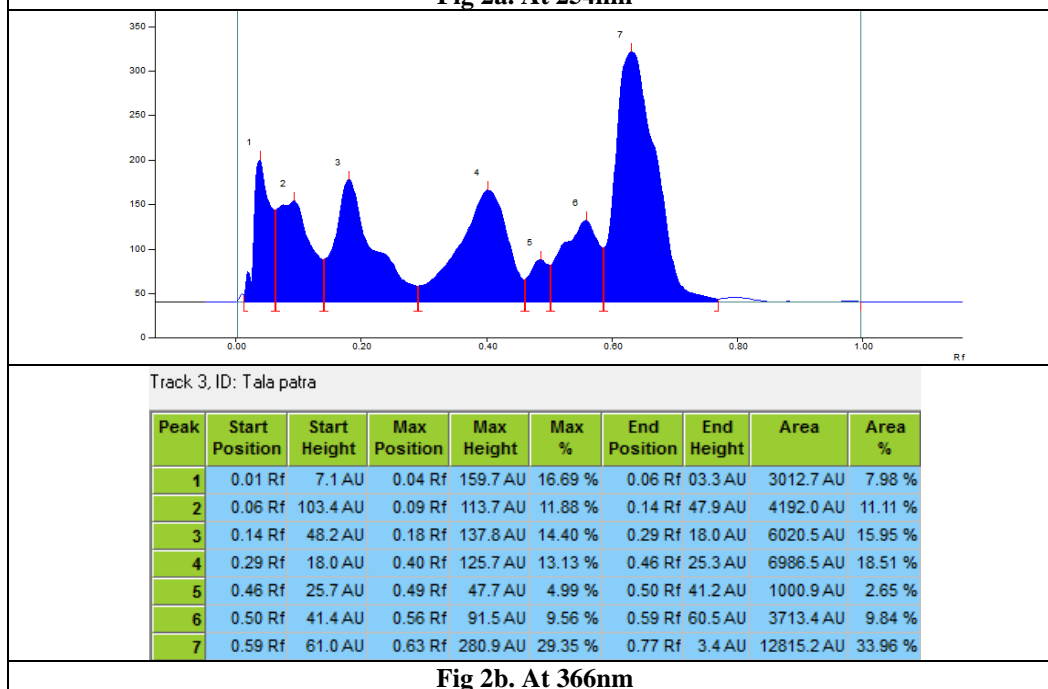


Fig 2b. At 366nm

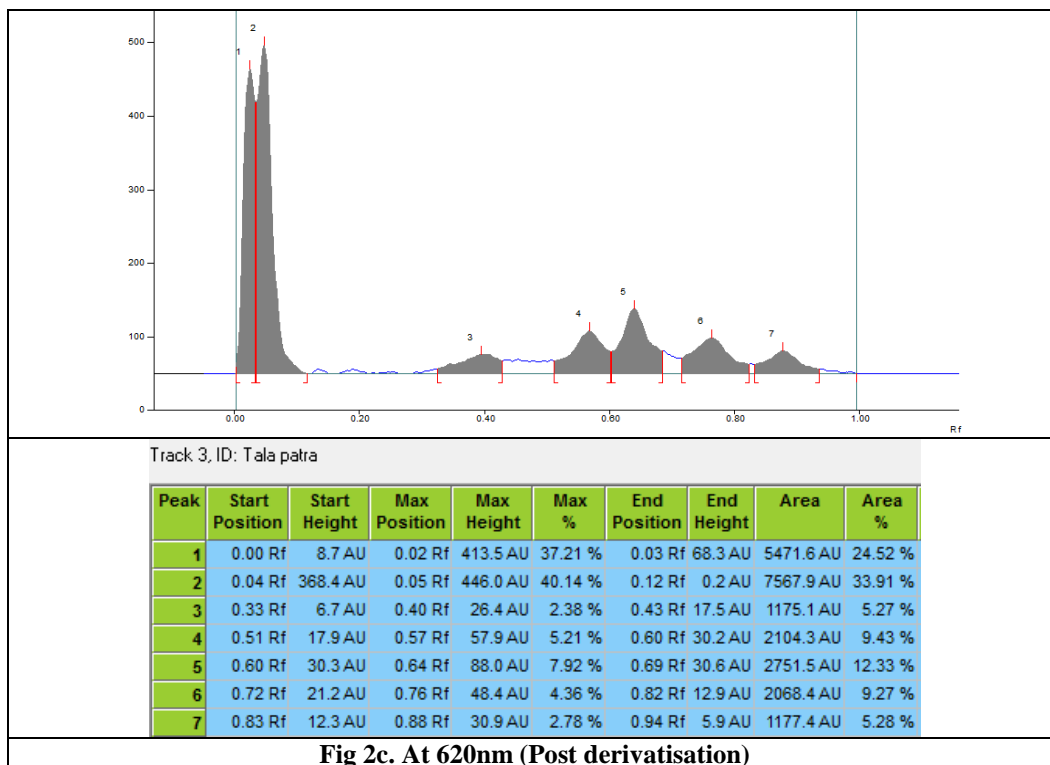


Figure 2: Showing Densitometric scan of Tala patra.

4. Elemental Analysis Of Kshara By XRD Technique
 XRD(X-Ray Diffraction): The test was performed to detection and identification of various compounds

present in the sample. Analysis shows chief compound present in samples are Potassium, Sodium carbonate, Magnesium, Manganese, silicon chloride.

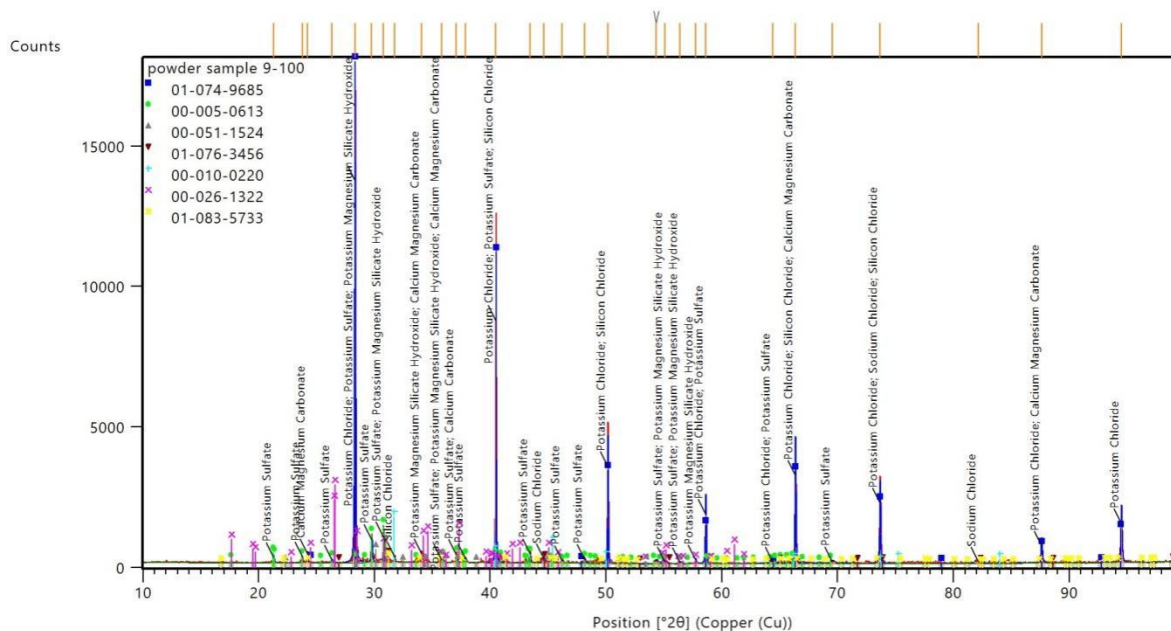


Figure 2: Showing peaks compared with all possible elements of kshara by XRD technique.

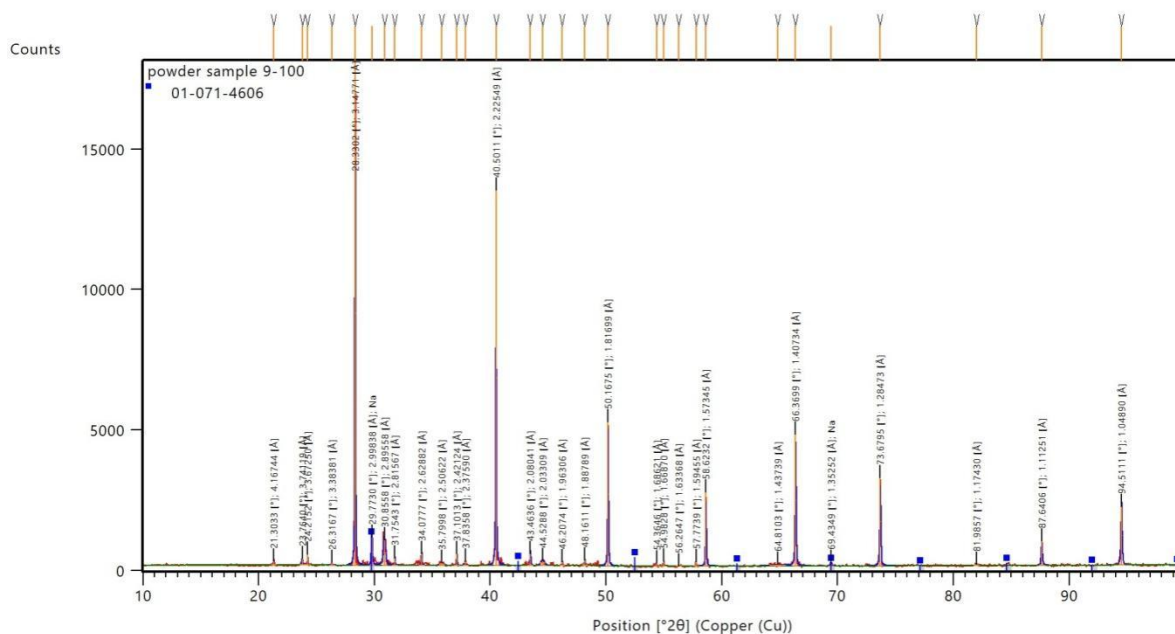


Figure 3: Showing peaks compared with element Sodium (Na).

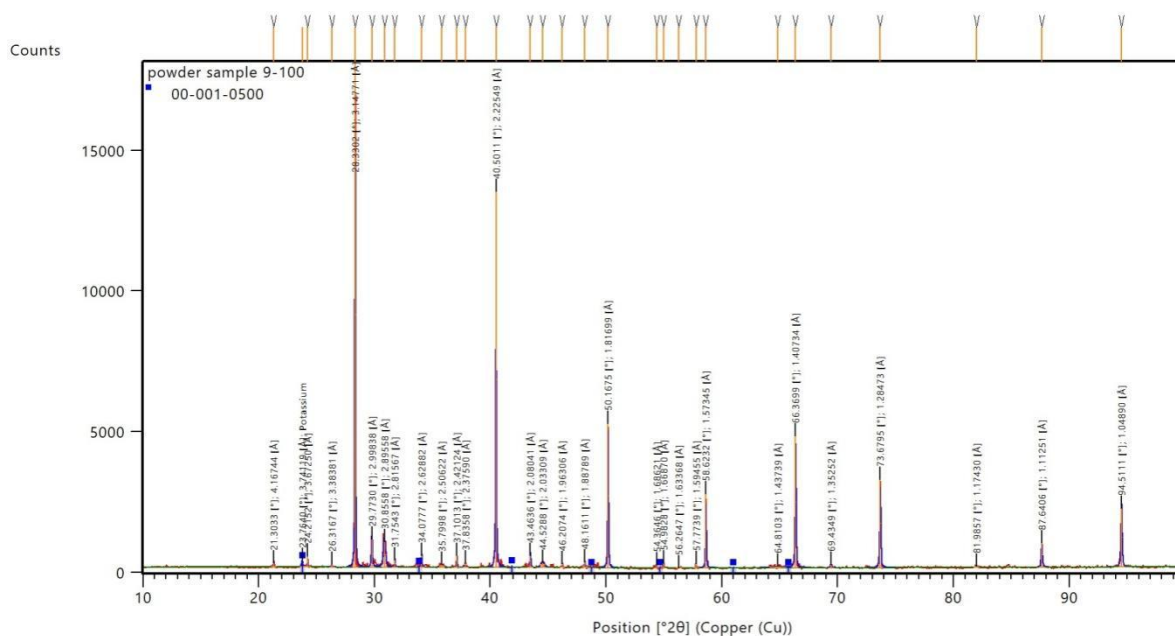


Figure 4: Showing peaks compared with element Potassium (K).

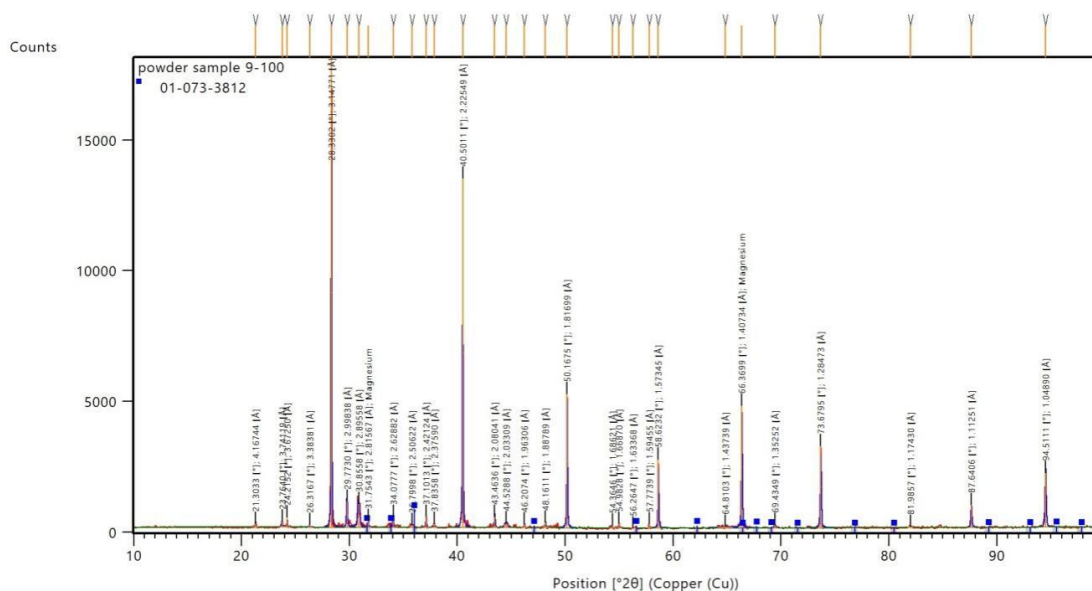


Figure 5: Showing peaks compared element with Magnesium (Mg).

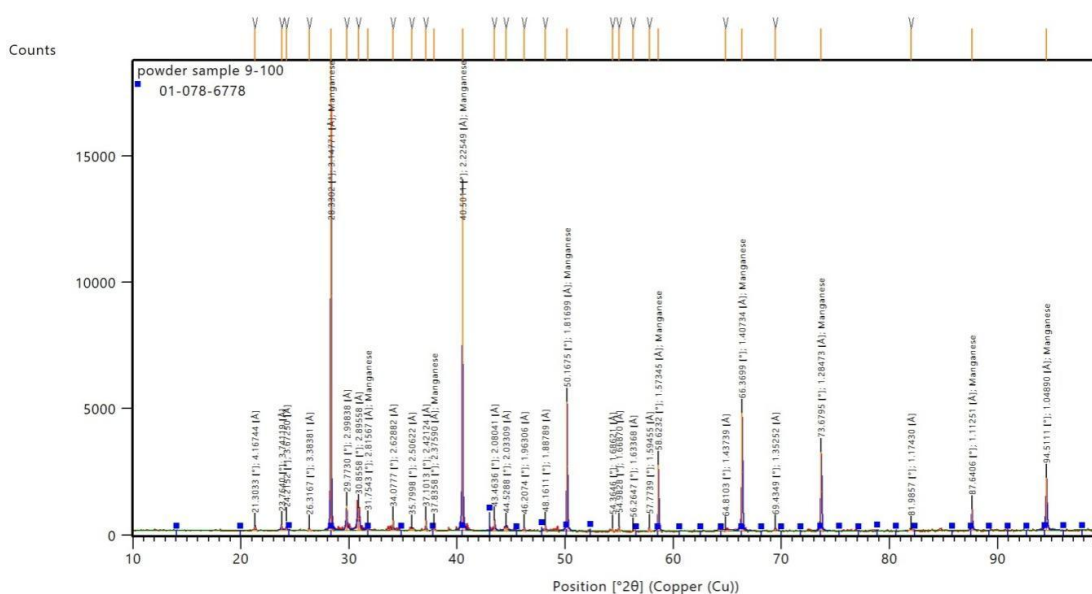


Figure 6: Showing peaks compared with Manganese (Mn).

5. Heavy Metal Analysis of Kshara ICP-OES Technique. (Inductively Coupled Plasma-Optical Emission Spectroscopy)

ICP-OES Technique used for elemental analysis and here used for heavy metal content in the sample.

Table 10: Showing heavy metal analysis of kshara.

Sl no.	Parameters	Kshara
1	Potassium as K wt%	61.67
2	Iron as Fe wt%	0.29
3	Aluminium as Al wt%	0.04
4	Calcium as Ca wt%	0.62
5	Cadmium as Cd wt%	BDL
6	Lead as Pb wt%	0.01
7	Zinc as Zn wt%	< 0.01

**BDL-Below Detectable Limit
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Figure 7.1: Tala tree.



Figure 7.2: Fresh leaves of Tala.



Figure 7.3: cleaned leaves.



Figure 7.4: Cut and kept for Drying.



Figure 7.5: partial drying.



Figure 7.6: complete drying.

Figure 7: Showing drying of Tala leaves.



Figure 8.1: burning of leaves.



Figure 8.2: during burning.



Figure 8.3: complete burning.



Figure 8.4: kept for cooling.



Figure 8.5: cooled ash.



Figure 8.6: collected ash.

Figure 8: Showing burning of Tala leaves into ash.



Figure 9.1: Taking ash in vessel.



Figure 9.2: pouring water.



Figure 9.3: Ash completely dissolved in water.



Figure 9.4: Maceration with hand.



Figure 9.5: Liquid kept overnight.

Figure 9: Showing Preparation of Kshara Jala.



Figure 10.1: Filtration with Kora cloth. Figure 10.2: Final filtration of Ksharodaka. Figure 10.3: Kept for heating.



Figure 10.4: Initial stage froth appeared.



Figure 10.5: Leaving white ash at sides.



Figure 10.6: Semi solid mass.



Figure 10.7: After complete.



Figure 10.8: Cooled and collected.



Figure 10.9: Stored in a evaporation of water ash glass bottle.

Figure 10: Showing filtration of ksharodaka and process of heating to obtain kshara.

DISCUSSION

In the present study preparation and analysis of physico-chemical parameters of Tala Patra Kshara has been carried out. The study revealed the various property of drug. The various parametric values which have been obtained may serve as standard parameter for genuine preparation of Tala Patra Kshara.

- Physico-chemical parameters and HPTLC of leaves of Tala proved drug was authentic.
- Leaves of Tala(14kg) collected cleaned cut into pieces. The reason behind size reduction is to make

easy and uniform drying and helps for further process like burning and preparing Ash. It is dried well under sunlight for 15days. After all water content got evaporated, leaves should be burnt into ash in a big iron vessel in open place.

- After complete cooling ash collected, taken in a stainless steel container to avoid possible chemical reactions. Then 4 parts of water is added and rubbed well with hands for proper mixing. Kept overnight undisturbed allowed particle to settle down. Next day supernatant water collected carefully, precaution

taken to avoid entry of sediments. A clean kora cloth should be used for filtering.

- The ksharajala obtained heated in mandagni until water evaporates. Vapors and cracking sound increased with temperature raised. Kshara started sticking to bottom of the vessel in last stage. It was stirred carefully to prevent bumping and sticking. Finally greyish white coloured kshara was obtained.

Organoleptic characters

Colour: Colour was greyish white in colour. Colour may be due to the evaporation of water portion during boiling the sediments which possesses the greyish white colour.

Taste: The taste was pungent salty which shows presence of inorganic salts in kshara.

Odour-Odour is characteristic and slightly pungent because of property of kshara.

Touch-It is amorphous, smooth, in nature.

Physico-chemical parameters

Loss on drying: The test helps in assessing the amount of moisture present in the given sample. The value came zero suggests no moisture content.

Total Ash: Total ash is an indicator of the amount of the inorganic matter present in the sample. The total ash usually consists of carbonates, phosphates, silicates and silica which include both physiological and non physiological ash. It is very important in standardization of the prepared product. Here the value 91.86 higher value justified in kshara as it is basically derived from the ash of plants.

Acid insoluble Ash: It was carried out to evaluate the percentage of insoluble inorganic content of the sample in dilute acid. Since a drug must first pass into the solution before it can be absorbed, so the acid insoluble ash test for drug is therapeutically very important. It is important to evaluate physiological availability of the drug. Acid insoluble Ash of Tala Patra Kshara is 7.9%.

Water soluble Ash: It indicates the percentage of solubility of contents of the sample soluble in water. Aims at extraction of water soluble contents of the ash obtained from the plant. The water soluble ash value of Tala Patra Kshara was 83.48±2.

Alcohol Soluble Extractive: This is performed to assess the amount of alcohol Soluble Extractive in the sample. The value is 3.03.±0.01.

Water soluble extractive: This is performed to assess the amount of water soluble extractive. The value is 92.19±0.01 This value justifies as kshara extracted from ash of plants after soaking it in water.

pH Value: pH value of an aqueous solution may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration. The pH value is 8. It indicates drug is alkaline in nature due to presence of

alkali salts. Absorption efficacy and irritability of a medicine will depend on pH value.

XRD(XRay diffraction): analysis shows chief compound present in samples are potassium, sodium carbonates, silicon, chloride which are responsible for alkalinity of sample.

ICP-OES technique: The study revealed sample of Tala Patra Kshara showed Potassium K wt%-61.87 and heavy metals like Iron as Fe wt%-0.29, Aluminum as Al wt%-0.04, Calcium as Ca wt%-0.63, Cadmium as Cd wt%-BDL(Below Detectable Limit), Lead as Pb wt%-0.01, Zn as Zn wt %-<0.01. The values obtained are within permissible limits.

CONCLUSION

Kshara preparation is unique Pharmaceutical procedure consists many steps but very effective Kalpana. The drug Tala Patra used in study is cost effective and available throughout India. In present study 24.72% of Tala Patra kshara was obtained from 275 grams of ash. Prepared kshara having pH 8 and other analytical parameters proves its authenticity. The physico-chemical parameters and quantitative inorganic estimation can be taken as preliminary standards of the formulation. This work will be beneficial for further clinical studies and will be helpful in future.

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