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Research Article

PHARMACEUTICO-ANALYTICAL PROFILE OF ARKA KSHARA THE FORMULATION OF UPAVISHA ARKA (*CALOTROPIS PROCERA* AIT. R. BR)

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ABSTRACT

Analytical study of Ayurvedic formulation is the need of present scientific era. Though the Ayurvedic drugs are time tested and have been used successfully in the management of various ailments, it is now necessary to prove their quality, efficacy and safety to the scientific world through various parameters. Agadtantra is a branch of Ayurveda dealing with classification, mode of action, clinical manifestations and treatment of various poisons. Arka (*Calotropis procera*) is included in Upavisha by Rasatarangini. Arka Kshara is an alkaline preparation of Upavisha Arka (*Calotropis procera*) described in treating many disorders. Till date no data is available regarding analytical profile of Arka Kshara. So, the present study is planned to prepare Arka Kshara and develop its analytical profile. These findings will be useful in establishing quality control standards and standardization of Arka Kshara in future.

Keywords: Arka (*Calotropis procera*), Agadtantra, Upavisha, Arka Kshara, Analytical profile

INTRODUCTION

Agadtantra is one of the branches of Ashtang Ayurveda which deals with the study of poisons, their action, detection and treatment. These poisons are basically classified into Visha and Upavisha. Arka (*Calotropis procera*) is one among Upavishas having its own therapeutic importance.[1,2]

In Ayurveda, substance of natural origin, such as plants, animals and minerals are used for preparation of various formulations. Acharya Charak has mentioned eighteen parts of plant which can be used in medicinal purpose and kshara is one among them.[3] Kshara is the alkaline substance obtained from the water-soluble ash of the drugs of plant origin.[4] Kshara is the ayurvedic formulation which causes Ksharan of Mamsadi Dhatu by its properties like Chedana, Bhedana and Lekhana.[5] Kshara is included as an ingredient in many formulations e.g. Ksharagada, Ksharagutika, Pippalyadi churna, Marichyadi churna etc. [6,7,8] Due to its guna- karma, it has more importance in pharmaceutics and also has specific therapeutic value. Kshara can be used internally and externally and has topmost place in all surgical and para surgical measures. [9]

Acharya Sushruta father of Indian surgery is the pioneer of Kshara Kalpana has praised kshara as, Shastraanushastrabhyam Kshara Pradhantamha, which means among shastra and anushastra, kshara is superior. [10] According to Acharya Sushruta, kshara dravyas has ksharanatwa (Corrosive) property. [11] Different opinion exists regarding the proportion of water use for the preparation of Kshara in various Ayurvedic text. The ratio of ash and water is narrated 1:6 and 1:8 respectively by Acharya Sushruta and Ayurveda Sarsangraha, while it is mentioned 1:4 in Rasatarangini, Sharangdhara and Ayurveda Prakash. [12-16] Kshara is prepared from various Ayurvedic herbs viz. Arka (*Calotropis Procera*), Snuhi (*Euphorbia nerifolia*), Mulaka (*Raphanus sativus*), Apamarga (*Achyranthes aspera*) etc. [17]

Arka Kshara the formulation of Upavisha Arka is mentioned in Rasatarangini and Siddha Bhaishajya Sangraha. [18,19] It is indicated in the diseases Gulma, Pleeha, Udararoga, Shwasa, Kasa, Kaphajroga etc. [20,21] Arka Kshara given in the dose of 2 to 4 Ratti or 2 to 6 Ratti with Anupana of Ushnajala, Madhu or Asava, Arishta, Kwatha. [22,23] Various combinations of Kshara are available in classics like Ksharadvaya, Ksharatraya, Ksharapanchaka, Ksharashastaka, Ksharasaptaka and Ksharaashtaka. [24] Arka Kshara has been mentioned in Ksharashtaka by Rasatarangini and Dhanwantari Nighantu. [25,26] Rasatarangini has described Arka Kshara, Snuhi Kshara, Apamarga Kshara, Tila Kshara, Palash Kshara & Chincha Kshara in detail. [27] In present study, Arka Kshara was prepared by using classical reference of Sharangdhar Samhita also the use of Kashtha for the preparation of Kshara is mentioned in this text. [28] The world health organization has appreciated the importance of herbal plants and their formulations for public health care. Hence, it is need of time to validate the Ayurvedic formulations using various parameters. For the preliminary Physico-chemical profile of Arka Kshara, parameters like loss on drying, pH value, water soluble ash, acid insoluble ash and sodium, potassium and iron ions were measured.

MATERIALS AND METHODS

Collection of Raw Material - Arka Kashtha was collected from the field from nearby area of Nagpur.

Authentication of Raw Drug - The procured sample of Arka Kashtha was authenticated at the Department of Dravyaguna in

the institute and the Department of Botany at Rashtrasant Tukdoji Maharaj Nagpur University, Nagpur. Herbarium No- 10408

Standardization of Raw Drug - Standardization of Arka Kashtha was done as per Ayurvedic Pharmacopoeia of India at Sheetal Laboratory, Pune. [NABL Accredited Laboratory, IEC 17025]

Instruments

- Iron Pan
- Steel Container
- Weighing Machine
- Gas Stove
- Cotton Cloth
- Ladle/Spatula
- Steel Plate
- Measuring jar
- Rubber Tube for decantation

Pharmaceutical Study

Arka Kshara has been prepared in the institute by following method mentioned in the text Sharangdhar Samhita. The process of preparation is divided into three stages.

1. Preparation of Ash
2. Preparation of Kshara Jala
3. Preparation of Arka Kshara

Preparation of Ash

The fresh Arka Kashtha was collected and dried in sunlight. It was burnt completely in a big Iron pan till it is converted into greyish white ash. After the self- cooling ash was collected (Figure1)

Preparation of Kshara Jala

The prepared ash and water in the ratio of 1:4 was taken in cylindrical vessel. The mixture was macerated thoroughly with hands and kept undisturbed for overnight. Next morning the clear supernatant liquid was decanted carefully and filtered till obtaining clear Ksharajala, through cotton cloth. (Figure 2)

Preparation of Arka kshara

The obtained Kshara Jala (filtrate) was subjected to heat for evaporation of the water content. After complete evaporation of the water, the obtained Kshara was collected from the inner surface of vessel by scraping and stored in airtight glass container. (Figure 3)

Table 1: Details regarding the collection and drying of Arka Kashtha

Details	Date and Duration specification
Date of Collection of Arka Kashtha	12/12/2020
Date of completely drying of Arka Kashtha	30/01/2021
Duration required for complete drying	48 days

Analytical Profile

It was carried out at Sheetal Laboratory, Pune. [NABL Accredited Laboratory, IEC 17025]

A. For Arka Kashtha

1. Organoleptic Parameters

- Colour,
- Odour,
- Taste

2. Physicochemical Parameters

- Loss on drying at 110^0C
- Ash Value
- Acid Insoluble Ash
- Water soluble extract
- Alcohol soluble extract

B. For Arka Kshara – Parameters were assessed as per Ayurvedic Pharmacopoeia of India guidelines- [29]

1. Organoleptic Parameters

- Colour
- Odour
- Taste

2. Physicochemical parameters

- Loss on drying at 110^0C
- Acid insoluble ash,
- pH

3. Assay

- Sodium,
- Potassium,
- Iron

4. Chromatographic study- Thin Layer Chromatography (TLC)

OBSERVATIONS AND RESULTS

Table 2: Details of Arka Kashtha and Arka ash

Parameters	Values
Weight of fresh Arka Kashtha	24 kg
Weight of dry Arka Kashtha	9.1 kg
Weight loss of Arka Kashtha after drying	14.9 kg
Percentage of weight loss of Arka Kashtha after drying	62.08%
Weight of ash obtained	530 gm
Percentage of ash obtained from Dry Arka Kashtha	5.8%
Percentage of ash obtained from fresh Arka Kashtha	2.2%

Table 3: Details of Ksharajala preparation

Parameters	Values
Volume of water taken	2,120 ml
Ksharajala obtained after filtration	1,330 ml
Time required for preparation of Kshara Jala	12 hrs
Percentage of Kshara Jala obtained	62.73%
Percentage of Kshara Jala loss	37.27%

Table 4: Details of Arka Kshara

Parameters	Values
Volume of Ksharajala taken	1330 ml
Time required for Kshara preparation	2 hrs
Kshara obtained	85 gm
Percentage of Kshara obtained from ash	16.03%
Percentage of Kshara obtained from Fresh Arka Kashtha	0.35%
Percentage of Kshara obtained from Dry Arka Kashtha	0.93%

Table 5: Organoleptic and Physicochemical Parameters of Arka Kashtha

Parameters	Values
Organoleptic	Colour - Faint brown Creamish Odour - Strong pungent Taste - Strong Bitter
Physicochemical	
Loss on drying at 110ºC	6.42%
Total Ash Content	7.46%
Acid Insoluble Ash	Nil
Water Soluble Extract	15.84%
Alcohol Soluble Extract	11.42%

Table 6: Organoleptic, Physicochemical Parameters and Assays of Arka Kshara

Parameters	Values
Organoleptic	Colour - Faint Creamish Odour - Kshara odour Taste - Pungent Saline
Physicochemical	
Loss on drying at 110^0C	0.44%
Acid Insoluble Ash	1.01%
pH (5% aqueous solution)	10.62
Assay	
Sodium	1.94%
Potassium	42.67%
Iron	45.29 ppm

Table 7: TLC Analysis

Observation by/at	RF Value	Colour
Eye	0.87	Yellow
254nm	0.87	Yellow
365nm	0.87	Yellow
Iodine chamber	0.87	Brown

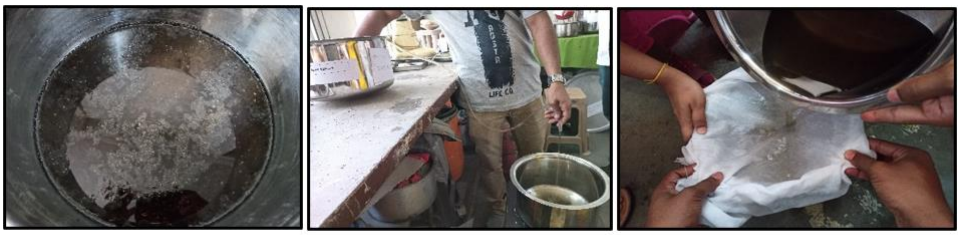
[Stationary Phase-Toluene; Ethyl Acetate; Formic acid (6:3:1)]
[Mobile phase- Ethanol Extract]

Figures of Preparation of Arka Kshara

Fresh Arka Kashtha **Dry Arka Kashtha** **Burning of Arka Kashtha**

Ash

Fig. 1-Preparation of Arka Ash



Ash +Water **Decantation of Ksharajala** **Filtration of Ksharajala**

Ksharajala before and after filtration

Fig. 2: Preparation of Kshara Jala

Heating of Ksharajala | Evaporation of Ksharajala | Last stage of Kshara preparation

Arka Kshara

Fig. 3: Preparation of Arka Kshara

DISCUSSION

In the present study analytical profile of Arka Kshara has been carried out. Arka Kashtha should be cut into small pieces for better drying. Kashtha burnt quickly as it was completely dried. Arka Kashtha should be burnt into open space in a vessel to prevent contamination during burning. The greyish white coloured ash with a characteristic taste was obtained. After drying of Arka Kashtha 62.08% of weight loss was observed. Percentage of ash obtained from dried Arka Kashtha was 5.8% [Table No.2]

In one part of Ash four parts of water should be added. Stainless steel vessel should be used to avoid possible chemical reactions for sedimentation. Ash should be macerated well in water for proper mixing and allowed to settle down for overnight. If charcoal particles are found floating, then they have to be removed with sieve. Kshara Jala should be obtained very cautiously through the rubber pipe without disturbing the vessel. Precautions should be taken to avoid the entry of sediments. A clean cotton cloth should be used for filtration of Kshara Jala. Before filtration new cotton cloth must be washed properly for removal of excessive starch content. Filtration of Kshara Jala should be done till obtaining clear Kshara Jala. The prepared Kshara Jala was clear, yellowish in colour. Average time required for preparation of Kshara Jala was 12 hrs. Kshara Jala obtained after number of filtrations was 62.73% [Table No.3]

Kshara Jala should be kept on Mandagni to obtain Kshara. During the process of evaporation of Kshara Jala continuous slow stirring was done to avoid sticking and burning. Initially with the evaporation of Kshara Jala, vapours are seen and crackling sound is heard and it get increased as time progresses. Colour of Kshara Jala was changed from yellowish to light brown gradually with the time. Arka kshara started to stick on the bottom of the vessel in final stage and bumping was observed. At this stage it was stirred carefully to prevent bumping and sticking. Finally, faint creamish coloured Arka Kshara was obtained. The average time required for the preparation of Arka Kshara was 2 hrs. The Arka Kshara obtained from dry Arka Kashtha was 0.93% [Table No.4] Kshara absorbs moisture as it is hygroscopic in nature. Moisture will lead to the activation of enzymes and can harm the quality of the Kshara. So, Kshara must be preserved in air tight glass container with addition of silica gel packet in it.

Loss on drying test is done to measure the amount of water and volatile matters in Arka Kashtha, which was found to be 6.42%. Total ash value depends upon the inorganic substances present in the particular drug, ash value for Arka Kashtha was 7.46%. Acid insoluble ash indicates siliceous impurities which was Nil in Arka Kashtha. Various components have their solubility in particular media. Soluble extractive of the Arka Kashtha found in alcohol & water was 11.42% and 15.84% [Table No.5] The physico-chemical results obtained for Arka Kashtha was found under the limits when compared with that of Arka stem bark mentioned in Ayurvedic Pharmacopoeia of India.

Arka Kshara obtained was faint creamish in colour having kshara odour and pungent saline taste. The pH conventionally represents the acidity and alkalinity, pH of the Arka Kshara was 10.62 which shows its alkaline nature. The value of loss on drying for Arka kshara is found to be 0.44%. Acid insoluble ash is a common test carried out to evaluate the percentage of insoluble inorganic content of the sample in dilute acid. Value obtained for Arka Kshara was 1.01%. Sodium, Potassium & Iron ions was found to be 1.94%, 42.67% & 45.29 ppm, it shows that the Arka Kshara possesses higher concentration of potassium ions. [Table No.6] In TLC Profile of Arka Kshara each one spot observed by naked eye, 254nm, 365nm at 0.87 Rf value (All yellow). Also, one spot was observed at Iodine chamber at 0.87 Rf value (brown). This can be considered as reference standard for validating this formulation in future. [Table No.7]

CONCLUSION

Classical method of preparation of Kshara mentioned by Acharya Sharangadhar is used to develop the preliminary profile of Arka Kshara. The formulation Arka Kshara has various therapeutic importance but still there is no data available regarding its analytical profile, so present study will help to fill this gap. The physico-chemical, organoleptic parameters and Chromatographic study of Arka Kshara can be taken as preliminary standards. These findings will be useful in establishing quality control standards and standardization of Arka Kshara in future.

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