wjpmr, 2017,3(4), 44-46

SJIF Impact Factor: 4.103

WORLD JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.wjpmr.com

Research Article

ISSN 2455-3301

WJPMR

CHEMICAL ANALYSIS OF ARKA KSHARA: A HERBAL PREPARATION

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Article Received on 26/02/2017 **Article Revised on 19/03/2017** **Article Accepted on 08/04/2017**

ABSTRACT

Background and Objective: Among various drugs described in Ayurveda, Kshara are a class of drug derived from the ashes of different medicinal plants which are known for their wide utility in practice. However, little is known about chemical aspects of these substances. Calotropis procera (Arka) is an important plant described widely in the Ayurveda literature for the beneficial preparations derived out of the whole plant as well as from its ash. This study was aimed at to analyse the Arka Kshara on chemical parameters. **Methods**: Arka kshara was characterized using X-Ray diffraction, FT-IR Fourier transmission infrared spectroscopy and pH measurement. **Results**: Sulphates and carbonates of potassium were found in Arka Kshara. **Conclusion:** Arka Kshara is mainly composed of inorganic salts of potassium.

KEYWORDS: Arka kshar; Herbal preparations; X-Ray diffraction; FT-IR Fourier transmission infrared spectroscopy; pH.

INTRODUCTION

Medicinal plants constitute the most important source for natural products and useful chemicals. Their importance and utility in medicinal and pharmaceutical field is ever increasing. Generally when any plant is dried and burnt, it gives white ash which is composed of inorganic components one water soluble and other insoluble part. This water soluble part possesses useful medicinal and pharmaceutical properties and their uses are described in Ayurvedic system of medicine. The water-soluble components of several medicinal plants are biosalts and in ayurveda these are known as ksharas. In Sushrut Samhita[1] Kshara is defined as ‘‘Tatra Ksharanat Kshanadwarn ksharah’’ Meaning: *Kshara* possess inherent property to destroy. These biosalts possess diverse medicinal properties and they constituent an interesting class of ayurvedic drugs. According to Vagbhat[2] Kshar therapy is superior to surgical treatment in certain cases. These kshars or biosalts can be employed in such complicated cases where surgery is difficult or inapplicable. Despite of this, ksharas are neither manufactured on large scale for commercial purpose, nor are they regularly in use for regular treatment. Therefore there are no literature reports on the scientific charecterization of kshara from modern pharmaceutical point of view. *Arka* (*Calatropis procera*) is an important medicinal plant of *Ayurveda* whose kshara preparation is used internally and externally in various diseases. As in present era, Ayurvedic drugs are receiving popularity all over the world, attention has been diverted to the scientific validation of drugs derived out of herbal or mineral origin. It has become the need of hour to explore the ayurvedic drugs by following modern scientific approach for their validation and global acceptance. Keeping this view in mind, this study was aimed at to analyse the Arka Kshara on chemical parameters.

MATERIAL AND METHODS

Isolation of the inorganic products form selected plants is done according to the traditional procedure given in standard *ayurvedic t*exts.[3] The experimental details are briefly summarized below.

Experimental details: The *Arka* kshara was prepared using the usual method reported in the literature.[3] *Arka* plant was collected from field and it was washed and dried in shade. After weighing, it was burnt at a neat and clean open place in open flame. When it completely burnt, the ash was allowed to cool and collected in stainless steel vessel and weighed using electronic balance. The ash was taken in a volumetric flask in and 6x distilled water were added to it. The mixture was stirred well with a glass rod and was kept as such overnight. Solution was filtered through whatmann’s filter paper with pore size 615 A and filtrate was

collected in a calibrated glass container and its volume was measured. The filtrate was boiled on mild heat in stainless steel vessel to dryness with intermittent stirring. The resultant dry material known as *kshara* was grounded and stored in airtight container at room temperature. The water soluble salts are then subjected to chemical analysis to find their inorganic constituents. The chemical composition of the material extracted in the form of powder or dissolved in double distil water and subjected for X-Ray diffraction , FT-IR Fourier transmission infrared spectroscopy and pH measurement.

RESULTS

X-ray Diffraction- X-ray diffraction (XRD) is a versatile, non-destructive technique that reveals detailed information about the chemical composition and crystallographic structure of natural and manufactured materials.

XRD studies were performed with X-ray Diffractometer (Bruker, Germany) to find out the prime constituents present in this substance. The cathode for X-ray radiation was Cu Kα (λ = 1.5406 nm) with 2 theta (2Θ) angles ranging from 10 to 90 degrees at room temperature. The graphical diffraction pattern obtained was analyzed with the J.C.P.D.S. [Joint Committee on Powder Diffraction Standards] which was inbuilt in X-ray Diffractometer to postulate the results. The diffraction pattern is shown in figure 1. Strong peaks showing high intensities at 2 θ^0 angles of 12.865, 37.195 and 31.683 were recorded. These peaks correspond to potassium carbonate (K_2CO_3). Some intermediate peaks at $2\theta^0$ angles of 21.316, 23.287, 28.362, 30.981, 40.522, 47.439, 50.59, 58.599 and 66.3654 etc were also recorded and were analysed to result from K_2SO_4. These results suggest that the *Arka* Kshāra comprises mainly of K_2CO_3 and K_2SO_4.

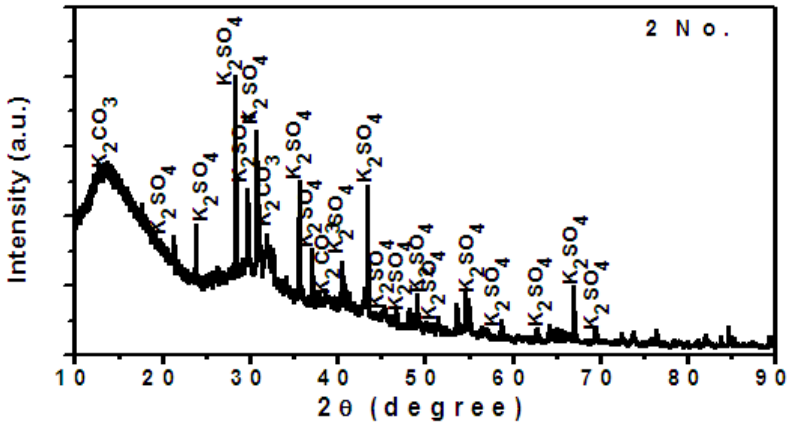

Figure 1: Arka kshara -XRD Pattern.

Fourier transmission infrared spectroscopy: The main goal of IR spectroscopic analysis is to determine the chemical functional groups in the sample. It is the absorption measurement of different IR frequencies by a sample positioned in the path of an IR beam. To identify a component of certain compounds, they are exposed to high energy such as Infrared Radiation (IR). The reaction results to emission of energy showing the reactions of the molecules, which are automatically plotted to a graph by one of the programs embedded in spectroscopic instruments.

FT-IR analysis:[5,6,7] Perkin Elmer Spectrometer FTIR SPECTRUM ONE in the range of 4000-400 cm-1 at a resolution of 4 cm-1 was used. The sample was mixed with KBr procured from Merck chemicals. Thin sample pellet was prepared by pressing with the Hydraulic Pellet Press and subjected to FT-IR analysis.

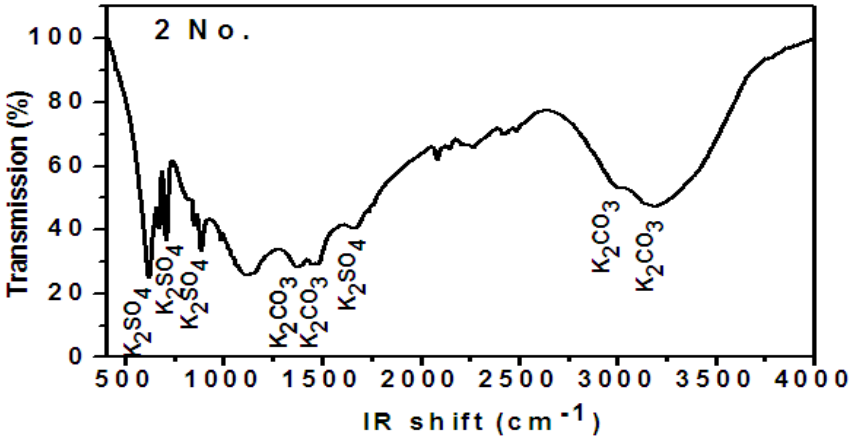

Figure 2: IR Pattern of Arka Kshara.

Fourier transmission infrared spectroscopy report of *Arka kshara*

Major peaks were found at 1663.3, 2081.5, 2912.71 and 3213.16 cm-1 which corresponds to K2CO3 and other peaks at 670.4, 672, 695.6, 864.5, 885.26 and 982.77 which corresponds to sulphate group of potassium.[5,6,7]

pH measurement: A very high pH solution is expected to destroy healthy tissues and have coagulation effect on protein. In view of this, pH of water solution of this substance was measured at its 1% concentrations. The pH of the solution was recorded 10.56.

CONCLUSION

The major constituent of this Arka Kshara are potassium compounds like K2CO3 and K2SO4 and the pH of it is 10.56 which shows its alkaline nature. When they come in contact of water they may produce CO_3^{-} and OH^{-} .The strong alkaline nature of the water soluble salts is due to presence of potassium salts (CO3, OH) , because of its alkaline nature they exhibit various actions such as antacid, digestive, carminative,[4] krimighna (anti helminthic), medoghna (lipolytic), used in cases of Ashmari (Urolithiasis), show styptic activity, used for scrapping of unhealthy tissues in cases of chronic ulcers by its medical debriding nature.[4] The pharmaceutical and medicinal utility of the Biosalts have interesting and appreciable aspect from applied point of view as the kshara may liquefy the phlem and fat and thus clear the body channels, useful in wound bed preparation and skin diseases. The detail chemical composition of the total white ashes and their utilization is still an important area for exploration.

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