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Research Article

ARKA LAVANA THE FORMULATION OF UPAVISHA ARKA (*CALOTROPIS PROCERA* AIT. R. BR.): AN ANALYTICAL PROFILE

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ABSTRACT

Lavana kalpana is one of the most commonly used dosage forms because of its easy administration and dosing. Arka lavana is a herbo mineral preparation containing Upavisha Arka (*Calotropis procera*) and Saindhava lavana. It is used in the management of Yakrit pleeha, Udara and Gulma roga. As it contains Upavisha, standardization becomes necessary to keep up its therapeutic efficacy. In this study an attempt has been made to find out the authenticity of the raw drugs, to prepare and analyse Arka lavana to set the preliminary standards for the same. Arka lavana was prepared as per the reference of Bhaishajya ratnavali. The analytical study was carried out in terms of organoleptic, physicochemical and TLC evaluation and results were noted. The pharmaceutical and analytical results can be used as reference standard for quality assurance and standardization of Arka lavana for further study.

KEY WORDS: Upavisha, Arka *(Calotropis procera)*, Saindhava lavana, Arka Lavana, Standardization, Agadtantra.

INTRODUCTION

Over time Ayurvedic practitioners have tried to develop a number of traditional methods to convert toxic medicinal plants to useful medicines. Poisonous plants for treating ailments are an age-old tradition in India after they are properly purified.[1] Visha Chikitsa or Agada Tantra include the treatment of diseases caused by poisons.[2] *Calotropis procera* (Ait) R.Br. from the family Asclepiadaceae is one such medicinal plant which has been used traditionally against various diseases over several years.[3] Arka is among one of the Upavisha mentioned by Bhavprakash and Rasatarangini respectively, though an Upavisha it is used in various Kalpanas.[4,5,6] The symptoms produced in the body due to Upavisha are less toxic, less severe, usually not life threatening and their toxicity can be controlled by therapeutic measures. According to Acharya Bhavmishra properly purified Visha Dravya when taken with Yukti will act as Pranadayi, Rasayana, Tridoshaghna, Yogavahi, Brihana and Veerya Vardhaka.[7] Many compound formulations in Samhitas and AFI (Ayurvedic formulary of India) contains Upavisha Arka for their imperative actions.

Lavana kalpana is the dosage form in which lavana is used predominantly along with other drugs subjecting to Putagni sanskara.[8] Saindhava lavana is considered as best amongst all the varieties of Lavana.[9] It is included in 'Trilavana, Panchalavana, Shadlavana,' by various Acharya in Bruhatrayi, Laghutrayi, Nighantu and in ancient texts of Rasashastra.[10] 'Ras Ratna Samuchchaya' has included Saindhava lavana in Vishaghna Gana.[11] Arka lavana is one such lavana kalpana which has become prevalent in therapeutics in recent times. This is a herbo mineral drug prepared from Arka patra and Saindhava lavana by subjecting it to Gajaputa.[12] It is therapeutically used in the management of Yakrita, Pleeha, Udara roga, Gulma, Mandagni, Panduroga etc.[13] It is given in the dose of 4 Ratti to 8 Ratti along with Anupana Mastu, Koshna Jal.[14] Arka lavana is quite sustainable owing to its effective therapeutic use, easy availability of Arka patra and Saindhava lavana, cost effective and fewer requirement of equipment's for its preparation.

Most of the tests for standardization described in ancient literature appear to be based on observations and seems to be subjective without valid scientific support. A systemic approach is adopted to validate the therapies and approaches with integration of principles of Ayurveda. It requires adequate standard procedures to establish safety, efficacy and acceptability of drugs for Ayurveda approaches.[15] To fulfil these criteria raw material identification, standardization and S.O.P of the pharmaceutical procedure are important. However minimal work is available regarding the establishment of standard operating procedure for Arka lavana which is the formulation of Upavisha Arka.[16] Considering the importance of standardization for formulations containing Upavisha, pharmaceutical and analytical study needs to be done. Hence this present study aims at pharmaceutical and analytical standardization of Arka lavana.

MATERIALS AND METHODS

Equipments

- Putayantra
- Thermocouple - This instrument is a portable, compact sized digital thermometer designed to use as temperature sensor. Temperature Scale: Celsius or Fahrenheit.
- Cow dungs (Upala) as source of heat
- Sharava
- Clay (Multani)
- Clay smeared cloth (Matkapada)

- Khalvayantra
- Lighter
- Knife
- Weighing machine
- Sieve no 100

Pharmaceutical Study

Collection, identification and Authentication of Raw drugs

Fresh leaves of Arka (*Calotropis Procera*) were collected from the field. Part of plant used (Leaves) were Identified and Authenticated at Dravyaguna department of the institute as well as at Botany department of Rashtrasanth Tukdoji Maharaj Nagpur University, Nagpur. Herbarium No – 10406
Saindhava lavana was procured from the authorized raw drug shop, Nagpur.

Preparation of Arka Lavana[17, 18]

Formulation was prepared as per the textual description Bhaishajyaratnavali and guidelines in Ayurvedic Pharmacopoeia of India (API)

Table 1: Ingredients and its quantity used for preparation of Arka Lavana

Ingredients	Latin Name	Quantity
Arka patra	*Calotropis procera*	250 gm
Saindhava lavana	Rock Salt	250 gm

Table 2: Size and weight of cow dung cakes

Parameters	Size and weight
Total weight of cow dung	10.35 kg
Average weight of cow dung	230 gm
Average diameter of cow dung	22 cm
Average thickness of cow dung	1 cm
Average circumference of cow dung	69.08 cm

The fresh leaves of Arka were collected from field, thoroughly washed with water, dried and weighed. Powdered Saindhava lavana was taken from local market and weighed. Cow dung cakes were collected from local market and weighed. Dry and clean Sharava was taken. The collected Arka patra was then placed in a sandwich pattern with Saindhava lavana where upper and lower layers were of Arka patra. Another sharava was placed over it and sealed with seven-layer of clay (multani mitti) smeared cloth (matkapada) sharava was allowed to dry for a day. Then it was subjected to Puta in Putayantra with 45 number of cow dungs, weighing 10.35 kg. In the Putayantra at the bottom 23 cow dungs were arranged. By using matchstick cow dung was ignited. The dried clay smeared Sharava was placed over it and the remaining 22 cow dungs were placed covering the sides and the upper surface of the Sharava. Temperature was maintained for a certain period of time. After gradual cooling, the joined part of Sharava was scraped with a knife. It was observed that final product was completely burnt and was grayish black in colour. The content was collected and grinded to a fine powder in Khalvayantra and passed through sieve no 100 (Fig 2).

Analytical Study

Analytical study of Raw material and Arka lavana was done at Sheetal Analytical Laboratory Pune, An ISO/IEC 17025/ NABL Accredited Laboratory[19, 20].

Parameters assessed for Arka Patra and Saindhava Lavana
Organoleptic tests: Colour, Odour, Taste

Physico-chemical tests
1. Loss on drying
2. Total Ash Content
3. Acid Insoluble Ash
4. Water Soluble Extract
5. Alcohol Soluble Extract
6. Sodium content

Parameters assessed for Arka lavana
Organoleptic tests: Colour, Odour, Taste

Physico-chemical tests
1. pH
2. Loss On Drying
3. Acid Insoluble Ash
4. Assay for sodium, potassium & iron

Chromatographic study[21]

The Chromatographic evaluation of Arka lavana was done by Thin Layer Chromatography as per API.

OBSERVATIONS AND RESULTS

Table 3: Physicochemical parameters of Arka patra

Parameter	Results
Description	Colour- Greenish Odour – Pungent Taste – Bitter and Astringent
Loss on drying at 110°C	7.48 %
Total Ash Content	13.40 %
Acid Insoluble Ash	0.45 %
Water Soluble Extract	30.53 %
Alcohol Soluble Extract	17.12 %

Table 4: Physicochemical parameters of Saindhava Lavana

Parameter	Results
Description	Colour - Off whitish Odour - Faint Taste - Saline
Loss on Drying at 110°C	0.009%
Total Ash Content	99.38 %
Acid Insoluble Ash	Nil
Water Soluble Extract	99.98 %
Alcohol soluble Extract	47.94 %
Sodium Content	26.82 %

Table 5: Total yield and weight loss of Final product

Weight of Ingredients	Weight of Final product in gm	Weight loss in gm
1. Arka patra – 250 gm 2. Saindhava lavana – 250 gm	204	296

Table 6: Temperature readings and time recorded during preparation

Observation	Detail
Initial temperature	40°C
Maximum temperature attained	912°C
800°C + temperature	Maintained for 35 min
Total time required for puta	4 hrs

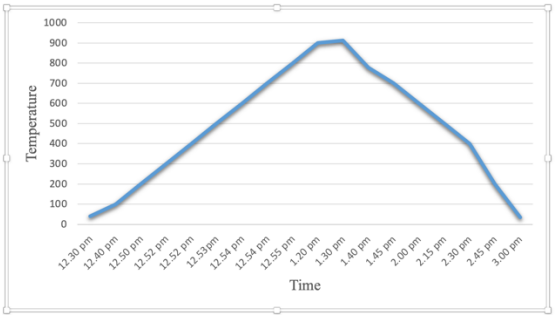

Figure 1: Graphical representation of Temperature pattern

Table 7: Organoleptic evaluation of Arka Lavana

Particular	Arka Lavana
Sound (Shabda)	Not specific
Texture (Sparsha)	Smooth, fine
Colour (Roop)	Grayish black
Taste (Rasa)	Saline
Odour (Gandha)	Faint pungent

Table 8: Physicochemical parameters of Arka Lavana

Parameter	Result
pH 5%	10.12
Loss On Drying at 110°C	0.34%
Acid Insoluble Ash	1.42%
Sodium (Na)	27.44%
Potassium (K)	2.68%
Iron (Fe)	207.1 ppm (0.02%)

Table 9: Thin Layer Chromatography

Stationary phase – Toluene; Ethyl Acetate; Formic acid (6:3:1)	**Mobile phase** – Ethanol Extract
Eye Observed	
RF Value	**Colour**
0.9	Yellow
254 nm observed	
0.89	Yellow
365 nm observed	
RF Value	**Colour**
0.9	Yellow
0.15	Yellow
Iodine Chamber	
RF Value	**Colour**
0.9	Brown
0.15	Brown

DISCUSSION

Pharmaceutical and analytical study determines standards of Arka lavana. After collection and authentication of raw materials, Arka lavana was prepared and analysed by following SOP (Standard Operative Procedure). Authentication of raw materials assures the safe and efficacious finished product.

Sharava taken should be shallow and their margins must be regular so that the two Sharava should fit evenly on applying clay smeared cloth (Matakapda). It must be dried overnight before subjecting to Puta. According to classical texts Arka lavana is prepared by using Gajputa where the source of heat is cow dung cakes. Following references from review, it was found that temperature required for Gajputa is around 800°C. Hence in this experiment emphasize was given to achieve required temperature, so instead of classical Gajputa a mobile Puta was used where ideal temperature can easily achieved. Formulation containing Arka patra and Saindhava lavana are Mrudu dravya, thus 800°C temperature is enough for its conversion or it's Bhasmikarana. Total of 45 cow dung cakes, each weighing average 250 gm were used.

The peak temperature recorded was 912°C after 35 minutes of ignition, and it was maintained in the range of 800°C to 912°C for 35 minutes. Total duration of heat treatment was 2.5 hours and then it was allowed to self-cool. Maximum temperature required for conversion of raw material into proper quality of final product was between 800°C to 912°C. Sharava should be opened cautiously by using knife to prevent impurities from getting in. Final product gets changed into compound form and was grayish black in colour. Mardan should be done appropriately in Khalvayantra then after it should be passed through sieve no 100 to get fine powder. The output obtained was 40.8% while the loss observed was 59.2% (Table no 5). It was kept in an airtight glass vessel with silica packet in it. The final product yield percentage depends on how much quantity of Saindhava lavana was used. Three factors can be considered while discussing about the output of Arka lavana. 1) Type of heat source 2) Quantum of heat applied (Max. Temp about 800°C) 3) Total time required for conversion of raw material into final product.

Raw materials used were evaluated for their physicochemical parameters using standard method (Table no 3,4) the values estimated comply with the standards approved in the API. Physico-chemical parameters are important in determination of adulterant and improper handling of drugs. Further analytical assessment of Arka lavana was done in the laboratory. Organoleptic characters were assessed (Table no 7) Physicochemical parameters were evaluated as per the standards mentioned in API were pH noted was 10.12 which state it is alkaline in nature. Loss on drying at 110°C was 0.34%. It indicates presence of moisture content, since the value is in permissible limit the formulation has more stability. If moisture content is more than permissible limit, then the formulation is more likely to get infected by fungal growth. Acid insoluble ash was found to be 1.42% which gives an idea about the amount of inorganic content such as silica. Amount of Sodium ion found

was 27.44% which was less by 3% as compared to standards of API i.e (not less than 31%). Potassium ion noted to be 2.68% (Not less than 0.3%). Percentage of iron noted was 0.02% which is slightly less than standard limit given in API (not less than 0.11%).

TLC of the formulation was carried out using Toluene; Ethyl Acetate; Formic acid (6:3:1) as Stationary phase and Ethanol extract as Mobile phase. Rf values of the spots and their colour by TLC documentation of Arka lavana extracts have been developed. The Rf values are tabulated in (Table no 9) Spots were observed under UV light. Ethanol extract of Arka lavana observed by naked eye showed 1 spot (0.9 Yellow) at 254 nm showed 1 spot (0.89 Yellow) whereas under 365 nm it showed 2 spots (0.9 Yellow, 0.15 Yellow) Iodine chamber showed 2 spots (0.9 Brown, 0.15 Brown). TLC results obtained from the study could be utilized as a reference for setting limits in the routine standardization.

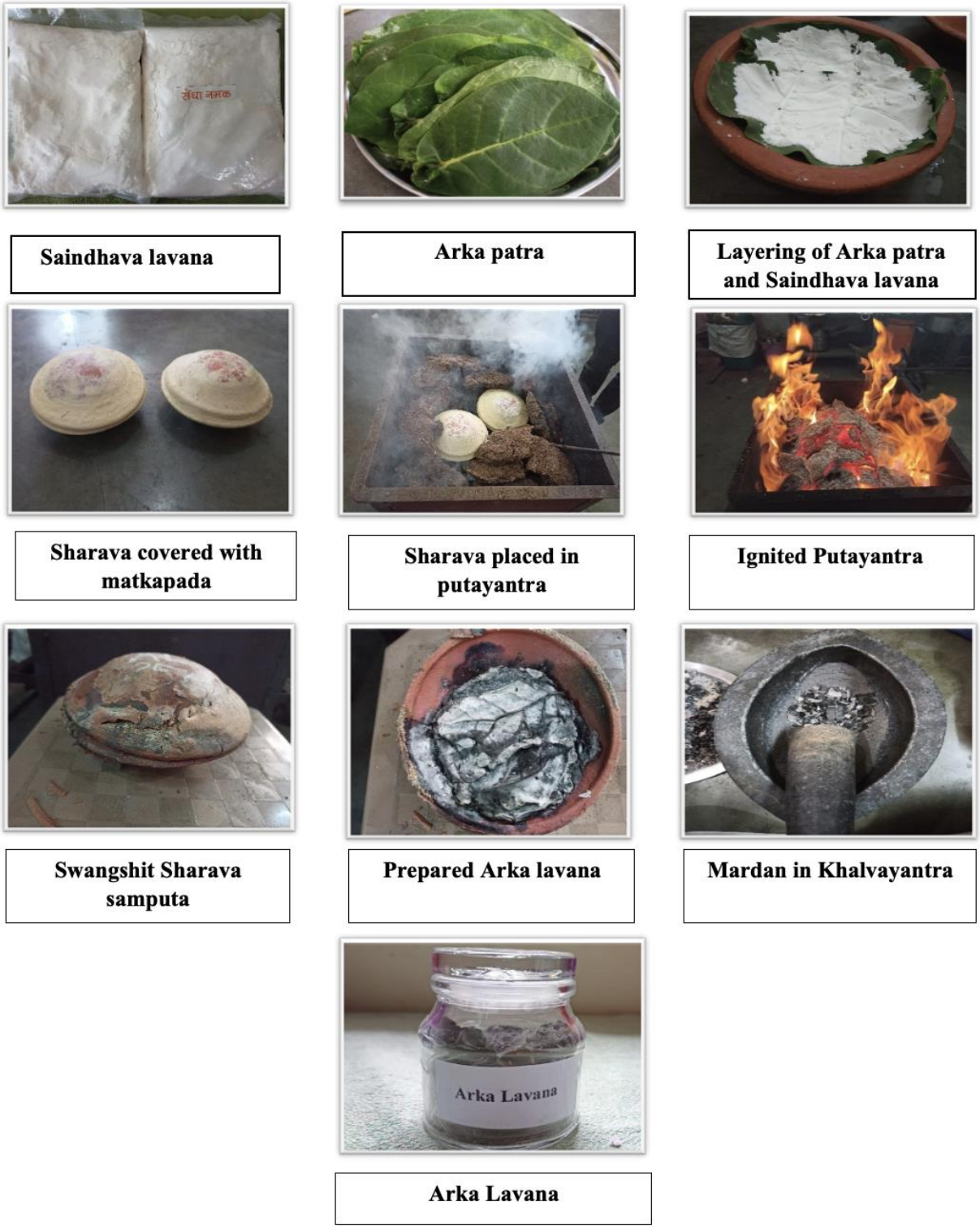

FIGURE 2: PREPARATION OF ARKA LAVANA

CONCLUSION

Considering therapeutic utility of Arka lavana, a thought was given to standardize it for wide spectrum use. The method implemented for preparation from Bhaishajyaratnavali was simple and convenient. The temperature (highest required temperature about 800°C) obtained in Gajputa to prepare Arka lavana can be considered as standard heating pattern. This study was aimed at authentication of ingredients used and physico-chemical characterization using latest technology. It can be concluded that the physicochemical parameters and distinguishing bands in the TLC are very important for monitoring quality of Arka lavana. The tests results obtained would serve as preliminary test for the standardization of the formulation for further studies.

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