

Comparative Evaluation of Arka Lavana – An Ayurvedic Herbomineral Formulation

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ABSTRACT

Arka lavana is one of the Herbo - mineral preparations which is explained under Lavana Kalpana (Preparation of Salt) of Ayurveda. Since many years, it is traditionally used in the effective management of liver and spleen diseases, ascites etc. To do a comparative study of Arka lavana prepared employing traditional and modern methods. Arka lavana was prepared in two different methods viz., Traditional puta method and the Modern muffle furnace method and named as Arka lavana – A and Arka lavana – B respectively. The formulations thus prepared were analyzed with standard parameters like physicochemical characterization. Arka lavana was characterized using FT-IR spectroscopy, Particle size analyzer, Zeta sizer, TG-DTA and X- ray Fluorescence spectroscopy. Sodium and Chloride content was 52.09%, 22.40% and 49.37%, 22.91% in Arka lavana – A and B respectively. Though Arka lavana - A prepared by employing traditional puta method, was matching with Ayurvedic Pharmacopeia of India, based on the parameters of analysis, it is difficult to conclude that Traditional puta method is best method than the Modern muffle furnace method.

Key words: Arka, Saindhava lavana, FT-IR spectroscopy, X- ray Fluorescence spectroscopy, TG-DTA.

INTRODUCTION

Arka lavana is one of the Ayurvedic preparations which contain Arka patra (Fresh leaves of *Calotropis gigantea*) and Saindhava lavana (Rock salt). Arka is included in the upavishavarga [1] of Ayurveda. Arka kshira (latex) of the plant is considered as poisonous.

Arka consists of dry leaves of *Calotropis gigantea* which is available throughout India. It is used in the preparation of kshara sutra (caustic thread) and in the effective management of Arsha (Piles) and Bhagandara (Fistula in ano).

Saindhava lavana is one among the panchalavanas (Five Salts) [2] and it is considered as best among all the lavanas [3] because of its unique qualities. It is named as Saindhava lavana as it is obtained from Sindhu desa [4]. The term Lavana in Ayurveda refers to Saindhava lavana [5] only.

Arka lavana is mainly indicated in the management of yakrit pliha rogas (diseases of liver and spleen), udara (ascites), Atisara (diarrhea) etc [6]. It has different actions with different anupanas (vehicle) like koshnajala (luke warm water), dadhi mastu (curd supernatant) etc.

MATERIALS AND METHODS

The required raw material Saindhava lavana was purchased from the raw drug shop, Thanjavur, India. Fresh leaves of Arka (*Calotropis gigantea*), were collected from the herbal garden of Siddha and Ayurveda Pharmacy, SASTRA University, Thanjavur, India. Arka lavana was prepared by traditional puta method and muffle furnace method which was named as Arka lavana - A & B respectively. Both the prepared drugs were analyzed in Centre for Advanced Research in Indian

System of Medicine (CARISM), SASTRA University, Thanjavur, India.

Method of preparation: Puta method:

1. Arka patra – 430 gm
2. Saindhava lavana – 430 gm.

Equal quantity of Arka patra and Saindhava lavana was taken. Saindhava lavana (Fig.1.) was made in to coarse powder. The leaves and Saindhava lavana was kept in alternative layers in Sarava samputa (earthen plate), sealed and dried (Fig.2.). Then it was subjected to puta with 60 number of cow dung cakes, weighing 9.3 Kg. The Sarava samputa was taken out the next day, after cooling by itself. The final product was collected and made in to fine powder [7]. The weight of the final product was 413 gm (Fig.3.).

Muffle furnace method:

1. Arka patra – 500 gm
2. Saindhava lavana – 500 gm

Saindhava lavana and Arka patra was taken in equal quantity and placed in alternative layers in a sarava samputa. The sarava samputa was sealed and dried. After drying it was kept in a muffle furnace and heated to 350o C. After cooling the final product was collected and made in to fine powder [8]. The weight of the final product was 480 gm (Fig.4.). The observations made during the process are given in Table – 1.

Physico-chemical parameters: The final product of formulation were determined such as pH, loss on drying at 105°C, total ash, acid insoluble ash, and Bulk density, were carried out according to the standard procedure (Table - 2) [9].

FT-IR analysis: Perkin Elmer Spectrometer FT-

IR SPECTRUM ONE in the range of 4000-400 cm^{-1} at a resolution of 4 cm^{-1} was used. The sample was mixed

series (Malvern). Measurements were taken in the range between 0.1 and 10000 nm. (Fig.7.)



Fig.1. Raw Materials [A] *Saindhava lavana* [B] *Arka patra*

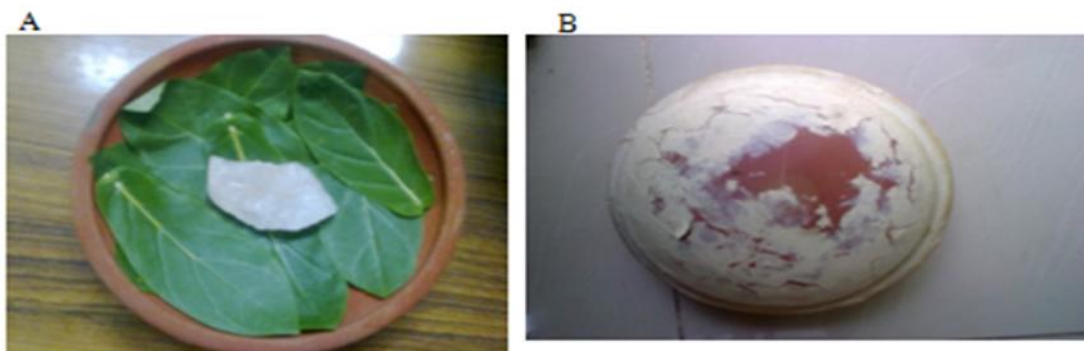


Fig.2. Arrangements for *Sarava sampita* [A] Raw materials kept in *sarava*

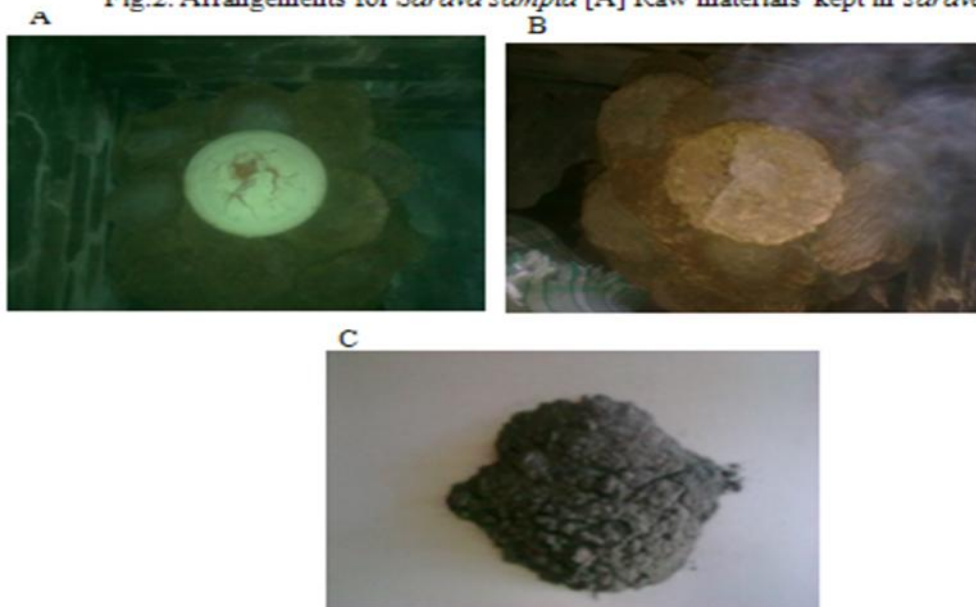


Fig.3. Puta method [A] *Sarava sampita* kept [B] Subjecting to *puta* [C] *Arka lavana* - A

with KBr procured from Merck chemicals. Thin sample pellet was prepared by pressing with the Hydraulic Pellet Press and subjected to FT-IR analysis (Fig.5.). Particle size analyzer: Particle Size Analysis (Bluewave Microtrac, Nikkiso, Japan) (Fig.6.) Zeta sizer: Particle sizing experiments were carried out by means of laser diffractometry, using Zeta sizer nano

The Zeta Potential Analysis of both the samples was carried out in the different anupanas of Arka lavana and the results are given in Table – 3.

TG-DTA analysis: Thermo gravimetric differential scanning calorimeter analysis was carried out using TG-

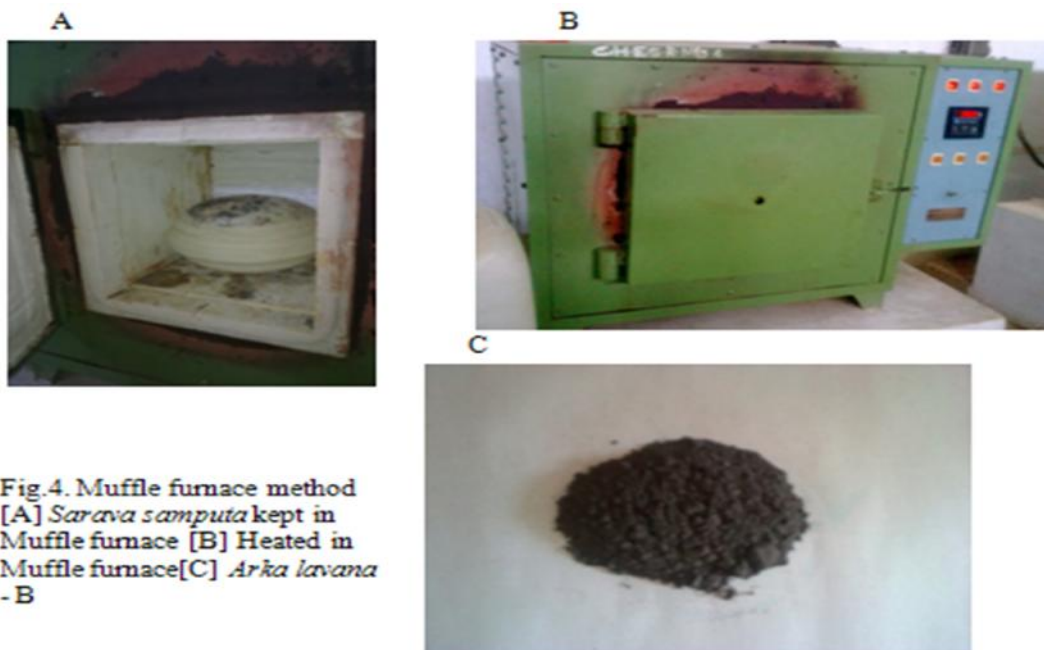


Fig.4. Muffle furnace method [A] *Sarava samputa* kept in Muffle furnace [B] Heated in Muffle furnace [C] *Arka lavana - B*

Table – 1: Observations made during the preparation

<i>Arka lavana</i>	Qty of Raw drugs	Materials used	Wt of the Final product	Wt loss
<i>Arka lavana- A</i>	<i>Arka patra</i> – 430 gm <i>Saindava lavana</i> – 430 gm	60 nos cow dung cakes	413 gm	447 gm
<i>Arka lavana- B</i>	<i>Arka patra</i> – 500 gm <i>Saindava lavana</i> – 500 gm	Muffle furnace at 350°C	480 gm	520 gm

Table – 2: Physico - chemical parameters

S. No	Test	<i>Arka lavana - A</i>	<i>Arka lavana - B</i>
1.	Description	Grey colored powder, odorless and salty taste	Greyish brown colored powder with characteristic odor and salty taste
2.	pH (1% W/V Solution)	9.53	9.13
3.	Chloride	+	+
4.	Loss on Drying at 105°C	0.2090%	0.9849%
5.	Total Ash	97.6235%	89.7123%
6.	Acid Insoluble Ash	0.4004%	1.0556%
7.	Bulk Density	0.9348gm/ml	0.7693gm/ml

DTA (SDT Q600 model ,TA Instruments, USA).About 5mg of the sample was taken in an Alumina cup holder and heated up to 1000°C at the rate of 10°C/min. (Fig.8.) XRF procedure: 1 gram of sample was uniformly spread over the surface of boric acid taken in a aluminium cup. The cup was pelletized in a hydraulic press at 25 tonnes pressure. The pellet of 34 mm diameter was loaded into the sample holders and analyzed using X-ray fluorescence spectrophotometer (Bruker S8 Tiger, Germany). (Table – 4 & 5) Microbial limit test: Microbial Limit Test was carried out according to the standard procedure (Table – 6) [10].

RESULTS AND DISCUSSIONS

Arka lavana was prepared by *Arka* leaves and *Saindhava lavana*. The base used in formulation was identified by pH and test for chloride. The purity of *Arka lavana -A* was found to be more and it was confirmed by Loss on Drying, Total ash. (0.2090%, 97.6235%) when compared to *Arka lavana-B* (Table – 2).FT-IR spectrum concludes the less degradation pattern in *Arka lavana-A* due to the complex formation between base and plant leaves (Fig.5.). The distribution of particle at 50% in *Arka lavana -A* was found to be 22.13µm whereas in *Arka lavana-B* it was

20.04 μm analyzed by particle size analyzer (Fig.6). Zeta Sizer analysis was carried out between 0.1-10000nm. The

Table – 5 Elements

Element

Na
Cl
O
Mg
K
Ca
S
P
Fe
Hg
Cu
Br

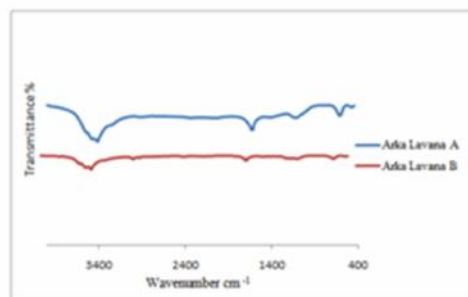


Fig.5. FT – IR spectrum of Arka lavana – A & B

58 ppm

0.01%

Particle size analysis:

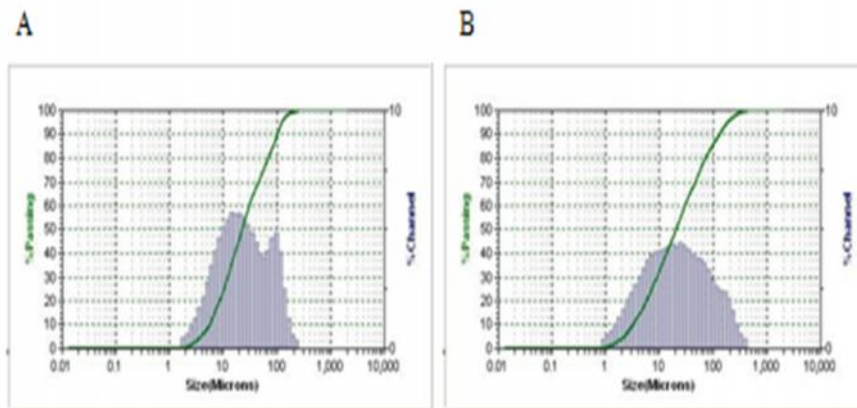


Fig.6. Particle Size Analysis [A] Arka lavana - A [B] Arka lavana - B

Zeta sizer report

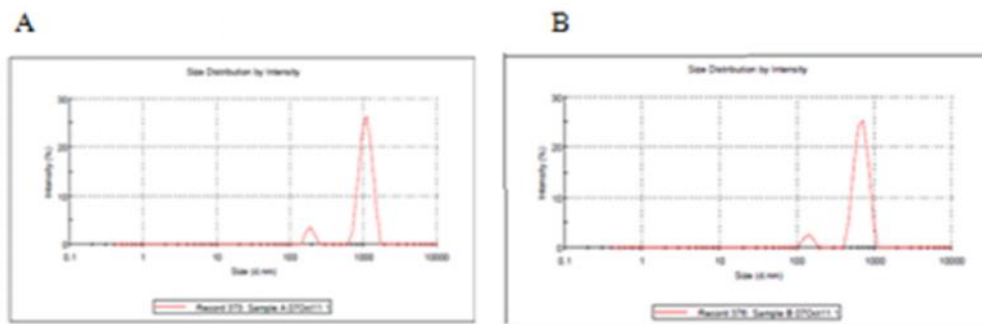


Fig.7. Zeta Sizer Analysis [A] Arka lavana - A [B] Arka lavana - B

Table – 3: Zeta potential analysis

Administration mode	Sample Details	Average (d. nm)	Major Peak (d. nm)	Width (d. nm)	Zeta Potential (mV)
In Luke warm water	Arka lavana - A	1322	1537	381.1	-11.7
	Arka lavana - B	1885	1051	222.7	-16.8
In Curd supernatant	Arka lavana - A	1528	1307	2844	-0.444
	Arka lavana - B	2001	1739	295	-0.328

Salmonella and Pseudomonas were found to be absent.

TG- DTA analysis

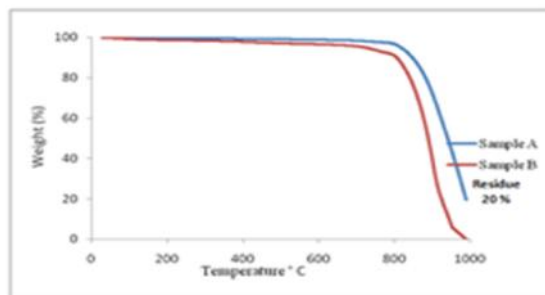


Fig.8. TG – DTA Analysis of Arka lavana – A & B

average diameter of the particles was found to be 187.6

The total microbial count was >20 cfu/ml for Arka lavana

Table – 4 Oxide form

Oxide	Arka lavana - A	Arka lavana - B
Na ₂ O	70.19 %	56.69%
Cl	23.23 %	23.33%
MgO	2.53%	4.17%
CaO	1.31%	0.89%
SO ₃	1.30%	3.24%
K ₂ O	1.11%	1.52%
P ₂ O ₅	0.22%	0.25%
Fe ₂ O ₃	0.05%	0.06%
Hg	0.03%	-
Pd	0.02%	55 ppm
Ru	0.01%	-
Br	27 ppm	86 ppm

and

– A (Table – 6).

1088nm and the peak intensities were found to be 92.0 and

8.0 % for Arka lavana-A respectively (Fig.7.). The thermo

gram of the two samples indicated stability up to 800°C. The Arka lavana - A degraded by 80% upto 1000°C,

whereas Arka lavana - B degraded completely (Fig.8). This

indicates that the sample prepared by Puta method is thermally stable compared to the sample prepared by

Table – 6 Microbial limit test

S.No	Microbial Test	Arka lavana - A	Arka lavana - B
1.	Total Microbial Count	>20 cfu/ml	>70 cfu/ml
2.	<i>E.Coli</i>	Nil	Nil
3.	<i>Salmonella</i>	Nil	Nil
4.	<i>Pseudomonas</i>	Nil	Nil

Muffle furnace method. The weight loss curve did not indicate presence of moisture or impurities. XRF data showed the percentage of elements present in the formulation. The amount of sodium and chloride was found to be more in Arka lavana-A (Table – 4 and 5) Microbial analysis was done for pathogens like E.Coli,

CONCLUSION

The comparative study of traditional and modern method of preparation reveals that, there is no much variations found between Arka lavana – A and Arka lavana – B. Even though, Arka lavana - A prepared employing traditional puta method, was matching with Pharmacopeial standards of Ayurveda, based on the parameters of analysis, it is difficult to say that the traditionally prepared sample is the best. As the results of both the samples were compared more closely, muffle furnace method may also be employed in case of bulk production.

Glossary of technical terms used in this article:

Puta: It is the measure of amount of heat required to

convert or transform any metal or mineral in to bhasma. The amount of heat is substance specific and measured in terms of fuel used, number of cow dung cakes or its weight.

Sarava: An earthen plate with specific measurements.

Sarava Samputa: Keeping a sarava one over the other and sealing their edges with the help of multani matti (Rajasthan clay) smeared cloth.

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