

Pharmaceutico - Analytical Standardization of Ajamoda Arka Prepared by Three Different Methods

*Thejus Antony, **Radhika Ranjan Geethesh P, ***Ravindra Angadi, ****Chippy P. R.

Abstract

Arka Kalpana is one among various kalpanas in Ayurveda. Arka kalpana is one of the most special and important kalpana. In contemporary science, Arka kalpana is generally defined as distilled water of herbal medicines. Ravana is believed to be the inventor of Arka Kalpana. He has authored a book named Arkaprakasha¹. This book is dedicated towards the various arka preparations and its uses. The exact time period for the composition of this book is not clear. But these Arka preparations are proving to be effective even in today's practice both for the sadhya and the asadhya vyadhis both in Ayurveda as well as the Unani medical systems. The acceptability of these Arka preparations increases in the patients owing to its, low cost, ease of production, ease of use and rapid absorption. Arka can be formulated in many different ways. Ancestors prepared arka in mud pot initially and later adopted the loha patra for its preparation. Now a days even the pressure cooker is used for preparation of Arka.

However, standardization of the arka prepared using these methods are very important and have proven need of the hour. Keeping this picture in mind this work was taken up and Ajamoda Arka was prepared using three different methods and standardization and analytical study was also performed. Just to provide more support to the directives of our sages we have plan one research-oriented study to evaluate the theme of "Bahukulpam" and to explore the hidden pharmaceutical wisdom of "Arka Kalpana", this study was planned. This study discusses about the standardization, advantages & disadvantages of all the three methods used for the preparation of Ajamoda Arka.

Key word

Ajamoda arka

Introduction

Ayurveda is an ancient science which has its own samhitas and literature. Researches are the basic fuel of ayurvedic science. Knowledge about literature gives clear idea not only about the science and but also for research works. Arka-Kalpana was introduced and flourished in Ayurveda only after Sangraha kala, which is very specific in its mode of preparation and methods. Due to this particularity, it possesses all volatile active substances and essence of chemicals in their effective form in its final product.

According to Arka prakasha the Dravya kalpas are five in number; they are kalka, choorna, swarasa, taila and Arka. Its efficacy is gradually increasing in descending order². This effectiveness of individual formulation is may be due to various degrees in the concentration of active principles and its nature of absorbability in human body. The author of Arka Prakasha - Ravana³ has mentioned that, on the basis of concentration of drug and its chemicals in the formulation the effectiveness of individual formulation varies. Just like the heat of the sun evaporates the water from the ocean, which later gets condensed due to the coldness and come down as rain once it gets heavy, similarly, in the process of Arka preparation, due to the heat which is subjected to the drug, the volatile contents and the essential oils get evaporated, which is cooled down and condensed and later collected as the final product.

Materials and Methods

In Pharmaceutical study the procedure of arka preparation by three different methods, including its requirements, setup and method of preparations are mentioned,

- 1) Laboratory method - simple distillation (Fig: 1)
- 2) Mud pot method (Fig: 5)

*Assistant Manager QA, Vaidyaratnam Oushadhashala, Ollur, ** Associate Professor, Dept. of RSBK, SDMCA Udupi, *** 2Associate Professor, Dept. of RSBK, SDMCA Udupi, ****Assistant professor, Dept. Of Prasoothantha and Streeroga, Ahalya Ayurveda Hospital, Palakkad

3) Pressure cooker method (Fig: 12)

Source of data:

Pharmaceutical source:

- Ajamoda (Common Name: Celery seed, B.N: Apium graveolens, F: Apiaceae) is the raw drug of arka preparation, it was collected from SDM Ayurvedic pharmacy, Udupi.
- Laboratory method (simple distillation) of preparation was done in S.D.M. center for research in Ayurveda and allied sciences.
- Other two methods are done in practical laboratory of department of P.G. and PhD studies in Rasashastra and Bhaishajya Kalpana, S.D.M. college of Ayurveda, Udupi.

Materials:

Equipments needed for Laboratory method (simple distillation)

1. Beaker, 2. Ajamoda, 3. Water, 4. Collecting flask

Equipments needed for Mud pot method

1. Two mud pots, 2. Cloth, 3. Thread, 4. Ajamoda, 5. Water, 6. Cold water bath

Equipments needed for Pressure cooker method

1. Pressure Cooker, 2. Condensing vessel with cold water bath, 3. Tube, 4. Collecting vessel

Method of Preparation:

1. The Laboratory (simple distillation) method (Fig:1):

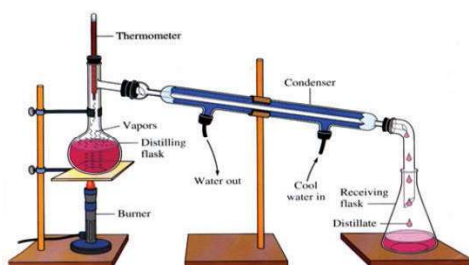


Figure 1: Pictorial representation of Laboratory distillation (Simple distillation) method 1.

Step1: Ajamoda is considered as a kathina dravya 65.2g of Ajamoda is taken in a vessel and two times water is added to this. It is kept for soaking for one-night (Fig:2). On the next day, it is filled in the distillation apparatus added with 1.125L water to it. Now the ratio of Ajamoda and water is 1:185.

Step2: Give Mandagni to this still part, till 700ml arka is obtained in the collecting vessel (Fig:3).



Fig 2:
Raw Ajamoda seeds



Fig 3:
distillation process in laboratory

Step3: Though out the process, cool water current should be maintained in the condensing part for the effective condensation.

Step4: After 18 minutes, once the Ajamoda arka starts forming, collect it in the collecting vessel.

Step5: Once 700 ml of Ajamoda arka was collected in the collecting vessel (Fig:4), the procedure is stopped. The product obtained is stored in 50ml bottles with tight stopper and cap. No gap should be left between the upper meniscus of Ajamoda arka and the stopper, so as to avoid further evaporation.



Fig 4: Ajamoda arka distilled in Laboratory (simple distillation)

2. Mud pot method (Fig:5):

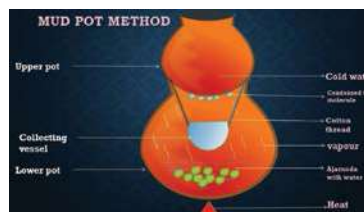


Fig 5: Schematic representation of mud pot method (method-2)

Step1: 62.5 gm of Ajamoda is taken. To this, two parts of water is added. It is then kept for soaking for one night (Fig:6). This Ajamoda along with 1.125L water, is filled in to a big mouthed mud pot.



Fig 6: Lower mud pot with raw Ajamoda and cotton threads for hanging the collecting vessel.

Step2: A small collecting vessel is hanged in the middle of this wide mouth vessel with the help of cotton threads. (Fig:7). It must be hanged in such a way that; it should not touch the raw material and also either side of the lower mud pot.



Fig 7: Lower mud pot with Ajamoda and collecting vessel.

Step3: Over the lower mud pot, another small mud pot is placed, forming the upper mud pot (Fig:8). Its base should exactly join with the mouth of lower mud pot. In this upper mud pot, cold water is taken.

Step4: Sandhibandhana is done between the lower and the upper mud pots (Fig:8). Now, the collecting vessel is inside the arrangement.



Fig 8: Ajamoda arka patana by using mud pot method (method-2)

Step 5: Give Mandagni to the lower mud pot. The vapours produced from the raw material will condense on the lower surface of upper mud pot. Due to the dome shape of the base of upper mud pot and gravitational force the condensed arka fall through the mid line, which will get collected in the collecting vessel placed in the midline. The process continues till 700 ml of product is obtained in the collecting vessel. and it transfer in to a clean glass vessel for the easy management (Fig:9). The obtained product is stored in 50ml bottles with tight stopper an cap. No gap should be left in between the upper meniscus of Ajamoda arka and stopper so as to prevent further evaporation.



Fig 9: Ajamoda arka prepared by mud pot method. (sample-2)

3. Pressure cooker method (Fig:10):

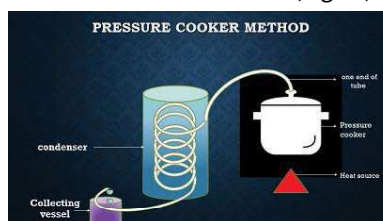


Fig 10: Schematic representation of pressure cooker method. (method-3)

Step1: One night soaked 62.5g Ajamoda in two times water was taken on the next day. To this, 1.125 L water was added and was taken in a pressure cooker (Fig:11).



Fig 11: Raw Ajamoda in pressure cooker.

Step2: Nozzle of pressure cooker is connected with one end of a tube. And the other end of the tube was directed into a collecting vessel. Body of the tube should be spiral in shape so as to increase the contact surface. This tube should be passed through a condenser which contains cold water (Fig:12).



Fig 12: Pressure cooker method (method-3)

Step3: Pressure cooker should be subjected for mandagni, till 700ml arka collected.

Step4: The vapour produced inside the pressure cooker, enters into the tube and pass through the condenser. Due to the coldness of the condenser, these vapours get converted into arka and comes out through the other end (Fig:13).



Fig 13: Ajamoda arka prepared by Pressure cooker method (sample-3)

Step5: The product is stored in 50ml bottles with tight stopper an cap. No gap should be left in between the upper meniscus of Ajamoda arka and stopper so as to prevent further evaporation.

Result

In this work, the chemical analysis results and GC-MS results are giving a satisfactory ending for this work. The obtained samples were sent for chemical analysis and chromatography. Chemical analysis was done in SDM centre for research in Ayurveda and allied sciences. In chemical analysis the volatile matter, viscosity, refractive index etc was analysed. The result is given bellow.

Table 1: Chemical analysis results of three Ajamoda arka (water distillate of celery seeds) samples (Fig:14).

PARAMETERS	AJAMODA ARKA		
	Laboratory method (simple distillation)	Mud pot method	Pressure cooker method
Volatile matter (%)	0.28	0.04	0.03
Specific gravity (g/cm3)	0.9678	1.0081	1.005
Refractive index	1.33329	1.33239	1.33279
Viscosity (Pa S)	0.9843	0.9671	0.9663
Total acidity (g/l)	0.02	0.021	0.019
pH value (m/l)	6.15	6.79	6.95

Gas chromatography was done in Siddha Central Research Institute, Chennai. Results and observations are given bellow,

- Laboratory (simple distillation) method showed 10 peaks and each peak hit (showed similarities) with 3 laboratory library samples.
- Mud pot method sample showed 7 peaks and here also each peak hit with 3 laboratory library samples.
- Pressure cooker method sample showed 4 peaks in GC-MS and each peak hit with laboratory library samples.

Table 2: GC-MS details of Laboratory (simple distillation) method

PEAK No	RT	% (AREA)	POSSIBLE CHEMICALS MATCHED
1	5.322	9.16	[1,2-b]thieno[3,4-d]p11H-Naphtho
			octamethyl- Cyclotetrasiloxane,
			1,1,1,5,5,5-hexamet trisiloxane,
2	5.758	4.79	-
			-
			-
3	10.447	10,76	4-methoxy-N2-(5-b) Benzhydrazide,
			2-(5-Chloro-pyridin-2-ylamino)-3...
			N-(2,6.)Adamantane-1-carboxamide,
4	24.909	8.04	Methyltris(trimethylsiloxy) silane
			hexamethyl- Cyclotrisiloxane,
			2'-Hydroxy-5'- methylacetophenone...
5	25.119	9.39	2,3-dihydr 1,4-Phthalazinedione,.
			2,4-dimethyl- Benzo[h] quinoline
			2-Ethylacridine
6	25.345	6.59	Hexamethyl- Cyclotrisiloxane
			5-Methyl-2-phenylindolizine
			TBDM1,2-Benzisothiazol-3-amine
7	26.017	24.79	1,2-Bis(trimethylsilyl) benzene
			Hhexamethyl- Cyclotrisiloxane
			Hexamethyl- Cyclotrisiloxane
8	26.302	7.76	5-(1,3,5-1,2,4-Triazol-3-amine
			2,4-dimethyl- Benzo[h] quinoline
			1, 2,5-bis(1,1-dim,4- Benzenediol

9	26.470	5.90	Tris(tert-butyl dimethylsilyloxy)...
			Hexamethyl- Cyclotrisiloxane
			Hexamethyl- Cyclotrisiloxane
10	26.604	12.82	Tris(trimethylsil) Arsenous acid
			2-Methyl-7-phenylindole
			Hexamethyl- Cyclotrisiloxane

Table 3: GC-MS details of Mud pot method sample

PEAK No	RT	% (AREA)	POSSIBLE CHEMICALS MATCHED
1	6.248	62.41	Thymol
			Tymol
			3-Methyl-4-isopropylphenol
2	15.112	2.36	n-Hexadecanoic acid
			n-Hexadecanoic acid
			Tridecanoic acid
3	17.288	16.37	(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
			Cis-7-Dodecen-1-yl acetate
4	17.348	6.64	(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
5	17.580	2.24	(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
6	19.941	5.80	12- Octadecadienoate, n-Propyl 9
			Isopropyl linoleate
			(Z,Z)9,12-Octadecadienoic acid-
7	21.872	4.18	(Z,Z)9,12-Octadecadienoic acid-
			(Z,Z)9,12-Octadecadienoic acid-
			12- Octadecadienoate, Butyl 9

Table 4: GC-MS details of Pressure cooker method sample

PEAK No	RT	% (AREA)	POSSIBLE CHEMICALS MATCHED
1	14.370	4.43	Tetradecamet, Cycloheptasiloxane
			Tetradecamet, Cycloheptasiloxane
			1,1,1,7,7,7-hexamet-3-Isopropoxy
2	18.062	92.49	Thymol
			3-Methyl-4-isopropylphenol
			Thymol
3	19.633	1.79	N-[(pentafluor) Benzeneethanamine
			2,4-bis[(trimethyl) Benzoic acid
			Decamethyl- Cyclopentasiloxane
4	23.958	1.30	Hexamethyl- Cyclotrisiloxane,
			Tris(trimethylsil) Arsenous acid,
			3-(2-methoxyethyl)-2-1H-Indole

Discussion

In this work, three standardised samples of the Ajamoda arka was prepared by three different methods. These methods were widely used to prepare arka and other distilled products. In these, all the three products are better than one another, even though they showed slight differences in physical, chemical, and quantity.

Discussion part divided in to three parts,

- Discussion on literary review
- Discussion on pharmaceutical study
- Discussion on analytical study

Discussion on Literary Review

Arka Prakasha is the main source of knowledge about arkakalpana in Ayurveda sector. It contains detail description about types of raw materials, preparation methods, lots of arka yogas etc. It is a complete work about arka preparations. All the ten chapters, gives deep rooted information about arka.

Discussion on classical literary review

The literary review is based mainly on Arka prakasha text book. It has mentioned about importance of arka Kalpana, preparation of Jeernasthi mritika vessel, general method of preparation of arka, some special techniques of arka preparations, its use, properties etc are explained in detail. Every aspect related to arka kalpana mentioned in our classics has been included in this section. This part of dissertation work is not only a collection of knowledge but also a good reference material about arka Kalpana.

Discussion on drug review

Drug review is an important part in this work. It contains details about Ajamoda from historical quoting's to the latest modern researches. Ajamoda is not only a medicine but also is used as an edible vegetable in our daily life. This single drug can prevent and cure lot of diseases like microbial infections, heart diseases, cancer, kidney diseases etc.

Discussion on modern literary review

The information regarding the modern methods of distillations are collected from internet, web pages, articles and authentic text books explaining about distillation process. Parts of modern distillation apparatus, modern concept regarding evaporation, condensation, influence of temperature and pressure in the distillation process are discussed in the modern literary review.

Discussion on Pharmaceutical Study

According to API, the ratio of Ajamoda and water in Ajamoda arka is 1:185. But the capacity of vessel, mud pot and pressure cooker was around 3L. So the quantity was taken as 62.5g of Ajamoda : 1.125L. water (1:18 ratio), for the practical easiness. The same ratio of Ajamoda and water was maintained in all three methods. In this study output was fixed as 700 ml. As per modern distillation process when the output of a distillation process reaches 60-70% the procedure is considered to be complete. Here 700ml Ajamoda arka is 62% of 1.125L raw material. Hence the value was fixed.

Laboratory method (simple distillation)

Preparation Method

62.5 g of fresh Ajamoda was soaked in two times water and kept overnight. Next day it was taken in the laboratory distillation apparatus along with 1.125L water and the procedure was conducted. The fire source was maintained in the minimum level.

Observation during preparation

The first drop of arka came after first 18 minutes, in

distillation apparatus we can see the evaporation and condensation clearly as the apparatus is glass made. Boiling of water and Ajamoda inside the vessel, vapours passing through the glass condenser, condensation process, outcome of Ajamoda arka etc can be clearly evaluated in this apparatus. Total procedure was conducted 1 hour and 25 min for the preparation of 700ml of Ajamoda arka. And the temperature maintained at 70-80°C. throughout the procedure.

Observation about product

The product was collected in a measuring bottle. It was watery and turbid in appearance. Over the product surface an oil droplet was noticed which was thin and slimy in nature. It was watery but not clear or transparent.

Mud pot method

Preparation

Ajamoda was soaked in water and taken in a mud pot. Collecting vessel was hanged in the centre of this mud pot. Another mud pot was taken and was placed above the first pot. It was filled with cold water and sandhibandana was done between the upper and lower pot.

Here the collecting vessel used was stainless-steel vessel for avoiding the reaction and absorption of the end product. mild fire was maintained till the end of the process. Continuous supply of cold water was provided to maintain the temperature of upper mud pot which is needed for effective condensation. The temperature was maintained at 70-80°C during the procedure. The procedure got completed in 1 hour 35 min. It took the maximum time period when compared to other procedures. It may be due to the less temperature conductivity of mud pot than glass and steel cooker.

Observation about product

After swanga seeta the sandhi bandana was removed. Gently collecting vessel was taken out. The colour of the Ajamoda arka was crystal clear. It was transferred to a glass bottle. 700 ml of Arka was obtained after the procedure.

Pressure cooker method

Preparation

Pressure cooker with raw material and water was placed in the heat source. Connected the tube on the nozzle of pressure cooker such that the tube was passing through the condenser. The other end of the tube was kept inside the collecting vessel. The tube selected should sustain the heat of steam and never become

flabby and bend during the procedure. Also, it must be inert to the steam and product.

Observation during preparation

After 20 min, the vapours came through the nozzle to the connected pipe. The temperature was maintained between 70-80 °C. That area of pipe was very hot. Up to the condenser the vapour molecule were as steam only. Inside the condenser vapours of arka was very evident. The water inside the condenser was continuously changed with cold water. The total procedure got completed within 1 hour and 10 min.

Observation about product

The product was coming through the other end of the tube. It was clear transparent watery liquid.

Discussion on Analytical Study

Analytical standardisation was done in S.D.M. Centre for research in Ayurveda and allied sciences, Udupi and, in Siddha central research institute Chennai.

Physical properties

Colour:

- Laboratory (simple distillation) method: Transparent (little bit turbid)
- Mud pot method sample: Clear and transparent
- Pressure cooker method sample: Clear and transparent
- All arka kalpanas are transparent and colourless. Its colour may change with the presence of impurities, oil content, sedimentations and the vessels that are used. In this study Mud pot method sample and pressure cooker method sample are crystal clear but Laboratory (simple distillation) method is slightly turbid. This may be due to the presence of more volatile oil content.

Taste:

- Laboratory (simple distillation) method: Tasteless
- Mud pot method sample: Tasteless
- Pressure cooker method sample: Tasteless
- Arka preparations are tasteless. If any taste is felt, indicates that the arka is not proper. Here, all the three samples are devoid of any taste.

Smell:

- Laboratory (simple distillation) method: Intense smell of Ajamoda
- Mud pot method sample: Intense smell of Ajamoda
- Pressure cooker method sample: smell of Ajamoda
- According to Arka prakasha, the arka should smell more than its raw material. It is a unique quality of

a good variety of arka. When comparing the three samples, Pressure cooker method sample has less smell than that of Laboratory (simple distillation) method and Mud pot method sample. Laboratory (simple distillation) method and Mud pot sample showed good smell of Ajamoda, which may be due to the presence of volatile oil and other Phyto-chemicals with more olfactory properties.

Touch:

- Laboratory (simple distillation) method: Watery
- Mud pot method sample: Watery
- Pressure cooker method sample: Watery
- Arka samples were obtained in watery form. Any derangement in this, shows the components of arka are different and is not proper.

Chemical properties

Volatile matter: (Table: 1)

- Laboratory (simple distillation) method: 0.28 %
- Mud pot method sample: 0.04%
- Pressure cooker method sample: 0.03%

Here, Laboratory (simple distillation) method showed more percentage of volatile matter compared to other two samples. Mud pot method sample has slight difference with pressure cooker method sample, but almost similar quantity of volatile matter is present in the Mud pot method sample and Pressure cooker method sample.

Specific gravity: (Table: 1)

- Laboratory (simple distillation) method: 0.9678 g/cm³
- Mud pot method sample: 1.0081 g/cm³
- Pressure cooker method sample: 1.005 g/cm³

When these three samples are compared, Mud pot method sample and pressure cooker sample showed very close readings ie. 1.0081 and 1.005, that might be because, the product had almost similar solid contents. Whereas Laboratory (simple distillation) method had 0.9678, which might be due to lesser amount of solids present in it.

Refractive index: (Table: 1)

- Laboratory (simple distillation) method: 1.33329
- Mud pot method sample: 1.3323
- Pressure cooker method sample: 1.33279

In this study, all three specimens showed almost similar refractive index. The specimens maintained almost similar transparency, which might be the reason.

Viscosity: (Fig: 1)

- Laboratory (simple distillation) method: 0.9843 Pa.S.

- Mud pot method sample: 0.9671 Pa.S.
- Pressure cooker method sample: 0.9663 Pa.S.

Laboratory (simple distillation) method has more viscosity than the other two samples, it might be due to the presence of more chemicals in it. Mud pot method sample and pressure cooker sample showed almost similar viscosity as stated above. But overall, the three results are almost similar.

Total acidity: (Table: 1)

- Laboratory (simple distillation) method: 0.020 mg/ml
- Mud pot method sample: 0.021 mg/ml
- Pressure cooker method sample: 0.019 mg/ml

Total acidity depends upon the presence of H⁺ ion in that medium, here Laboratory (simple distillation) method and mud pot method showed very near results but the Pressure cooked method sample showed less acidic value.

pH value: (Table: 1)

- Laboratory (simple distillation) method: 6.15 m/l
- Mud pot method sample: 6.79 m/l
- Pressure cooker method sample: 6.95 m/l

pH value is different from total acidity, pH value is the concentration of H⁺ ion in a solution. Here Mud pot method sample and Pressure cooker method sample maintained the pH near to water ie: 6.79 m/l and 6.95 m/l. Laboratory method (simple distillation) showed 6.15 m/l pH value. All the samples were not alkaline in nature and their value did not exceed more than seven in the pH meter.

GS-MS (Table: 2,3,4)

Gas chromatography helped to identify possible chemicals in each specimen. Here, for the first specimen 10 active peaks were showed. It means, each peak representing some chemicals present in that arka preparation. In GC-MS, each peak got three best hits from laboratory library. Like that, Mud pot method showed 7 active peaks and Pressure cooker method sample showed 4 active peaks. Possible 3 hits for each peak are the possible chemical matches for that.

From the peak analysis we can say, Laboratory method (simple distillation) specimen had 10 peaks and it may contain Cyclotrisiloxane, hexamethyl-, 1, 2-Benzisothiazol-3-amine, Benzo [h] quinoline, 2,4-dimethyl etc. Mud pot method showed 7 peaks and it may contain Thymol, 9,12-Octadecadienoic acid(Z,Z)-, n-Hexadecanoic acid etc. Pressure cooker method sample showed 4 peaks and it may contains Cycloheptasiloxane, tetradecane, Thymol etc. Cyclotrisiloxane, hexamethyl-, Thymol, 9,12-Octadecadienoic acid(Z,Z)-, Isopropyl linoleate are common in these three samples may be

these chemicals are the most common and potent chemicals present in Ajamoda.

As per the GC MS, Laboratory method (simple distillation) specimen showed more peaks, which means, it contains more chemicals and Pressure cooker method sample showed very less peaks hence it contains less chemicals.

Conclusion

Arka is a distilled product of medicines, which contains volatile principles and chemicals. Now a days arka can be prepared by different methods, like by using distillation apparatus, by pressure cooker etc. Quantity and quality of arka can vary according to the method of preparations. Ajamoda is a seed which contain volatile principles and it is widely used for arka preparation in Ayurveda, Unani and also in Siddha medical systems. For this work, Ajamoda was collected from SDM pharmacy. The arka preparation was carried out in SDMCA Rasashala.

Ajamoda arka is prepared by distillation apparatus, olden mud pot method and pressure cooker method. Arka preparation in Laboratory distillation apparatus is pharmaceutically more time-consuming procedure but yield is more compare to other two methods. The product samples are compared by chemical analysis and standardized in SDM Research centre. From the physico-chemical analysis, we can conclude that distillation apparatus method and olden mud pot method showed almost similar values in all parameters. But pressure cooker method is little less efficient than other two methods, which might be due to its vessel structure and influence of mild pressure variation etc. So, we can conclude, for preparation of a standard Ajamoda arka, using distillation apparatus method or olden pot method is more efficient.

Acknowledgement

SDM Centre for Research in Ayurveda and Allied Sciences, Udupi

Conflict of Interest: Nil

References:

1. Lankapathi Ravana, Indradev Tripathy. Arkaprakasha.2nd ed. Varanasi: Chowkamba Sanskrit, Series 2006,p.1,8,9
2. Lankapathi Ravana, Arka Prakasha, Edited by Dr. Indradeva Tripathi, 1st Ed, Varanasi, Choukamba Publications;1995, p9.
3. Lankapathi Ravana, Indradev Tripathy. Arkaprakasha.2nd ed. Varanasi: Chowkamba Sanskrit, Series 2006,p.1,8,9
4. Lankapathi ravana, ArkaPrakasha commentary by Indradev Tripathi, 1st edition Varanasi, Krishnadas Academy; 1995, p10.
5. Government of India, The Ayurvedic Formulary of India,2nd Edition, Part-1, Delhi, The Controller of Publications Civil line; 2003, p27.