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Research Article

PHARMACEUTICO-ANALYTICAL STUDY OF *MUKHAPAKAHARA ARKA*

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ABSTRACT

Arka kalpana is a unique pharmaceutical preparation in Ayurveda in which the volatile oil and active principles of a drug are collected by the process of distillation using *Arka yantra* or any convenient modern distillation apparatus. *Mukhapakahara arka* is a formulation mentioned in *Arka prakasha sapthama shataka* as a *Gandusha yoga* to cure *Mukhapaka.* The ingredients of *Mukhapakahara arka* are *Jatheepatra, Amruta, Draksha, Vasa, Darvi, Hareetaki, Vibheetaki* and *Amalaki*. Based on the properties of the ingredients, the formulation possesses potent wound healing, anti- inflammatory properties and hence could be beneficial in conditions like Recurrent Aphthous Stomatitis. Being an *Arka kalpana*, *Mukhapakahara arka* has many advantages in terms of palatability, shelf life and user-friendly aspects. No previous works have been carried out on *Mukhapakahara arka.* In this study, *Mukhapakahara arka* was prepared and was subjected to organoleptic evaluation and physicochemical tests like determination of pH value, specific gravity and volatile matter. HPTLC profile of *Mukhapakahara arka* was also obtained which could be useful for further works.

INTRODUCTION

The five primary preparations according to the classical textbook *Ravana's Arka Prakasha* are *Kalka, Choorna, Rasa, Thaila* and *Arka* in the increasing order of potency.[1] Hence *Arka kalpana* is considered to be most potent and can yield quick action compared to other *Kalpana's*. *Arka* is a suspension of distillate in water having slight turbidity and colour according to the nature of the drugs used and smell of the predominant drug.[2] According to *Arka Prakasha*, *Arka* is described as *Dosharahita* and *Guna sanghaprakasaka*.[3] *Arka Kalpana* is having longer shelf life and can be preserved for a longer time without any kinds of preservatives. Also, it is more palatable and require lesser dosage for internal administration, compared with other dosage forms like *Kwatha kalpanas*. The active drug principles along with volatile oil in the drug are obtained in this preparation. Owing to these advantages, *Arka kalpana* is gaining popularity in the modern era. The formulation *Mukhapakahara arka*[4] is mentioned in *Arka Prakasha sapthama shataka* as a *Gandusha yoga* to cure *Mukhapaka* which can be clinically correlated with Recurrent Aphthous Stomatitis. This formulation has many advantages compared to other preparations like *Kashaya's*, mouth paints, gels and mouthwashes used in such condition in terms of its user- friendly aspects, palatability and having a longer shelf life without any preservatives. No previous works have been carried out on *Mukhapakahara arka*. The aim and objectives of the study was to prepare *Mukhapakahara arka* and conduct its organoleptic evaluation and physicochemical tests like determination of pH value, specific gravity, volatile matter and HPTLC.

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MATERIALS AND METHODS

Pharmaceutical Study: Pharmaceutical study started from collection of genuine raw materials, followed by its pre- processing and finally conversion to the product- *Mukhapakahara arka*.

Raw Materials

The ingredients of *Mukhapakahara arka* are *Jathi (jatheepatra), Amrutha, Draksha, Vasa, Darvi, Hareetaki, Vibheetaki* and *Amalaki.*[4] All the ingredients were taken in equal proportion. There are no other references regarding this formulation, except

the one seen in *Arka Prakasha*. However similar *Yogas* are described as *Gandusha yogas* in texts like *Sarangadhara Samhita*, *Gada nigraha* in the context of *Mukhapaka* with almost same ingredients of *Mukhapakahara arka* except the drug *Vasa*. In *Sarangadhara samhitha yoga* named *Darvyadi kwatha gandusha* to cure *Mukhapaka*, have the 7 same ingredients as of *Mukhapakahara arka*. But, instead of the drug *Vasa* in *Mukhapakahara arka*, *Yavasa* is described as 8th ingredient in *Darvyadi kwatha gandusha yoga*.[5] In *Gadanigraha*, instead of *Vasa*, *Pada* is described.[6] In this study of *Mukhapakahara arka*, the drug *Vasa* (*Adhatoda vasica* Nees) is taken as per reference of *Arka Prakasha*.[4] Malayalam translation and commentary books on *Arka Prakasha* also authenticate this reference of *Mukhapakahara arka*.[7]

Ingredients of *Mukhapakahara arka*

Name of Drug	Botanical Name	Family	Part Used
Jathi	*Jasminum grandiflorum* Linn.	Oleaceae	Leaf
Amruta	*Tinospora cordifolia* (Willd.) Miers.	Menispermaceae	Stem
Draksha	*Vitis vinifera* Linn.	Vitaceae	Fruit
Vasa	*Adhatoda vasica* Nees	Acanthaceae	Leaf
Darvi	*Berberis aristata* DC.	Berberidaceae	Stem
Vibheetaki	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Fruit rind
Amalaki	*Emblica officinalis* Gaertn.	Euphorbiaceae	Fruit rind
Hareetaki	*Terminalia chebula* Retz.	Combretaceae	Fruit rind

Fig. 1: Ingredients of Mukhapakahara arka

a) *Jathi*

b) *Amrutha*

c) *Draksha*

d) *Vasa*

e) *Darvi*

f) *Amalaki*

g) *Hareetaki*

h) *Vibheetaki*

Collection of Raw Drugs: The raw drugs were collected from a GMP certified pharmacy. All the drugs except leaves of *Jathi* (*Jatheepatra*) and *Vasa* were procured in dried state. In case of *Jathi* and *Vasa*, fresh leaves were collected and verified based on macroscopic characteristics. The genuinity of raw drugs were authenticated by Department of Dravyaguna Vijnana and Department of Rasasastra and Bhaishajyakalpana, Government Ayurveda College, Tripunithura.

Drug pre-processing: All the ingredients of the formulation *Mukhapakahara arka* were not of the same kind. Leaves of *Jathi* and *Vasa* were collected in fresh state on the day of preparation of *arka* and was cleaned well. Other raw drugs except *Draksha* were cleaned well and made to coarse powder form. *Draksha* was cleaned and crushed.

Preparation of *Mukhapakahara arka*: As per the method of preparation of *Arka* described in *Rasatantrasara va sidhaprayoga sangraha*[8], one part of drug was soaked in eight times of water. It was kept for twenty-four hours and distilled using distillation apparatus. The 8 ingredients of *Mukhapakahara arka* were taken in a quantity 1.75 kg each. In total 14kg raw drugs were used for the study. It was soaked in 8 times potable water (112 litres) in wide mouthed stainless-steel vessel with lid for 24 hours. After 24 hours, it was distilled using distillation apparatus. 304 grade stainless steel vessel with lid and attachments for proper condensation was used as distillation apparatus. The capacity of the distillation apparatus was 200 litres. Proper sealing of the vessel and lid were done with paste of black gram powder. After one-hour *Arka* started coming out of the outlet as drop by drop. When the flow of *Arka* through the outlet attained a uniform speed, it was collected in a stainless-steel vessel. 67 litres of *Arka* was received. The total yield was 60%. The *Arka* obtained was a clear liquid. It had a pleasant smell characteristic of the ingredients.

Fig. No. 2: Preparation of *Mukhapakahara arka*

a) Drugs soaked in water

b) Distillation apparatus

c) Distillate coming out of outlet

Fig. No. 3: *Mukhapakahara arka* in dispensable form

Analytical Study

Study Setting

Quality Assurance Lab, R & D Department, Arya Vaidya Sala, Kottakkal Analytical lab, Department of Rasasastra and Bhaishajya Kalpana, Government Ayurveda College, Tripunithura.

Organoleptic Evaluation of *Mukhapakahara Arka*: The colour, odour, taste and appearance of *Mukhapakahara arka* was assessed using sense organs as a part of its organoleptic evaluation.

Physicochemical tests conducted on *Mukhapakahara arka* included determination of its pH value, specific gravity, volatile matter and HPTLC.

Determination of pH value: The pH value of an aqueous liquid may be defined as the common logarithm of the reciprocal of the hydrogen ion concentration expressed in g per litre.[9] The pH value of a liquid can be determined potentiometrically by means of the glass electrode, a reference electrode and a pH meter either of the digital or analogue type.[9] pH of *Mukhapakahara arka* was determined using a digital pH meter.

Determination of Specific Gravity: The specific gravity of a liquid is the weight of a given volume of the liquid at 25- degree Celsius (unless otherwise specified) compared with the weight of an equal volume of water at the same temperature, all weighing being taken in air.[10]

Procedure: A thoroughly clean and dry pycnometer was taken and weighed. Weight of the pycnometer was

taken as (A). It was filled with distilled water and weight of pycnometer filled with distilled water was taken as (B). The pycnometer was emptied completely without any remains and filled with the sample of *Mukhapakahara arka*. Weight of the pycnometer with *Arka* was taken as (C). Calculation: Specific gravity = C-A/B-A

Determination of Volatile Oil [11]**:** The clevenger's apparatus or any similar apparatus may be used.

Method of determination: 100 ml of *Mukhapakahara arka* was taken in the one litre distilling flask, and a few pieces of porous earthen ware and one filter paper 15cm cut into small strips, 7 to 12mm wide, were also put in the distilling flask. It was then connected to the still head. Before attaching the condenser, water was run into the graduated receiver, keeping the tap open until the water overflows. By pressing the tube any air bubbles in the rubber tubing were carefully removed. The tap was then closed and the condenser was attached. The contents of the flask were then heated and stirred by frequent agitation until ebullition commences. The distillation was continued at a rate, which keeps the lower end of the condenser cool. At the end of the specified time (2 to 3 hours) heating was discontinued, the apparatus was allowed to cool for 10 minutes. The tap was opened and tube lowered slowly. As soon as the layer of the oil completely entered into the graduated part of the receiver the tap was closed and the volume was read. The tube was then raised till the level of water in it was above the level of bulb, when the tap was slowly opened to return the oil to the bulb. The distillation was again continued for another hour and the volume of oil was again read, after cooling the apparatus as before. The distillation can be again continued, if necessary, until successive readings of the volatile oil do not differ. The measured yield of volatile oil was taken to be the content of volatile oil in the formulation.

HPTLC-High Performance Thin Layer Chromatography

Procedure:

Stationary phase: Merk, 1.05554.0007, TLC Silica gel 60 F_{254}, 10*10cm aluminium sheet

Mobile phase: Toluene: ethyl acetate (9:1)

Development: CAMAG 10*10cm twin trough chamber

HPTLC instrumentation: CAMAG Linomat 5, CAMAG TLC Scanner 3, CAMAG Reprostar 3.

Derivatization: Iodine reagent.

Test solution: Shake 10ml *Mukhapakahara arka* sample with 10ml of toluene in a separating funnel. Allow the two layers to separate. Separate the Toluene layer, filter and concentrate to 10ml and carry out the analysis. Apply 30microlitre of the extract on TLC plate. Develop the plate to a distance of 9cm using toluene: ethyl acetate (9:1) as mobile phase. After development, allow the plate to dry in air. Spray the plate with iodine reagent for about 10 min.

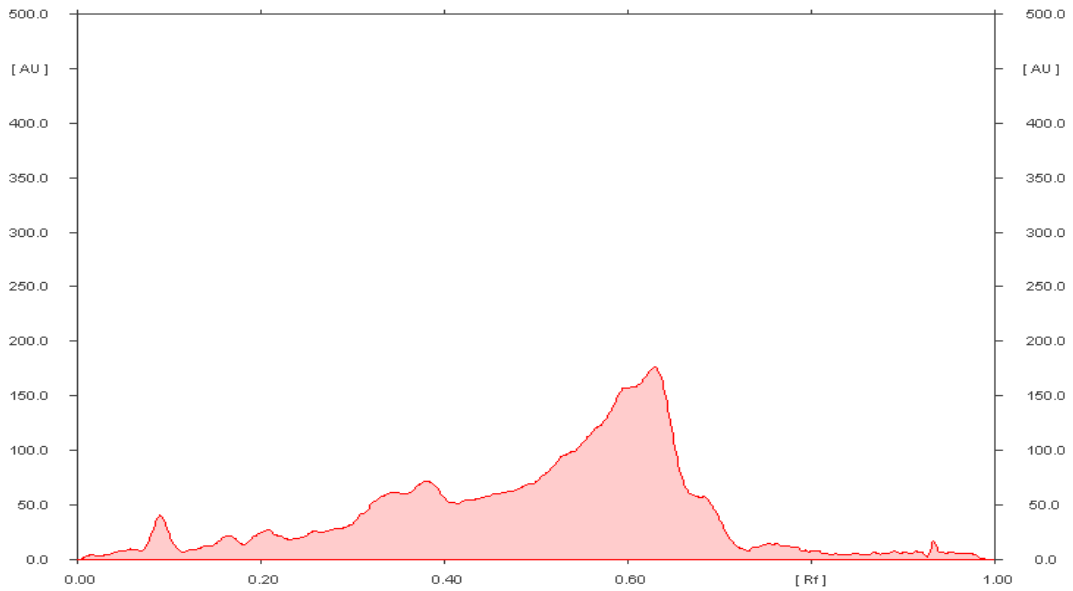
OBSERVATION AND RESULTS

Organoleptic evaluation of *Mukhapakahara arka*

- Colour- Colourless
- Odour- Aromatic odour
- Taste- Slight bitter taste
- Appearance- Watery, clear liquid

Results of physicochemical tests done were as follows

- pH of *Mukhapakahara arka* - 4.20
- Specific gravity- 1.0
- Volatile matter: 0.1 percent v/v
- HPTLC fingerprint of *Mukhapakahara arka*



Graph 1: HPTLC profile of *Mukhapakahara arka*

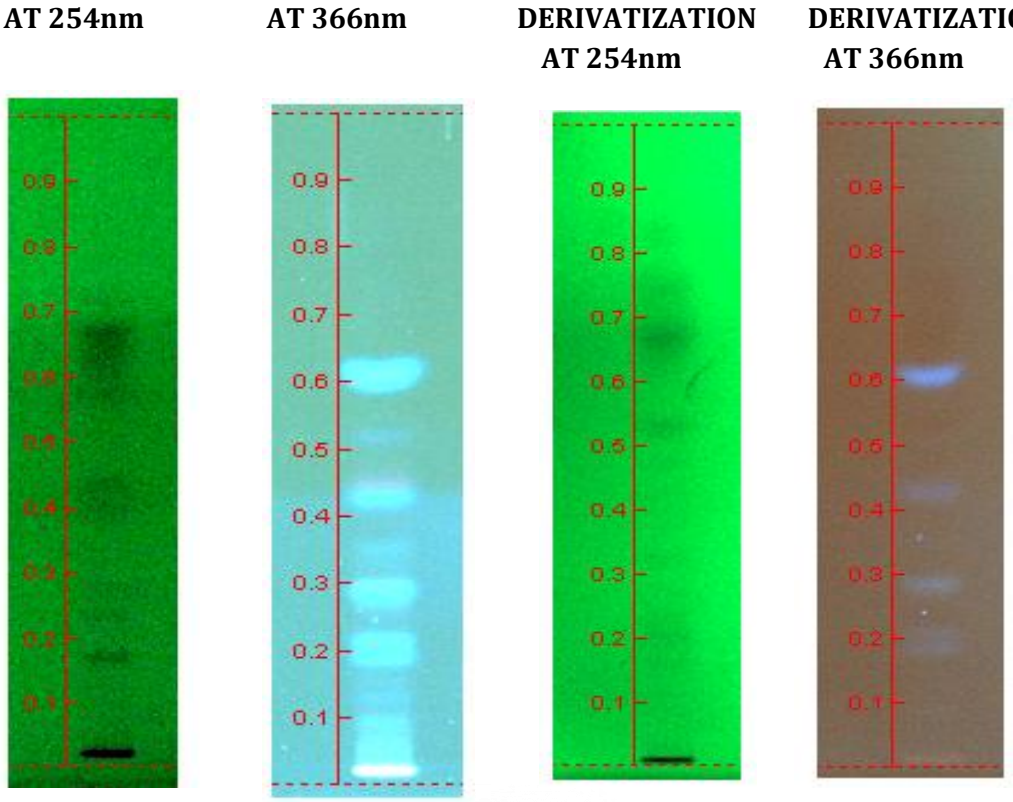


Fig. No. 4: TLC plate view of *Mukhapakahara arka*

Rf Value & % area of *Mukhapakahara arka* sample at 254nm

Peak No	Rf Value	Area (AU)	% Area (AU)
1	0.09	592.4	3.66
2	0.17	205.3	1.27
3	0.21	232.0	1.43
4	0.34	277.4	1.71
5	0.38	338.7	2.09
6	0.63	14476.7	89.36
7	0.93	77.2	0.48

Total Peak no – 07

Total Area – 16199.7 (AU)

DISCUSSION

Pharmaceutical Study: Genuine raw drugs were procured as initial step of preparing the formulation *Mukhapakahara arka*. The 8 ingredients of the formulation were taken in equal proportion. All the drugs except the leaves of *Jathi* and *Vasa* were procured in dry state. Leaves of *Jathi* and *Vasa* were collected in fresh state for preparing the *Arka*. The formulation contained drugs of different nature as some were leaves, some were fruits and some stems. Hence nature of size reduction was different. Drugs *Amruta, Darvi, Hareetaki, Amalaki* and *Vibheetaki* were made to coarse form. *Draksha* was crushed. Leaves of *Jathi* and *Vasa* were chopped. As per *Arka Prakasha* the quantity of water required for soaking the drugs prior to distillation varies based on drug hardness. As this formulation contain drugs of different nature, to aid proper extraction, eight times of water was added for soaking the drugs and it was kept for 24 hours as per the reference from *Rasatantrasara va Sidhaprayoga sangraha*. 304 grade stainless steel vessel with lid and attachments for proper condensation and having a capacity of 200 litres was used as distillation apparatus. The *Arka* was seen coming out of the outlet drop by drop after one hour of distillation. The initial and last fraction was discarded following the general rule of distillation as this fraction may not contain any active components. Oil like globules were seen on the surface of *Mukhapakahara arka* and it might be the indication of volatile matter present in the *Arka*. The *Arka* was advised to be shaked well before use. 67 litres of *Arka* was obtained using 14kg raw drugs and 112 litres of water, resulting in 60% yield. Soaking the drugs in water for duration of 24 hours further softens the drugs and on subjecting to boiling process in *Arka* preparation results in extraction of therapeutically active components of the constituent drugs. This process of distillation is basically similar to aqueous

extraction as in *Kashaya kalpanas*. The additional advantage of *Arka kalpana* is the volatile principles are preserved in this method of preparation. Also, it is more palatable, has better shelf life and is user friendly.

On keeping the *Arka* constantly for 6 months white-coloured sediments were seen at bottom of bottles. However, there was no indication of spoilage, the *Arka* had the same smell, colour and physicochemical parameters like pH, specific gravity also remained unaltered. The white-coloured sediments could be probably due to the starchy matter of constituent drugs especially *Amrutha*.

Analytical study: *Mukhapakahara arka* is a preparation that has not been standardized and there are no previous analytical studies regarding this formulation. Based on the organoleptic evaluation, *Mukhapakahara arka* is a colourless clear liquid with slight bitter taste and aromatic odour characteristic of the ingredients. The pH, specific gravity, volatile matter and HPTLC of *Mukhapaakhara arka* were determined as part of the study.

pH Value: The pH value indicates whether a given sample is acidic or alkaline*. Mukhapakahara arka* was prepared and its pH was determined as part of the study. The pH of the formulation *Mukhapakahara arka* was found to be 4.2 which indicate it is acidic in nature.

Specific Gravity: Specific gravity of a liquid preparation gives idea about the density. It is indicative of concentration of solutes in a solvent. The molecular information can be assessed in a non-invasive way by determining the specific gravity. *Mukhapakahara arka* was prepared and its specific gravity was noted as 1.0.

Volatile Matter: On collecting the *Arka*, small oil like globules were seen floating on the surface and this was indicative of volatile matter in *Arka*. The percentage of volatile matter in *Mukhapakahara arka* was estimated using Clevenger apparatus and it was noted as 0.1% v/v. This indicates that the volatile components in the constituent drugs are not lost during distillation process and is present in the *Arka* thereby increasing its therapeutic efficacy.

HPTLC: The HPTLC fingerprint of *Mukhapakahara arka* was done as a part of the study as there exists no previous works on this formulation. 7 peaks were obtained. This HPTLC fingerprint of *Mukhapakahara arka* obtained can be used for further reference.

CONCLUSION

The pharmaceutico analytical study of *Mukhapakhahara arka* was carried out in this study. *Mukhapakahara arka* was prepared with eight times of water as this formulation contains drugs of different nature. The drugs were soaked for 24 hours' time period to aid proper extraction. The yield obtained was 60%. Analytical studies carried out on the formulation including HPTLC have helped to generate preliminary standards as no previous works are available regarding the same. GCMS study has to be carried out on this formulation. Also, further studies can be carried out in *Mukhapakahara arka* with varying proportion of water, time period of soaking the drugs and the product thus obtained could be subjected to physicochemical evaluation to understand the differences.

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