

## Standard Manufacturing Procedure of *Jaharamohara Bhasma* Prepared by Two Methods

Parth B. Chandak<sup>1,\*</sup>, Bharti Umretia<sup>2</sup>, Bharat Kalsariya<sup>3</sup>

### Abstract

*Jaharamohara (Serpentine) is an important drug of Ayurveda and Unani medicine. In the literature of Rasashastra it is classified under Sikta Varga (group of silica-containing drugs). In classical texts, different Bhavana Dravya (levigating material) are advised for the preparation of Jaharamohara Bhasma which enhances its potency. However, no work has been done till date to standardize Jaharamohara Bhasma. An attempt has been made to prepare Jaharamohara Bhasma by two different methods. Three batches of Jaharamohara Bhasma were prepared by Shodhana (purification) of Jaharamohara followed by Marana (calcination) as per the reference of Rasatanrasaar and Siddhaprayoga Sangrah and Rasodddharatantra to develop Standard Manufacturing Procedure. In the present study, Go-Dugdha as well as Arjuna Twak Kwatha and Vatajata Kwatha was used for Bhavana (levigation). Jaharamohara Bhasma was prepared by using Gajaputa (34 kg cow dung cakes) while, by using Varahaputa (10 kg cow dung cakes) in terms of pharmaceutical standards that is, creamish white and greyish white colour with 80.89% and 76.36% yield respectively. The present study has assured and standardised the preparation of Jaharamohara Bhasma prepared by two methods in accordance with the procedure described in the classical literature.*

**Keywords:** *Jaharamohara Bhasma, Gajaputa, Varahaputa, Standard Manufacturing Procedure (SMP).*

### INTRODUCTION

Adoption of the prescribed pharmaceutical method for the drug's quality, safety, and efficacy depends on pharmaceutical standardization. In the development of pharmaceutical technology, it is imperative to adhere to the current guidelines while determining the standard parameters for the classical formulation. The pharmaceutical standardization of *Bhasma* refers to the collection of genuine samples ensuring ideal manufacturing conditions, including *Shodhana* (purification), *Bhavana* (levigation), and *Putra* (use of heating devices for incineration) in order to achieve high-quality final products. These factors have a direct impact on the medicinal qualities of the drug.

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Received Date: January 20, 2024

Accepted Date: February 12, 2024

Published Date: April 06, 2024

**Citation:** Parth B. Chandak, Bharti Umretia, Bharat Kalsariya. Standard Manufacturing Procedure of *Jaharamohara Bhasma* Prepared by Two Methods. *Research & Reviews: A Journal of Ayurvedic Science, Yoga & Naturopathy*. 2024; 11(1): 1–13p.

*Jaharamohara* is the drug adopted by *Ayurveda* from the Unani system of medicine and initiatory mentioned by Acharya Yadavji Trikamji—the author of *Rasamritam*. *Jaharamohara Bhasma* is widely used by Vaidya and Hakim in various disorders such as *Swasa*, *Kasa*, *Raktapitta*, and *Arsha* [1]. *Harita*, *Peeta* and *Swetabhyukta Hareeta* color of *Jaharamohara* are described in different *Rasagrantha* [2]. Variety of *Jaharamohara* obtained from Kahtun region of Iran, which is called as *Jaharamohara Khatai*, is considered as the best variety [3]. Even Unani system of medicine consider *Harita*, *Peeta* and *Swethabha* variety of *Jaharamohara* as the best variety [4].

*Jaharamohara* is categorized under silica-containing drugs. *Jaharamohara* was first mentioned in *Ayurvedic* texts of 20<sup>th</sup> century, though the preparatory method of *Jaharamohara Bhasma* is mentioned in *Ayurvedic* treatises such as *Rasatantrasaar*, *Siddhaprayoga Sangraha*, and *Rasoddharatantra*. Therefore, an effort has been made in the present study to highlight the significance of pharmaceutical procedures and to develop the standard parameters for *Jaharamohara Bhasma* prepared by two different methods. Till date no work has been carried out on Standard Manufacturing Procedure (SMP) of *Jaharamohara Bhasma* prepared by the given two methods.

## MATERIALS AND METHODS

### Procurement and Authentication of the Raw Material

*Jaharamohara* was procured from an authorized gem trader from Khambhat, Gujarat, India. After procurement, *Jaharamohara* was given for authentication at “Neel Gem Testing Laboratory” (ISO certified (9001–2008), Ahmedabad, Gujarat, India). The laboratory authenticated and certified the sample as Serpentine on the bases of physical and optical parameters such as hardness, refractive index, specific gravity, fluorescence (Table 1). *Arjun Twak* (*Terminalia arjuna* W&A) was procured from Government Ayurved Pharmacy, Rajpipla and pharmacognostical study was carried out at Upgraded Department of Dravyaguna, Government Ayurved College, Vadodara, Gujarat, India for its identification and authentication. *Vatajata* (*Ficus bengalensis* Linn.) was collected from the Botanical Garden, M. S. University, Vadodara, Gujarat, India and pharmacognostical study was carried out at Upgraded Department of Dravyaguna, Government Ayurved College, Vadodara Gujarat, India for its identification and authentication. *Go-Dugdha* (Cow’s milk) was procured from the local market of Vadodara having *fssai* standards.

### Preparation of Drug

All the samples of *Jaharamohara Bhasma* were prepared by two methods in pharmaceutical laboratory of Upgraded Department of Rasashastra and Bhaishajya Kalpana, Government Ayurved College, Vadodara, Gujarat, India.

To develop SMP, three batches of *Jaharamohara Bhasma* prepared by two methods were carried out in following steps:

1. Preparation of *Jaharamohara Shodhana* (JMS),
2. Preparation of *Jaharamohara Bhasma*

### Preparation of *Jaharamohara Shodhana* (JMS)

*Shodhana* of *Jaharamohara* was carried out by *Nirvapa* (heating and quenching) in *Go-Dugdha* as per the reference of *Rasatantrasaar* and *Siddhaprayoga Sangraha* [5]. About 620 g of *Ashodhita Jaharamohara* were heated between 470–480°C in an s.s pan and quenched in *Go-Dugdha* for 21 times. Liquid media was changed each time and taken in such amount that the material was properly immersed in the media ( $500\text{ ml} \times 1 \times 21 = 10500\text{ ml}$ ) ( $10500\text{ ml} \times 3\text{ batches } \textit{Jaharamohara} = 31500\text{ ml}$ ) (Figure 1). The details of JMS are depicted in Table 2.

### Preparation of *Jaharamohara Bhasma*

#### *Jaharamohara Bhasma method-1* (JMB-1)

*Jaharamohara Bhasma* (JMB-1) was prepared as per the reference of *Rasatantrasaar* and *Siddhaprayoga Sangraha* [6]. About 150 g of *Shodhita Jaharamohara* powder was levigated with *Go-Dugdha* for 6 h by manually in a stone mortar. After 6 hours of trituration, uniform sizes of pellets were prepared and allowed to dry completely. After drying, pellets were placed in an earthen *Sharava* and covered with another *Sharava*. *Sandhibandhana* was done by mud smeared cotton cloth and kept for drying (Figure 2). It was then subjected to *Putra*. The cow dung cakes were arranged from all sides in mentioned size of *Gajaputa* (27×27×27 (l×b×h) inch) with covering *Sharava Samputa* and ignited. After self-cooling, *Sharava Samputa* was taken out, collected the pellets and weighed. That procedure

was repeated for another time. After completion of 2<sup>nd</sup> *Putra*, pellets were weighed and subjected to trituration in a stone mortar pestle to get a fine powder of it. The fine powder was stored in an airtight container. Total 2 *Putra* was given to complete the preparation of *Jaharamohara Bhasma* that is passing all classical parameters. Cow dung cakes required for each *Gajaputa* were 280–300 weighing 34 kg. Total used quantity of cow dung cakes was 204 kg (34 kg × 1 × 2 *Putra* × 3 batches *Jaharamohara Bhasma* (JMB-1)).

### Preparation of *Jaharamohara Bhasma* method -2 (JMB-2)

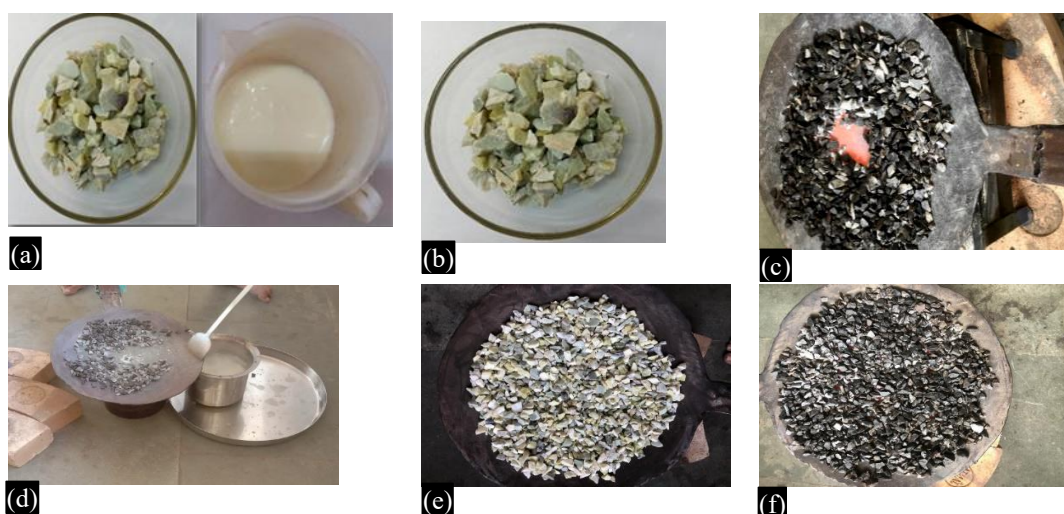
*Preparation of Arjun Twak Kwatha for Jaharamohara Bhasma method-2: Arjun Twak Kwatha* was used as *Bhavana Dravya* in preparation of *Jaharamohara Bhasma* method-2 (JMB-2). Therefore, for the preparation of JMB-2, *Arjun Twak Kwatha* preparation is requisite step. *Arjun Twak Kwatha* was prepared as per the reference of Rasatarangini [5]. This filtrate was taken as *Arjuna Twak Kwatha* and used for further process. About 150 g *Arjuna Twak* was taken, washed properly with water and made *Yavakuta* (coarse form) by using mixer grinder. After that it was taken in a vessel containing eight times of potable water. Then, it was heated on constant mild heat with intermediate stirring and reduced water until its 1/8<sup>th</sup> part was remained. After desirable reduction in volume, it was filtered through clean cotton cloth. This filtrate was taken as *Vatajata Kwatha* and used for further process.

**Table 1.** Details of Authentication parameters of Serpentine.

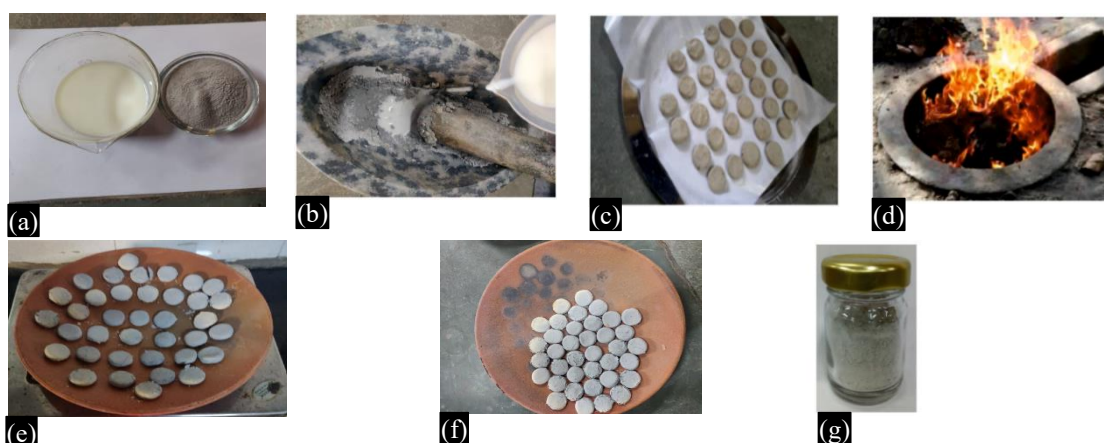
S.No.	Parameters	Results
1	Hardness	2.5–6
2	Refractive Index	1.56–1.57
3	Specific gravity	3.49–3.57
4	Fluorescence	None

**Table 2.** Result of *Jaharamohara Shodhana* (JMS).

S.N.	Parameters		Results			
			B-1	B-2	B-3	Average
1	Initial quantity of <i>Ashodhita Jaharamohara</i> (g)		1000	1000	1000	1000
2	Total time taken for <i>Jaharamohara Shodhana</i> (h: min)		07:15	07:10	07:25	07:17
3	Temperature (°C)	Flame (°C)	549.13	558.33	558.14	555.02
		<i>Jaharamohara</i> in red hot stage (°C)	440.23	462.24	465.04	455.84
4	Quantity of <i>Go-Dugdha</i> required for each quenching (ml)		600	600	600	600
5	Final quantity of <i>Shodhita Jaharamohara</i>	Before drying (g)	1005	1005	1005	1005
		After drying (g)	965	966	967	966
6	Total quantity of <i>Go-Dugdha</i> required for 21 times of quenching (ml)		12600	12600	12600	12600
7	Final weight of <i>Shodhita Jaharamohara</i> after drying (%)		96.5	96.6	96.7	96.6
8	Total loss / gain (g)		35	34	33	34
9	Total loss / gain (%)		3.5	3.4	3.3	3.4
10	Reason of loss		Due to quenching and straining			
11	Remaining quantity of <i>Go-Dugdha</i> after 21 times of quenching (ml)		9450	9360	9410	9406.67
12	Loss of volume of media after quenching		3150	3240	3190	3193.33
13	Total loss (%)		25	25.71	25.32	25.34
14	Reason of loss		Evaporation of <i>Go-Dugdha</i> while quenching of heated <i>Jaharamohara</i>			



**Figure 1.** *Jaharamohara Shodhana* (JMS) (A) Ingredients for *Jaharamohara Shodhana*, (B) *Ashuddha Jaharamohara*, (C) Heating of raw *Jaharamohara*, (D) Quenching of *Jaharamohara* in *Go-Dugdha*, (E) *Jaharamohara* before *Shodhana*, (F) *Jaharamohara* after *Shodhana*.



**Figure 2.** *Jaharamohara Bhasma* (JMB-1) (A) Ingredients of *Jaharamohara Bhasma* (JMB-1), (B) Levigation with *Go-Dugdha*, (C) *Chakrika Nirmana*, (D) Subjected to 1<sup>st</sup> *Gajaputa*, (E) Levigation with *Go-Dugdha* for 2<sup>nd</sup> *Put*a, (F) *Chakrika* after 2<sup>nd</sup> *Put*a, (G) *Jaharamohara Bhasma*.

*Preparation of Vatajata Kwatha for Jaharamohara Bhasma method-2:* *Vatajata Kwatha* was used as *Bhavana Dravya* in preparation of *Jaharamohara Bhasma* method-2 (JMB-2). Therefore, for the preparation of JMB-2, *Vatajata Kwatha* preparation is requisite step. *Vatajata Kwatha* was prepared as per the reference of *Rasatarangini* [7]. About 150 g *Vatajata* was taken, washed properly with water and made *Yavakuta* (coarse form) by using mixer grinder. After that it was taken in a vessel containing eight times of potable water. Then, it was heated on constant mild heat with intermediate stirring and reduced water until its 1/8<sup>th</sup> part was remained. After desirable reduction in volume, it was filtered through clean cotton cloth. This filtrate was taken as *Vatajata Kwatha* and used for further process.

#### **Preparation of *Jaharamohara Bhasma* method -2 (JMB-2)**

About 150 g of *Shodhita Jaharamohara* powder was levigated with *Arjun Twak Kwatha* for 12 h by manually in a stone mortar. After 12 h of trituration, next day uniform sizes of pellets were prepared and allowed to dry completely. After drying, pellets were placed in an earthen *Sharava* and covered with another *Sharava*. *Sandhibandhana* was done by mud smeared cotton cloth and kept for drying (Figure 3). It was then subjected to *Put*a. The cow dung cakes were arranged from all sides in mentioned size of *Varahaputa* (18×18×18 (l×b×h) inch) [8] with covering *Sharava Samputa* and ignited. After

self-cooling, *Sharava Samputa* was taken out, collected the pellets and weighed. That procedure was repeated for four times. After completion of 5<sup>th</sup> *Putra*, pellets were weighed and subjected to trituration in a stone mortar pestle to get a fine powder of it. The fine powder was stored in an airtight container. Total 5 *Putra* was given to complete the preparation of *Jaharamohara Bhasma* that passed all classical parameters. Cow dung cakes required for each *Varahaputa* were 90–110 weighing 10 kg. Total used quantity of cow dung cakes was 150 kg (10 kg × 1 × 5 *Putra* × 3 batches *Jaharamohara Bhasma* (JMB-2)).

## OBSERVATIONS AND RESULTS

In the raw material (*Jaharamohara*), the color of the material became greyish black during *Shodhana*, when heated in the temperature between 470–480°C. *Jaharamohara* became brittle and less shiny after 21 times of quenching. The weight of *Jaharamohara* increased after quenching in *Go-Dugdha* as a small amount of *Go-Dugdha* remained in it. In media, as soon as, the material was quenched in *Go-Dugdha*, typical crackling sound was heard with effervescence. A smell of *Go-Dugdha* was observed after quenching. When the material was quenched in *Go-Dugdha*, the temperature of liquid media was raised and the color became slightly brownish. Characteristic smell of *Go-Dugdha* was felt. Details of *Jaharamohara Shodhana* (JMS) are depicted in Table 2.

Powdering of *Jaharamohara* was prerequisite step in the manufacturing of *Jaharamohara Bhasma*. This process is an intermediate process between *Shodhana* and *Marana*. As *Shodhita Jaharamohara* was hard, it was quite difficult to make a powder of *Jaharamohara* in a mixer. After sieving, grey colored fine powder of *Jaharamohara* was obtained. The details of *Shodhita Jaharamohara* powdering are depicted in Table 3.

**Table 3.** Details of *Shodhita Jaharamohara* powdering.

Parameters	<i>Shodhita Jaharamohara</i>			
	<i>B-1</i>	<i>B-2</i>	<i>B-3</i>	Avg.
Weight before powdering (g)	925	926	927	926
Weight after powdering (g)	907	905	902	904.66
Loss on powdering (g)	18	21	25	21.33
Loss on powdering percentage (%)	1.95	2.27	2.70	2.31
Total time required for powdering of <i>Jaharamohara</i> (h:min)	04:35	04:45	04:50	04.43

**Table 4.** Observations during preparation of JMB-1 (*B-1*).

Parameters		Observations	
		No. of <i>Putra</i>	
		1 <sup>st</sup> <i>Putra</i>	2 <sup>nd</sup> <i>Putra</i>
Quantity of <i>Go-Dugdha</i> required for the preparation of <i>Chakrika</i> (ml)		125	110
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	169	153
	After Drying	150	136
	After <i>Putra</i>	138	122
	*Sample analysis	10	-
Required quantity of cow dung cakes	Number	285	290
	Weight (kg)	34	34
Maximum temperature (°C)		954	978
Time required for attainment of maximum temperature (h: min)		02:15	02:30
Total time of heating for individual <i>Putra</i> (h:min)		08:45	09:00
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Grey	Light grey
	After <i>Putra</i>	Light grey	Creamish white
Hardness/Softness		Soft	Soft
Loss in weight after <i>Putra</i> (g)		12	14
Loss in weight after <i>Putra</i> (%)		08	11.11

Observations and Results for JMB-1 are depicted in Tables 4–9.

Observations and Results for JMB-2 are depicted in Tables 10–13.

JMB-1 can be prepared by using *Gajaputa* Pit; for that 34 kg cow dung cakes were used. After 1<sup>st</sup> *Putra*, the *Chakrika* became light grey, hard and not passed through classical parameters. So it was decided to give 2<sup>nd</sup> *Putra*. After 2<sup>nd</sup> *Putra*, the *Chakrika* became creamish white, soft and passed through all classical parameters. Therefore, to prepare *Bhasma 2 Gajaputa* were given. Results of JMB-1 is depicted in Table 7.

**Table 5.** Observations during preparation of JMB-1 (B-2).

Parameters		Observations	
		No. of <i>Putra</i>	
		1 <sup>st</sup> <i>Putra</i>	2 <sup>nd</sup> <i>Putra</i>
Quantity of <i>Go-Dugdha</i> required for the preparation of <i>Chakrika</i> (ml)		135	130
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	165	152
	After drying	150	130
	After <i>Putra</i>	132	118
	*Sample analysis	10	-
Required quantity of cow dung cakes	Number	282	290
	Weight (kg)	34	34
Maximum temperature (°C)		942	953
Time required for attainment of maximum temperature (h:min)		02:00	02:00
Total time of heating for individual <i>Putra</i> (h:min)		08:30	08:45
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Grey	Light grey
	After <i>Putra</i>	Light grey	Creamish white
Hardness/Softness		Soft	Soft
Loss in weight after <i>Putra</i> (g)		18	12
Loss in weight after <i>Putra</i> (%)		12	8

**Table 6.** Observations during preparation of JMB-1 (B-3).

Parameters		Observations	
		No. of <i>Putra</i>	
		1 <sup>st</sup> <i>Putra</i>	2 <sup>nd</sup> <i>Putra</i>
Quantity of <i>Go-Dugdha</i> required for the preparation of <i>Chakrika</i> (ml)		145	130
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	160	158
	After drying	150	138
	After <i>Putra</i>	133	124
	*Sample analysis	10	-
Required quantity of cow dung cakes	Number	285	282
	Weight (kg)	34	34
Maximum temperature (°C)		966	978
Time required for attainment of maximum temperature (h:min)		02:00	01:45
Total time of heating for individual <i>Putra</i> (h:min)		08:45	08:45
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Grey	Light grey
	After <i>Putra</i>	Light grey	Creamish white
Hardness/Softness		Soft	Soft
Loss in weight after <i>Putra</i> (g)		17	14
Loss in weight after <i>Putra</i> (%)		11.33	9.33

\*Note: Initially 150 g of *Shuddha Jaharamohara* was taken for *Marana* procedure. After each *Putra*, 10 g of sample was taken out for analysis and remaining material was used for *Putra Paka*. So here final percentage of *Bhasma* was counted on the basis of weight of material taken for *Putra Paka* procedure.

**Table 7.** Results of JMB-1.

S.No.	Parameters	Results			
		B-1	B-2	B-3	Average
1	Initial quantity of <i>Shodhita Jaharamohara Churna</i> (g)	150	150	150	150
2	Total time taken for <i>Jaharamohara Bhasma</i> (days)	07	07	07	07
3	Total quantity of <i>Go-Dugdha</i> required (ml)	265	265	275	268.33
4	*Weight of sample taken for analysis (g)	10	10	10	10
5	*Final quantity of <i>Jaharamohara Bhasma</i> (g)	122	118	124	121.33
6	*Final quantity of <i>Jaharamohara Bhasma</i> (%)	81.33	78.66	82.66	80.89
8	Total loss / <del>gain</del> (g)	28	32	26	28.67
9	Total loss / <del>gain</del> (%)	18.67	21.33	17.33	19.11
10	Reason of loss	Due to incineration process			

**Table 8.** Results of *Arjun Twak Kwatha* for JMB-2.

S.No.	Parameters	Results			
		B-1	B-2	B-3	Avg.
1	Initial quantity of dry <i>Arjuna Twak</i> (g)	150	150	150	150
2	Total quantity of water taken (ml)	1200	1200	1200	1200
3	Total time taken for preparation of <i>Kwatha</i> (Soaking + Boiling)	1 ½ day	1 ½ day	1 ½ day	1 ½ day
4	Final quantity of <i>Kwatha</i> (ml)	155	160	165	160
5	Final quantity of <i>Kwatha</i> (%)	12.92	13.33	13.75	13.33
6	Total loss / <del>gain</del> (ml)	1045	1040	1035	1040
7	Total loss / <del>gain</del> (%)	87.08	86.67	86.25	86.73
8	Reason of loss	Due to evaporation			
9	Weight of residue after filtration (g)	182.51	192.40	190.25	188.39

**Table 9.** Results of *Vatajata Kwatha* for JMB-2.

S.No.	Parameters	Results			
		B-1	B-2	B-3	Avg
1	Initial quantity of <i>Vatajata</i> (g)	150	150	150	150
2	Total quantity of water taken (ml)	1200	1200	1200	1200
3	Total time taken for preparation of <i>Kwatha</i> (Soaking + Boiling)	1 ½ day	1 ½ day	1 ½ day	1 ½ day
4	Final quantity of <i>Kwatha</i> (ml)	160	165	160	160
5	Final quantity of <i>Kwatha</i> (%)	13.33	13.75	13.33	13.33
6	Total loss / <del>gain</del> (ml)	1040	1040	1040	1040
7	Total loss / <del>gain</del> (%)	86.67	86.25	86.67	86.73
8	Reason of loss	Due to evaporation			
9	Weight of residue after filtration (g)	168.75	183.25	182.50	188.39

JMB-2 can be prepared by using *Varahaputa* Pit for that 10 kg cow dung cakes were used. After 1<sup>st</sup> *Putra*, *Chakrika* became grey coloured, hard and not passed through the classical parameters. So it was decided to give further *Putra* till the *Bhasma Siddhi Lakshana* were fulfilled. After that 2<sup>nd</sup> *Putra* was given, similar observation were seen. After 3<sup>rd</sup> *Putra* *Chakrika* became soft and light grey. *Chakrika* became greyish white from light grey colour after 4<sup>th</sup> *Varahaputa* but till not passed through classical parameters. But after 5<sup>th</sup> *Varahaputa*, *Chakrika* became *Mridu* (soft), greyish white in colour and passed through all classical parameters. So it was decided to give 5 *Varahaputa* for *Bhasma* preparation. Tables 13 and 14 depicts the organoleptic characters of JMB-1 and JMB-2.

**Table 10.** Observations during preparation of JMB-2 (B-1).

Parameters		Observations				
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
Quantity of <i>Arjuna Twak Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		265	215	185	175	160
Quantity of <i>Vatajata Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		235	220	180	160	145
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	176	170	142	130	121
	After Drying	148	134	127	105	92
	After <i>Putra</i>	140	120	113	96	86
	*Sample analysis	10	10	10	10	-
Required quantity of cow dung cakes	Number	93	96	101	94	97
	Weight (kg)	10	10	10	10	10
Maximum temperature (°C)		878	825	814	840	835
Time required to attain the maximum temperature (h:min)		02:15	02:15	01:35	02:15	02:00
Total time of heating for individual <i>Putra</i> (h:min)		07:30	07:30	07:00	07:00	07:30
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Brown	Brown	Brown	Brown	Brown
	After <i>Putra</i>	Grey	Light grey	Light grey	Greyish white	Greyish white
Hardness/Softness		Soft	Soft	Soft	Soft	Soft
Loss in weight after <i>Putra</i> (g)		10	14	14	9	6
Loss in weight after <i>Putra</i> (%)		6.66	9.33	9.33	6	4

**Table 11.** Observation during preparation of JMB-2 (B-2).

Parameters		Observations				
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
Quantity of <i>Arjuna Twak Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		260	222	186	175	165
Quantity of <i>Vatajata Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		225	220	185	165	135
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	168	165	138	130	121
	After drying	145	134	126	108	94
	After <i>Putra</i>	139	118	110	96	87
	*Sample analysis	10	10	10	10	-
Required quantity of cow dung cakes	Number	94	92	98	93	96
	Weight (kg)	10	10	10	10	10
Maximum temperature (°C)		806	864	825	813	845
Time required to attain the maximum temperature (h:min)		01:45	02:00	01:45	02:15	01:45
Total time of heating for individual <i>Putra</i> (h:min)		07:00	07:15	07:30	07:00	07:15
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Brown	Brown	Brown	Brown	Brown
	After <i>Putra</i>	Grey	Light grey	Light grey	Greyish white	Greyish white
Hardness/Softness		Soft	Soft	Soft	Soft	Soft
Loss in weight after <i>Putra</i> (g)		11	16	12	12	7
Loss in weight after <i>Putra</i> (%)		7.33	10.67	8	8	4.67

**Table 12.** Observation during preparation of JMB-2 (B-3).

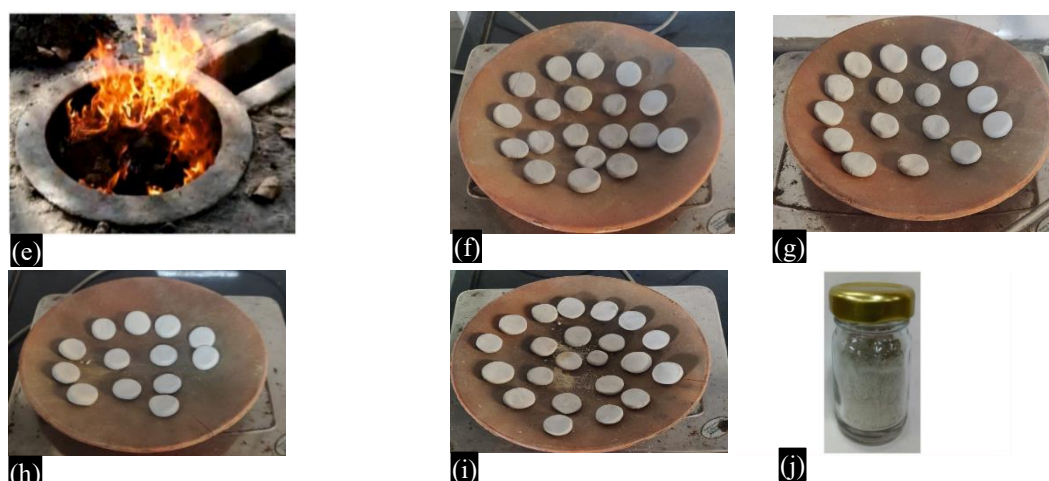
Parameters		Observations				
		1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>
Quantity of <i>Arjuna Twak Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		270	225	170	165	150
Quantity of <i>Vatajata Kwatha</i> required for the preparation of <i>Chakrika</i> (ml)		225	230	185	175	125
Weight of <i>Chakrika</i> (g)	After <i>Bhavana</i>	172	157	135	126	129
	After drying	148	139	126	114	98
	After <i>Putra</i>	138	123	116	102	89
	*Sample analysis	10	10	10	10	10
Required quantity of cow dung cakes	Number	95	93	98	93	96
	Weight (kg)	10	10	10	10	10
Maximum Temperature (°C)		834	828	855	833	842
Time required to attain the maximum temperature (h:min)		02:30	02:00	02:15	02:15	02:30
Total time of heating for individual <i>Putra</i> (h:min)		07:00	08:00	07:30	07:45	08:00
Colour of <i>Chakrika</i>	Before <i>Putra</i>	Brown	Brown	Brown	Brown	Brown
	After <i>Putra</i>	Grey	Light grey	Light grey	Greyish white	Greyish white
Hardness/Softness		Soft	Soft	Soft	Soft	Soft
Loss in weight after <i>Putra</i> (g)		12	16	10	12	9
Loss in weight after <i>Putra</i> (%)		8	10.67	6.67	8	6

**Table 13.** Results of JMB-2.

S.No.	Parameters	Results			
		B-1	B-2	B-3	Average
1	Initial quantity of <i>Shodhita Jaharamohara Churna</i> (g)	150	150	150	150
2	Total time taken for <i>Jaharamohara Bhasma</i> (days)	21	21	21	21
3	Quantity of <i>Arjuna Twak Kwatha</i> required (ml)	1000	1008	980	996
4	Quantity of <i>Vatajata Kwatha</i> required (ml)	940	930	940	936.67
5	*Weight of sample taken for analysis (g)	40	40	40	40
6	Final quantity of <i>Jaharamohara Bhasma</i> (g)	126	127	129	127.33
7	*Final quantity of <i>Jaharamohara Bhasma</i> (g)	86	87	89	87.33
8	*Final quantity of <i>Jaharamohara Bhasma</i> (%)	78.18	79.09	80.9	79.39
9	Total loss (g)	24	23	21	22.67
10	Total loss (%)	16	15.33	14	15.11
11	Reason of loss	Due to Incineration process			

\*Note: Initially 150 g of *Shuddha Jaharamohara* was taken for *Marana* procedure. After each *Putra*, 10 g of sample was taken out for analysis and remaining material was used for *Putra Paka*. So here final percentage of *Bhasma* was counted on the basis of weight of material taken for *Putra Paka* procedure.





**Figure 3.** *Jaharamohara Bhasma* (JMB-2) (A) Ingredients of *Jaharamohara Bhasma* (JMB-2), (B) Levigation with *Arjuna Twak Kwatha*, (C) Levigation with *Vatajata Kwatha*, (D) *Chakrika Nirmana*, (E) Subjected to 1st *Varahaputa*, (F) *Chakrika* after 1<sup>st</sup> *Putra*, (G) *Chakrika* after 2<sup>nd</sup> *Putra*, (H) *Chakrika* after 3<sup>rd</sup> *Putra*, (I) *Chakrika* after 4<sup>th</sup> *Putra*, (J) *Jaharamohara Bhasma*.

**Table 14.** Organoleptic characters of JMB-1 and JMB-2.

Parameters	JMB-1			JMB-2		
	B-1	B-2	B-3	B-1	B-2	B-3
Colour	Creamish white	Creamish white	Creamish white	Greyish white	Greyish white	Greyish white
Odour	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless
Taste	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless	Tasteless
Texture	Soft	Soft	Soft	Soft	Soft	Soft

## DISCUSSION

The present study was aimed at standardizing the preparation method of *Jaharamohara Bhasma*. It was prepared by adopting two methods. The first method was described by Rasatantrasaar and Siddhaprayog Sangraha [9], in which *Go-Dugdha* was used as a *Bhavana Dravya*, while second method was by Rasoddharatantra [10], in which *Arjun Twak Kwatha* and *Vatajata Kwatha* were used as *Bhavana Dravya*. The quantity of liquid media used for quenching in the *Nirvapa* is not described in any Rasagrantha. As a result, enough liquid media was added to ensure that the material was completely immersed in it. Based on the inferences obtained from the pilot study, 500 ml of *Go-Dugdha* was required for each *Nirvapa* of 620 g *Jaharamohara*. Required quantity of *Go-Dugdha* for *Jaharamohara Shodhana* (12600×3 batches = 37800 ml), for *Bhasma* (JMB-1) was 805 ml. During *Jaharamohara Shodhana*, when the material was heated between 470–480°C, the color changed to blackish red. The temperature was also not exceeding to 500°C and also the color of the material remained the same. For that reason, the temperature was decided in between 470 and 480°C.

In classics, 1 *Gajaputa* [11] is indicated for *Jaharamohara Bhasma* while 1 *Varahaputa* has been mentioned by Bhashaja Samhita/Rasoddharatantra. There have been several references to *Jaharamohara Bhasma* in which the quantity of cow dung cakes and *Putra* are considered variables and the cakes themselves are considered a standard fuel [12, 13]. In that *Putra*, the average peak temperature was observed as 938.5°C. After 1<sup>st</sup> *Putra*, the *Chakrika* became light grey, hard and not passed through classical parameters. So it was decided to give 2<sup>nd</sup> *Putra*. After 2<sup>nd</sup> *Putra*, the *Chakrika* became creamish white, soft and passed through all classical parameters. So it was decided to give 2 *Gajaputa* for *Bhasma* preparation. Average temperature range was observed as 900–980°C. As per observations obtained from pilot batch, same methodology was adopted for the preparation of main batch of JMB-1.

The average peak temperature was observed as 857.4°C. After 1<sup>st</sup> *Puta*, *Chakrika* became grey coloured, hard and not passed through the classical parameters. So, it was decided to give further *Puta* till the *Bhasma Siddhi Lakshana* were fulfilled. After that 2<sup>nd</sup> *Puta* was given and similar observations were seen. *Chakrika* became soft and light grey after 3<sup>rd</sup> *Puta*. Similar observation was seen in 4<sup>th</sup> *Varahaputa* but till not passed through classical parameters. But after 5<sup>th</sup> *Varahaputa*, *Chakrika* became *Mridu* (soft), light grey in colour and passed through all classical parameters. So it was decided to give 5 *Varahaputa* for *Bhasma* preparation. Average temperature range was observed to be 800–870 °C. As per observations obtained from the above pilot batch, same methodology was adopted for the main batch of JMB-2.

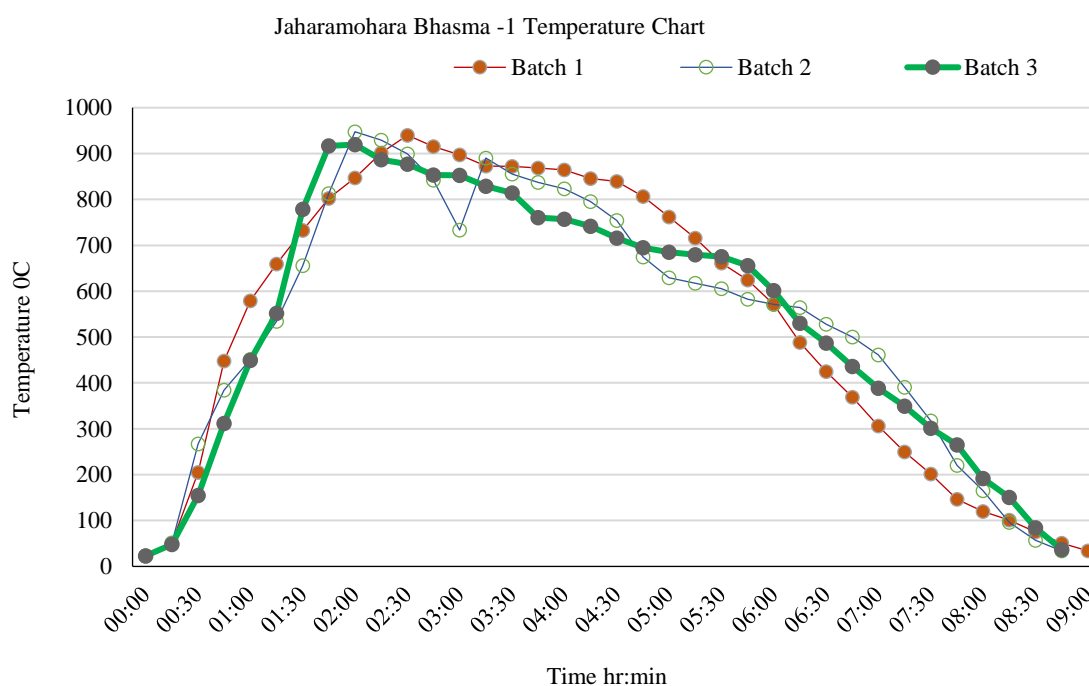
In preparation of JMB-1 higher amount of total loss observed after completion of two successive *Puta* was 18.67%, 21.33%, 17.33% and yield was 122 g (81.33%), 118 g (78.66%), and 124 g (82.66%), respectively. The reason of loss may be due to incineration procedure. The temperature of *Puta* during *Marana* of *Jaharamohara* was recorded at regular intervals of 15 min for 9:00 hours only for an outline idea of temperature (Figure 4).

In preparation of JMB-2, higher amount of total loss observed after completion of five successive *Puta* was 16%, 15.33%, 14% and yield was 86 g (78.18%), 87 g (79.09%) and 89 g (80.9%), respectively. The reason of loss may be due to incineration procedure. The temperature of *Puta* during *Marana* of *Jaharamohara* was recorded at regular intervals of 15 min for 8:00 hours only for an outline idea of temperature (Figure 5).

### Temperature Pattern

The temperature of *Puta* during *Marana* of *Jaharamohara* was recorded at regular intervals of 15 min for 9:00 hours in JMB-1 and for 8:00 hours in JMB-2.

The peak temperature was observed between 913°C and 953°C after average 02:30 hours in JMB-1 and 806°C and 864°C after 02:00 hours in JMB-2. It was retained static 30 min for JMB-1 and 15 min for JMB-2. The highest temperature peak for all the three batches of JMB-1 and JMB-2 is depicted in Figure 6.



**Figure 4.** Temperature chart of JMB-1.

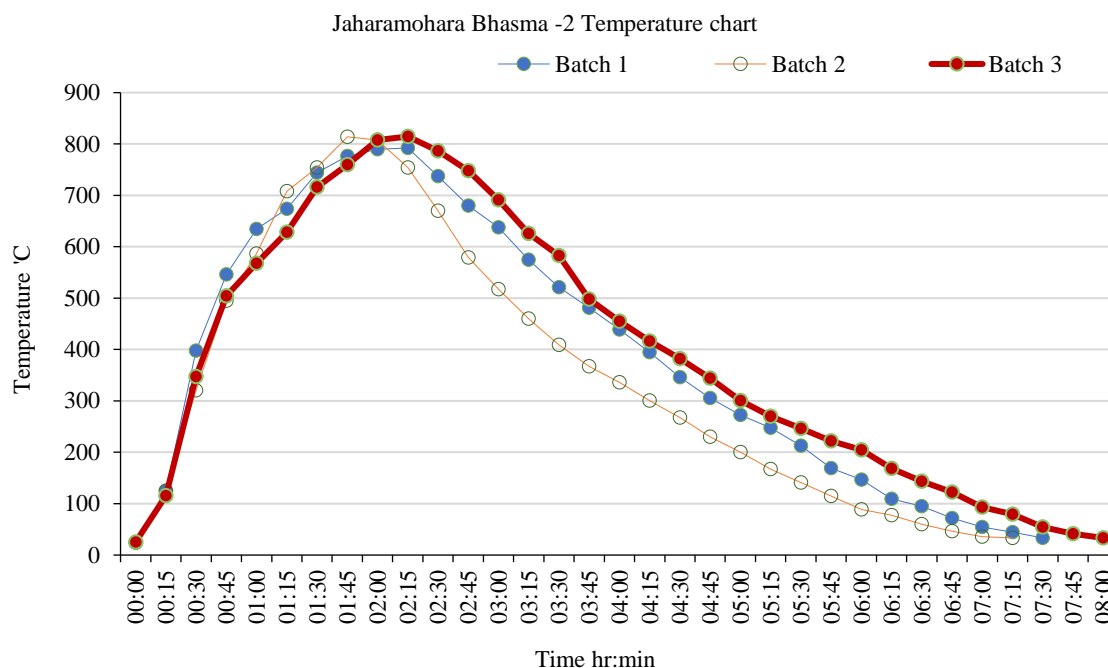


Figure 5. Temperature chart of JMB-2.

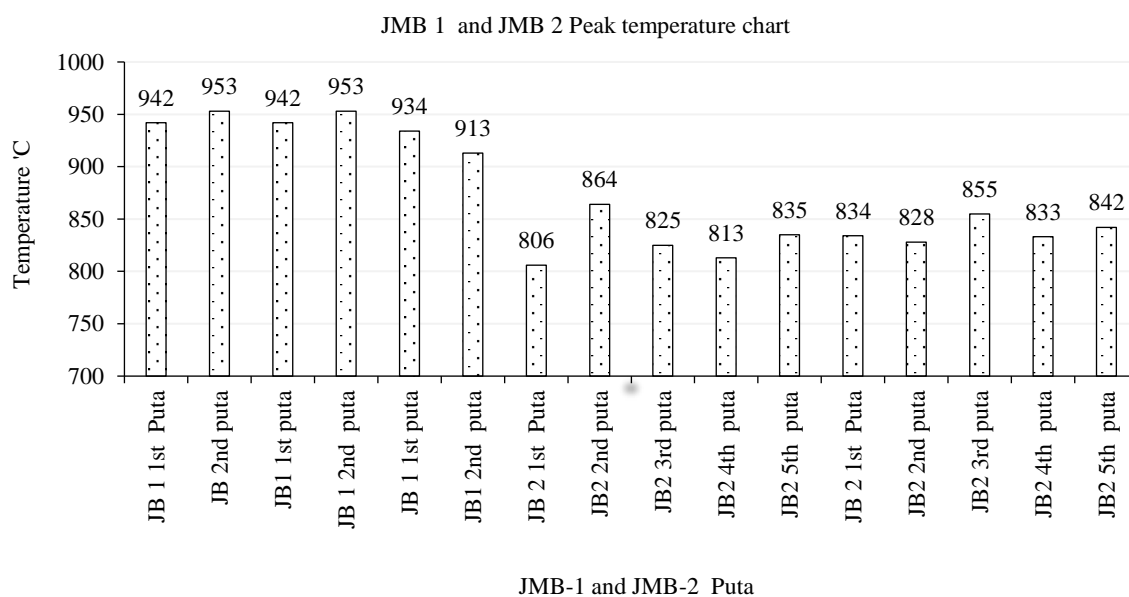


Figure 6. Peak temperature chart for JMB-1 and JMB-2.

In the preparation of JMB-1, total time taken for three batches was 21 working days, total quantity of *Go-Dugdha* used were 805 ml during the entire preparation. While for JMB-2, total time taken for three batches was 63 working days and total quantity of *Arjun Twak Kwatha* and *Vatajata Kwatha* were 996 ml and 936.67 ml, respectively. Colour of JMB-1 and JMB-2 were creamish white and greyish white, respectively.

Average comparative yield percentage of JMB-1 and JMB-2 were 80.89% and 76.36%, respectively. The average yield percentage decreased both *Bhasma* as in *Puta*, only the inorganic part of the active principles remains in a very minute amount. As herbo-mineral mixture is incinerated in closed vessel, nano-oxide particles converted into a more favourable oxidation for human consumption.

## CONCLUSION

Temperature sustains for longer duration (30 min) in JMB-1 while in JMB-2 it remains for 15 min. An optimized temperature and duration of self-cooling for the preparation of JMB-1 was 938.5 °C and 08:45 hours, while for JMB-2 it was 857.4 °C and 08:00 hours, respectively. JMB-1 was prepared in 2 *Gajaputa* whereas, JMB-2 was prepared in 5 *Varahaputa*. In consideration of pharmaceutical study, JMB-1 was found easier than JMB-2 in terms of preparatory method and an average comparative yield. Yield of JMB-1 and JMB-2 were 80.89% and 76.36%, respectively. JMB-1 can be prepared in less time and required less number of *Putra*. As no standardization profile was found on these both the preparatory method of *Bhasma* reported till date, the current data may be considered in future studies..

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