



Pharmaceutical Standardization

Standardization of *Gaja Puta* and *Ardha Gaja Puta* in the preparation of *Vanga Bhasma*

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Abstract

The *Vanga Bhasma* is an important one amongst the metallic *Bhasmas*. Mainly *Gaja Puta*, *Ardhagaja Puta* and *Laghu Puta* have been described for *Marana* of *Vanga*. The medicines, which are prepared from *Gaja Puta*, are said to be the best ones (*Mahagunavidhayaka*). *Gaja Puta* is commonly used in the preparation of almost all the *Bhasmas*. There are a few references found in classics regarding *Ardhagaja Puta*, but not any reference regarding its detail description, therefore, the effort was made to standardize both the *Putas* with regard to *Vanga Bhasma*. In the present study, *Vanga Bhasma* was prepared by *Gaja Puta* and *Ardhagaja Puta*. For *Marana* of *Vanga*, it was found that the *Ardhagaja Puta* is more convenient than *Gaja Puta* with respect to color and particle size analysis of *Bhasma* after *Jarana* procedure of *Vanga*.

Key words: *Gaja Puta*, *Ardhagaja Puta*, *Shodhana*, *Jarana*, *Marana*

Introduction

In *Rasashastra*, the majority of the materials used for medicinal purpose are hard substances like metals, minerals, precious stones, and such others. Before using these materials, they must be subjected for some processes like *Shodhana*, *Jarana*, *Marana* etc., which makes the substances desirable for the body. *Marana* is such a process by which the material converts into *Bhasma*, which are easily assimilable with higher medicinal values. *Puta* is one of the major principles of *Rasashastra* for *Marana*. Standardization of such *Puta* (heating system) may boost to develop standard operative procedure (SOP) for the preparation of *Bhasmas*. Various texts give different opinion for *Gaja Puta*'s pit.^[1-4] The *Ardhagaja Puta* is mentioned for *Marana* of *Vanga*,^[5] *Tamra*,^[6] *Abhraka*,^[7] *Loha*^[8] etc., but detailed description was not found regarding it. Also the previous researches gave controversy regarding *Ardhagaja Puta*.^[9-11] Therefore, in the present study, taking the classical reference of "*Rasa Ratna Samuchhaya*" i.e., one *Rajahasta pramana* (30 Angulas = 57 cm)^[12] for *Gaja Puta* and with keeping this in mind, the *Ardhagaja Puta* was standardized in concern to *Vanga Bhasma*.

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Aims and Objectives

To standardize the *Gaja Puta* and *Ardhagaja Puta* with concern to *Vanga Bhasma*.

Materials and Methods

Collection of raw materials

Vanga (Tin), *Tila Taila* (sesame oil), *Takra* (buttermilk), *Gomutra* (cow's urine), *Kanji* (sour gruel), *Kulattha Kwatha* (decoction of *Dolichos biflorus* Linn.), *Nirgundi Patra Swarasa* (expressed juice of *Vitex nigundo*), *Haridra Churna* (powder of *Curcuma longa* Linn), *Apamarga Panchanga Churna* (powder of *Achyranthes aspera* Linn.), *Kumari Swarasa* (expressed juice of *Aloe vera* Tourn ex-Linn) etc., were taken as per classical references and processed through the described methods. The preparation of *Vanga Bhasma* was divided into following manner:

1) *Shodhana of Vanga*

Vanga was subjected to *Shodhana*. It was heated up to melting and *Dhalana* into prescribed liquid media, which was previously taken in *Pithara Yantra* for seven times in each liquid media for *Samanya Shodhana* and again, procedure was followed for three times in *Nirgundi Patra Swarasa* and *Prakshepa* of *Haridra Churna*.

2) *Jarana of Shuddha Vanga*

After *Shodhana*, *Jarana* of the *Shuddha Vanga* was done by using one-fourth part of *Apamarga Panchanga Churna*. *Shodhita Vanga* was melted in an open *Lauha Kadhai* and *Apamarga*

Panchanga Churna was added in small pinches to the molten *Vanga*. The stirring and rubbing is done with iron ladle. The small quantity of *Apamarga Panchanga Churna* was added frequently with continuous stirring and rubbing. The process is repeated till the whole of the *Vanga* was converted into powder form. This powder is piled up in the center of the *Lauha Kadhai*, covered with an earthen saucer and heated strongly till the whole powder becomes red hot. After that it was left for self-cooling and collected.

3) Bhavana and Putapaka of Jarita Vanga

Jarita Vanga and *Kumari Swarasa* was levigated in mortar with the help of pestle until it formed a thick paste, suitable for making *Chakrikas* (pellets), then pellets were made and kept on plastic sheet for sun drying. After proper drying of *Chakrikas*,

they were weighed and *Sharavasamputa* was done with the help of two *Sharava* (earthen saucer) and junction was sealed by double-folded mud-smeared cloth and again allowed for complete drying. Then it was subjected to *Putapaka*.

This process was repeated six times more for total seven *Gaja Puta* and seven *Ardhagaja Puta* in their respective batches.

Observations and Results

The observations and results of *Vanga Shodhana* [Table 1], *Jarana* of *Shuddha Vanga* [Table 2], *Marana* of *Jarita Vanga* by *Ardhagaja Puta* [Table 3] and *Gaja Puta* [Table 4] are documented. Results of various analytical parameters are showed from Tables 5–10 and Figures 1 and 2.

Table 1: Observation of shodhana of Vanga

Liquid media used	Processing stage	Weight of Vanga (g)			Avg. loss of Vanga (g)	% weight. loss / gain	Total duration (h:minutes)
		S1	S2	S3			
<i>Tila Taila</i>	Before	1200	1200	1200	7↓	0.19↓	06:40
	After	1196	1188	1195			
Takra	Before	1196	1188	1195	5↓	0.14↓	06:45
	After	1181	1185	1195			
Gaumutra	Before	1181	1185	1195	4.67↓	0.13↓	05:15
	After	1169	1185	1193			
Kanji	Before	1169	1185	1193	11↓	0.31↓	06:45
	After	1159	1175	1180			
<i>Kulattha Kwatha</i>	Before	1159	1175	1180	20.67↓	0.59↓	05:15
	After	1130	1160	1144			
<i>Nirgundi Patra Swarasa</i> + <i>Haridra Churna</i>	Before	1117	1140	1122	04.33↑	0.13↑	03:00
	After	1112	1150	1130			

Table 2: Observation of Jarana of Shuddha Vanga

Batch number	Weight of Vanga (g)	Weight of <i>Apamarga panchanga</i> (g) ¼ part	Duration (hours)	Weight of <i>Jarita Vanga</i> (g)	Weight increase in %	Color of <i>Jarita Vanga</i>
1 st	350	87.5	08:00	368	5.14	Bright-white
2 nd	350	87.5	07:15	368	5.14	Bright-white
3 rd	350	87.5	06:55	359	2.57	Dull-white
4 th	350	87.5	07:20	359	2.57	Pinkish-white
5 th	350	87.5	06:50	368	5.14	Dull-white
6 th	350	87.5	07:20	369	5.43	Dull-white

Table 3: Observations of Marana of Jarita Vanga by Ardha gaja Puta

Batch Number	Weight of <i>Jarita Vanga</i>	Weight of <i>Bhasma</i> obtained	Color of <i>Bhasma</i>	No. of cow dung cakes
1 st	350 g	343 g	Dull-white	45–65
2 nd	350 g	340 g	Dull-white	45–65
3 rd	350 g	342 g	Dull-white	45–65

Table 4: Observations of Marana of Jarita Vanga by Gaja Puta

Batch Number	Weight of <i>Jarita Vanga</i>	Weight of <i>Bhasma</i> obtained	Color of <i>Bhasma</i>	Number of cow dung cakes
1 st	350 g	334 g	Creamish	94–110
2 nd	350 g	344 g	Dark-pink	94–110
3 rd	350 g	348 g	Grayish-pink	94–110

Table 5: Results of quantitative inorganic assay

Elements	Sample identification (%)				
	Ashuddha Vanga	Shuddha Vanga	Jarita Vanga	Vanga Bhasma by Gaja Puta	Vanga Bhasma by Ardha gaja Puta
Sn	99.45	94.94	-	-	-
SnO ₂	-	-	97.55	90.14	92.22
Na	-	-	0.19	0.13	0.26
K	-	-	0.11	0.21	0.58

Table 6: Observations of classical analytical tests of Vanga Bhasma samples

Parameters	Vanga Bhasma by Ardha gaja Puta	Vanga Bhasma by Gaja Puta
Sparsha (touch)	Soft No coarse particles perceived	Soft No coarse particles perceived
Rupa (appearance)		
Varna	Dull-white for all 3 batches	Creamish for 1 st Batch, Dark pink for 2 nd Batch, Grayish pink for 3 rd Batch
Nishchandravam	+ve	+ve
Rekhapurnatvam	+ve	+ve
Varitaratva	+ve	+ve
Unama	+ve	+ve
Rasa (taste)	Tasteless	Tasteless
Gandha (odor)	Not specific	Not specific

+ve - Compiles as per classics.

Table 7: Modern analytical parameters of Vanga Bhasma (VB) and Jarita Vanga

Parameters	Samples (% w/w)		
	Jarita Vanga	VB by Ardha gaja Puta	VB by Gaja Puta
Loss on drying	0.07	0.11	0.21
Ash value	98.66	98.60	99.26
Acid insoluble ash	93.84	93.73	95.98

Table 8: Results of XRD analysis of Vanga Bhasma

Sample ID	XRD
	Major phage
1 st Batch by AGP	SnO ₂
2 nd Batch by GP	SnO ₂

AGP - Ardha gaja Puta, GP - Gaja Puta.

Discussion

Jarana process is essential pre-procedure of Marana for all Puti loha. The purpose of the Jarana of Puti loha is to increase the melting point. For putapka of Putiloha without Jarana process it difficult to convert the Bhasma because these metal have low melting point. After 1st Bhavana increase in weight of Jarita Vanga was observed, which was persisted after Puta. In successive Putapka increase in Hardness was in both method of Puta where as dullness of colour of Chakrika was increased comparatively in more in batches of Ardha gaja Puta in successive Putapka. Numbers of Cow dung cakes were increased in successive Putapka as per reference of Rasamritam.

Quantitative inorganic assay shows that Tin present in raw material was 99.45% and interestingly, it was decreased in Shuddha Vanga i.e. 94.94%, which may be due to conversion of some part of the Vanga into Tin oxide form, also Vanga turned into small balls with some blackish powder. Average weight loss was observed maximum in Kulattha Kwatha that is 0.59%. In Vishesh Shodhana of Vanga, ratio was fixed as 1:1₁₆ for Nirgundi Patra Swarasa, Haridra Churna, and Nirgundi Patra Swarasa was taken in the same quantity to Vanga.^[12] Marginal increase was found in the weight of Vanga due to incorporation of Haridra Churna in the small pores of Vanga with some blackish powder. Jarana of the Shuddha Vanga (350 g in each batch) was done by using one-fourth part of Apamarga Panchanga Churna. Temperature of Jarita Vanga and frying pan was noted at 630°C and 680°C, respectively. After Jarana, slight increase in weight of Vanga ranging from 2.57% to 5.43% was observed.

Marana was done by two methods, namely, seven Ardha gaja Puta^[5] and seven Gaja Puta^[13] following Bhavana by Kumari Swarasa, which was taken as 200 mL for 3 h in each Bhavana and was fixed on the basis of pilot study for 350 g for initial Jarita Vanga. In the present study, the measurement of Gaja Puta's pit as per the classical reference of "Rasa Ratna Samuchhaya"

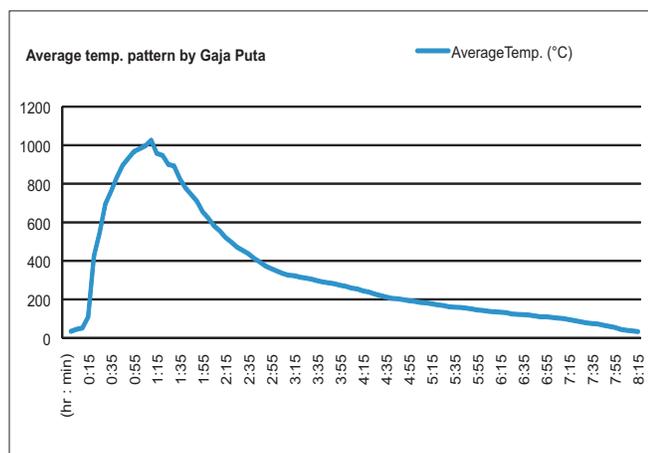


Figure 1: The average temperature pattern for Gaja Puta

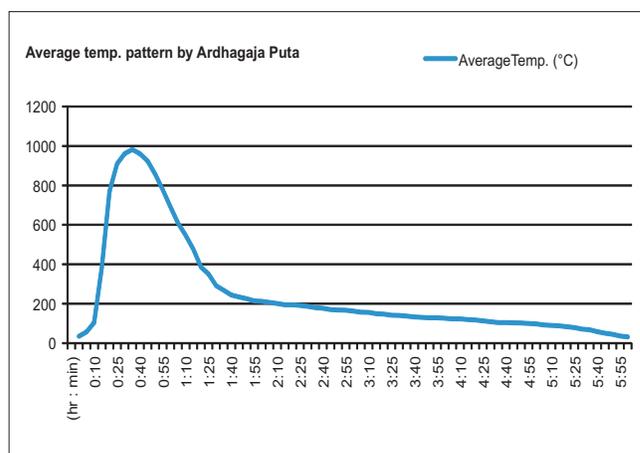


Figure 2: The average temperature pattern for Ardha gaja Puta

Table 9: Results of particle size analysis of Vanga Bhasma

Sample ID	VMD (in µm)	X 10 (in µm)	X 50 (in µm)	X 90 (in µm)
In process				
S2J2	20.3	2.00	11.19	73.16
S2J2GP1	24.3	1.92	12.73	107.03
S1J1AGP1	15.2	1.68	7.58	60.83
Final product				
S2J2GP7	29.4	2.59	28.45	53.66
S1J1AGP7	10.5	1.40	5.21	88.30

VMD - Volumetric mean diameter, X 10 = 10% of the material is below the mentioned micron value, X 50 = 50% of the material is below the mentioned micron value, X 90 = 90% of the material is below the mentioned micron value; In process: S2J2 = Shodhana 2nd and Jarana 2nd batch (Jarita Vanga), S2J2GP1 = Vanga Bhasma after 1st Gaja Puta, Shodhana 2nd and Jarana 2nd batch, S1J1AGP1 = Vanga Bhasma after 1st Aradhagaja Puta, Shodhana 1st and Jarana 1st batch; Final Product: S2J2GP7 = Vanga Bhasma after 7th Gaja Puta, Shodhana 2nd and Jarana 2nd batch, S1J1AGP7 = Vanga Bhasma after 7th Aradhagaja Puta, Shodhana 1st and Jarana 1st batch

Table 10: Results of AES-ICP analysis of Vanga Bhasma sample

Elements	Instrument detection limit (ppm)	Sample results mg/kg (ppm)	
		S1J1AGP7	S2J2GP7
Cadmium (Cd)	0.0027	Not detected	Not detected
Lead (Pb)	0.0420	142.10	705.59
Mercury (Hg)	0.0610	Not detected	Not detected
Iron (Fe)	0.0046	7002.9	5698.9
Sodium (Na)	0.0690	1996.4	983.25
Potassium (K)	-	4409.3	1565.4

S2J2GP7 = Vanga Bhasma after 7th Gaja Puta; S1J1AGP7 = Vanga Bhasma after 7th Ardha gaja Puta

that is, one *Rajahasta Pramana* (30 *angulas* = 57 cm) and half the dimension of the *Gaja Puta* that is, 45.3 cm (l × b × h) was taken for *Ardha gaja Puta*. Three batches of each sample were prepared from 350 g of *Jarita Vanga*. Present study reveals of 10 cow dung cakes' weight = 1100 g ± 14 that were found in the sample of commercial cow dung cakes provided by the pharmacy of Gujarat Ayurved University, Jamnagar. Cow dung cakes ranging 45–65 in number were used for *Ardha gaja Puta* and 94–110 in number were used for *Gaja Puta*. All three batches by *Ardha gaja Puta* were found as dull-white colored *Bhasma* and from *Gaja Puta* creamish, pink, grayish-pink in 1st, 2nd, 3rd batch respectively. Marginal change was observed in weight of *Bhasma* from weight of *Jarita Vanga*.

In *Ardha gaja Puta*, the peak temperature was observed to be 1008°C at 35 ± 5 minutes after ignition of *Putra*, above 800°C temperature was maintained for 20 ± 5 minutes and above 600°C temperature was maintained for 40 ± 5 minutes and also self-cooling was found at 6 h duration. In *Gaja Puta*, the peak temperature was observed at 1087°C for 70 minutes after ignition of *Putra*, above 800°C temperature was maintained for 80 ± 5 minutes and also self-cooling time duration was found at 8 hours 10 minutes.

Analytically, the *Vanga Bhasma* is tin dioxide having sodium and potassium in traces (XRD and AES-ICP) and also iron and lead was found in traces in both the samples of *Vanga Bhasma* due

to rubbing in *Lauha Kadhai* with iron ladle in *Jarana* process and *Pithara Yantra* was used common for *Putilohas* for their *Shodhana*, respectively.

The result obtained by particle size analysis shows that 15.2 μm volumetric mean diameter was found after first *Ardhagaja Puta*, which was reduced up to 10.5 μm (VMD) after the seventh *Ardhagaja Puta*. However, the sample of *Jarita Vanga*, which was further subjected to *Gaja Puta*, was found in particle size in terms of volumetric mean diameter in increasing manner like for *Jarita Vanga* 20.3 μm , after 1st *Gaja Puta* 24.3 μm and after 7th *Gaja Puta* 29.4 μm . It reveals that the *Puta* can reduce particle size when it is given in proper quantum. The above results also reminds of pharmaceutical study in which the *Chakrikas* of *Vanga Bhasma* by *Gaja Puta* was observed harder than *Ardhagaja Puta*. This indicates overheat by *Gaja Puta*.

Conclusion

Color is one of the important parameter in *Bhasma Pariksha*. The color for *Vanga Bhasma* i.e., *Shankhakundendudhavalam* (whitish) is observed in *Ardhagaja Puta* in comparison to *Gaja Puta*. Further, particle size analysis substantiates this observation to 10.5 μm in *Ardhagaja Puta* and 29.4 μm in *Gaja Puta*.

The measurement mentioned respectively 57 cm (30 angula) and 45.3 cm (l \times b \times h) for *Gaja Puta* and *Ardhagaja Puta* may be taken on the basis of cubic area, and temperature pattern should be considered as standard with reference to *Vanga Bhasma*.

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