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.

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), Comutra (cow’s urine), Kanji (sour gruel), Kalatthu Kwatha (deoconction of Dolichos biflorus Linn.), Nirgundi Patra Swarasa (expressed juice of Vitex negundo), Haridra Churna (powder of Curcuma longa Linn), Apamarga Panchanga Churna (powder of Achyranthes aspera Linn.), Kumari Swarasa (expressed juice of Aloe vera Turn 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 Dhulana into prescribed liquid media, which was previously taken in Pitara Yantra for seven times in each liquid media for Samanya Shodhana and again, procedure was followed for three times in Nirgundi Patra Swarasa and Prakshhepa 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-smeread 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 Ardha gaja 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 Ardha gaja 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) |
| Tila Taila | Before | 1200 | 1200 | 1200 | 7↓ | 0.19↓ | 06:40 |
| | After | 1196 | 1188 | 1195 | 7↓ | 0.19↓ | 06:40 |
| Takra | Before | 1196 | 1188 | 1195 | 5↓ | 0.14↓ | 06:45 |
| | After | 1181 | 1185 | 1195 | 5↓ | 0.14↓ | 06:45 |
| Gaumutra | Before | 1181 | 1185 | 1195 | 4.67↓ | 0.13↓ | 05:15 |
| | After | 1169 | 1185 | 1193 | 4.67↓ | 0.13↓ | 05:15 |
| Kanji | Before | 1169 | 1185 | 1195 | 11↓ | 0.31↓ | 06:45 |
| | After | 1159 | 1175 | 1180 | 11↓ | 0.31↓ | 06:45 |
| Kulattha Kwatha | Before | 1159 | 1175 | 1180 | 20.67↓ | 0.59↓ | 05:15 |
| | After | 1130 | 1160 | 1144 | 20.67↓ | 0.59↓ | 05:15 |
| Nirgundi Patra Swarasa + Haridra Churna | Before | 1117 | 1140 | 1122 | 04.33↑ | 0.13↑ | 03:00 |
| | After | 1112 | 1150 | 1130 | 04.33↑ | 0.13↑ | 03:00 |

| Table 2: Observation of Jarana of Shuddha Vanga |
|-----------------------------------------------|
| Batch number | Weight of Vanga (g) | Weight of Apamarga panchanga (g) ¼ part | Duration (hours) | Weight of Jarita Vanga (g) | Weight increase in % | Color of Jarita Vanga |
| 1st | 350 | 87.5 | 08:00 | 368 | 5.14 | Bright-white |
| 2nd | 350 | 87.5 | 07:15 | 368 | 5.14 | Bright-white |
| 3rd | 350 | 87.5 | 06:55 | 359 | 2.57 | Dull-white |
| 4th | 350 | 87.5 | 07:20 | 359 | 2.57 | Pinkish-white |
| 5th | 350 | 87.5 | 06:50 | 368 | 5.14 | Dull-white |
| 6th | 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 Jarita Vanga | Weight of Bhasma obtained | Color of Bhasma | No. of cow dung cakes |
| 1st | 350 g | 343 g | Dull-white | 45–65 |
| 2nd | 350 g | 340 g | Dull-white | 45–65 |
| 3rd | 350 g | 342 g | Dull-white | 45–65 |

| Table 4: Observations of Marana of Jarita Vanga by Gaja Puta |
|-----------------------------------------------|
| Batch Number | Weight of Jarita Vanga | Weight of Bhasma obtained | Color of Bhasma | Number of cow dung cakes |
| 1st | 350 g | 334 g | Creamish | 94–110 |
| 2nd | 350 g | 344 g | Dark-pink | 94–110 |
| 3rd | 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 Ardhagaja Puta |
|----------|---------------------------|----------------|--------------|--------------|---------------------------|-------------------------------|
| Sn       |                           | 99.45          | 94.94        | -            | -                         | -                             |
| SnO₂     | -                         | -              | 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 Ardhagaja Puta | Vanga Bhasma by Gaja Puta |
|--------------------|--------------------------------|---------------------------|
| Sparsha (touch)    | Soft                           | Soft                      |
|                    | No course particles perceived  | No course particles perceived |
| Rupa (appearance)  |                                |                           |
| Varna              | Dull-white for all 3 batches   | Creamish for 1st Batch, Dark pink for 2nd Batch, Grayish pink for 3rd Batch |
| Nishchandratvam    | +ve                            | +ve                       |
| Rekhpurnatvam      | +ve                            | +ve                       |
| Varitaratva        | +ve                            | +ve                       |
| Unama              | +ve                            | +ve                       |
| Rasa (taste)       | Tasteless                      | Tasteless                 |
| Gandha (odor)      | Not specific                   | Not specific              |

+ve - Samples as per classics.

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

| Parameters | Jarita Vanga | VB by Ardhagajaputa | 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 |
|-----------------|-----------------|
| 1st Batch by AGP | SnO₂            |
| 2nd Batch by GP  | SnO₂            |

AGP - Ardhagaja 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 Ardhagajaputa in successive Putapka. Numbers of Cow dung cakes were increased in successive Putapaka as per reference of Kasamritam.

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 Vishesha Shodhana of Vanga, ratio was fixed as 1:16 for Nirgundipatra Swarasa, Haridra Churna, and Nirgundi Patra Swarasa was taken in the same quantity to Vanga. 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 as 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 Ardhagaja Puta[15] 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.”
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 Ardhagaja Puta. Three batches of each sample were prepared from 350 g of Jarita Vanga. Present study reveals 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 Ardhagaja Puta and 94–110 in number were used for Gaja Puta. All three batches by Ardhagaja 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 Ardhagaja Puta, the peak temperature was observed to be 1005°C at 55 ± 5 minutes after ignition of Puta, 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 Puta, above 800°C temperature was maintained for 55 ± 5 minutes and above 600°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 its preparation by the method that was used for its preparation.
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 parameters 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 × b × 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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