Pharmaceutical Standardization

Study on Bhasma Kalpana with special reference to the preparation of Kasisa Bhasma

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Abstract

Bhasma means ash but according to Ayurveda, Bhasma means conversion of a metal into a form which is irreversible in the sense that one cannot derive the metal back from it again (Apunarbhava). It should be so light so that it must float on the surface of water after sprinkling, called Varitara. Its particle should be so small that it can enter into the creases of fingers called Rekha-purnatva. The preparative procedure of Bhasma is a bit complicated. Many texts are available regarding the identification, acceptable qualities of metals and minerals, their purification, uses and method of preparation of their Bhasma. But in many texts, the method of Bhasma preparation of some metals and minerals is mentioned very briefly, i.e. their references are available in Sutrarupa. This leads to many practical difficulties in the preparation of Bhasma. Kasisa Bhasma is one of them. The present work was aimed to study the basic concept of Bhasma Kalpana by means preparing Kasisa Bhasma. This study suggests some modifications and ways for standardization of Bhasma procedure.

Key words: Bhasma, Kasisa Bhasma, Marana, standar operand procedure

Introduction

“Bhasma Kalpana” is a special procedure of preparing Ayurvedic medicine from metals and minerals. It involves four basic steps such as selection of acceptable form of metal (Grahya Rasa Dravya), its purification by Ayurvedic method (Shodhana), levigation (Bhavana) and generation (Maran or Puta). Out of these, the first three steps remain valid today, but the last step, i.e. Maran or Puta needs to be modified. Because the material mentioned for Maran, i.e. Puta and cow dung cakes, varies from place to place. The other drawback about Puta is that in the Rasa Granthha, only the size of pit and number of cow dung cakes for Puta are mentioned but the quantity of metal to be incinerated in the respective Puta is not described. Along with this, during the preparative method of many Bhasmas, it is observed that there is a need to slightly modify the concept of Puta to evaluate the preparative method of some Bhasma, and to accept some modern technological help. Therefore, Kasisa Bhasma was selected for study as the preparative procedure of Kasisa Bhasma is described very briefly in some of the most valuable Rasa Granthas including Rasa Taranjini and Rasa Ratna Samuchchaya and Ayurveda Prakasha.

In the present study, emphasis has been given on the number and weight of cow dung cakes, respective temperature, quantity of Kasisa in each Sharava, the duration of constant maximum temperature and size and number of Sharava.

Aims and objectives

1. To prepare Kasisa Bhasma.
2. To find a direction for modification in the preparative procedure of Bhasma.

Place of study

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Materials and Methods

Selection of Grahya Kasisa

There are two types of Kasisa:

- चूर्णकारीसाधारण युक्तकारीसक्तत्वा ||
  कार्यसन्धिको यथायत रससंत्रयणेतुम्या ि
- र. त. 21/228
- कार्यसन्धिको चुर्ण पुनर्मान्यायस्य ||
  र. र. 3/51
Valuka Kasisa is like sand, with greenish and slight yellowish color, while the Pushpa Kasisa is in small crystalline form with bright green color. According to the reference, the Pushpa Kasisa is of Grahya type and used for medicinal purpose. Hence, Pushpa Kasisa is selected to prepare Kasisa Bhasma. 1500 g of raw Pushpa Kasisa was purchased from Nagpur.

Purification of Kasisa

Material

Raw Pushpa Kasisa: 1500 g
Bhringaraja Swarasa: 81 (Swaras was extracted from fresh Bhringaraja which was collected from Barad Herbarium of G.A.C., Nanded).

Method

Kasisa in small crystalline form with greenish and slight yellowish color, only the size of 8 l (for 1 l) instead of Niramlatva is selected to prepare Kasisa Bhasma. 1500 g of raw Pushpa Kasisa was purchased from Nagpur.

Kukkataputa. In Rasa Tarangini, Rasa Ratna Samuchchay and Ayurved Prakash, only the size of Kukkataputa is given. The number of cow dung cakes, temperature of Puta, quantity of metal in Sharava and number of the Sharava are interrelated with each other. Therefore, on the basis of past experience, we knew that 20 cow dung cakes will give up to 650°C temperature and are sufficient to close two Sharavas from all sides.

All Sharavas must be closed by cow dung cakes to get equal temperature from all the sides. Hence, it was decided to give a Kukkataputa of 20 cow dung cakes for two Sharavas containing 150 g Kasisa in each. Similar Puta were given to other three groups. Temperature was recorded continuously by pyrometer [Figure 1].

According to the reference from Rasa Tarangini, after the first Puta, ligation of Kasisa was done in Nimbu Swarasa (extract of Citrus acida) instead of Kanji. Similar procedure was repeated again for three times for each group. After each Puta, the obtained Bhasma was tested for no sourness (Niramlatva) which is the main test for Kasisa Bhasma.

Bhasma Pariksha

After four puta for each group, completely sourless Kasisa Bhasma was obtained. The obtained Bhasma was tested for Varitara, Apunarbhava, Niruttha, Rekha-purnatva [Figure 2], Dantagre-kachkachabahv and Atomic Absorption Spectroscopy for the elemental assay of Fe in Kasisa Bhasma, X-Ray Diffraction, total ash, acid-soluble ash, acid-insoluble ash, moisture content, organoleptic characters, water-insoluble and water-soluble ash.

Figure 1: Preparation of Kasisa Bhasma
Results and Observations

From the above observations, it becomes clear that, though the number of cow dung cakes is constant, the temperature and duration of peak constant temperature will vary with variation in weight of the cow dungs taken.

Discussion

In the present study, 1500 g raw Kasisa was taken for the preparation of Kasisa Bhasma, out of which 1200 g was taken after purification for the Marana procedure. For Kasisa purification, totally 81 of fresh Bhringaraj swarasa was required for 3-hour Swedana in Dolyantra.

Kanj was prepared as per the reference mentioned in Rasendra Chintamani and seven times levigation was done for each batch separately. Then, Nimbu Swarasa was used instead of Kanji as mentioned in Rasa Tarangini. The cakes were prepared as uniform as possible in their size and shape, i.e. 4–5 cm in diameter and 0.3–0.4 cm in thickness. This is done to facilitate exact Paka (heating) and to observe the color changes in cakes. The size and shape of Sharava were also taken into consideration. All the Sharavas used were 19 cm in diameter, round shaped, and have a depth of 9 cm and average thickness 0.5 cm. As the Sharavas are low conductors of heat, their thickness affects the inner temperature in between Sharavasamputa. Similarly, the diameter of Sharava is related with the number of cow dung cakes and quantity of Bhasma. If the Sharava taken is big, then it requires more cow dung cakes to be completely closed from all the sides, and if the Sharava is small, it will not be able to accommodate all Chakrikas.

Detailed observations of each Pata was done for color changes in cakes, sourness of Kasisa, weight of Kasisa before and after Pata, number of required cow dung cakes and maximum temperature. The temperature was recorded by pyrometer. The duration of maximum constant temperature was also noted as it is the most important factor that affects the quality of Bhasma. If the maximum temperature remains constant for a long time, then the formed Bhasma will be Khara-paka (more heated). Typical pattern of temperature for Kukkuta Pata is shown in Graph 1. During Pata, it is found that when the weight of cow dung cakes is increased, then the maximum temperature and its duration also increases which is shown in I Pata of “B” batch and II Pata of “C” and “D” batch. Kasisa were tested for sourness. It was observed that batch “B” was sourless after III Pata, while the other batches were not. This may be due to the exact paka of Kasisa. The IV Pata was given to batch “B” in spite of sourless taste because it did not completely pass the other tests, i.e. Rekha-Parnatva and Dantagre-Kachkachabhav. After four Pata, all the batches passed all Bhasma Parikshas [Table 1].

After 1st Pata, while levigating with Nimbu Swarasa, Kasisa was sticked to Khaha Yantra, which resulted in 64.5% loss. [Table 2]. The obtained kasisa Bhasma of all four batches passes similar organoleptic characters i.e. colour, odour, luster, taste and touch [Table 3]. Apunarbhava and Nirutthata are related with heat stability of the Bhasma. Same result was obtained in Apunarbhava test [Table 4] but in Nirutthata test slight difference was observed in weight after incineration with silver which is due to sticky nature of kasisa Bhasma [Table 5]. Moisture content of Kasisa Bhasma was measured with the help of Metler-Toledo moisture analyzer. If the Bhasma contains more percentage of moisture, then it does not pass the Varitara Pariksha. The percent moisture content of batch A, B, C and D is 0.62, 0.68, 0.58 and 0.62 respectively, which shows no significant difference [Table 6]. In Atomic Absorption Spectroscopy nearly same percentages of ferrous was observed [Tables 7]. The parameters were also produced no significant changes [Table 8].

X-ray diffraction was done by using the standard data JCPDS – KDD. In this the relative intensities and their corresponding a<d values are to be tallied with standard values of compounds. In present study, Analysis of four batches of Kasisa Bhasma was done by powder crystal method, as shown in the results of XRD. Prepared Kasisa Bhasma may be having complex chemical structure. In XRD studies peaks of many compounds remain unidentified, only sharp peaks denotes crystalline structure. It requires further more studies [Graphs 2a to 2d].

This study has some limitations, e.g. the quality of cow dung cakes varies from place to place. The effect of Bhavana Dravya, trituration frequency, time and applied pressure for trituration are not mentioned in this study because it a separate topic for research. However, this study will help in the preparation of Kasisa Bhasma in detail and will give direction for standardization of Kasisa Bhasma.

Conclusions

1. The purification method of Kasisa mentioned in Rasa Ratna Samuchchaya (5/54) is suitable for only artificially prepared Kasisa.
### Table 1: Detailed observation of Puta

| No. of Puta | Group | Color of Kasisa cakes | Sourness | Weight of Kasisa (g) | No. of Sharava | Cow dung cakes used | Weight of cow dung cakes (g) | Maximum temperature (°C) | Constant temp. for minutes |
|------------|-------|-----------------------|----------|--------------------|---------------|--------------------|-----------------------------|--------------------------|--------------------------|
| I          | A     | D.G. W.R.             | +++ ++   | 300 185            | 2             | 20                 | 3200                        | 580                      | 2                        |
|            | B     | D.G. W.R.             | +++ ++   | 300 182            | 2             | 20                 | 3419                        | 713                      | 5                        |
|            | C     | D.G. W.R.             | +++ ++   | 300 190            | 2             | 20                 | 3240                        | 610                      | 3                        |
|            | D     | D.G. W.R.             | +++ ++   | 300 179            | 2             | 20                 | 3260                        | 640                      | 3                        |
| II         | A     | W.R. Red              | ++ +     | 185 150            | 2             | 20                 | 3252                        | 624                      | 3                        |
|            | B     | W.R. Red              | ++ +     | 182 146            | 2             | 20                 | 2340                        | 704                      | 4                        |
|            | C     | W.R. Red              | ++ +     | 190 155            | 2             | 20                 | 3352                        | 690                      | 4                        |
|            | D     | W.R. Red              | ++ +     | 179 151            | 2             | 20                 | 3270                        | 660                      | 3                        |
| III        | A     | Red D.R.              | + +      | 150 132            | 2             | 20                 | 3190                        | 572                      | 2                        |
|            | B     | Red D.R.              | + +      | 146 120            | 2             | 20                 | 3340                        | 678                      | 3                        |
|            | C     | Red D.R.              | + +      | 155 128            | 2             | 20                 | 3287                        | 619                      | 3                        |
|            | D     | Red D.R.              | + +      | 151 127            | 2             | 20                 | 3312                        | 682                      | 4                        |
| IV         | A     | D.R. D.R.             | - -      | 132 119            | 2             | 20                 | 3227                        | 600                      | 2                        |
|            | B     | D.R. D.R.             | - -      | 120 95             | 2             | 20                 | 3314                        | 668                      | 4                        |
|            | C     | D.R. D.R.             | - -      | 128 110            | 2             | 20                 | 3360                        | 686                      | 4                        |
|            | D     | D.R. D.R.             | - -      | 127 102            | 2             | 20                 | 3346                        | 674                      | 4                        |

D.G. - Dark green, W.R. - Whitish red, D.R. - Dark red, B.P. - Before puta, A.P. - After puta

### Table 2: Loss of Kasisa during Bhasma preparation

| Raw Kasisa (g) | Purified Kasisa (g) | Wt. of Kasisa (g) | Loss (%) |
|----------------|---------------------|-------------------|----------|
| 1500           | 1310                | 190               | 15.83    |
| 1200           | 736                 | 464               | 38.66    |
| 736            | 736                 | 502               | 18.20    |
| 602            | 602                 | 602               | 15.78    |
| 507            | 507                 | 507               | 15.97    |
| 426            | 426                 | 426               | =774     |

B.P. - Before puta, A.P. - After puta

### Table 3: Organoleptic characters of Kasisa Bhasma

| Character | Batch A | Batch B | Batch C | Batch D |
|-----------|---------|---------|---------|---------|
| Color     | Dark red| Dark red| Red     | Red     |
| Luster    | No      | No      | No      | No      |
| Odor      | Not specific | Not specific | Not specific | Not specific |
| Taste     | Not sour| Not sour| Not sour| Not sour|
| Touch     | Smooth  | Smooth  | Smooth  | Smooth  |

### Table 4: Apunarbhava Pariksha of Kasisa Bhasma

| Batch | Reading no. | Weight of Kasisa Bhasma (g) | Weight of Mitra-panchaka (g) | Color of end product | Regain of Dhatu |
|-------|-------------|-----------------------------|-----------------------------|----------------------|-----------------|
| A     | 1           | 5                           | 5                           | 5.15                 | Black           |
|       | 2           | 5                           | 5                           | 5.18                 | Black           |
| B     | 1           | 5                           | 5                           | 5.12                 | Black           |
|       | 2           | 5                           | 5                           | 5.12                 | Black           |
| C     | 1           | 5                           | 5                           | 5.15                 | Black           |
|       | 2           | 5                           | 5                           | 5.17                 | Black           |
| D     | 1           | 5                           | 5                           | 5.14                 | Black           |
|       | 2           | 5                           | 5                           | 5.13                 | Black           |

### Table 5: Niruttha Pariksha of Kasisa Bhasma

| Batch | Reading no. | Weight of Kasisa Bhasma (g) | Weight of silver (g) | Weight gain of silver (g) |
|-------|-------------|-----------------------------|----------------------|---------------------------|
| A     | 1           | 5                           | 5.9                  | 0.9                       |
|       | 2           | 5                           | 5.9                  | 0.9                       |
| B     | 1           | 5                           | 5.86                 | 0.86                      |
|       | 2           | 5                           | 5.91                 | 0.91                      |
| C     | 1           | 5                           | 5.88                 | 0.88                      |
|       | 2           | 5                           | 5.86                 | 0.86                      |
| D     | 1           | 5                           | 5.85                 | 0.85                      |
|       | 2           | 5                           | 5.87                 | 0.87                      |

### Table 6: Percent moisture content of Kasisa Bhasma

| Batch | Percent moisture content |
|-------|--------------------------|
| A     | 0.62                     |
| B     | 0.68                     |
| C     | 0.58                     |
| D     | 0.62                     |
Table 7: AAS for Fe of Kasisa Bhasma

| Batch | Percentage of Fe |
|-------|------------------|
| A     | 65.41            |
| B     | 66.12            |
| C     | 64.60            |
| D     | 62.49            |

Table 8: Ash value of Kasisa Bhasma

| Parameter                  | Batch A | Batch B | Batch C | Batch D |
|----------------------------|---------|---------|---------|---------|
| Description                | Red color | Red color | Red color | Red color |
| Total ash                  | 92.93    | 93.40    | 85.85    | 90.19    |
| Acid-soluble ash           | 26.95    | 28.13    | 24.43    | 27.62    |
| Acid-insoluble ash         | 65.28    | 65.27    | 61.62    | 62.57    |
| Water-soluble ash          | 92.65    | 93.19    | 85.58    | 89.95    |
| Water-insoluble ash        | 0.28     | 0.21     | 0.29     | 0.26     |

Graph 2a: XRD report of batch A

Graph 2b: XRD report of batch B

Graph 2c: XRD report of batch C

Graph 2d: XRD Report of batch D

2. The common purification method for both artificial and natural Kasisa is given in Rasa Tarangini (21/230) and Ayurveda Prakasha (2/275).

3. Maximum temperature for 300 g Kasisa which was placed in two Sharava and incinerated by 3200 g cow dung cakes was 650°C, which remains constant for 3 minutes and four such Puta may be sufficient to produce sourless Kasisa Bhasma.

4. Factors closely related with Puta procedure and that help in the modification of Puta are:
   a. quantity of material (Rasa Dravya);
   b. Bhavana Dravya;
   c. number and size of Sharava;
   d. weight of cow dung cakes;
   e. expected range of temperature; and
   f. duration of constant maximum temperature.

5. Total weight of cow dung cakes, quality of cow dung cakes, time required to reach the maximum temperature and duration of constant maximum temperature can be considered as the parameters for Bhasma preparation.

6. During Bhasma preparation, heating must be started from a temperature lower than the required temperature and is gradually increased after each Puta, which helps to create perfect Paka of Rasa Dravya.

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हिन्दी सारांश

कासीस भर्सम निर्माण – एक अध्ययन

धीरजसिंह सुमेशसिंह राजपूत, जी. एस. टेकाले

आयुर्वेद रसग्रन्थों में कासीस भर्सम निर्माण अत्यंत संक्षिप्त रूप में वर्णित है। प्रस्तुत अध्ययन में कासीस भर्सम निर्माण विधि का विस्तृत रूप से विवेचन किया गया है। साथ ही भर्सम निर्माण के महत्वपूर्ण सिद्धांतों का यथार्थ संभव विवेचन किया गया है। यथा शोधन, भावना, घुट आदि विषयों पर रक्षकाश डाला गया है। यह अध्ययन विशेष रूप से कासीस निर्माण के साथ-साथ भर्सम कल्पना के मानदंड में कुछ नवीनतम तथा आधुनिक विचित्रियों के सुझाव के लिए किया गया है। जिसका वर्णन निष्कर्ष के अंतर्गत प्रस्तुत किया गया है। भर्सम निर्माणार्थ दिये जानेवाले पुट के मूल स्वरूप को बनाये रखते हुये उनमें आधुनिक दृष्टिकोण से कुछ परिवर्तनों की आवश्यकता तथा उपादेयता का विचार इस अध्ययन की प्रमुख विशेषता है।