Pharmaceutical Standardization

Pharmaceutical standardization of Jala Shukti Bhasma and Mukta Shukti Bhasma

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Abstract

Shukti is an important component of Sudha Varga, which is considered as the latest class in the field of Rasa Shastra. Two types of Shukti have been mentioned in Rasa Shastra texts i.e. Jala Shukti and Mukta Shukti according to the availability. In present study, an attempt has been made to develop a standard manufacturing procedure (SMP) of Jala Shukti Bhasma and Mukta Shukti Bhasma. Five batches of Jala Shukti Bhasma and Mukta Shukti Bhasma were prepared and standardization was attempted by maintaining batch manufacturing records of individual batches. During pharmaceutical procedures like Shodhana, Bhavana, Marana, etc. due care of temperature, its duration, percentage of weight gain or loss and the cost factor of the end product, etc. were considered. The average weight loss observed was 12.08 g i.e. 2.42% and 14.62 g i.e. 2.92% during Jala Shukti and Mukta Shukti Shodhana respectively. Average weight loss found was 38.94 g i.e. 7.79% in Jala Shukti Bhasma while in Mukta Shukti Bhasma, it was 35.24 g i.e. 7.05%. At the end of the pharmaceutical procedure, it was found that Mukta Shukti Bhasma is 2.8 times costlier than Jala Shukti Bhasma.

Key words: Bhasma, Jala Shukti, Marana, Mukta Shukti, Shodhana

Introduction

Ancient Acharyas of Rasa Shastra had included Shukti in different Vargas like Shukta Varga,1 Shodhaniya Gana,2 Shweta Varga,3 Uparasa,4 Uparatan,5 Shankhadi Vigyanimath6 etc. but later on in the 20th century A.D., it was included under Sudha Varga due to the predominance of calcium or Sudha. First time the author of Ayurved Prakash7 has mentioned two types of Shukti (Jala Shukti and Mukta Shukti) along with their synonyms, Shodhana and therapeutic uses accepted these in detail. Almost all authors of Rasa Shastra have mentioned two types of Shukti. In Rasa Tarangini, Shukti is described in detail under the broad heading of Shankhadi Vigyanimath. Further two types of Mukta Shukti i.e. broad and circular and ear-like (Karnikakara) according to their shape. Among those, Karnikakara Mukta Shukti is the best variety and should be used in medicine. If it is not available, the first variety can be used as the substitute of the second variety but it is of lower quality.9

There are some controversies regarding Jala Shukti and Mukta Shukti. Jala Shukti is easily available and cheaper, while Mukta Shukti is not easily available and costlier than Jala Shukti. Jala Shukti is mostly procured from fresh water, while Mukta Shukti is procured from sea water. In this attempt, Jala Shukti Bhasma and Mukta Shukti Bhasma were prepared in order to develop a Standard Manufacturing Procedure (SMP).

Materials and Methods

Collection of raw materials

Jala Shukti was collected from Gomati river bank near Jaipur, Uttarak Pradesh. Mukta Shukti was procured from Prabhas Patan near Vrindavan, Gujarat. Nimbu (Citrus medica (Linn.) Burm. f) was purchased from the local market of Jamnagar. Kumari (Aloe vera Tourn. ex Linn.) was collected from the botanical garden of Gujarat Ayurved University, Jamnagar [Figures 1, 2].

Shodhana of Ashuddha Jala Shukti and Mukta Shukti: For Shodhana of both Shukti, 500 g was taken in each batch and Nimbu Swarasa was used as media for Swedana. Nimbu Swarasa was prepared as per the Sharangadhara Samhita.9 Before processing it was washed with potable water properly, then cut in two pieces with knife. The cut part of the Nimbu was put in an in extractor and compressed to collect Swarasa which was filtered through a cotton cloth. The details of observations and results are presented in Table 1. The Shodhana process of both
Shukti was carried out as per the Rasatarangini. Details of ingredients and their ratio used in the Shodhana process have been shown in Tables 2 and 3. Ashuddha Jala Shukti was made into small pieces, kept in two folded white clean cotton cloth and Pottali was prepared [Figure 3]. It was suspended in Dola Yantra containing 3 L of Nimbu Swarasa (lemon juice) and mild heat was applied to boil Nimbu Swarasa which was maintained for 3 h. When the level of Nimbu Swarasa decreased, again extra 1 L (average) was added. After completion of processing, heating was stopped and left for self-cooling. Then the Pottali was opened and Shukti pieces were washed thoroughly with hot water and dried. Similar procedure was followed for Mukta Shukti Shodhana. The observation and results obtained during the Shodhana process have been presented in Tables 4, 5 and Figures 4, 5.

Marana of Shuddha Jala Shukti and Mukta Shukti

First Pata
Shuddhita materials (Shuddha Jala Shukti or Mukta Shukti) were kept in Sharava in one layer and Sharava Samputa was prepared. After that, Sharava Samputa was allowed to dry in sunlight. The

### Table 1: Quantity of Nimbu Swarasa obtained

| Batches            | Quantity of Nimbu Swarasa | Average quantity of Nimbu Swarasa |
|--------------------|---------------------------|-----------------------------------|
| For Jala Shukti Shodhana |
| A₁                 | 4.100 L                   | 4.140 L                           |
| A₂                 | 4.220 L                   |                                   |
| A₃                 | 4.140 L                   |                                   |
| A₄                 | 4.040 L                   |                                   |
| A₅                 | 4.200 L                   |                                   |
| For Mukta Shukti Shodhana |
| B₁                 | 4.000 L                   | 4.144 L                           |
| B₂                 | 4.100 L                   |                                   |
| B₃                 | 4.120 L                   |                                   |
| B₄                 | 4.220 L                   |                                   |
| B₅                 | 4.280 L                   |                                   |

### Table 2: Ingredients and their quantity for Jala Shukti Shodhana

| Ingredient          | Quantity per batch | Total quantity | Proportion |
|---------------------|--------------------|----------------|------------|
| Ashuddha Jala Shukti| 500 g              | 2.500 kg       | 1          |
| Nimbu Swarasa       | 4 L                | 20 L           | 8          |

### Table 3: Ingredients and their quantity for Mukta Shukti Shodhana

| Name                | Quantity per batch | Total quantity | Proportion |
|---------------------|--------------------|----------------|------------|
| Ashuddha Mukta Shukti| 500 g              | 2.500 kg       | 1          |
| Nimbu Swarasa       | 4 L                | 20 L           | 8          |
Sharava Samputa was subjected to Puta Puka in the conventional Puta i.e. Gaja Puta. After placing ignited cow dung cakes and filling two-thirds of the pit with 60 cow dung cakes, Sharava Samputa was kept on them and the remaining one-third part was filled with 40 cow dung cakes to cover Sharava Samputa. After complete burning of all the cow dung cakes, the pit was allowed to self-cool. On the next day, after self-cooling of Sharava Samputa, it was opened and Jala Shukti pieces - Mukta Shukti pieces were collected carefully and weighed. The results obtained during the first Puta have been presented in Tables 6, 7 and Figure 6.

**Second Puta**

Kumari Swarasa was extracted by Nishpidana (expression) Vidhi. Leaves of Kumari were washed in tap water; thorny ridges and apex were cut by knife. Mucilaginous pulp was separated from the leaves with the help of knife and pulp was churned in mixer and then strained through cotton cloth. The results are presented in Table 8.

Jala Shukti powder - Mukta Shukti powder (obtained after 1st Puta) was levigated with Kumari Swarasa in porcelain mortar until it formed a thick paste [Figures 7,8] and become suitable for making Chakrikas (pellets). Small amount of levigated doughy mass was made into flat and round-shaped Chakrikas. The prepared pellets were kept on a plastic sheet for drying.

After proper drying of Chakrikas, they were weighed and kept in an earthen Sharava. That Sharava was covered by another earthen Sharava and the junction between the two Sharavas was sealed by a cotton cloth smeared with Mulatani Mitti and again allowed to dry completely. The remaining procedure was carried out the was similar to first Puta. The observations and results obtained during the second Puta have been presented in Tables 9, 10 and Figures 9-12. The final product was powdered and sieved through 120 # mesh to obtain fine Bhasma. Then Jala Shukti Bhasma or Mukta Shukti Bhasma was filled inside ‘0’ no. (500 mg in volume) gelatine capsules for oral administration.

**Average temperature pattern**

The temperature of Puta during Marana procedure of Jala Shukti and Mukta Shukti was recorded at regular intervals of 15 min for 6 h. During Jala Shukti Bhasma preparation, the average peak temperature observed was 859.80°C and 852.6°C in the first and second Puta respectively, whereas in Mukta Shukti Bhasma preparation the peak temperature was found to be 850.80°C and 849.20°C in the first and second Puta respectively. The temperature pattern observed during the first Puta and second Puta of both Bhasma are presented in Graphs 1 and 2.

**Discussion**

For the Shodhana procedure, each batch of Jala Shukti and Mukta Shukti, 500 g were taken and average four l of Nimbu Swarasa was required for each batch to complete Swedana process. The ratio of materials and liquid media required was 1:8.

| Processing stage | Weight of Jala Shukti (g) | Average wt. loss |
|------------------|--------------------------|------------------|
|                  | A₁ | A₂ | A₃ | A₄ | A₅ | Average | In g | In % |
| Before Shodhana  | 500| 500| 500| 500| 500| 500      | 12.08| 2.42 |
| After Shodhana   | 483.5| 490.6| 491.3| 488.0| 486.2| 487.92  |       |      |

| Processing stage | Weight of Mukta Shukti (g) | Average weight (g) | Average wt. loss (g) | Average wt. loss in (%) |
|------------------|----------------------------|--------------------|----------------------|-------------------------|
|                  | B₁ | B₂ | B₃ | B₄ | B₅ |                        |                    |                   |
| Before Shodhana  | 500| 500| 500| 500| 500| 500                     | 14.62              | 2.92              |
| After Shodhana   | 481.8| 486.2| 487.4| 482.0| 489.5| 485.38                 |                    |                   |
Table 6: Results obtained during the first Puta of Jala Shukti Bhasma

| Batch | Wt. of Jala Shukti Before 1st Puta (g) | After 1st Puta (g) | Average Upalas Wt. (kg) | No. |
|-------|---------------------------------------|--------------------|------------------------|-----|
| A₁    | 483.50                                | 471.20             | 12.50                  | 100 |
| A₂    | 490.60                                | 474.90             |                        |     |
| A₃    | 491.30                                | 476.40             |                        |     |
| A₄    | 488.00                                | 474.20             |                        |     |
| A₅    | 486.20                                | 472.00             |                        |     |
| Average| 487.92                               | 473.74             |                        |     |

Table 7: Results obtained during the first Puta of Mukta Shukti Bhasma

| Batch | Wt. of Mukta Shukti Before 1st Puta (g) | After 1st Puta (g) | Average Upalas Wt. (kg) | No. |
|-------|-----------------------------------------|--------------------|------------------------|-----|
| B₁    | 481.80                                  | 470.30             | 12.74                  | 100 |
| B₂    | 486.20                                  | 473.60             |                        |     |
| B₃    | 487.40                                  | 473.20             |                        |     |
| B₄    | 482.00                                  | 469.80             |                        |     |
| B₅    | 489.50                                  | 475.90             |                        |     |
| Average| 485.38                               | 472.56             |                        |     |

Average 4 L Nimbu Swarasa was obtained from 8 kg of Nimbu. During Shodhana procedure, it was observed that the color of media i.e. Nimbu Swarasa changed from yellow to turbid yellow and more viscous which may be due to the reaction between the media and the substance. The temperature of the media was maintained between 105°C and 110°C throughout the procedure. A whitish powder-like substance was deposited at the bottom of the Dola Yantra suggesting the escape of impurities.
Table 9: Results obtained during the second Puta of Jala Shukti Bhasma

| Batch | Wt. of Jala Shukti Bhasma Before 2nd Puta (g) | After 2nd Puta (g) | Wt. (kg) | No. |
|-------|---------------------------------------------|-------------------|---------|----|
| A<sub>1</sub> | 471.20 | 458.50 | 12.50 | 100 |
| A<sub>2</sub> | 474.90 | 463.20 | 13.06 | 110 |
| A<sub>3</sub> | 476.40 | 464.60 | 13.14 | 115 |
| A<sub>4</sub> | 474.20 | 461.00 | 12.71 | 105 |
| A<sub>5</sub> | 472.00 | 458.00 | 12.52 | 100 |
| Average | 473.74 | 461.06 |         |     |

Table 10: Results obtained during the second Puta of Mukta Shukti Bhasma

| Batch | Wt. of Mukta Shukti Bhasma Before 2nd Puta (g) | After 2nd Puta (g) | Wt. (kg) | No. |
|-------|---------------------------------------------|-------------------|---------|----|
| B<sub>1</sub> | 470.30 | 463.00 | 13.28kg | 100 |
| B<sub>2</sub> | 473.60 | 466.30 | 13.40kg | 110 |
| B<sub>3</sub> | 473.20 | 464.80 | 13.37kg | 105 |
| B<sub>4</sub> | 469.80 | 461.50 | 13.35kg | 110 |
| B<sub>5</sub> | 474.00 | 468.20 | 13.46kg | 115 |
| Average | 472.56 | 464.76 |         |     |
through the pores of the Pottali. After Shodhana, it was noticed that Jala Shukti pieces became whiter with shining and became smooth while Mukta Shukti pieces became bright white with rainbow-like shining and smoothness.

The average weight loss observed was 12.08 g i.e. 2.42% and 14.62 g i.e. 2.92% in Jala Shukti and Mukta Shukti Shodhana respectively [Tables 4,5]. It may be due to removal of impurities that dissolved and escaped through the pores of Pottali during Shodhana procedure. Some particles may be lost during washing with hot water after Shodhana.

For the first Puta, a fixed amount of cow dung cakes (100 in number) was taken for average 487.92 g of Jala Shukti and 485.38 g of Mukta Shukti. Average weight of 100 Upalas was found to be 12.62 kg. After the first Puta, Jala Shukti and Mukta Shukti pieces became pale white in color, brittle and soft. Shining was disappeared but fragility attributed after 1st Puta. The average weight loss observed was 26.26 g i.e. 5.25% after the first Puta in the preparation of Jala Shukti Bhasma and 27.44 g i.e. 5.49% in the preparation of Mukta Shukti Bhasma. After that Jala Shukti and Mukta Shukti pieces were powdered well and taken for further procedure i.e. Bhavana.

Jala Shukti powder and Mukta Shukti powder were levigated with Kumari Swarasa in porcelain mortar with the help of pestle until it formed a thick paste and was suitable for making Chakrikas (pellets). Total 250 ml of Kumari Swarasa was used for levigation and was done continuously for 5 h. Extra Kumari Swarasa was added from time to time for maintaining proper levigation. Levigation was done properly with uniform and sufficient pressure to make the materials fine. The pellets were made uniform in shape and size for proper heat exposure. After drying, the average weight of one Chakrika was observed 8 to 10 g, the average diameter was 2.0 to 2.5 cm and thickness was 0.5 to 0.7 cm.

For the second Puta, fixed amount of cow dung cakes (100 in number) were taken for average 473.74 g of Jala Shukti and 472.56 g of Mukta Shukti. Average weight of 100 Upalas was found to be 12.89 kg. After the second Puta, Chakrikas of Jala Shukti Bhasma were found to be soft, fragile, smooth and white in color while Chakrikas of Mukta Shukti Bhasma were found to be more smooth and bright white in color. After powdering of the Jala Shukti Bhasma became white whereas Mukta Shukti Bhasma became bright white [Table 11]. Both Bhasma became fine, soft and smooth and they had passed classical parameters like Rekhatpuratwa, Varitaratwa, Gatarasatwa, Sukshmatwa, Mridutwa [Table 12]. Regarding Sudha Varga, no specific parameters are described in the classics of Rasa Shastra for Bhasma Pariksha except the color of Bhasma. Rasa Varitaratva has mentioned the color of Shukti Bhasma as ‘Himakundendu Samkasham’ i.e. white which was observed in both Bhasma after the second Puta.

The average weight loss was found to be 38.94 g i.e. 7.79% in Jala Shukti Bhasma after the second Puta while in the Mukta Shukti Bhasma it was observed to be 35.24 g i.e. 7.05%. This loss may be due to vaporization of water and burning of some organic or inorganic materials. The peculiar odor observed during levigation with Kumari Swarasa disappeared after the second Puta in both Bhasma.

Varitaratwa was attempted to evaluate in both the samples of Shukti Bhasma by following the classical method as explained in Rasa Ratna Samuchaya. In general, this test is not mentioned in classical literature, though the authors tried to evaluate it. The Varitaratwa test was observed to be positive in Mukta Shukti Bhasma, while it was mild in Jala Shukti Bhasma, it may be due to some difference regarding its inorganic chemical elements. Rekhatpuratwa was observed in both Bhasma after the second Puta indicating fineness of Bhasma.

At the end of the pharmaceutical procedure, it was found that Mukta Shukti Bhasma is 2.8 times costlier than Jala Shukti Bhasma.

### Conclusion

1. 51.75% Nimbu Swarasa (average 4.142 l) acquired from 8 kg lemon is sufficient for 500 g of Jala Shukti or Mukta Shukti Shodhana by Swedana Vidhi i.e. ratio of materials and liquid is 1:8.
2. To convert 500 g batches of Shukti into Bhasma, minimum 100 cow dung cakes in the first and second Puta were required and peak temperature observed for Jala Shukti was 859.8°C and for Mukta Shukti was 850.8°C.
3. There is no significant color difference between Jala Shukti Bhasma and Mukta Shukti Bhasma i.e. white and bright white respectively. Varitaratwa Bhasma Pariksha was found positive in both the Bhasma.

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हिन्दी सारांश

जल शुक्ति एवं मुक्ता शुक्ति भर्स्म का औषधीय मानकीकरण

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शुक्ति सुधार्य का एक महत्वपूर्ण दृष्टि है, जिसे रसरसार के क्षेत्र में बहुत समय तक समावेश किया गया। रसरसार के ग्रन्थों में मुक्ता की उद्योगी या अनुत्तरी के आधार पर शुक्ति के दो प्रकार बताये हैं, जलशुक्ति और मुक्तशुक्ति। प्रस्तुत शोधपत्र में जलशुक्ति भर्स्म और मुक्तशुक्ति भर्स्म के लिये प्रभावित निम्नगणन अभिक्षित करने का प्रयास किया गया है। अतः जलशुक्ति भर्स्म और मुक्तशुक्ति भर्स्म दोनों के पांच-पांच वर्ण बनाये गये हैं और प्रत्येक वर्ण में प्राप्ततया के आधार पर निम्नगणित अंकार्य को विकसित किया गया है। शोधन, भावना, भावण इत्यादि प्रक्रियाओं के दौरान उपलब्ध है, समय, भार दृष्टि या हास्य का प्रतिकोण प्रमाण, मूल्य अवमान इत्यादि बातों को भी ध्यान में रखा गया है। जलशुक्ति शोधन और मुक्तसुक्ति शोधन में क्रमश: 2.42 % (12.08 ग्राम) और 2.92% (14.62 ग्राम) भार हस्त हुआ। द्वितीय पृथ्वी के बाद जलशुक्ति भर्स्म और मुक्तशुक्ति भर्स्म में क्रमशः 7.79% (38.94 ग्राम) और 7.05% (35.24 ग्राम) भार हस्त मिला।