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**Research Article**

# PREPARATION OF *MUKTA BHASMA* BY TWO DIFFERENT METHODS AND ITS COMPARATIVE ANALYTICAL STUDY

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**ABSTRACT**

*Mukta bhasma* (calx of pearl) is a unique *Rasashastra* preparation contains calcium compounds and widely recommended and traditionally used for G.I tract disorders, anti-pyretic and it strengthens bones.

Nowadays, every scholar and practitioner must be aware of pharmaceutical processing of minerals and metals and prevent the toxicity of medicine from the prepared final product. The aim of study is to compare Pharmaceutical and Analysis of '*Mukta Bhasma*' prepared by two different methods of *Shodhan* and *Maran* and its objective is to carry out *Shodhan* (purification) and *Maran* (calcinations) of *Mukta* (pearls) by two different Methods. The comparison of two samples *Mukta Bhasma Godugdha Marit* (MBG) & *Mukta Bhasma Kulitha Marit* (MBK) is carried out by using different analytical methods.

The result shows that the Physico-chemical analysis, Solubility, Particle size of both *Bhasmas* shows similar values. The qualitative analysis for Inorganic Elements like Calcium, Carbonate etc. are present in both *Bhasmas*. Quantitative analysis of Na, K, Ca by flame photometry found the MBG having 9±1.04, 50±3.76, 283±25.95 and MBK 11±1.04, 53±3.72, 300±23.96 respectively. The *Mukta Bhasma* prepared with both methods shows similar values and can be suggested that *Mukta Bhasma* prepared with either method can result in good quantity of *Bhasma*.

**KEYWORDS:** *Mukta, Mukta Bhasma Godugdha Marit* (MBG), *Mukta Bhasma Kulitha Marit* (MBK), Comparative Analytical study.

## INTRODUCTION

Ancient *Acharyas* of *Rasa Shastra* had included *Mukta* (pearl) in *Samanya pancaratna*[1], *Ashta manis*[2], *Navaratna*[3,4].

Nowadays, some people, unaware of pharmaceutical processing of Rasashastra are talking about the toxicity of medicine prepared from minerals and metals. *Mukta* (pearl) bearing qualities like *Sheetavirya, Madhuravipaka, Kapha-pitta shamaka, Vrishya, Aaushyam, Balakara* and *Brihmana* and also indicated in *Kasa, Shwasa, Kshaya, Agnimandhya, Daha, Kaphaja Unmada, Vata vyadhi, Rajayakshma, Vish vikara* and *Netra roga*.[5] *Mukta* is one of the precious *Ratna* from ancient times. *Moti* or *Mukta* the name indicates freedom from physical and mental diseases.

### *Grahya lakshanans* of *Mukta*

*Shweta, Sthula, Snigdha, Nirmala, Mahat, Toyaprabha, Vritta, Chandrodbhasi.*[6,7]

### *Agrahya lakshanans* of *Mukta*

*Rukshanga, Nirjala, Shyaama, Tamrabha, Lavanopama/Ksharabhasa, Ardhashubhra, Vikata, Grantila, Yugmakam, Vichayaam, Vyangakaya, Shuktisprasha* etc.[8,9]

## AIM AND OBJECTIVES

Pharmaceutical preparation of '*Mukta Bhasma*' is prepared by two different methods of *Shodhan* and *Maran* and compare Analytic findings of these two methods.

All pharmaceutical processes were carried out in Rasa shastra department of S.V.N.H.T'S Ayurved College, Rahuri factory, Rahuri.

## Materials and Methods

1. Pharmaceutical Study
   a. *Shodhana* of *Mukta*
   b. Marana of *Mukta*
2. Physico-chemical analysis

### 1. Pharmaceutical Study

Preparation of *Mukta bhasma* by two different methods, by preparing two samples namely *Mukta Bhasma Godugdha Marit* (MBG) and *Mukta Bhasma Kulitha* Marit (MBK). The pharmaceutical study encompasses following points:

Procurement of genuine raw material and associated drugs from the professional suppliers and were checked and confirmed by experts of Department of Rasashastra and also confirmed in our institutional CRL (central research lab).

The *Mukta* was also authenticated from Deccan Institute of Gem Technology, Hyderabad.

- Proper method of processing like *Shodhana*.
- *Marana* procedure to obtain *Mukta bhasma*.

Physico-chemical analysis of the *Bhasma* was carried out at Jeevanrekha Laboratories, Aurangabad.

### *a. Shodhan* of *Mukta*

**I Method-** *Mukta* was taken in *Sharava* (earthen vessel) and filled with *Curnodaka* (lime water) heat on mild flame for 3 hours.[10]

**II Method-** *Shodhan* done by *Jayanti patra swaras* as reference given in *Sharangdhar*.[11]

### *b. Maran* of *Mukta*

**I Method**-*Maran* done by *Godugdha* and *Laghu Puta* as reference given in *Ras-tarangini*. [12]

**II Method**-Maran done by *Kulith kwath* as reference given in *Sharangdhar.* [13]

**RESULTS-** Results are described under following headings

**Table 1: Pharmaceutical preparation of *Mukta bhasma***

| S.No. | Procedures | | By MBG | By MBK |
|---|---|---|---|---|
| 1. | Quantity of *Mukta* | | 500 g | 500 g |
| 2. | *Shodhita Mukta* | Before | 500g | 500g |
| | | After | 442g | 451g |
| | | Loss | 58g | 49g |
| 3. | *Churnikarana* | Before | 442g | 451g |
| | | After | 437.8g | 447.2g |
| | | Loss | 4.2g | 3.8g |
| 4. | *Bhavana* | Before | 437.8g | 447.2g |
| | | After | 464g | 472.6g |
| | | Gain | 26.2g | 45.4g |
| 5. | *Marana* (1st *puta*) | Before | 458g | 466.6g |
| | | After | 319g | 326.6g |
| | | Loss | 139g | 140g |
| 6. | *Marana* (2nd *puta*) | Before | 304g | 316.6g |
| | | After | 279g | 291.6g |
| | | Loss | 25g | 25g |
| 7. | Marana (3rd *puta*) | Before | 279g | 291.6g |
| | | After | 273g | 285g |

| | | | | |
|---|---|---|---|---|
| | | Loss | 6gm | 6.6g |
| 8. | Marana ( 4th *puta* ) | Before | 259g | - |
| | | After | 250g | - |
| | | Loss | 9g | - |

**Table 2: physico-chemical analysis by Ayurvedic Method**

| S.No. | Type of *Parikshan* | By MBG method | By MBK method |
|---|---|---|---|
| 1. | *Shabda* (Sound) | - | - |
| 2. | *Sparsh* (Touch) | Smooth, soft in Touch | Smooth, soft in Touch |
| 3. | *Rupa* (Appearance) | White Amorphous powder | White greyish powder |
| 4. | *Rasa* (Taste) | Tasteless | Tasteless |
| 5. | *Gandha* (Smell) | Odourless | Odourless |

**Table 3: Physico-chemical analysis[14,15] of *Mukta bhasma***

| S.No. | Test | MBG | MBK |
|---|---|---|---|
| 1. | pH | 11.97 | 11.80 |
| 2. | Specific gravity | 1.030 | 1.026 |
| 3. | Loss on drying | 0.6% | 0.7% |
| 4. | Ash value | 98.41% | 98.85% |
| 5. | Acid insoluble ash | 31.62% | 31.14% |

**Table 4: Solubility test of *Mukta bhasma***

| S.No. | Solvents | *Mukta bhasma* | |
|---|---|---|---|
| | | By MBG Method | By MBK Method |
| 1. | Distilled water | PS | PS |
| 2. | Ethanol | SS(+) | SS(+) |
| 3. | Methanol | SS(++) | SS(++) |
| 4. | Ether | NS | NS |
| 5. | CCl4 | NS | NS |
| 6. | Tween 80 | PS (Suspension form) | PS (Suspension form) |

**Table 5: Qualitative Test for Inorganic Elements in *Mukta Bhasma***

| S.No. | Tests for | Result | |
|---|---|---|---|
| | | By MBG Method | By MBK Method |
| 1. | Calcium | Present | Present |
| 2. | Carbonate | Present | Present |
| 3. | Sulphate | Present | Present |
| 4. | Iron | Absent | Absent |
| 5. | Sodium | Present | Present |
| 6. | Potassium | Absent | Absent |
| 7. | Chloride | Present | Present |

**Table 6: Particle size of *Mukta Bhasma Godugdha Marit***

| Sieve No. | Micron size µm | Particle size mm | Sample Name (% wt. Retained) | Cumulative amt. Rtnd. |
|---|---|---|---|---|
| 8/10 | 2057 | >2057 | - | |
| 10/12 | 1680 | 2057-1680 | - | |
| 16/18 | 1003 | 1680-1003 | 0.190 | 0.163 |
| 22/25 | 710 | 1003-710 | 0.346 | 0.595 |
| 44/45 | 355 | 710-355 | 0.469 | 1.066 |

| | | | | |
|---|---|---|---|---|
| 50/52 | 300 | 355-300 | 0.050 | 1.00 |
| 60 | 250 | 300-250 | 1.639 | 2.896 |
| 80/85 | 180 | 250-180 | 5.100 | 6.584 |
| 100 | 150 | 180-150 | 1.176 | 9.10 |
| 300 | 53 | 150-53 | 0.50 | 9.53 |

**Table 7: Particle size of *Mukta Bhasma Kulitha Marit* (MBK)**

| Sieve No. | Micron size µm | Particle size mm | Sample Name (% wt. Retained) | Cumulative amt. Rtnd. |
|---|---|---|---|---|
| 8/10 | 2057 | >2057 | - | |
| 10/12 | 1680 | 2057-1680 | - | |
| 16/18 | 1003 | 1680-1003 | 0.198 | 0.198 |
| 22/25 | 710 | 1003-710 | 0.383 | 0.536 |
| 44/45 | 355 | 710-355 | 0.469 | 1.016 |
| 50/52 | 300 | 355-300 | 0.059 | 1.08 |
| 60 | 250 | 300-250 | 1.690 | 2.750 |
| 80/85 | 180 | 250-180 | 5.190 | 7.863 |
| 100 | 150 | 180-150 | 1.183 | 9.05 |
| 300 | 53 | 150-53 | 0.62 | 9.66 |

**Table 8: Analysis of *Mukta Bhasma* by flame photometry**

| Sample name | Na ( mmol/L) | K (mmol/L) | Ca (ppm) |
|---|---|---|---|
| MBG | 9±1.04 | 50±3.76 | 283 ±25.95 |
| MBK | 11±1.04 | 53±3.72 | 300±23.96 |

## DISCUSSION

An attempt has been made in the present study to evaluate the *Mukta* (cultured pearl) *bhasma* analytically.

### Pharmaceutical part

### Selection of raw material

*Grahya-agrahya lakshanas* of mukta are told in classics. But in current study, application of these *Grahya-agrahya lakshanas* were not suitable as the study itself was on cultured Pearls. But some *lakshnas* like *Slakshna*, *Snigdha*, *Shweta*, *Nirmala* were slightly observed.

### a) *Mukta Shodhana*

As *Mukta* is an aquatic gem, there are very less chances of being contaminated. However, to enhance the therapeutic properties of *Mukta* with the help of herbal juice, *Shodhana* is necessary.

500g of raw *Mukta* taken for *Shodhana* in both methods and after the purification 442gm, 451gm of purified Mukta collected, So minimum loss were observed.

*Shodhana* can be better understood by applying some theories of basic science.

### Fick's low of diffusion

This law states, "the flux of an atom of a substance travels from one concentration to other concentration in a fix period of time." So, the diffusion between two planes X and Y in a non-homogeneous solution can be expressed quantitatively as follows: **ds/dt=DA(dc/dx)** where in, ds/dt=the rate of moment of solutes, D-Diffusion constant, A-The area of planes, dc/dx- the concentration gradient between X and Y.

According to this law, there is diffusion of molecules between *Shodhana* of *dravya* and media, as there is a concentration gradient between the two media. Therefore, in the *Shodhana* procedure, the solutes travel from *Jayantri patra/ Sudhodak swarasa* to *Mukta* and in the same time, unwanted materials move from *Mukta* to the *Shodhana* media. Hence, the weight gain of *Mukta* after *Shodhana* can be attributed to the above said law. In addition, pH of *Jayanti swarasa* before *Shodhana* was 6.37 and after *Shodhana* was 5.84, and that of *Sudhodaka*

before *Shodhana* was 6.37 and after *Shodhana* were 5.84. This change may be due to continuous heating for 3 hours or it may be due to interaction of *Swarasa* with *Mukta*.

***b) Mukta Marana***

For *Laghu Puta*, after discussing with the experts, a pit was constructed in the garden of our college using bricks. *Sharava* of required capacity, uniform size, well burnt, devoid of cracks were taken for the study after rubbing the edges on the sand. *Chakrikas* of *Langli beeja* size were made and kept in *Sharava* for drying in the shade. After complete drying, *Sharava samputa* was done with *Multani mitti* and cotton cloth. Cow dung cakes of uniform size and weight were selected for the *Puta*. To measure temperature pattern of the *Puta*, thermocouple was used and this temperature pattern was presented in the graph form. During all process of preparation of *Mukta bhasma* by both methods, some amount of drug got lost due to manual errors.

*Shodhita Mukta* is triturated with *Godhugdha/ Kulith kwatha* after each *Puta* by which there is reduction in particle size and also the chemical constituents of *Godugdha/ Kulith kwatha* (Ca) and *Sheeta virya*, *Snigdha guna* may increase the therapeutic efficacy of *Mukta bhasma*.

During *Mukta Marana*, *Chakrikas* were found to be advantageous for the better *Agnipaka*, maintenance of uniform heat for all the particles, availability of more surface area for the chemical conversion.

*Sharava Sandhi bandhana* is necessary to maintain the pressure inside the apparatus and to avoid direct loss of material in the completely burnt ash of *Vanopala*.

The *Puta* adopt in the present study was *Laghuputa* which exerted maximum temperature range upto 700-850$^{o}$c which was maintained for 35 minutes.

After giving 4 *Putas* (MBG) and 3 *Putas* (MBK) respectively, it passed all *bhasma parikshas.*

**Fourier's principle of thermodynamics**

Heat flow in *Laghuputa* is explained by mechanism of conduction, i.e. heat flow from a hot surface to cold surface. During *Laghuputa*, heat flow through *Chakrikas* can be supported by this law. According to this law "the rate of heat flow through a uniform material is proportional to the area and the temperature drop and inversely proportional to the length of the path of flow". So the area of *Chakrika* is uniform in shape and even the path of heat flow is very less, which will help in uniform and maximum heat flow.

**Hess's law of thermodynamics**

In the Marana of *Mukta* the conversion of material takes place in many steps. Moreover, it is necessary to maintain uniform temperature and which is very difficult in *Laghuputa*. There is some difference in temperature but which is not significant. Because according to this law "the amount of heat evolved or absorbed in a chemical change is same whether the process takes place in one or several steps". Therefore, change of *Mukta* into *bhasma* needs an average degree of temperature. Even if there is a slight change in the temperature during *Laghuputa*, which is common, can be confirmed.

***Bhasma parikshas***

- The colour of *Mukta bhasma* was straw in colour. *Sparsha* is smooth and soft, odourless and tasteless. All samples fulfilled *Rekhapurnatwa*, *Varitaratwa*, *Unama, Jihwa pariksha* after four and three *Laghuputa* respectively (MBG and MBK Method).
- Physico-chemical analysis in which pH (11.97, 11.80), specific gravity (1.030, 1.026), loss on drying (0.6%, 0.7%), ash value (98.41%, 98.85%) and acid insoluble ash (31.62%, 31.14%) of *Mukta Bhasma Godugdha Marit (MBG) & Mukta Bhasma Kulitha Marit (MBK)* respectively.
- Solubility test in distilled, ethanol, methanol, ether, calcium chloride of *Mukta bhasma* were done.

- Qualitative test for inorganic elements like calcium, carbonate, sulphate, iron, sodium, potassium, chloride were done.

Physiologically, the integrity and permeability of cell membrane is regulated mainly by Calcium which is abundantly present in *Mukta*. Quantitative analysis of Na, K, Ca by flame photometry found the MBG having 9±1.04, 50±3.76, 283 ±25.95 and MBK 11±1.04, 53±3.72, 300±23.96 respectively.

## CONCLUSION

- *Mukta Bhasma* is prepared by use of *Godugdha* and *Kulatha Kwatha. Marana* method required four and three *Laghuputas* respectively.
- 50% and 53% weight loss was observed in finished product of *Mukta Bhasma* prepared by *Godugdha* and *Kulatha Kwatha Marana* method respectively.
- Organoleptic analysis showed only difference in colour whereas physico-chemical analysis does not reveal any difference to major extent in both compared *Bhasma*. Flame-photometry showed more calcium level in *Mukta Bhasma* prepared by *Kulatha Kwatha* Marana (ca: 300±23.96 ppm) method compared to *Godugdha* Marana (ca: 283 ±25.95) method.
- Fineness of particles was found more in *Mukta Bhasma* prepared by *Kulatha Kwatha Marana* method compared to *Godugdha Marana* method.
- On the overall comparison of both *Bhasma*, *Bhasma* prepared by *Kulatha Kwatha* method was found better to some extent.

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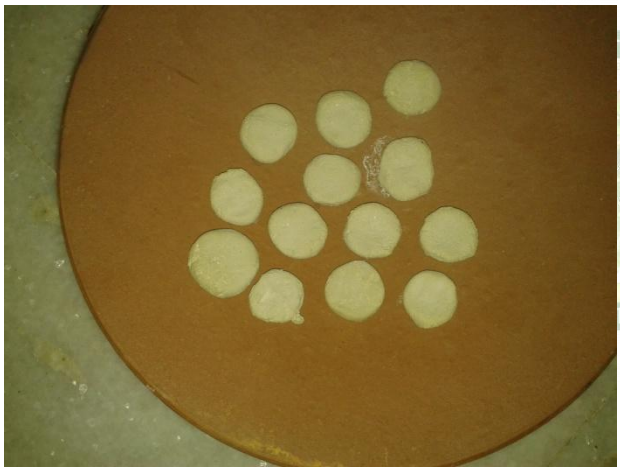
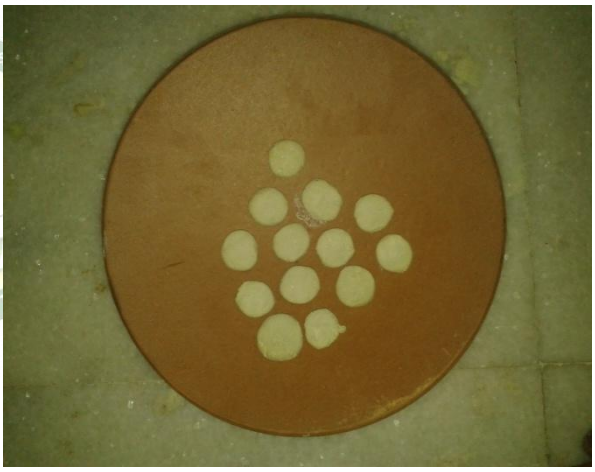
## PHOTOGRAPHS OF PREPARATION OF MUKTA BHASMA

***Marana*** **By MBG Method**

***Marana*** **by MBK Method**



***Chakrika*** **by MBG METHOD**



***Chakrika*** **by MBK Method**

***Mukta Bhasma*** **by MBG Method**

***Mukta Bhasma*** **by MBK Method**