



Research Article

PHARMACEUTICO-ANALYTICAL STUDY OF *MUKTA BHASMA* PREPARED IN *GODUGDHA*

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ABSTRACT

Drug does its action on basis of its *Rasa, Guna, Veerya, Vipaka* (acc. to Ayurveda) and chemical composition (acc. to Modern concept) present in it. They are widely used in form of *Bhasma*, which is exclusively unique dosage form of Ayurveda, these acts in small doses and can cure chronic ailments. *Mukta bhasma* (calx of pearl) contains calcium carbonate and widely recommended and traditionally used for gastro-intestine tract disorders, anti-pyretic and it strengthens bones. The aim of study is Pharmaceutical and Analysis of '*Mukta Bhasma*' prepared in *Godugdha* by analytical procedures carried out vide infra in two major headings incorporating physico-chemical tests and advanced instrumental techniques like XRD and XRF. 300gms Raw *Mukta* was taken and gets 208gms dull white *Mukta Bhasma*. The Calcium percentage of *Mukta Bhasma* was 43.86% w/w by AAS and by XRF method Ca% in *Mukta* is 45.07%. *Mukta Bhasma* was evaluated for loss on drying (0.24%w/w), total ash (99.84%w/w), acid insoluble ash (0.34%w/w), water soluble ash (8.31%w/w), specific gravity (1.0185) and Particle size 20nm to 100nm by TEM was obtained. XRD peaks of the sample confirmed the presence of Calcium Carbonate (Calcite). Elements Detected by XRF study were present in *Mukta Bhasma* Ca (45.07%), O (41.52%), C (12.44%), Na (0.15%), P (0.13%), Si (0.12%), Cl (0.11%) S (0.08%), Mn (0.07%), Mg (0.07%), K (0.07), Sr (0.05%), Al (0.04%), Fe (0.04%), As (0.02%), Cu (0.01%), Zr in traces.

KEYWORDS: *Mukta Bhasma, Godugdha*, Pharmaceutico-Analytical Study.

INTRODUCTION

Mukta is a calcium compounds categorized under the name "*Sudha Vargiya Dravyas* (calcium group drugs)" first named by *Vaidya Yadavji Trikamji Acharya* [1]. It is obtained from the Pearl shell or oyster found in the sea. Pearls (*Mukta*) are the calcareous concretions formed as protection against the irritation caused by foreign objects, either sand or minute parasites which have lodged inside the shell, between the mantle and the shell of the animal. A fold of soft tissue envelops the foreign particles and deposits layer after layer of nacre on it to form a pearl. Nacre is composed of conchioline and calcium carbonate. *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* [2].

Grahya lakshanans of Mukta

Shweta, Sthula, Snigdha, Nirmala, Mahat, Toyaprabha, Vritta, Chandrodbhasi. [3, 4].

Bhasma are inorganic preparations produced by an alchemic process, which converts a metal or mineral into its compound like carbonates, oxides etc. They have great therapeutic value because they get absorbed easily in the body even in very small doses. This is due to their micro fineness. *Mukta bhasma* (using natural pearls) is a unique *Rasashastra*

preparation which is natural source of calcium compounds and widely used as antipyretic, antiulcer and antacid. It is also used in treatment of bone metabolic disorders associated with calcium deficiency. Very few reports are available where attempts have been made to understand the physico-chemical properties of *Mukta bhasma*. Considering all these facts, it was found worthwhile to carry out a systematic and scientific study of physico-chemical properties of *Mukta Bhasma*.

MATERIALS AND METHODS

Raw materials

Procurement of genuine raw material and associated drugs from the professional suppliers and were checked and confirmed by experts of Department of Rasashastra, of B.M.J. Ayurvedic College, Gajendergarh, Gadag.

Preparation of Mukta Bhasma

Pharmaceutical Study

Mukta Pariksha (tests)

The test for selecting *Jatya Mukta* is by immersing the *Mukta* in a vessel containing *Gomutra* along with *Lavana, Ksharas* and rubbing with husk. If the *Mukta* remains same in appearance, then it is considered as the best [5].

Shodhan of Mukta

Mukta was taken in *Sharava* (earthen vessel) and filled with *Churnodaka* (lime water) heat on mild flame for 3 hours [6].

Maran of Mukta

Maran done by *Godugdha* and *Laghu Puta* as reference given in *Ras-tarangini* [7].

Physico-chemical analysis

Physico-chemical analysis of the *Bhasma* was carried out at Ozone Pharmaceuticals Ltd. Analytical lab, Bahadurgarh, Haryana and Particle size by TEM and quantitative test by XRF was done at Punjab university, Chandigarh.

Results and Discussion

Physico-chemical analysis provides the objective parameters to fix up the standards for quality of raw drugs as well as finished products. *Bhasma* is analysed on parameters like organoleptic, physical, chemical which include loss on drying, total ash, acid insoluble ash, water soluble ash, specific gravity and qualitative and quantitative tests. *Shodhana* is an essential procedure before the preparation of *Bhasma*. *Mukta* is found in shallow waters of the sea, to remove the toxic impurities from them and to reduce the *Kshariyata* and hardness of *Mukta*, *Shodhana* is required. After *Shodhana* weight loss was 2 gms in *Mukta* which is very less. *Churnodaka jal* is *kshariya* in nature; *Shodhana* might reduce the alkalinity of the drug and make them brittle and soft for further procedures. (Table1).

Table 1: Pharmaceutical preparation of Mukta bhasma

S.No.	Procedures	Mukta Bhasma	
1.	Quantity of <i>Mukta</i>	300gms	
2.	<i>Shodhita Mukta</i>	Before	300gms
		After	298gms
		Loss	2gms
3.	Powdering of <i>Mukta</i>	Before	298gms
		After	296gms
		Loss	2gms
4.	<i>Bhavana</i>	Before	296gms
		After	310gms
		gain	14gms
5.	<i>Marana</i> (1st <i>puta</i>)	Before	310gms
		After	238gms
		Loss	72gms
6.	<i>Marana</i> (2nd <i>puta</i>)	Before	248gms
		After	220gms
		Loss	28gms
7.	<i>Marana</i> (3rd <i>puta</i>)	Before	230gms
		After	208gms
		Loss	22gms

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. 300g of raw *Mukta* taken for *Shodhana* and after the purification, 298gm purified *Mukta* collected, 296gms *Mukta* after powdering, so minimum loss were observed. *Churnodaka* media is *Kshariya* in nature. After *Shodhana*, *Mukta* became clear and brittle. Corrosive effect of the *Shodhana* media might have turned the drugs in to more fragile and soft. It may be due to the *Chedana Bhedana* property of *Sudhodaka* /*Churnodaka*.

Godugdha being *Atyanta Sheeta Veerya dravya*, prevents unwanted effects of heat on *Mukta*. By

Mardana it reduces the particle size and makes finer by further processing. *Godugdha* might enhance the *Pittahara* property of drug. Milk has a potent antiulcer activity that may be attributable to its phospholipid constituents. It also contains Calcium, Enzyme inhibitors, Vit C and B12, Lactoferrin, Xanthine, Oxidase, Lactoperoxidase, Lysozymes and Niacin. These might increase the therapeutic action of the drug.

Mukta Marana

Mukta is in aragonite form, when heated it is converted into calcite form and this calcite is more stable than aragonite. *Marana* are the procedures used to convert the metastable Calcium carbonate to stable Calcium carbonate and some amount of Calcium oxide.

And it also helps in reducing the particle size and to get homogenized, stable, bio-assimilable precipitated complex molecule (fig.1).

Total Ash Value

It also helps in judging, identification of sample or purity of the drug. *Mukta Bhasma* is evaluated for ash value and it was found 99.84%w/w.

Acid Insoluble Ash

Acid insoluble ash of *Mukta Bhasma* was 0.34% w/w. The acid insoluble ash is a part of the total ash that is insoluble in dilute hydrochloric acid. This test for drug is therapeutically very important. According to this test *Mukta bhasma* is said to be good.

Water soluble Ash

Mukta Bhasma was estimated for water soluble ash was 8.31%w/w, it denotes that water is not a soluble media for it. The salivary secretions, gastric enzymes may play an important role in the efficacy of *Mukta Bhasma*.

Loss on drying at 110° C

The moisture content of any pharmaceutical agent spoils not only the drug activity but also everything. Loss on drying at 110°C is a physical test to detect the percentage of moisture content and hence the shelf life of the sample. Lesser the loss on drying at 110°C, the better will be the drug. In the present study, *Mukta Bhasma* was found to possess 0.24%w/w.

Specific gravity

The Specific gravity of *Mukta* was 1.0185. The Specific gravity of *Mukta* is indication of its density. The greater a specific gravity, heavier it will feel.

Calcium percentage:

The Calcium percentage of *Mukta Bhasma* was 43.86 %w/w (by AAS method) and by XRF method Ca % in *Mukta* is 45.07%.

Particle Size Analysis (By TEM Method)

The TEM photomicrograph of *Mukta* showed 20-100nm particles in the sample. Particle size is one of the factors which will affect dissolution and absorption of drug. Particle size and surface area are inversely proportional to each other, as particle size decreases surface area increases. This leads to increase in dissolution of drug and rapid absorption. *Mukta* are having good dissolution rate and smaller particle size make the drug in bio assimilable form so it is easily and readily absorb in body (fig2).

XRD Study

In XRD of *Mukta Bhasma*, Peaks at $d = 3.04 \text{ \AA}$ ($2\theta = 29.3666$) confirmed the presence of calcite as the major crystalline phase in sample and *Bhasma* contained calcite form of calcium carbonate (CaCO_3).

X-Ray Fluorescence Spectrometer

XRF is a physical method of analysis which directly analyses almost all chemical elements of the periodic system in the sample. It helps in detection of major, minor as well as trace elements which are present in the drug. Elements present in *Mukta Bhasma* are Ca (45.07%), O (41.52%), C (12.44%), Na (0.15%), P (0.13%), Si (0.12%), Cl (0.11%)S (0.08%), Mn (0.07%), Mg (0.07%), K (0.07)

Table 2: Organoleptic and Physico-Chemical characters of Mukta Bhasma

Parameters	<i>Mukta Bhasma</i>
Color	Greyish white
Taste	Tasteless
Odor	Odorless
Touch	Soft, smooth
Appearance	Amorphous powder
Acid insoluble ash, w/w	0.34%
Total Ash, w/w	99.84%
Water soluble ash, w/w	8.31%
Water Insoluble ash, w/w	91.39%
Loss on drying, w/w	0.24%
Specific gravity	1.0185
Calcium (AAS method)	43.86%w/w
Calcium % (XRF method)	45.07%
Calcium oxide (AAS method)	61.36%w/w

Sr (0.05%), Al (0.04%), Fe (0.04%), As (0.02%), Cu (0.01%), Zr in traces (Table 2, 3 and fig3).

Table 3: Elements detected in XRF analysis of Mukta Bhasma

ELEMENTS	<i>Mukta Bhasma</i> (%)
Ca	45.07%
O	41.52%
C	12.44%
Mg	0.07%
Si	0.12%
S	0.08%
Fe	0.04%
Na	0.15%
Al	0.04%
Sr	0.05%
P	0.13%
Cl	0.11%
K	0.07%
Cu	0.01%
Zr	12PPM
Mn	0.07%
As	0.02%

CONCLUSION

- *Mukta Bhasma* is prepared by use of *Godugdha* and *Marana* method which required three *Laghuputas*.
- Approximately 30% weight loss was observed in finished product of *Mukta Bhasma* prepared by *Godugdha* and particles of *Bhasma* was found very fine which make it easily bio assimilable.
- *Mukta bhasma* is not only contained Ca but also other elements like Na, Mg, Al, Fe, O, P, Cl, Cu etc. which are essential for normal body functions.
- 45.07% Ca is found in *Mukta Bhasma* by XRF Method, which is very high can be used in Ca deficiency disease with other useful elements.

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Figure1: Preparation of Mukta Bhasma

a). Raw Mukta b). Choornodaka c). Shodhan of Mukta in Choornodaka d). Godugdha e). Powdered Mukta showing shining particles f). Bhawna given to Mukta in Godugdha g). Chakrika preparation for 1st Laghuputa h). Chakrika nirmana for 2nd Puta i). Chakrika nirmana for 3rd puta j). Greyish White coloured Mukta Bhasma

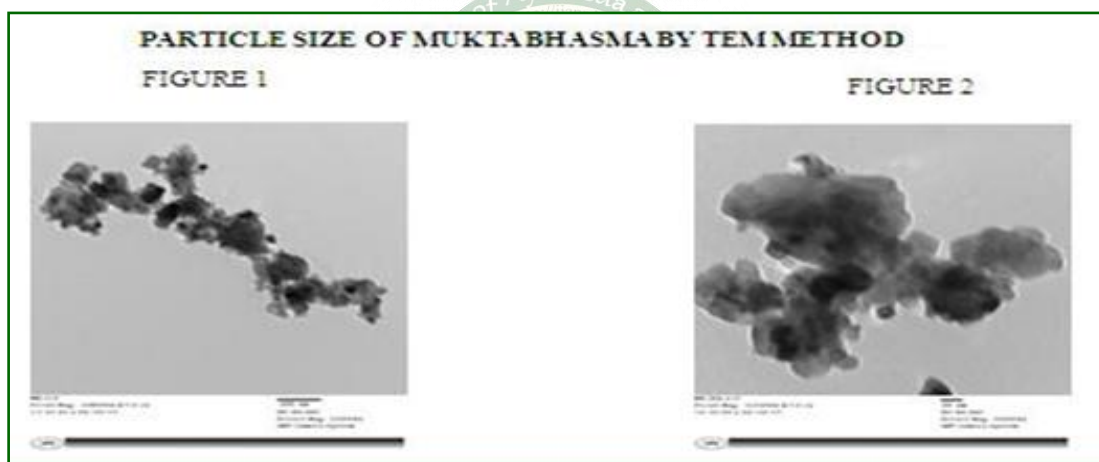


Figure 2: Particle size of Mukta Bhasma by TEM Method

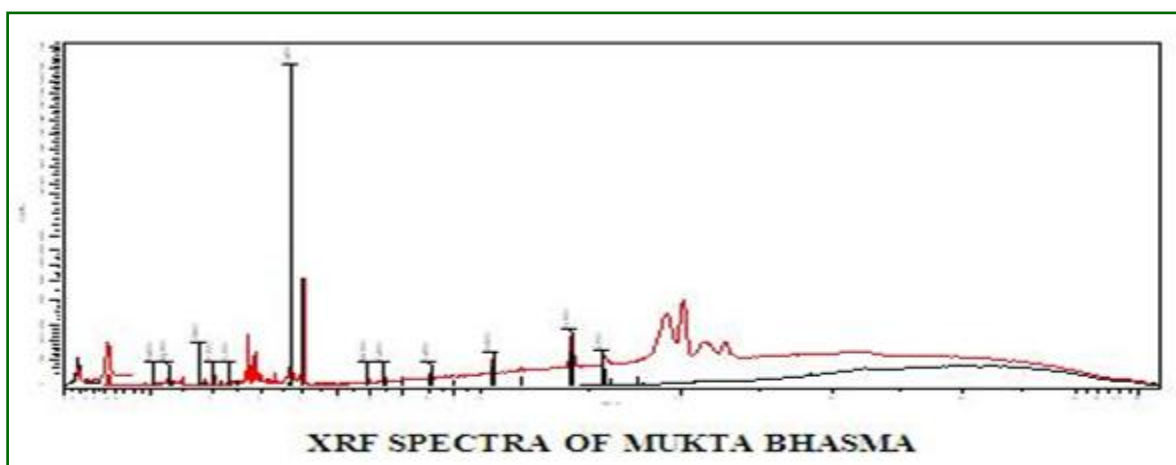


Figure 3: XRF Spectra of Mukta bhasma