ISSN 0976 – 3333

Available Online at www.ijpba.info

International Journal of Pharmaceutical & Biological Archives 2013; 4(2): 361 - 365

ORIGINAL RESEARCH ARTICLE

Pharmaceutical Standardization of *Swarna Makshika Bhasma*

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Received 28 Nov 2012; Revised 26 Mar 2013; Accepted 10 Apr 2013

ABSTRACT

Swarna Makshika Bhasma is very commonly administered medicine in therapeutics of Ayurveda. Anaemia, obesity, diabetes and skin disorders are main diseases where it works. Pharmaceutical standardization is phenomenal requirement of *Swarna Makshika Bhasma*. During procedures of *shodhana* and *marana* there are physicochemical changes in the raw material which ultimately attribute to its medicinal efficacy and safety. Control exposure of temperature in these two processes along with individualized treatment with intermediary media is basic boon of quality production of *Swarna Makshika Bhasma* which we standardized on pharmaceutical parameters. In this project we took 100gm raw *Swarna Makshika* in three batches and 91.98% yield was observed.

Key words: *Swarna Makshika Bhasma, shodhana, marana, puta.*

INTRODUCTION

Swarna Makshika Bhasma is one of the most famous mineral in therapeutic practices of Rasa Shastra. It is widely used in the treatment of anemia, obesity and diabetes[1] etc. Considering its abundant use in therapeutic, there is every chance of compromise in manufacturing processes of *Makshika Bhasma* to cope up the demand. Ayurvedic Pharmacopia Committee always advocates for the preparation of standard, quality, safe and efficacious *Ayurvedic bhasmas*. Many projects on the pharmaceutics of *Swarna Makshika Bhasma* have been completed with some data but none of them is showing complete parameters of manufacturing. Therefore we planned this project to fill the gap in the field of pharmaceutics of *Swarna Makshika Bhasma*.

MATERIALS AND METHOD

The whole pharmaceutical work can be divided into the following subheadings:

1. Collection of raw material

(A) Raw *Swarna Makshika* was collected from Department of Rasa Shastra, Faculty of Ayurveda, IMS, BHU, Varanasi.

(B) Procurement of lemon from market time to time according to need.

2. Pharmaceutical Processing

(A) Conversion of *Raw Swarna Makshika* to fine powder form.

(B) *Shodhana* of *Swarna Makshika*.

(C) *Marana* of *Swarna Makshika*.

(A) Conversion of Raw *Swarna Makshika* to fine powder form

Reference: *Rasa Tarangini* 21/7 (AFI)[2]

Verse:

Suvarnamakshikam lauha khalve tu khalu kuttayet, Sukuttitam tato gyaatva chaalanyam parichaalyet

Ingredients: *Raw Swarna Makshika*- 300gm

Equipment: Iron mortar and pestle, sieve (80 mess size)

Swarna Makshika is generally found in the form of large pieces. For proper processing, uniform exposure of the whole material to provide heat and required chemical conversion of the material first of all it is needed to convert the material into the form of fine powder form. For this purpose iron mortar and pestle is ideal equipment. First the material is pounded with the help of pestle and finally grinded to convert into fine powder form. The powder was intermittently sieved from sieve of 80 mess size to separate the fine particles and remaining was again

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grinded. In this way the whole material was converted into fine powder form. The 300gm material was then divided into three parts 100gm each for three batches.

(B)*Shodhana* of *Swarna Makshika*

Reference: *Rasa Tarangini* 21/8-11 (AFI)

Verse:

Tato Makshika churnantu chaalani parigaalitam, Samaadaaya kataahe tu sthaapayeda bhishjam varah, Nimbuka swarasa datvaa pachechulligatam tatah, Darvyam sanchalyed taavad yaavad syaat utpal prabham, Bhrisham dintrayam vaapi dvidinam vaa vidhaantah.

Principle: *Bharjana* (Roasting)

Ingredients: Main drug- Raw *Swarna Makshika*- 100gm and Accessory drug- Fresh lemon juice- quantity sufficient

Equipment: Heating device (Gas burner), Iron pan, Spatula, Earthen saucer.

Procedure: *Shodhana* of *Swarna Makshika* was performed by roasting the raw material on intense heat of gas burner on iron pan. On an average the material was fried for 3-4 hours per day and left for self cooling. The process was repeated for three consecutive days as per classical reference till conversion of material to brick red colour. The sequence of event can be summarized as below:

i. The finely powdered *Makshika* in an iron pan was put on heating device and *nimbuka swarasa* was added from above. It was then heated on intense heat.
ii. On drying of the *nimbuka swarasa*, added intermittently. The material was stirred continuously.
iii. On the final day (3^{rd} day), on conversion of material to brick red colour, the material was collected in the centre of pan, covered with earthen saucer and heat was intensified for two hours.
iv. The material was then left for self cooling.

Observations:

i. Evolutions of fumes observed in initial 1 hour and then fumes subsided.
ii. Colour of the raw *Swarna Makshika* changed from greenish yellow to black within half an hour.
iii. On heating upto 4 hour on very first day colour changed to brick red.
iv. The temperature of the heating device observed through pyrometer was 728^0C and that of upper surface of pan was 640^0C.
v. The basic procedure of *shodhana* was identical for the three batches. There was slight difference in final weight of material after *shodhana* which is illustrated below.
vi. More loss was observed in Batch III, because material adhered to the iron pan and it was not scratched forcefully to prevent contamination of iron from pan.

(C) *Marana* of *Swarna Makshika*

Reference: *Rasa Tarangini* 21/19-20

Verse: *Taapyam nimbwamlasampakwam punah nimbuka vaarina, Sampeshya samputasthantu putayet krit chakrikam , Evam dasputairev panchtaameti makshikam, Raktotpal dalachhaayam jaayate chaatishobhanam.*

Ingredients: *Shodhita Swarna Makshika*, *Nimbuka swarasa*

Equipments: *Kharal*, earthen saucer, cloth, mud, furnace, spatula etc.

Procedure: *Marana* of *Swarna Makshika* was performed by following the method described in AFI (RT). The procedure can be summarized in below mentioned steps

i. Procurement of *Swarna Makshika* after *shodhana*.
ii. Levigating the material with sufficient quantity of *nimbuka swarasa* (30-40ml), which completely immerse the *shodhita Swarna Makshika* powder. The trituration was done till complete drying of liquid and pellets could be made comfortably.
iii. Pellets were kept for complete drying. It was then placed in earthen saucer and sealed with mud and cloth and subjected for *Puta* in conventional *puta* system.
iv. Observing previous thesises on *Makshika* initially 4 Kg of cow dung cakes were taken for incineration but could not attend desired colour till 10^{th} *puta*, so afterwards 6Kg of cow dung cakes were taken for incineration.
v. There was slight difference of temperature (approximately 8- 10^0C) , but the duration of *puta* raised by approximately half an hour.
vi. Seasonal variation also affected the duration of *puta* and in peak winters it was ½ an hour less than normal.
vii. After every *puta* the material was grinded with *nimbuka swarasa* and converted to pellet and then subjected to *puta*.
viii. Same method of incineration was adopted for the rest two batches i.e. II and III. Samples were collected at intervals for the analytical study.

ix. No samples were collected from batch II to study the total yield.

RESULTS

In the process of *Shodhana* of *Swarna Makshika* there was 17gm increase in final weight of material. On an average 195- 200 ml of lemon juice was required in three days for the process of *shodhana* (**Table 1**). The practical done fully supports the verse of classics that, *Makshika* turns to red colour like lotus in three days. For the process of *marana* on an average 30- 40 ml of lemon juice is required for trituration and making pellets for 100gm material. Pellets took 2-3 days in drying. It requires 16 putas (4-6 Kg cow dung cakes) for complete conversion of 100gm raw *Swarna Makshika* to *bhasma* form (Table 2). The maximum temperature attained was 850 - 880^{0}C, and total duration of puta was approximately 5 ½ hours (**Figure 1**). Duration of *puta* raised by ½ an hour on taking 6 Kg cow dung cakes. Total yield of *Swarna Makshika Bhasma* is 91.98%.

Table 1: Final Weight of the three batches after *Samanya Shodhana*

Batch	Initial Wt. (gm)	Final Wt. (gm)	*Nimbuka swarasa*(ml)	Duration (hrs)	Wt. of sample collected (gm)
I	100	117.41	195	11	15
II	100	117.77	200	11	-
III	100	94.88	195	11	15

Table 2: Initial and final weight of material and observations after each puta (Batch II)

No. of *Puta*	Batch II		Observations
	Initial Wt. (gm)	Final Wt.(gm)	
1	117.77	94.93	Pellets fragile and soft in consistency. Material melted and adhered to sharav. Pellets were blackish on surface and red inside.
2	94.93	90.55	Same as above but pellets little bit hard.
3	90.55	91.93	Pellets hard in consistency and colour of pellet turned to black.
4	91.93	87.84	Same as previous puta
5	87.84	87.17	Same as previous puta
6	87.17	87.43	Same as previous puta
7	87.43	88.28	Same as previous puta
8	88.28	89.96	Same as previous puta
9	89.96	89.85	Same as previous puta
10	89.85	91.17	No. of cow dung cakes increased to 6 Kg from 4 Kg. Pellets still hard and black in colour
11	91.17	89.70	Same as previous puta
12	89.70	89.82	Same as previous puta
13	89.82	91.73	Same as previous puta
14	91.73	92.70	Slight change in colour of pellets to blackish maroon
15	92.70	92.50	Colour persisted
16	92.50	91.98	Pellets soft in consistency.Bhasma passed all the tests of completion.

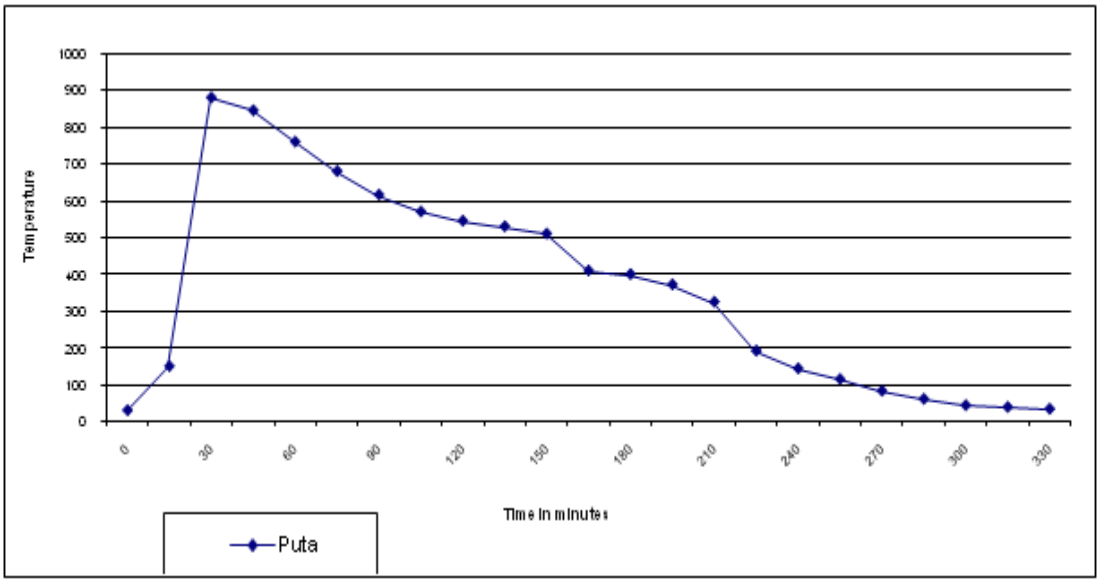

Fig 1: Temperature pattern of Puta (Maximum temperature 880^{0}C and total duration of 5 ½ hours)

Fig 2: Raw Swarna Makshika

Fig 3: Swarna Makshika after Shodhana

Fig 4: Levigation with Nimbuka swarasa before Puta

Fig 5: Finally prepared Bhasma after 16th Puta

DISCUSSION

"*Puta*" is one of the most advanced systems of controlled heating of material which lead to the conversion of mineral/ metal raw materials in the form of magic medicine. The concept of *puta* has been very well defined in Ayurvedic classics. It is the quantum of heat specifying the *paka* (conversion) of *dravys* like rasa etc; it should neither be too much nor too little, but an exact quantum of heat is required for good medicinal preparation.[3] In this project we followed classical instructions of heating of *Swarna Makshika Bhasma* as per parameters quoted in Ayurvedic Formulary of India. *Varaha Puta*[4] or *Gaja Puta* have been suggested for incineration of *Swarna Makshika*. On the basis of previous work[5] done in department and other expert opinion primarily we decided to take 4 Kg of cow dung cake for one sample of 100gm. Before heating, for smooth conduction of heat and for conversion of molecules we made pellets of *Swarna Makshika Bhasma*. The significance of making pellets may be understood from the verse of a thesis[6] "The *bhasma* is different from its parent metal qualitatively as well as quantitatively. This is the result of the reaction occurring between various phases. For reaction to occur, some sort of fluidity is mandatory. Fluidity here is not actually of a liquid which flows but some reaction areas, which can provide for intermingling of various materials. This is for sure that this fluidity cannot be a spontaneous eruption as, if it would have been , no *chakrika* would have emerged in the form of *chakrika* itself in spite of reaching so a high temperature. In any of the solids, if it has to undergo a state change, liquefaction occurs. This starts at the surface of *chakrika* when the optimum temperature is reached. This appears as a number of small spots called *nuclei for liquefaction*, throughout on the surface of *chakrika*, which go on increasing centrifugally top merge into each other, forming a complete layer in the reactive state. If the optimum temperature is maintained, the layer below and below undergo the same liquefaction through nucleation, till it reaches the center. The moment the temperature drops down, this process halts and from that very point of time, process of freezing starts. Contrary o the nucleation for liquefaction, the nucleation for freezing appears first in the center of the *chakrika* and spreads centrifugally to the surface. Hence, we find that the vertical section of a *chakrika* through, its center, yields the surface layer to have achieved the desired colour prior to the center". We noticed that duration of total timing of *puta*

enhanced with increase in weight of cow dung cakes. It may be due to high production of heat. We observed that even after 10 *puta* we were not getting the particular colour of *Swarna Makshika Bhasma*. Means there was no proper conversion of material to be called as *Swarna makshika bhasma*. So as per the expert opinion we enhanced the weight of cow dung cakes from 4Kg to 6 Kg. After 3 *puta* of enhanced cow dung cakes we got the desired colour of *bhasma* that is *Raktotpala* colour. There was increase in weight of material after *shodhana* in two batches. The reason for increase in weight of material may be due to the trace elements present in the lemon juice. There was loss in the weight of material during the process of *marana*. This may be procedural loss. The total yield of *bhasma* is 91.98%. The duration of *puta* varies according to the environmental condition. The temperature graph presented here was recorded in the month of February. On an average it took 3 month to prepare a single batch of *bhasma.*

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