

Standard manufacturing procedure of Makshika Bhasma

Research article

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Abstract

Rasa Shastra is a pharmaceutical science of *Ayurveda* known as Ayurvedic pharmaceuticals deals with the processing of metals and minerals having therapeutic importance. *Swarna makshika* is an important mineral of *Maharasa* varga frequently used in therapeutics since *Samhita* period. Ancient *Rasa* Scholars have developed number of processing methods for a single drug by which crude form of drug converted into highly potent therapeutic agent. It is necessary to find out the standard manufacturing procedure for metals/minerals bhasma which ensures the quality, safety, efficacy, and reproducibility of the products for their global acceptability. This paper aims to make available SMP of *Swarna makshika* bhasma by *kupipaka* followed by *putapaka* method. Longitudinal muffle furnace instead of conventional *voluka yantra* was found advantageous for *kupipaka* of *Swarna makshika* with *kajjali*. *Makshika* obtained after *kupipaka* was further subjected to 6 *puta* with 4 kg cow dung cakes fire for genuine *bhasma* preparation.

Key words: *Process, Sodhana, Marana, Puta, Standard*

Introduction:

Ayurvedic pharmaceuticals is a science and art of drug manufacturing. History of *Ayurveda* is as old as the history of mankind. In the development stream of civilization it was simultaneously developed. Drug, disease and their management are available in Vedic literature but in a scattered manner. It is found systematized later during *Samhita* period. During this period the use of different *Ayurvedic* dosage form of herbal drugs were frequent. Up to *Samhita* period, the use of metals, minerals in

therapeutics were very limited and their processing techniques were not developed. During that period, minerals and metals were converted in to fine powder form with the help of heating, quenching, grinding and filtering and used for therapeutic purposes. After development of *Rasa Shastra* in medieval period as an independent branch of learning, many other specialized processing techniques like *Shodhana* (Purification), *Marana* (Incineration), *Amritikarana* (Nectorization), *Satvapatana* (Extraction of metal), *Samskara* (specialized processing techniques specially used for mercury) etc. were developed to convert raw and crude material in to easily absorbable therapeutic forms. *Sodhana* and *marana* occupy a major place in making *Ayurvedic* mineral and metallic *bhasmas* free from toxicity and easily digestible, absorbable and assimilable into the body

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tissues. Due to growth of commercialization of Ayurvedic pharmaceuticals, it is difficult to get genuine *bhasma* with desired medicinal properties mentioned in classical texts. Hence it is essential to standardize the prepared *bhasma* at pharmaceutical level. Ancient *Rasa* Scholars have evolved number of *shodhana* and *marana* procedures for each metal and mineral. Selection of excellent, trouble-free and economical method for the preparation of metallic *bhasma* with regards to its safety, efficacy and cost effectiveness is essential. In this study, *bharjana* (roasting) method for *shodhana* amongst various methods described for *shodhana* and *kupipaka* followed by *putapaka* for *marana* of *Swarna Makshika* have been selected for establish standard manufacturing procedure of *Makshika bhasma*.

Aim and objectives:

1. To study the effect of *shodhana* process on *Makshika*.
2. To find out the best, easy and cheap method and to set forth standard manufacturing procedure of *Makshika bhasma*.

Materials and Methods:

Raw *Swarna makshika* was procured from the Ayurvedic Pharmacy, Faculty of Ayurveda, I.M.S., B.H.U., Varanasi. Other allied material i.e. *Gandhaka*, *Parada* and *Lemon* is procured from the local market.

Shodhana of Swarna Makshika:

Reference : Rasa Tarangini 21/7-11

Principle : *Bharjana* (Roasting)

Ingredients : Raw *Swarna Makshika*: 1 kg & *Lemon juice*: q.s.

Equipments : Iron pan, Spatula, *Kosthi*, *Khalva yantra*

Procedure:

Raw *Swarna Makshika* was taken in a clean and dry *khalva yantra* and pounded well to prepare its fine powder. Fine powdered Raw *Swarna Makshika* was kept in a clean and dry iron pan and subjected to intense heat at about a temperature of 750⁰C- 900⁰C. The iron pan is then closed with an iron lid to avoid loss of material due to dusting. This process was continued for three days after complete cessation of sulphur fumes and till the mixture become red like fire.

Observations:

During the process, fume and odour of sulphur was emitted. During the addition of lemon juice in to heated iron pan dust of material comes out. Initially powdered *Swarna Makshika* was greenish black in colour then gradually changed in to blackish brown and finally reddish brown colour. Total duration of 3 days was required for completion of *sodhana* process. After completion of process loss in weight of *Swarna Makshika* was observed.

Result:

Initial weight - 1 kg

Final weight - 920 g

Loss - 80 g

Reason for loss:

Sulphur gets burnt and evaporated in the form of oxides of Sulphur and some particles of *Makshika* escapes in the form of dust / fine powder during roasting.

Marana of Swarna Makshika:

Reference : Rasayan Sar Page 286-287/282-283

Principle : *Kupipaka* & *Putapaka*

Ingredients : *Sudha Parada* 100 gm, *Sudha Gandhaka* 100 gm, *Sudha Makshika* 100 gm kg & *Lemon juice*: q.s.

Equipments : *Khalva yantra*, *Valuka Yantra*, Iron rod, Cloth and Mud smeared glass bottle

Preparation of Mixture:

Sudha *Parada* 100 gm and Sudha *Gandhaka* 100 gm were taken into a stone mortar and triturated till black coloured, shining free powder (*Kajjali*) was formed. In this 100 gm Shodhita *Swarna makshika* was added and triturated with nimbu swarasa till whole the material became homogenous and dried. *Kajjali* of *Shuddha Parada*, *Shuddha Gandhaka* and *Shuddha Swarna Makshika* were prepared for preparation of *Swarna Makshika Bhasma* following *Kupipakwa* method as initial step and then *puta paka*.

Kupipaka:

Filling of *kachkupi*: 300 gm. of *Kajjali* was filled in the bottle with the help of funnel.

Heating of *Kupi* in Electric Muffle Furnace: *Kajjali* filled *Kach-kupi* was kept in a vertical furnace and heating was started. Temperature was maintained in increasing order of *mrudu*, *madhya* and *teevragni* dividing the time into 3 parts as shown in the given table.

Table No. 1: Shows different stages of Kupipaka process.

Type of Agni	Temperature	Stages	Time
Mradu agni	Up to 250°C	Stage of melting	3hrs
Madhyam a agni	250°C-450°C	Stage of fuming	3 hrs
Teevra agni	450°C-650°C	Stage of flaming	4hrs

Procedure and observations:

- At the starting of the experiment temperature recorded was 20°C.
- Temperature was recorded after every 15 minutes.
- Just after one and half hour when temperature reached 180°C, slowly yellow fumes started emitting from the mouth of the bottle.
- On increasing temperature, emission of fumes becomes dense. Gradually the

temperature was allowed to rise up to 250°C.

- Red hot iron rod was repeatedly inserted into the mouth of bottle to clean the blockage if occurs during the stage of fuming.
- After three hours, during *madhyamagni* dark yellow fumes started to emerge out of the bottle in profuse quantity. The temperature recorded was 310°C. Gradually the temperature was allowed to rise up to 450°C. At this temperature fumes were completely subsided.
- When temperature was 500°C, blue flame comes out at the time of inserting red hot iron rod in to the bottle.
- At the temperature 525°C yellow coloured flames started coming from the mouth of the *kupi*, which reached a maximum height of 3 inches with increasing temperature. At this stage the temperature was 580°C.
- Gradually the length of flame was shortened and after 45 minutes it was disappeared. At this stage the temperature was 600°C.
- When the flames disappeared, bottom of the bottle became red hot, a copper coin was put on the mouth of the bottle and white shining particles of mercury were observed then corking was done and sealed.
- After corking high temperature of 650°C was given for ½ an hour and after that E.M.F. was switched off and allowed for self cooling.
- Next day when furnace was cooled, bottle was taken out and breaking was done as given below.

Breaking of Kupi:

Next day when furnace was self cooled then the bottle was carefully taken out, cleaned by scraping the outer covering of the bottle, a kerosene soaked thread was wrapped in the middle, over it and burnt. When flame was declined small amount of

water was sprinkled over the heated part of the bottle. This makes the bottle to break with a sound symmetrically. Carefully separated the both parts and partially prepared *Swarna Makshika Bhasma* was procured from bottom of the bottle and *Rasa sindura* was collected from the neck of the bottle.

Colour of Partially prepared *Swarna Makshika* bhasma was Blackish Green. Obtained *bhasma* was very smooth, *rekhapurna* and *varitara* but did not pass *amla pariksha*.

Table No. 2: Showing the Results of Kupipakwa process.

Weight of <i>Kajjali</i>	Weight of <i>Makshika bhasma</i> (After <i>Kupipaka</i>)	Weight of <i>Rasa Sindura</i>
300 gm	96.5 gm	112 gm

Putapaka:

Ingredients:

Makshika Bhasma (After *Kupipaka*): 96.5 g & Lemon juice: q.s.

Equipments:

Sarava (Casserole), *Khalva yantra* (Stone mortar with pestle), *kapada mitti* (Cloth smear with mud), *Upala* (Cow dung cakes), pyrometer etc.

Procedure:

Partially prepared *Swarna makshika bhasma* was put into a stone mortar and triturated with lemon juice until it was became like smooth paste. Thin, round and small *chakrika* were made with paste and dried in sun shine. Properly dried, greenish black coloured and weighted *chakrika* were arranged in a *sharava* and closed by another *sharava*. Gap between *sharava* was sealed by cloth smeared with clay for seven times and allowed to dry. Properly sealed and dried *samputa* was subjected to *puta* system of heating with 4 kg cow dung cakes. Same process was repeated for 6 times to obtain desirable *Swarna makshika bhasma*. The

prepared *bhasma* had passed all confirmatory tests of properly prepared *bhasma* specified in classics for *makshika bhasma*.

Observation:

Greenish black pellets were turned to brownish black after 1st *puta*, from 2nd *puta* onwards the colour of material was gradually converted in to Reddish brown. After 1st *puta* pellets were very hard in consistency but after 2nd *puta* gradually pellets become soft. Initially after *puta* weight of pellets was decrease but after 3th *puta* weight of pellets gradually increases in small amount. Till 3rd *puta*, partially prepared *bhasma* was slightly passed *varitara* and other required testing parameters of *bhasma*. After 6th *puta* material was passed all required classical test parameters of *bhasma*.

Result: Initial weight - 94g

Final weight - 102g

Gain - 08 g

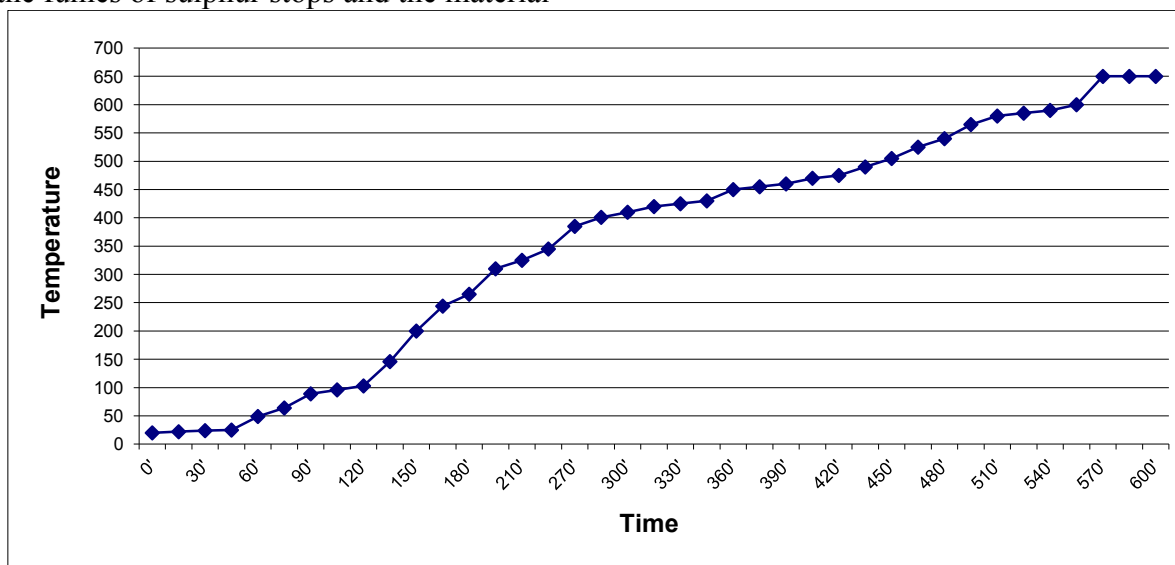
Reason for gain: Due to the formation of different compounds.

Discussion:

Shodhana and *Marana* are the two essential steps for the preparation of *Ayurvedic bhasma*. *Shodhana* detoxifies the crude raw material and make them suitable for *marana*. *Swedana*, *Mardana*, *Bharjana*, *Nirvapana* and *Putapaka* are the different pharmaceutical techniques (principles) adopted by our Acharyas for *Makshika shodhana*. *Bharjana* method of *shodhana* was adopted for this study with the idea to make material fine and to provide maximum time to expose all material for chemical reactions. For this, procured *Makshika* was crushed and grinded to 80 mesh size and then roasted with *nimbu swarasa* at temperature ranges between 750°C-900°C with continuous stirring with the help of iron pestle. During roasting sulphur fumes was liberated from the *Makshika* in the form of oxides of

sulphur. The roasting was continued till the fumes of sulphur stops and the material

becomes reddish brown in colour.



(Graph 1: Showing the heating pattern of kupi paka)

Apart from the puta system of heating, *kupipaka* in *valuka yantra* for *marana* is preferred by some *Rasa* scholars. As *Rasa Vagbhata* stated that mercury is the best material for incineration of metals. Hasty trituration, specific pattern of temperature and pressure promote the amalgamation of material with mercury. Amalgamation helps disintegration of material in to fine particles. Due to this, the surface area of the material is extensively enhanced, which facilitates the rapid compounding process. Thus mercury acts as a catalyst in the compounding reaction and minimizes the time and labour. Due to these reasons, mercury was selected as medium for *marana* of *Makshika*. In this study *shodhita Makshika* was subjected to *kupipaka* followed by *putapaka*. For *kupipaka* instead of the traditional *valuka yantra* a modified electric muffle furnace (vertical) was used. The product obtained after *kupipaka* was further subjected to 6 *puta* with 4 kg cow dung cakes. *Kupipaka* has its own importance as *Rasa Sindura* can be procured as byproduct. In *kupipaka* process, a particular quantity of *gandhaka* is utilized by mercury forms Mercuric sulphide and sublimated at the neck of the *kanchakupi* which is collected as *Rasa*

Sindura and some amount of *gandhaka* is escaped from the *kupi*. After proper *paka* fine powder of greenish material is found at the bottom of the *kupi*. XRD study of this material reveals that the material was $CuFeS_2$. It may be due to some parts of the sulphur are still remaining un-reacted in the bottom of the bottle. On a specific temperature and condition, this un-reacted Sulphur may react with Copper and Iron and get converted in to Copper pyrite. But it was so fine and after *putapaka* quickly converted in to desire quality of *Makshika bhasma*. *Kupipaka* treatment with *kajjali* before *putapaka*, allow the material undergo hasty oxidation and reduction reactions in the presence of heat, oxygen, sulphur and mercury.

Conclusion:

Mercury and sulphur together act as the best media in preparing metallic and mineral *bhasma*. Muffle furnace is found advantageous than the conventional *valuka yantra* with regards to controlled (regulated) system, economical (saves land, labour, and capital) and prevention of dirt and contamination. It was found suitable for achieving optimum yield of the product. *Marana* with *kajjali* and



bhavana with nimbu *swarasa* is found better, convenient can save time, labour and capital.

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