

PHARMACEUTICAL AND ANALYTICAL STUDY OF TAMRA BHASMA – A RESEARCH ARTICLE

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ABSTRACT

Background- *Rasa Shastra* is a specialized branch of Ayurveda which mainly deals with the pharmaceutical preparations. *Bhasma* is a special dosage form mentioned in metal obtained after various *samskaras*. *Bhasmas* are said to be properly prepared if they pass certain *Bhasma Pariksha* mention in *Rasashastra* texts. But in the present era, only *Bhasma pariksha* are not enough in modern world hence the present study was carried out to assess analytical parameters as per modern technique. **Objective-** The present study is attempted to prepare *Tamra Bhasma* as per classical reference. **Method-** *Tamra Bhasma* was prepared as per reference in *Rasashastra Dept, GAC, Osmanabad*. *Tamra Bhasma* was tested with both ancient and modern parameters. **Result-** After 8th classical put black coloured *Tamra Bhasma* was obtained. Chemical analysis confirmed presence of elements viz. S-1.5%, Hg-10.9%, Cu -61.48%. **Conclusion-** observations could be specified as the quality control parameters conforming to all the classical tests under the *Bhasma Pariksha*.

Keywords: *Rasa Shastra*, *Tamra*, *Bhasma*, *Bhasma Pariksha*.

INTRODUCTION

Ayurveda, an ancient medical system of Indian sub-continent, utilizes natural resources including herbs, metals, minerals, etc., and formulations in therapeutics. *Rasashastra*, an integral part of Ayurveda, exclusively deals with different types of metals, minerals, their origin, processing techniques, properties, therapeutic uses, possibilities of developing adverse effects and their management in a comprehensive way.

Metallic and mineral preparation in the form of Ash or *Bhasma* is popular among Ayurvedic physician, which are being used successfully for thousands of years.

These formulations had longer shelf-life and efficacy in smaller doses and known to have a broader therapeutic usage. *Bhasma* means ash, which is an inorganic preparation produced by metal or minerals which are eventually converted to the compounds such as carbonates and oxides. *Bhasmas* have gained popularity for their stability, availability, and safety^[1,2]. Modern medicine recognises the significant role of metallic and mineral formulations of the alternative medicine in the treatment of several diseases^[3]. Classics of *Rasashastra* exclusively deal with wide range of

Bhasmas, their therapeutic effects, and method of administration. *Tamra Bhasma* (incinerated copper), one among such *Bhasmas* is recommended for various ailments like ascites (*Udara*), anaemia (*Pandu*), bronchial asthma (*Svasa*), hyperacidity (*Amlapitta*), etc.^[4,5,6] In this commercial world, it is necessary to check superiority of *Bhasma*. Accordingly, practical knowledge is required to overcome lacuna therefore this study is planned.

Aim and objective

1. To study Purification of *Tamra*.
2. To study Purification of *Parada*.
3. To carry out Purification of *Gandhak*.
4. To prepare *Kajjali*
5. To prepare *Tamra Bhasma*.
6. To study its Physico-Chemical properties.

MATERIALS AND METHODS

The present study deals with exact procedures performed during the preparation of *Tamra Bhasma*. The whole topic of this thesis can be divided into following sub-headings

1.Preparation of *Tamra Bhasma*

2.To study its physico- chemical properties

Initially we discuss the first one. It consists of the following processes as,

Purification of *Parada*; Purification of *Gandhak*;

Preparation of *Kajjali*; Purification of *Tamra*

Incineration of *Tamra*

We shall now see each step-in detail

Purification of *Parada*^[7]

Lime powder and *Parada* was taken in the same *Khalwa yantra*. Trituration of both the substances was started. The mixture was triturated for a period of 3 days. Both the contents never mixed up together and be different contents. *Parada* was carefully separated from the lime powder using cotton cloth for filtration. Filtration was repeated twice. This filtered *Parada* was taken in a separate *Khalwa yantra*. Paste of *Rasona* and powder of *Saindhava* was added to it. The mixture was again triturated till the colour of the mixture turned to dark black. 12 hrs were required for the same. On full darkening, mercury was separated from the paste using Luke-warm water. Adding water and then removing it with the help of blotting paper was

continued till only mercury remained in the *Khalwa*. This *Parada* was finally washed with Luke-warm water thoroughly and *Parada* could dry in shade.

Parada initially taken –600 gm; Lime powder – 600gm; Amount of *Parada* obtained – 588;

Rasona kalka-588 gm; *Saindhava* powder – 294 gm;

Obtained mercury–580 gm

PURIFICATION OF GANDHAK^[8]

Type of Procedure: *Swedana*

Purpose: *Shodhana* of *Gandhaka*

Duration: 1 day

Equipments: Heating apparatus, mortar and pestle, steel vessels, spatula, sieve cloth, cloth.

Ingredients:

Ashuddha Gandhaka

Amul's cow milk

Amul's cow *Ghee*

Procedure: Amul's cow milk is boiled and left till warm *Ashuddha Gandhaka* is finely powdered and melted in Amul's cow *Ghee*. After complete melting it is sieved (through *Ghee* smeared filter cloth) into warm milk. Milk is discarded and *Gandhaka* washed thoroughly in hot water and dried. At the end *Gandhaka* was shade dried and weighted.

Precautions: Process should be conducted in *Mrudwagni* to avoid burning of *Gandhaka*. Sieve cloth should be smeared with *Ghee* while sieving the *Gandhaka* to avoid burning of *Gandhaka*. Sieve cloth should be smeared with *Ghee* while sieving the *Gandhaka* to avoid sticking of sulphur to the cloth. Milk should be lukewarm. *Gandhaka* after *Shodhana* should be thoroughly washed in hot water to get rid of the extra *Ghee* stuck to it.

***Gandhak* taken initially – 600 gm**

***Ghrita* – 600 gm**

Milk – 2400 ml

Obtained amount – 570 gm

Preparation of *Kajjali*^[9]

It also comes as a type of *Parada Bandha* used to control the *Parada* from elimination and used it for internal administration. We have selected the reference from *Rasaratnasamucchaya* for the preparation of *Kajjali* which says that, pure *Parada* and pure *Gandhaka* are taken in the *Khalwa yantra*. The mix-

ture is thoroughly triturated. The process of trituration is continued till the mixture turns into fine black powder.

Amount of Parada taken- 500 gm

Amount of Gandhaka taken - 500gm

Time of trituration- 18 Hrs

Kajjali obtained- 990 gms

Purification of Tamra: The actual process of purification of *Tamra* consists of two sub-processes as

- Simple purification
- Special purification

Rasaratnasamucchaya gives the reference for the simple *shodhana* of *Tamra*. It says that,

Simple purification^[10]: *Tamra patra* is heated on flame till it is converted to red hot stage. This *Tamra patra* is cooled into *Tila Taila*. *Taila* is rubbed and then the heating and cooling procedure is again repeated using different *Tila Taila*. This procedure is repeated 7 times with *Tila Taila*. On this completion, the *Tamra patra* are heated and cooled similarly with the sequence of *Takra*, *Gomutra*, *Kanji* and *Kulattha Kwatha*.

Tamra patra taken for purification –200 gm; *Tila Taila*– 2 ltr

Tamra patra after purification with *Tila Taila*– 194 gm; *Takra*– 2 ltr

Tamra patra after purification with *takra* – 190 gm; *Gomutra* – 2 ltr

Tamra patra after purification with *Gomutra* – 185 gm; *Kanji* – 2 ltr

Tamra patra after purification with *kanji* – 181; *Kulatthakwatha* – 2 ltr

Obtained *Tamra* after purification – 178gm

Special Purification (*Vishesha Shodhana* of *Tamra*)^[11]

Reference: R.R.S. 5/52

Type of Procedure: *Swedana*

Purpose: Preparation of *Tamra* For *Marana*

Duration: 4 hours (3 hours procedure + 1hour preparation)

Equipments: *Dola Yantra* consisting of *mrutpatra* with rod placed horizontal on the mouth of vessel suitable for suspending the cloth in which copper is wound.

Ingredients: *Samanya Shodhita Tamra*, *Gomutra*

Procedure: *Samanya Shodhita Tamra* is nicely wound in a cloth and suspended on a rod in *Dola Yantra* into the *Gomutra* kept inside *mrutpatra*, the whole thing kept on heating apparatus, *Swedana* of the *Samanya Shodhita Tamra* is done in *Dola Yantra* for 3 hours. Then the *Shodhita Tamra* taken out and dried in shade.

Precautions: *Gomutra* taken for process should be fresh. Whole process should be conducted under *Madhyamagni* temperature. *Tamra* wound in cloth should be completely dipped in *Gomutra* but should not touch the bottom, it should be freely suspended. As the level of *Gomutra* goes down during heating, new *Gomutra* should be added and level maintained.

- Initial weight – 178 gm
- Duration – 3 hours
- Quantity of *Gomutra* (*Swedana media*) – 5 lit
- Final weight – 173 gm
- Weight loss -5 gm

INCINERATION OF TAMRA^[12]: As per reference from *Rasaratnasamucchaya* for the process of incineration, Purified *Tamra patra* were taken for the process. *Kajjali* and *nimbu swaras* were mixed to form paste. This paste is applied to *Tamra Patra* uniformly, dried it and placed in *Sharav Samput*. The *Sharav Samput* was given 3 *Matkapad* which were also allowed to dry in shade. Then *Sharav Samput* was placed in *puta* to give heat. After self-cooling of *Sharav Samput* inside mixture and triturated to make a fine powder. *Bhasma Pariksha* was done but didn't get any proper result and so it was decided to do further *Putpaka Vidhi*. *Kajjali* and equal amount of powder received from *Sharav Samput* was taken and mixed with *Nimbu Swaras* to make *Chakrika*. *Chakrikas* were dried in shade and kept in *Sharav Samput*. This *Sharav Samput* is given 3 *Matkapad* which are also allowed to dry in shade. Then *Sharav Samput* was placed in *Puta* To give heat. After self-cooling, *Sharav Samput* was removed and mixture was triturated till a fine powder prepared. This process of trituration and *Putapaka* was repeated 8 times till *Tamra* powder converts into black color. Details about the exact process of *Tamra Marana* are summarized in the following table

Table 1: Ingredients for *Tamra Maran*

Putra	1 st	2 nd	3 th	4 th	5 th	6 th	7 th	8 th
<i>Kajjali taken</i>	50g	55 g	55g	50g	50g	50g	48g	48g
<i>Tamra taken</i>	50g	55g	50g	50g	50g	50	48g	48g
<i>Nimbuswaras</i>	50ml	55ml	55ml	50 ml	50 ml	50ml	48ml	48 ml
<i>Weight after puta</i>	55g	55 g	50g	50 g	50g	48g	50 g	48 g
<i>Bhas-ma pareek-sha</i>	-	-	-	<i>Varitaratva –ve</i> <i>Rekhapoomatva</i> <i>+ve</i>	<i>Varitaratva—</i> <i>ve</i>	<i>Varitaratva-</i> 80% passed	<i>Varitaratva-</i> 95% passed	<i>Unamap</i> positive Curd test +ve
<i>Test for genuinity of bhasma</i>							Curd test passed	

Tamra choorna taken initially –50gm

Kajjali required – 406 gm

Nimbuswaras required - 406 ml

Tamra Bhasma obtained - 48 gm

Tamra Bhasma thus obtained was then subjected for the following physico-chemical tests as,

1. Loss on Drying
2. PH
3. Acid insoluble ash
4. % of Mercury
5. % of Sulphur
6. Assay for Copper
7. Solubility in 0.1 N HCl
8. Solubility in Hexane
9. Solubility in Ether
10. Solubility in water
11. Bulk Density

All the tests were done at the laboratory Bhide Foundation, Pune.

Observations and Results

As described above, all the procedures were carried out and observations were kept for comparison. Details of observation are as follows: -

Purification of Parada: During the process, mercury and lime powder amalgam never found. The colour of lime powder turned to dusky white or greyish white after completion of trituration. *Rasonakalka* was converted to a dark black colour paste on continuous trituration. On washing it with Luke-warm water, much of the part of *Rasona* paste and *Saindhav* dissolved in water which made it easier to separate mercury from them. The shine of mercury increased considerably

after proper purification. Precaution was taken during the collection of mercury from the *Khalwa Yantra* to avoid any spillage.

Purification of Gandhak Heat was maintained on a low flame. *Gandhak* totally was converted into liquid state. Some amount of *Gandhak* lost on the cotton cloth during the process of filtration.

Preparation of Kajjali: The mixture very slowly gets assimilated into one another. Colour of *Gandhak* powder slowly started converting from yellow to ash colour. Gradually, Mercury also loses its liquid nature and completely assimilates with sulphur. At the end of this process, mercurial lustre disappears, and powder turns into dark black colour fine powder.

Purification of Tamra: *Tamra* plates were converted to dark red hot color by heating them. Hissing noise was getting whenever the plate was submerged into the said liquid submerging in oil was done carefully as oil can catches fire on heating. Colour of the plates turn from metallic red to dark black color. If *Takra* remains on the copper plates, next morning color of the plates is shiny blue like the neck of a peacock. Copper plates become brittle as the process of purification continues.

Incineration of Tamra: After every puta copper powder was tested for *Rekhapurnatva*, *Varitaratva* and *Nishkalankatva* which showed the following observations:

Table 2: Classical Parameters of *Tamra Bhasma*

	<i>Rekhapurnatva</i>	<i>Varitaratva</i>	<i>Nishkalank</i>
1 st	--	--	--
2 nd	--	--	--
3 rd	--	--	--

4 th	+	--	--
5 th	+	--	--
6 th	+	+	-
7 th	+	+	-
8 th	+	+	+

As described earlier, *TamraBhasma* after its completion was sent for its physico-chemical analysis to la-

boratory Bhide foundation Pune. It gave the following results.

Table 3: Physico-Chemical Parameters of *Tamra Bhasma*

Parameters	<i>TamraBhasma</i>
1. Loss on Drying	1.14%
2. pH	6.76
3. Acid insoluble ash	1.12%
4. % of Mercury	10.9%
5. % of Sulfur	1.5%
6. Assay for Copper	61.48%
7. Solubility in 0.1 N HCl	92.34%
8. Solubility in Hexane	0.27%
9. Solubility in Ether	0.14%
10. Solubility in water	1.33%
11. Bulk Density	6.288 gm/cc

DISCUSSION

Parad Shodhana- For *Parad Shodhan* lime, *Rasona Kalka* and *saindhava* were used. Lime is a white, slightly with 2572°C and 2850°C melting point and boiling point respectively. It is a widely used chemical compound. It is a white, caustic and alkaline crystalline solid. As a commercial product, lime often contains magnesium oxide, silicon oxide and smaller amounts of aluminium oxide and iron oxide. Lime is used in glass production and its ability to react with silicates is used in modern metal production industries to remove impurities as slug. This may be the property, which lime exhibits when it is triturated with mercury for the first 3 days during the *Samanya Shodhana* process. *Rasonakalka* is from Liliaceae family. It has a characteristic pungent, spicy flavour that mellows and sweetens considerably with cooking. The scientist simmer found that garlic contains and acid volatile oil, which is its active principle. This oil decomposes under 16 mm pressure into 4 fractions. Fraction 1 consists of allyl propyl disulphide which is pungent in odour and gives voluminous precipitate with mercury. Thus, this may be the action which our *Mardana* pro-

cess exhibits while trituration of mercury with *Rasona kalka*. As said earlier, mercuric salts are more poisonous than mercurous salts. Thus, *Rasona* helps us to free mercury from these hazardous salts.

The nutritional value of garlic is very high as it contains Thiamin (B1), Riboflavin (B2), Niacin (B3), Pantothenic acid (B5), Folate and vitamin C. All these substances are good antioxidants which helps to check oxidation reactions in the body. Garlic was chosen for purification because it prevents heart diseases including atherosclerosis, high blood pressure, high blood cholesterol. Thus, it would naturally enhance the activity of *Tamra Bhasma*. Garlic also has the vaso-dilative effect which is possibly caused by catabolism of garlic derived polysulphides to H₂S in RBC. Garlic also reduces platelet aggregation and hyperlipidaemia. It can also help in thinning of blood like the effect of aspirin.

Saindhava is a white crystalline solid with a melting point of 775°C and solubility of 34 gm per 100 cm³ of water at room temperature. In its pure state, it is odourless. The colour varies from pink to white depending upon mining and recovery process used. KCl

is the major content of *Saindhava* along with NaCl, Na₂CO₃ as well as some silicates. Potassium is more electro-positive than sodium and hence easily reduces a metal content i.e. separates other impurities. This may be the property used by ancient texts to purify *Parada* using *Saindhava*. It can be used as a salt substitute for food but due to its weak flavour, it is usually mixed with common salt to improve the taste. Medically it is used in the treatment of Hypokalemaia, in digitalis poisoning and as an electrolyte replisher. However, an excess dose of *Saindhava* may cause a few side-effects as gastric discomfort including nausea, vomiting, diarrhoea and seldom bleeding from the digestive tract. KCl, which is the main content of *Saindhava*, in very high doses, can cause cardiac death and rapid death.

Gandhak Shodhana - During the *Shodhana* process of *Gandhak*, *Shila Churna* and *Visha* are said to be separated from the same. The *Shila Churna* is separated during filtering it through the cotton cloth while *Visha* is said to be removed with the help of cow milk and Clarified butter. The sulphur obtained by this process is pure as compare to pure sulphur available.

Tamra– Samanya and Vishesh Shodhana-

Considering the *Samanya Shodhana* of *Tamra*, one can make out that *Dravyas* like *Tila Taila*, *Takra*, *Gomutra*, *Kanji* and *Kulattha Kwatha* have been used. *Shodhan Dravyas* not only reduce the harmful properties of a substance but also increase or enhance the activity of useful properties already present in the same. *Tamra* when used in its impure form, vitiates *Vata* and *Pitta Dosha* among the body. *Tila Taila* is the best remedy for vitiated *vatadosha*. Also, external impurities which may be fat soluble are initially removed by immersing hot copper plates in the same. *Tamra Dhatu* can be purified using *Amla Rasa*. The *Amla Rasa* here not only indicates taste but also pH as well. Considering *Dravyas* like *Takra*, *Gomutra* and *Kanji*, all have sour taste as well as all are acidic in nature. These substances act as external cleansing agents like *Nimbu swarasa* which is often used for purification of

Shankh, *kapardika* many a times. This will help in quick purification of *Tamra*. *Kulattha* is a substance

which is contra-indicated during the administration period of *Shilajeet* and is advisable for the patients with urinary calculi. The reason is it causes disintegration of silicates and crystals present in the same. This property may be used in the ancient Indian alchemy for the purification of copper. *Kulattha* as per modern science, is astringent, diuretic. These properties also point towards its used as a detoxifying agent for *Tamra Dhatu*. *Gomutra* used again during the *Vishesh Shodhan* of *Tamra* again due to their scrapping nature may be useful in getting rid of the external impurities of copper and making it purer. This process also helps in making *Tamra* more brittle, which further helps in its incineration as well. The *Marana* of *Tamra* has been done using *Kajjali* as the media *Marana* done with the help of *Parada* is the superior amongst all the processes of incineration. Therefore, it is used to obtain the highest quality *Tamra Bhasma* is made.

CONCLUSION

In *Tamra Bhasma Rekhapurnatva* occurs after 4 *puta*. *Varitaratva* occurs after 6 *Putra*. *Nishkalank pariksha* obtained after 8 *Putra*. All the classical parameters for the *Bhasma* have scientific background. Curd test is the simpler chemical method to check the genuineness of *Tamra Bhasma*. Chemically *Tamra Bhasma* is the sulphide form of copper (CuS) containing more amount of copper than sulphur along with other elements in traces. The observations in this study could be specified as the quality control parameters for *Tamra Bhasma* conforming to all the classical tests under the *Bhasma Pariksha*.

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