



Research Article

PHARMACEUTICAL PREPARATION OF TAMRA BHASMA

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ABSTRACT

Bhasma occupy the highest attention and have got a very unique place because of their small doses, tastelessness, quick action, easy absorption and also their prolonged shelf life, wide range of therapeutic efficacy and better rejuvenating (*Rasayana*) effects. Metals and minerals are integral part of therapeutics in Ayurveda and *Tamra* is one of such metals which if properly processed and detoxified is useful in many diseases. But if not processed properly it shows many ill effects called *Ashtmaha Dosh*. In the present study *Tamra Bhasma* was prepared by using *Tamra Patra*. This study included procedures like *Shodhana*, *Marana*, *Amrutikarana* as per classical texts. 380gm of raw *Tamra Patra* were taken. *Samanya* and *Vishesha Shodhana* were done as per reference of *Rasa Ratna Samuchya*. After complete *Shodhana*, total 350gm *Shudha Tamra* was obtained. Loss in weight after *Shodhana* may be due to loss in impurities present in raw *Tamra*. Total 21 *Putra* were given in the electrical muffle furnace to prepare *Tamra Bhasma*. Specific temperature pattern was adopted for *Putra* in the electrical muffle furnace. Total 300gm of *Tamra Bhasma* was obtained. After each *Putra* there was significant loss in weight of *Tamra* may be due to loss in hardness and impurities. *Marana* was followed by *Amrutikarana* and net weight of *Tamra Bhasma* obtained was 330gm. 30gm weight gain may be due to the organic material used for the *Amrutikarana* process. Color of *Bhasma* became black after *Amrutikarana*.

KEYWORDS: *Tamra Bhasma*, *Amrutikarana*, *Shodhana*, *Marana*.

INTRODUCTION

Rasa Shastra and *Bhaishajya Kalpana* covers the whole spectrum of Pharmaceutical Sciences and describes in detail the practical methods to convert raw drugs (herbal, mineral, animal origin, metals.etc.) into absorbable and therapeutically useful forms. It not only includes the drug manufacturing but also includes dispensing it to the patient in the most suitable form to attain maximum benefits. *Rasa Shastra* is the branch of Ayurveda, which deals with different types of *Kalpana* like *Bhasma*, *Pishti*, *Pottali*, *Kupi-pakwa* etc. "*Rasa Shastra*" the word itself indicating, the science chiefly dealing with *Rasa (Parada)* and many other minerals, metals, gems, silica, herbal poisonous and aquatic origin substances which got its establishment in the medieval period when people felt its requirement due to the changing life style which gave rise to many diseases. *Bhasma* is claimed to be biologically produced nano-particles as it is the concept of reduction in particle size of metal or mineral by treating them with herbal juices (*Swarasa*) or decoction (*Kwatha*) and exposing for certain quantum of heat as per *Putra* mentioned in

classical texts. Metallic *Bhasma* are highly valued in Ayurvedic treatment as they have good preventive, curative and rejuvenating potential due to rapid dissolution, quick bioavailability, low dose requirement and easy palatability.^[1] Ancient scholars of *Rasa Shastra* were aware of the fact that metals and minerals may produce some toxic effects on the human body, when administered as such. Hence, they evolved various suitable and systematic processes like *Shodhana*, *Jarana*, *Marana* and *Amrutikarana* so that these drugs could be made more useful and therapeutically more safe and effective. The metal *Tamra* mentioned in Ayurveda with a wide range of therapeutic utilities *Tamra Bhasma* is having *Ushna veerya* and *Lekhana*^[2] (scraping) properties and it is widely used in treatment of *Kushtha*, *Pandu*, *Sthaulya*, *Yakrit vikara*^[3] etc. But if it is not processed properly, it shows various ill effects in the body which are mentioned as *Ashta-mahadosha*^[4] in our classical texts. In the present study the classical method of *Tamra Bhasma* preparation was adopted and

different pharmaceutical procedures were compiled which were done for the *Bhasmikiranana* of *Tamra*.

Material and Methods

The present study was carried out in the PG Department of *Rasa Shastra* and *Bhaishajya Kalpana* of R.G.G.P.G. Ayurvedic College, Paprola, Himachal Pradesh. *Tamra patra* were procured from the local market of Paprola with 99.5% purity as per API monographs. *Tamra Shodhana* mentioned in texts as follows:

Samanya Shodhana of *Tamra*

Samanya Shodhana of *Tamra* was done as per reference of *Rasaratanasamuchya*^[5] with the principle of *Nirvapa*.^[6] 380g impure *Tamra Patra* were taken in long handled iron ladle and subjected to heat on L.P.G. furnace till it become red hot and quenched in the *Tila Taila*. After cooling *Tamra* was taken out from the vessel and same process was repeated for 6 times. The process of heating and quenching was repeated with *Takra*, *Gomutra*, *Kaanji* and *Kulattha Kwatha* in sequential order. Every time the fresh and gravimetrically equal amount of *Shodhana Dravya* was taken as that of *Tamra*. Weight of *Tamra*, weight and volume of media was recorded with each step of procedure. All the data was recorded in the pharmaceutical proforma.

Vishesha shodhana of *Samanya Shodhita Tamra*

Vishesha Shodhana of *Tamra* was done as per reference of *Rasaratanasamuchya*^[7] with the principle of *Nirvapa*. *Vishesha Shodhana* of *Tamra* was done in *Nirgundi Swarasa*. The *Samanya Shodhita Tamra* was taken and coated with the paste of *Nimbu swarasa* and *Saindhava lavana* and dried in sunlight. *Tamra* was now placed in iron ladle and heated on L.P.G. furnace up to red hot and quenched in *Nirgundi swarasa*. After cooling *Tamra* was taken out from the vessel. This process was repeated for 8 times. Every time fresh, gravimetrically same amount of *Nirgundi swarasa* was taken.

Parada Shodhana

The *Shodhana* of *Parada* was carried out as per reference of *Rasa Tarangini*^[8] with the principle of *Maradana*. *Parada shodhana* was done in two steps:

Step 1

500g of *Ashuddha Parada* and 500g Lime powder were taken (*Samguna*) and their trituration was started in *Khalva Yantra* for three days. Then as mentioned in texts it was squeezed through double folded piece of cotton cloth to obtain *Parada*. Now the lime powder was washed with water and left for overnight. Next morning *Parada* was collected from the base of the container.

Step 2

Now obtained *Parada* from the above step was taken and put into the *Khalva Yantra*. Equal amount of *Lashuna Kalka* and *Saindhava lavana* in half the amount were added to it. Then *Mardana* was done until the mixture appeared black in colour. Now this mixture was washed and decantate with the help of warm water for several times to get clear *Parada*. Lustre of *Parada* was increased after complete *Shodhana*.

Gandhaka Shodhana

Gandhaka Shodhana was done as per reference of *Rasamritama*^[9] with the principle of *dhalana*.^[10] It was done in three phases:

500gm of *Ashudha Gandhaka* was taken and then it was disintegrated into very small pieces. Hot *Godugdha* (2lit.) was poured in a stainless steel vessel and a piece of cotton cloth was tied over the mouth of steel vessel containing hot *Godugdha*. *Darvi* was taken and heated over LPG stove. Now *Goghrita* (100g) was taken into it. When *Goghrita* melted completely, it was smeared all over the surface of *Darvi*. Now powdered *Gandhaka* was taken into *Darvi* and allowed to melt. When *Gandhaka* was completely melted, it was poured into *Godugdha* through the cloth. *Gandhaka* was washed with *Godugdha* and taken out. Then it was washed again with hot water and allowed to dry in sunlight. After drying, *Gandhaka* was weighed. The same process was done for three times.

Preparation of *Kajjali*

Kajjali was prepared as per reference of *Rasa Tarangini*^[11] with the principle of *Maradana*. In a *Khalvayantra*, equal amount of *Shuddha Parada* (385g) and *Shuddha Gandhaka* (385g) were taken and trituration was started. During trituration, few drops of water were sprinkled over the powder to prevent it from spilling and dusting. Trituration was continued till the powder became black in colour and very fine like *Kajala* and it fulfilled all the criteria of *Kajjali*.

Marana of *Shuddha Tamra*

- Tamra Bhasma* was prepared as per reference of *Rasaratanasamuchya*^[12] with the principle of *bhavana*^[13] and *marana*.^[14] The weighed amount of *Shudha Tamra* powder to be calcined was taken in a clean mortar. Then 1/4th *Kajjali* to the amount of *Tamra* was mixed with *Tamra* and levigated well by adding sufficient quantity of *Nimbu Swarasa* with proper, constant pressure and frequency.
- After levigating for about six hours, as the paste became tough in consistency due to loss of moisture, it was transferred to a stainless steel plate and spread uniformly on it with the help of

stainless steel knife. Then the *Chakrika* (small pellets) of uniform size and thickness were made with the help of knife and kept for drying in sunlight.

3. After complete drying, these *Chakrika* were kept inside a *Sharava* and another *Sharava* was kept inverted over it. Then *Kapadmitti* was done with mud (*Gachanimitti*) smeared cloth so as to seal away any visible opening or gap between the two earthen plates and these *Sharva Samputa* were dried in sunlight.
 4. After drying, the *Sharava Samputa* were placed in an Electric Muffle Furnace at the specified temperature which was maintained for 60 minutes.
 5. The whole process was repeated three times and checked for all the tests of *Bhasma Pareeksha* such as *Varitarta*^[15], *Rekha-poornata*^[16], *Nirutha*^[17], *Amla pareeksha*^[18] etc. The material could not pass these tests. Moreover, in *Amla Pareeksha*, greenish blue coloration was observed within 30 minutes. Hence, it was inferred that further *Putra* treatment is necessary.
- First two *Putra* were given at temperature of 600°C. After second *Putra*, *Chakrika* became too hard so in the next *Putra* temperature was decreased. Next all *Putra* were given at temperature of 500°C. After each *Putra*, the EMF

was switched off and allowed to self cool. After the *Putra* became *Swangasheeta*, the earthen plates were removed and opened cautiously. The material kept between them was weighed and other observations like colour, taste, odour etc. were recorded. This whole process was repeated for 21 times using the end product of previous *Putra*. All the tests of *Bhasma Pareeksha* mentioned in classical texts were performed after each *Putra*. Almost all tests were positive after 19st *Putra* except color of *Bhasma*. Then *Bhasma* was passed through 200no. sieve but it didn't passed through sieve 100 percent. Further two more *Putra* were given and *Bhasma* was again passed through 200 no sieve. It passed completely through the sieve. But the colour of *Tamra bhasma* was still dark brown even after 21st *Putra*.

Amrutikarana of Tamra Bhasma

Amrutikarana of *Tamra Bhasma* was carried out as per reference of *Rasatarangini*.^[19] *Tamra bhasma* was taken in *Khalva Yantra* and *Mardana* was done with ½ part *Shudha Gandhaka* and *Panchamruta* until the required consistency was obtained. *Chakrika* were dried in shade, *Samputa* was done and subjected to heat at 600°C in E.m.f. After *Swangasheeta* the drug was removed out from the *Sharava* which was finely powdered and same process was done for three times.

Results

Table 1: Showing Result of Tamra Samanya shodhana in Tila taila

Observations	Tamra	Tila Taila
Initial weight	380g	7L
Final weight	374.5g	6.5L
Weight loss	5.5g	500ml
Changes during Process	Some <i>Tamra Patra</i> reduced to powder form, Blackish discolouration of <i>Tamra</i>	Colour of the <i>Tila Taila</i> changed to dirty red.

Table 2: Showing Result of Tamra Samanya shodhana in Takra

Observations	Tamra	Takra
Initial weight	374.5g	7L
Final weight	369g	6.8L
Weight loss	5.5g	200ml
Changes during Process	Again some <i>Tamra Patra</i> reduced to powder form, The powdered <i>Tamra</i> became grayish in colour	Grayish tinge

Table 3: Showing Result of Tamra Samanya shodhana in Gomutra

Observations	Tamra	Gomutra
Initial weight	369g	7L
Final weight	364.7g	6.7L
Weight loss	4.3g	300ml
Changes during Process	Shining reduced and became brittle	Turned to Rusty brown

Table 4: Showing Result of Tamra Samanya shodhana in Kaanji

Observations	Tamra	Kanji
Initial weight	364.7g	7L
Final weight	358.3g	6.6L
Weight loss	6.4g	400ml
Changes during Process	Maximum Tamra patra got powdered	Black discolouration with less Amla gandha

Table 5: Showing Result of Tamra Samanya shodhana in Kulattha kwatha

Observations	Tamra	Kulattha kwatha
Initial weight	358.3g	7L
Final weight	354.7g	6.5L
Weight loss	3.6g	500ml
Changes during Process	Brittle and powdered, Colour of Tamra was grayish brown	Dark brown

Table 6: Showing Result of Tamra Vishesh Shodhana

Observations	Tamra	Nirgundi swarasa
Initial weight	354.7g	8L
Final weight	350g	7.5L
Weight loss	4.7g	500ml
Changes during Process	Tamra patra completely converted into powder form Colour of the Tamra powder was gray	Swarasa became slightly blackish in colour

Table 7: Showing Observations and Result after complete Shodhana of Tamra:

Initial Weight	Final Weight	Weight Loss	Percentage of Weight Loss	Changes during Process
380 gm	350 gm	30gm	7.90%	Tamra patra completely converted into powder form, Colour of Tamra powder changed to gray

Table 8: Showing the Result of 1st step of Parada Shodhana

Ingredients	Amount
Ashudha Parada	500g
Lime powder	500g
Obtained Parada	410g
Percentage of Parada obtained	82%
Loss of Parada	90g
Percentage of loss of Parada	18%

Table 9: Showing Result of 2nd step of Parada shodhana

Lime Shodhita Parada	410gm
Lashun Kalka	410gm
Saindhav Lavana	205gm
Obtained Parada	385gm
Percentage of obtained Parada	93.9%
Loss of Parada	25gm
Percentage loss of Parada	6.1%

Table 10: Showing Final product obtained from whole procedure

Sr. no.	Amount of <i>ashuddha Parada</i>	Obtained amount of <i>Shuddha Parada</i>	% of final yield of <i>Parada</i>	Loss of <i>Parada</i>	% of loss of <i>Parada</i>	Observations
1	500 gm	385 gm	77%	115 gm	23%	Lustre of <i>Parada</i> was increased

Table 11: Showing Result of 1st phase of *Gandhaka Shodhana*

<i>Ashudha gandhaka</i>	500gm
Weight after <i>Shodhana</i>	495gm
Percentage of obtained <i>Shudha Gandhaka</i>	99%
Weight loss	5gm
Percentage of weight loss	1%
Description	Granular form
Touch	Slightly smooth

Table 12: Showing Result of 2nd phase of *Gandhaka Shodhana*

<i>Ashudha Gandhaka</i>	495gm
Weight after <i>Shodhana</i>	492gm
Percentage of obtained <i>Shudha Gandhaka</i>	99.3%
Wt loss	3gm
Percentage of wt.loss	0.7%
Description	Granular form
Touch	Slightly smooth

Table 13: Showing Result of 3rd phase of *Gandhaka Shodhana*

<i>Shudha Gandhaka</i>	492gm
Weight after <i>Shodhana</i>	490gm
Percentage of obtained <i>Shudha Gandhaka</i>	98%
Wt. loss	2gm
Percentage of wt.loss	2%
Description	Course powder
Touch	Smooth

Table 14: Showing obtained final product of whole procedure

<i>Ashuddha Gandhaka</i> (g)	Weight after <i>Shodhana</i> (g)	% of obtained <i>Shuddha Gandhaka</i>	Wt. loss (g)	% of wt. loss	Description	Touch
500g	490g	98%	10g	2%	Course powder	Smooth

Table 15: Showing result of *Kajjali* Preparation

Amount of <i>Kajjali</i> obtained	728.4gm
% of obtained <i>Kajjali</i>	94.5%
Net loss	41.6gm
% of weight loss	5.5%
Colour	Black
Touch	Very soft and smooth

Table 16: Showing Quantitative Observations during process of preparation of Tamra Bhasma

No. of Puta	Weight of Tamra (gm)		Weight of Kajjali added (gm)	Amt. of Nimbu swarasa added (ml)	Duration of Lavigation (hrs.)	Max.temp of Puta (0c)	Wt. loss/ gain of Tama
	Before Puta	After Puta					
1.	497	383.5	88	180	6	600	+33.5
2.	485	358.7	14	180	6	600	-24.8
3.	429.8	350.1	14	180	6	500	-8.6
4.	423.5	339.6	14	180	6	500	-10.5
5.	421.3	330	14	180	6	500	-6.6
6.	411	328.5	14	180	6	500	-4.5
7.	410.3	324.9	14	180	6	500	-3.6
8.	405.2	320.8	14	180	6	500	-4.1
9.	404.4	318.7	14	180	6	500	-2.1
10.	403.5	318	14	180	6	500	-0.7
11.	403.6	315.8	14	180	6	500	-4.2
12.	400	311.5	14	150	6	500	-4.3
13.	390.8	305.8	14	150	6	500	-5.7
14.	386	304.2	14	150	6	500	-1.6
15.	380.3	302.1	14	150	6	500	-2.1
16.	370.6	300.4	14	150	6	500	-1.7
17.	370	300.3	14	150	6	500	-0.1
18.	365.9	300.3	14	150	6	500	0
19.	364.6	300.3	14	150	6	500	0
20.	350.8	300	14	150	6	500	-.3
21.	310	300	14	150	6	500	0

Table: 17 Showing Qualitative Observations during process of preparation of Tamra Bhasma

No. of Puta	Parameters					
	Color	Odor	Nishchandra pariksha	Rekha-puranata	Varitarata	Amla Pareeksha
1 st	Greenish Black	Odorless	Negative	Negative	Negative	Positive
2 nd	Brown Black	Odorless	Negative	Negative	Negative	Positive
3 rd	Red Black	Odorless	Negative	Negative	Negative	Positive
4 th	Greenish Yellow	Odorless	Negative	Negative	Negative	Positive
5 th	Greenish Black	Odorless	Negative	Negative	Negative	Positive
6 th	Greenish Black	Odorless	Negative	Negative	Negative	Positive
7 th	Greenish Black	Odorless	Negative	Positive	10%	Positive
8 th	Brown Black	Odorless	Positive	Positive	30%	Positive
9 th	Brown	Odorless	Positive	Positive	40%	Positive
10 th	Brownish Black	Odorless	Positive	Positive	40%	Positive
11 th	Blackish Brown	Odorless	Positive	Positive	50%	Positive
12 th	Reddish Brown	Odorless	Positive	Positive	50%	Positive
13 th	Reddish Brown	Odorless	Positive	Positive	60%	Positive
14 th	Black	Odorless	Positive	Positive	60%	Positive
15 th	Black	Odorless	Positive	Positive	60%	Negative
16 th	Grayish Brown	Odorless	Positive	Positive	70%	Negative
17 th	Grayish Brown	Odorless	Positive	Positive	70%	Negative

18 th	Grayish Brown	Odorless	Positive	Positive	80%	Negative
19 th	Grayish Brown	Odorless	Positive	Positive	100%	Negative
20 th	Brownish Black	Odorless	Positive	Positive	100%	Negative
21 st	Dark brown	Odorless	Positive	Positive	100%	Negative

Table 18: Showing the Result of Amrutikarana:

Weight of <i>Bhasma</i> before <i>amrutikarana</i>	300gm
Weight of <i>Bhasma</i> obtained after <i>amrutikarana</i>	330gm
Total weight gain after <i>amrutikarana</i>	30gm
Colour of the <i>Bhasma</i>	Black
Odour	Odorless
Taste of <i>Bhasma</i>	Tasteless

DISCUSSION

Samanya Shodhana of Tamra

380gm of *Ashudha Tamra* was heated to red hot state and quenched for 7 times in each liquid media respectively as mentioned above. Instant quenching is important because repeated immediate cooling after heating leads to breaking of the material. During *Shodhana*, colour of *Tamra* became grayish brown. This may be because of the fact that during red hot state, *Tamra* reacts with atmospheric oxygen. The heating and quenching in these basic and acidic liquid media used for quenching lead to corrosive changes in the metal and may cause removal of acid and alkali soluble impurities from the metal. After complete *Samanya Shodhana*, the weight of *Tamra* was 354.7gm.

Vishesh Shodhana of Tamra

After *Vishesh Shodhana* the weight of *Tamra* was 350gm.

After complete *Shodhana* process, the total weight loss was 30gm i.e. 7.90%. Decrease in the weight of *Tamra* may be due to removal of some impurities present in the *Tamra* and handling loss.

Parada Shodhana

385g of *Shuddha Parada* was obtained from 500 gm of *Ashudha parada* with the yield of 77%. The colour of lime powder turned to dark gray. It may be due to presence of impurities present in *Parada*. The colour of *Lashuna Kalka* turned to black. It may be due to reaction of mercury with sulphur present in *Lashuna*. Weight loss of *Parada* may be due to its *Chanchala guna* and its five *Gati* mentioned in the classical texts. The shining of *Parada* increased after *Shodhana*.

Gandhaka Shodhana

After completion of *Shodhana*, 490gm of *Gandhaka* was obtained from 500gm of *Ashudha Gandhaka* with 2% loss. Each time, fresh *Godugdha* was taken to facilitate detoxification of *Gandhaka*. Some water soluble and fat soluble impurities were washed away with *Godugdha*. Some physical impurities were found on cotton cloth. During

washing with hot water some *Gandhaka* was lost. Some of *Gandhaka* remained adhered to cotton cloth and *Darvi*. These are the possible reasons of decrease in weight of *Gandhaka* after *Shodhana*. Continuous stirring was done while pouring molten *Gandhaka* into *Godugdha*. *Godugdha* facilitated the granulation of molten *Gandhaka* by virtue of maximum exposure of molten *Gandhaka* with *Godugdha*. *Goghrita* and *Godugdha* were used because both are *Sheeta Veerya* so they may reduce the *Tikshna Guna* of *Gandhaka*.

Preparation of Kajjali

Samaguna Kajjali was prepared taking 385gm of *Shuddha Parada* and 385gm *Shuddha Gandhaka*. It took 80 hours to prepare *Kajjali*. 728.4g *Kajjali* was prepared with 5.5% loss. Loss in weight may be due to handling of the material. All tests of *Kajjali* formation mentioned in texts were done. *Nishchandrata* and *Rekhapurnata* show that there may be no free mercury. Black colour of *kajjali* indicates the *Pot Bandha* mentioned in the texts.

Marana of Shuddha Tamra

After 8th *Putra*, *Rekhapurnata* was positive and *varitarta* was 10% positive. After 15th *Putra* *Amla Pareeksha* was negative and *Bhasma* was 60% *Vaitara*. After 19th *Putra*, *Bhasma* was 100% *Vaitara*. So it indicates that after each *Putra* particle size reduces. Cracks were seen on earthen surface may be due to increased pressure of vapours of mercury and sulphur inside the *Sharava Samputa* and pungent odour of sulphurdioxide (SO₂) was smelt. *Bhasma* was tasteless having dark brown colour. 300g of *Tamra Bhasma* was obtained from 350g of *Shuddha Tamra*. During *Marana* process decrease in weight was observed which can be due to handling loss occurring in preparation of pellets and repeated testing for *Bhasma Pariksha* at various stages.

Amrutikarana of Tamra Bhasma

After *Amrutikarana*, 30gm weight gain was found. It may be due to the organic material used for the *Amrutikarana* process. A whitish black layer was seen on the pellets after incineration. It may be the

burnt organic material of the *Panchamruta*. After the *Amrutikarana* process *Bhasma* was again subjected to all the tests and it clearly passed through all the tests. Colour of *Bhasma* changed to black. By process of *Amrutikarana*, *Bhasma* became free from toxic effects.

CONCLUSION

With the above study it can be concluded that the adopted classical method can be considered easy and convenient. *Shuddha Tamra* required minimum 21 *Putra* to be transformed into *Varitara*, *Rekhapurna*, *Nishchandra*, *Apunabhava* and *Niruttha Bhasma* using *Nimbu Swarasa* as levigation media. *Nirvapa* is one of the best method of *Shodhana* for minerals and metals which are hard in nature. The exact black colour of *Tamra bhasma* was found after *Amrutikarana*. Increase in the *Varitarata* after each *puta* indicated that there was reduction in the size of particles on heating subsequently after each *Putra*.

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