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PREPARATION AND ANALYTICAL STUDY OF *TAMRA BHASMA*.

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ABSTRACT

Metallic *Bhasmas* are highly valued and have their own importance in *Ayurvedic* formulations. *Tamra Bhasma* with its different properties used in the treatment of various diseases is quite famous among *Ayurvedic* physicians. Though several methods of preparation of *Tamra Bhasma* are found in *Rasashastra* classics, several difficulties occur during the preparation of good quality *Bhasma*. In this study, *Tamra Bhasma* was prepared and analytically studied. Each procedure was considered as an independent processing and an attempt was made to validate each procedure. Wires used for the purpose of electrical earthing were taken for the preparation of *Bhasma*. Procedures of *Shodhana, Marana,* and *Amrutikarana* were followed as per the classical references. A specific temperature pattern was adopted for *Puta*. *Bhasma Pariksha* was done as per *Ayurvedic* as well as Modern Parameters.

KEY-WORDS- *Shodhana, Marana, Amrutikarana, Bhasma Pariksha.*

INTRODUCTION-

Ayurveda is a holistic system of medical science and is the oldest healing science which is almost 5000 years old. *Ayurveda* contains two *Sanskrit* words: *Ayu* which means life and *Veda* mean knowledge. Thus, *Ayurveda* means the science of life.

Rasaushadhis are a treasure of *Ayurveda* due to their quicker action, lesser dose, tastelessness, prolonged shelf period, and better palatability. [1] *Rasaushadhis* have the potential to cure the disease as well as rejuvenate the body. The aim of *Ayurveda* is not only to maintain a person's health but also to cure a diseased person to regain health. [2] For maintaining the health of people, *Rasayana Dravya* plays an important role for it and all the metallic *bhasmas* are *Rasayana* in nature. *Tamra Bhasma* (incinerated copper) is important among the metallic *Bhasmas* used for the treatment of many diseases. [3] Though a number of methods of *Tamra Bhasma* preparation are described in *Rasa* literature; its preparation has always been a practical problem. Moreover, improperly prepared (*Apakwa*) *Tamra Bhasma* has been quoted as poison or more than a poison, because of its hazardous effects on the body. To indicate its toxic potential, *Ayurveda Prakasha* has quoted *Ashtamahadoshas* [4] (eight major ill effects). Therefore, it is extremely important to prepare *Tamra Bhasma* of good quality by following the classical procedures, which include *Shodhana*, *Marana*, and *Amritikarana*.

The quality of any medicinal preparation is depending upon Raw drug selection as per classical guidelines, in-process quality control, and final product standards. Present-day demand for *Ayurvedic* formulations has been raised globally due to increased response toward *Ayurveda*. Hence, the commercialization of *Ayurvedic* drug manufacturing has taken place. Therefore, certain things like standardization, quality control, and safety became essential requirements for *Ayurvedic* formulations. It is the need of the time to present, understand and implement these things into *Ayurvedic* formulations more accurately for the globalization of *Ayurveda*. So, this study is an attempt to establish some standards for *Rasamarita Tamra Bhasma*.

MATERIAL AND METHODS-

The present study was carried out in the PG Department of Rasashastra and Bhaishajya Kalpana of Government Ayurved College, Osmanabad, Maharashtra. *Tamra* wires and other raw drugs for *shodhana* and *Marana* purposes were procured from the local market.

- **Material-** These are various instruments *(yantra)* are used in the *Shodhana* procedure, *Tamra Marana*.

Table no. 1 shows- *Yantra* are used in this study-

Sr. no.	Name of *Yantra*	Description of *Yantra*	Used for-
1	***Khalva yantra*** *(Prakar- Pashana khalva yantra)*	Dimension- 16x10x10(lbh) *angula*, 7 *angula* deep, 2 feet thick, pestle-12 *angula.*	*Parada Shodhana &Tamra marana*
2	***Dolayantra***	A thick mud pot having height 25 cm, upper diameter 15 cm & middle dimeter 30 cm.	*Tamra Vishesha Shodhana.*
3	**Gas burner**	HP Gas Cylinder & Surya Gas burner.	*Tamra* heating to red hot, *Gandhaka Shodhana*, Tamra Vishesha Shodhana.

- **Methodology-** The whole procedure of study is divided into two parts-

a. Preparation of Tamra bhasma-

Preparation of Tamra bhasma consists of the following steps-

➢ ***Samanya shodhana* of *Tamra*-(Reference- R.R.S. 5/29) [5]**

The *Tamra* wire was heated to red hot directly on LPG gas flame and quenched immediately in the *Tila Taila*. After cooling, *Tamra* was taken out from the vessel, again heated on LPG gas flame and quenched. The process was repeated for 7 times in *Tila Taila*. The same procedure was done with Takra, *Gomutra, Kanji, and Kulattha Kwatha* respectively.

➢ ***Vishesha shodhana* of *Tamra*-(Reference- R.T. 17/14) [6]**

Vishesha Shodhana was carried out by Swedana procedure *in Saindhava* mixed *kanji* with the help of *Dolayantra* for 12 hours. After 12 hrs of heating, *Pottali* was allowed to cool for self -cooling. Then *Pottali* was removed from *Dolayantra*. It was then washed with warm water and dried for 6-8 hours. After complete drying the *Shuddha Tamra* was collected.

➢ ***Shodhana* of *Parada*-(Reference- R.T. 5/27) [7]**

The *Shodhana* of *Parada* was carried out with the principle of *Mardana*. *Parada shodhana* was done in two steps:

Ashuddha Parada and *Sudharaja* (Lime powder) were taken (Samguna) and their trituration was started in *Khalva Yantra* for six days. It was then stained with thin cotton cloth. It was then triturated with equal amount of *Rasona Kalka* and *Saindhava lavana* until the mixture appeared black in colour. Then this mixture was washed with warm water and decantated several times to obtain clear *Parada*. It was then dried in sunlight to evaporate remaining water.

➢ ***Gandhaka Shodhana*- (Reference- Rasayansar) [8]**

Gandhaka Shodhana was done with the principle of *Dhalana*. 500gm of *Ashuddha Gandhaka* was melted in 125ml of *Goghrita* and poured in a *Godugdha* (2lit). The solidified *Gandhaka* was taken out and washed with hot water. It was allowed to dry in sunlight. The procedure was repeated thrice.

➢ **Preparation of *Kajjali*-(Reference- R.T. 6/107) [9]**

Kajjali was prepared with the principle of *Mardana* with an equal amount of *Shuddha Parada* and *Shuddha Gandhaka* until it fulfilled all the criteria of *Kajjali*.

➢ ***Marana* of *Tamra* (Reference-R.T.17/25) [10]**

Whole *Marana* procedure can be divided into 2 parts-

A. Trituration (*Bhavana*) & Palletisation (*Chakrika Nirmana*)

Shuddha Tamra was taken with equal amount of *Kajjali* and sufficient quantity of *Nimbu* swarasa and triturated slowly. When paste like consistency appeared to the mixture, *Shuddha Tamra* was added to it and again triturated the mixture. As the mixture gets thickened due to loss of moisture, it was then subjected to palettization. *Chakrikas* were dried in direct sunlight. Dried *Chakrikas* were weighed. It was arranged in a *Sharava* uniformly and subjected to *Sharava Samputa*.

B. Calcination (*Putapaka*)

Tamra Chakrikas was subjected to *Laghuputa* (*Kapotputa*). Firstly 2/3rd of *Puta* was filled by cow dung cakes. Then *Sharava Samputa* was kept and finally 1/3 part was filled by cow dung cakes and ignited. Progression of temperature was observed with pyrometer, and the total time required to reach the peak temperature was recorded. Total three *putas* were given to achieve *Bhasma Pariksha*.

➢ ***Amrutikarana* of *Tamra*-(Reference- R.T. 17/43-44) [11]**

Prepared *Tamra Bhasma* was triturated with *Kumari Swarasa* till it dried to form Chakrikas. *Chakrikas* were dried and weighed before *Puta*. *Puta* procedure was the same as *Tamra Marana*. Total seven *Puta* were given to *Amrutikarana* process.

b. Analytical study-

Analytical study of *Tamra Bhasma* was done by *Ayurvedic* organoleptic as well as *Bhasma Pariksha* and Modern Parameters.

I) Organoleptic Parameters-

Tamra Bhasma was tested for all the organoleptic tests like *Shabda*, *Sparsha* etc and observations were noted.

II) *Bhasma Pariksha*

1) ***Nishchandratva***
2) ***Rekhapurnatva*** [12]
3) ***Varitaratva*** [13]
4) ***Utama/Unama***
5) ***Amla Pariksha***
6) ***Apunarbhavatva*** [14]
7) ***Nirutthatva*** [15]

Modern parameter- [16]

Tamra Bhasma was analysed by Following described procedure.

- **XRF (X-ray Fluorescence)**
- **XRD (X-Ray Diffraction)**
- **SEM (Scanning Electron Microscope)**

OBSERVATION AND RESULTS-

➢ **Observations of *Samanya Shodhana* of *Tamra*-**

1. Tila taila-

In Tila taila, reddish colour of *Tamra* become black and its metallic luster was lost. While dipping red-hot *Tamra* in *Tila taila*, a typical hissing sound was heard. Weight of *Tamra* was found increased. Colour of *Tila Taila* became light yellow to light brown and it became more viscid. Oil caught fire with dense fumes during quenching. A pungent smell and rush of black fumes were observed after quenching.

2. Takra

In *Takra, Tamra* caught fire during first heating, but did not catch in next heating. Colour of *Tamra* became black to blackish grey. Some part of *Tamra* was quenching. *Takra* started to boil and it separated in solid and liquid parts during quenching and solid part got settled down. Fine particles of *Tamra* which were suspended were found difficult to collect due to thickness of *Takra*.

3. Gomutra

In *Gomutra*, colour of *Tamra* became blackish grey to brown. Some *Tamra* flakes were broken into small pieces and some of it became course powder. Colour of *Gomutra* became yellowish to brownish after seven *Nirvapa*.

4. Kanji

In *Kanji*, colour of *Tamra* became brown to blackish brown. Flakes of *Tamra* became more brittle and were transformed to more coarse powder form. Colour of *Kanji* became yellowish to brownish and became more viscid after seven quenching.

5. *Kulattha Kwatha*

In *Kulattha Kwatha,* Colour of *Tamra* became blackish brown to deep brown, it became more in coarse powder form. Colour of *Kulattha Kwatha* became brown to bluish brown and its consistency became thicker.

Table no. 2 shows- Results of *Samanya Shodhana* of *Tamra*-

Media	Before *Shodhana* wt (gm)	After *Shodhana* wt (gm)	Weight gain or loss (gm)	% Of wt gain or loss
Tila taila	500	514	14 ↑	2.80%
Takra	514	488	26 ↓	5.06%
Gomutra	488	478	10 ↓	2.05%
Kanji	478	466	12 ↓	2.51%
Kulattha kwatha	466	460	6 ↓	1.28%
Total	500	460	40 ↓	8%

➢ **Observations of *Vishesha Shodhana* of *Tamra*-**

Froth was observed on *Kanji* after 10 min of boiling, which subsided itself after 10 mins. For every 2.5 hours, 500 ml of warm *kanji* added to *Dolayantra.* It takes about 10 hours to self-cooling of *Tamra pottali* in *kanji*. When *Pottali* was washed with warm water, greenish colour water passes from it. Before *Shodhana*, *kanji* which was clear and transparent, it became turbid after *Shodhana*. *Kanji* turned to Greenish black in colour, with a strong irritating smell. After *Shodhana*, *Tamra* become more blackish in colour and more brittle in nature.

Table no. 3 shows- Results of *Vishesha Shodhana* of *Tamra*-

Sr. no	Parameters	*Tamra*	*Kanji*
1	Initial weight	460 gm	8 lit
2	Final weight	456 gm	5.5 lit
3	% Of obtained product	99.13%	68.75%
4	Weight loss	4 gm	2.5 lit
5	% Of weight loss	0.86%	31.25%

Table no. 4 shows final *Tamra* obtained from whole *Shodhana* (Samanya *&* *Vishesha)* procedures-

Sr. no	Ingredients	Amount
1	*Ashuddha Tamra*	500gm
2	Obtained *Shuddha Tamra*	456gm
3	Percentage of yield of *Tamra*	91.2%
4	Loss of *Tamra*	44gm
5	Percentage of loss of *Tamra*	8.8%

➢ **Observations during *Marana* of *Tamra*-**

In first 3 days of trituration with *Kajjali* and *Nimbu swarasa, Tamra* wires were disappeared from the mixture. Average quantity of *Nimbu swarasa* required for each *Bhavana* was approximately 80-100ml. Average time required for each *bhavana* was nearly 6-8 hours. Whenever *Nimbu swarasa* was added, the mixture became green in colour in *Khalvayantra*. There was considerable increase in weight of mixture after levigated by *Nimbu swarasa*. Palettization was hard due to *Nimbu swarasa*. Average time taken for complete drying of pellets was nearly 12 hours. Slight *Chandrika* (metallic shine) were observed on inner side of upper *Sharava* after 1st puta. After *puta* pellets became so fragile that they could be manually powdered by hand also. After completion of 3rd *puta*, the *Chandrika* was completely lost. Colour of

Tamra bhasma turned to dark black after last puta.

Table no. 5 shows Observations in *Chakrika* and *bhasma* during *Marana*-

Sr.No	Parameters	After 1st *puta*	After 2nd *puta*	After 3rd *puta*
1	Nature of pellets	Rough but not cracked	Rough	Easily breaks
2	Colour	Bluish black	Greyish black	Black
3	Touch	Rough	Rough--	Smooth
4	Odour	Sulphur	Sulphur	Sulphur
5	Taste	Slightly metallic	Slightly metallic	No taste
6	*Chandrika*	20% seen	10% seen	Not seen
7	*Rekhapurnatva*	100%	100%	100%
8	*Varitaratva*	50%	100%	100%
9	*Amla Pariksha* in curd	Not done	No	No colour change

Table no. 6 shows Results of weight variations during *Tamra bhasma* preparation-

Table no. 7 shows final *Tamra bhasma* obtained from *Marana* procedure-

Sr.No	Parameters	1st *puta*	2nd *puta*	3rd *puta*
1	Weight before *puta* (gm)	100	146	272
2	Weight of *Kajjali* added(gm)	100	146	272
3	Total weight(gm)	200	292	544
4	Weight after *Bhavana*(gm)	212	334	560
5	Weight after *puta*(gm)	146	272	438
6	Weight gain(gm)	46	126	166
7	% Of Weight gain	23%	43.15%	61.02%

Sr. no.	Ingredients	Amount
1	*Shuddha Tamra*	100gm
2	Obtained *Tamra bhasma*	438gm
3	Gain in *Tamra bhasma*	338gm
4	Percentage of yield of *Tamra bhasma*	438%
5	Percentage of Gain of *Tamra bhasma*	338%

- **Observations during *Amrutikarana* of *Tamra*-**

3 hours of trituration was required for the consistency of *Chakrika* preparation. Average quantity of *Kumari swarasa* required for each *Bhavana* was approximately 80-100ml. After *putapaka*, *Chakrikas* were black inside and breaks by slight pressure. After trituration it converted to black, smooth and fine powder. After 3rd *puta*, no weight was seen in *Bhasma.*

Table no. 8 shows Results of *Amrutikarana* of *Tamra Bhasma*-

No. of puta	Before *puta* in gm	Wt. after *bhavana* of *Kumari swarasa*	After *puta* in gm	Wt. loss in gm	% Of wt. loss
1	420	428	404	16	3.80
2	404	412	398	6	1.48
3	398	408	390	8	2.01
4	390	400	390	-	-
5	390	406	390	-	-
6	390	408	390	-	-
	390	406	390	-	-

Table no. 9 shows final *Tamra Bhasma* obtained after *Amrutikarana* procedure-

Sr. no	Ingredients	Amount
1	*Tamra Bhasma* before *Amrutikarana*	420 gm
2	*Tamra Bhasma* after *Amrutikarana*	390 gm
3	Percentage of yield of *Tamra Bhasma*	92.86
4	Loss of *Tamra Bhasma*	30gm
5	Percentage of loss of *Tamra Bhasma*	7.14

Table no. 10 shows organoleptic tests of *Tamra Bhasma*

Sr. no.	Parameters	Observations
1	Consistency	Fine powder
2	Colour	Black
3	Touch	Smooth
4	Smell	Not specific
5	Taste	Not specific

Table no. 11 shows *Tamra Bhasma (TB) Pariksha*

Sr. no.	Parameters	Observations
1	*Nishchandratva*	All these tests were passed by *Tamra Bhasma.*
2	*Rekhapurnatva*	
3	*Varitaratva*	
4	*Unama*	
5	*Amla Pariksha*	
6	*Apunarbhavatva*	
7	*Nirutthatva*	

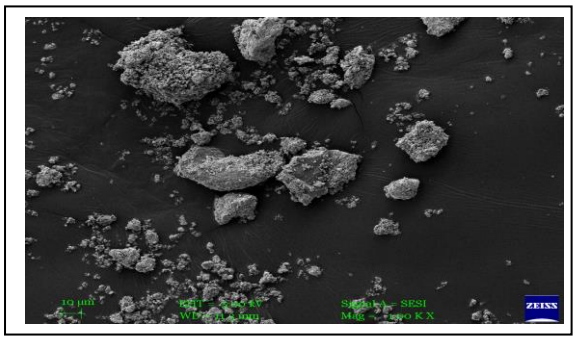
Table no. 12 shows XRF analysis of *Tamra bhasma*-

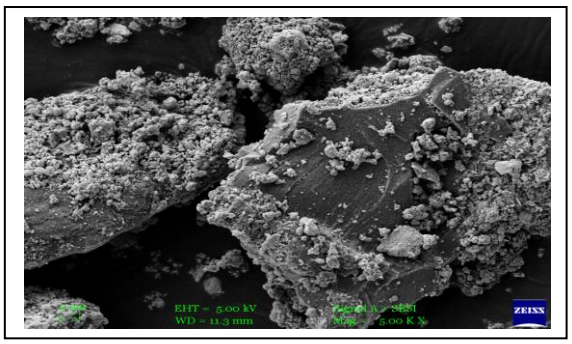
Sr. no	Component	Result	Unit
1	SO_3	48.4	Mass%
2	HgO	35.7	Mass%
3	CuO	13.5	Mass%
4	K_2O	0.911	Mass%
5	CaO	0.759	Mass%
6	Fe_20_3	0.749	Mass%
7	ZnO	0.0535	Mass%

Results of SEM analysis of *Tamra bhasma*- Scanning Electron Microscopy of *Tamra bhasma* was done by various magnification i.e., 1000x, 5000x, 25000x etc.

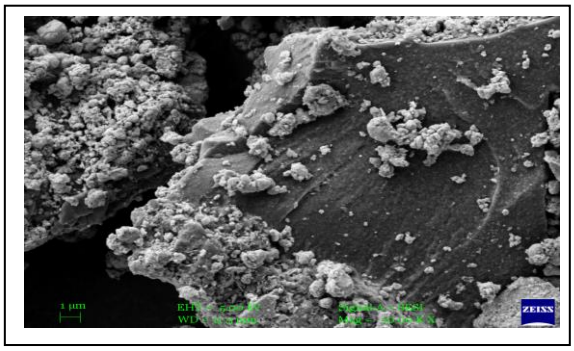
SEM Images of *Tamra bhasma*-

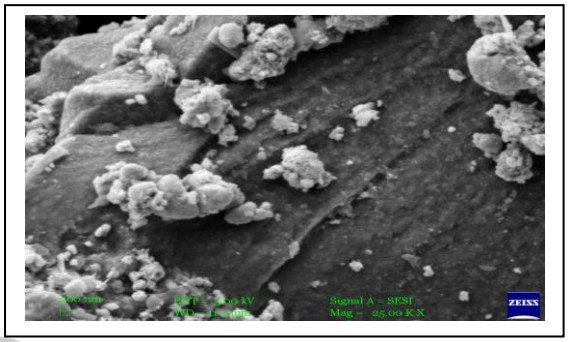
Results of XRD analysis of *Tamra bhasma*-



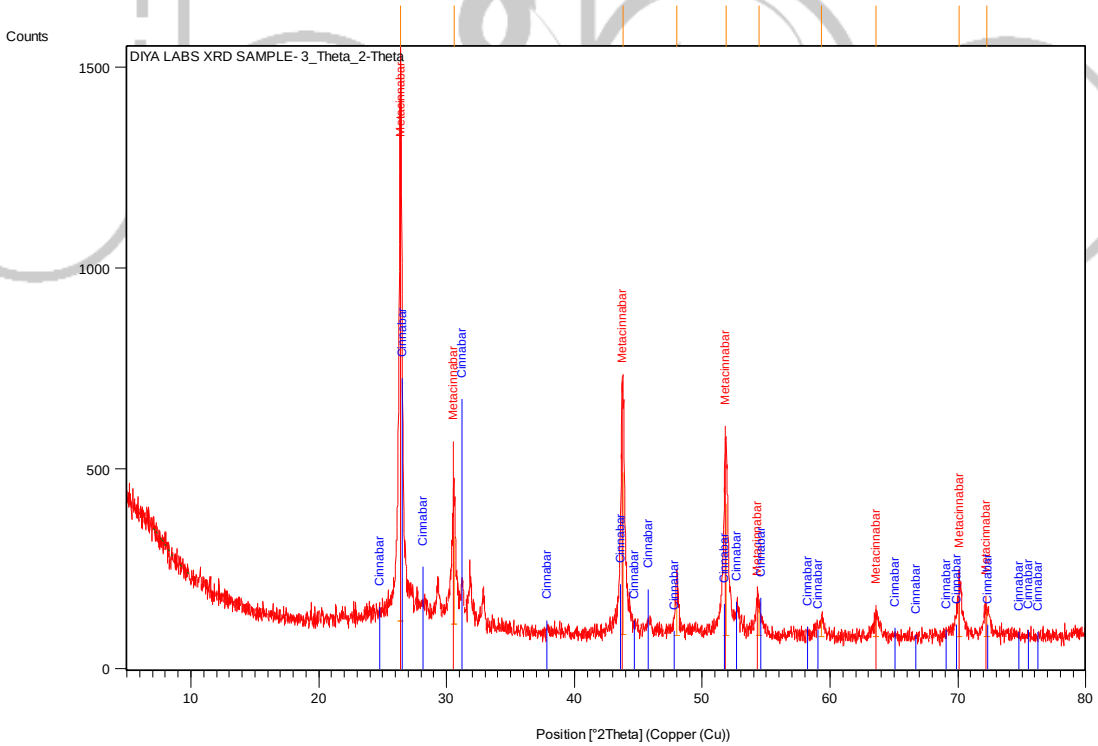


Graphics-





- **Peak List-**



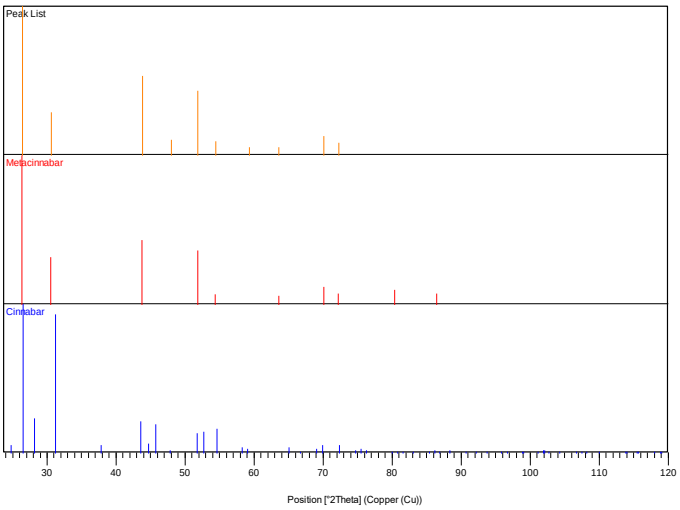
Pos. [°2Th.]	Height [cts]	FWHM [°2Th.]	d-spacing [Å]	Rel. Int. [%]	Tip width [°2Th.]	Matched by
26.4067	764.59	1.1520	3.37248	100.00	1.3824	01-075-1538; 00-042-1408
30.6144	219.65	0.7680	2.91786	28.73	0.9216	01-075-1538; 00-

43.8030	405.03	1.1520	2.06508	52.97	1.3824	042-1408 01-075-1538; 00-042-1408
47.9710	77.50	1.1520	1.89493	10.14	1.3824	00-042-1408
51.8498	329.21	1.1520	1.76192	43.06	1.3824	01-075-1538; 00-042-1408
54.4266	68.90	1.1520	1.68443	9.01	1.3824	01-075-1538; 00-042-1408
59.3347	41.56	0.7680	1.55627	5.44	0.9216	00-042-1408
63.6042	41.09	1.1520	1.46171	5.37	1.3824	01-075-1538
70.1112	97.84	1.1520	1.34112	12.80	1.3824	01-075-1538; 00-042-1408
72.2609	64.20	0.7680	1.30642	8.40	0.9216	01-075-1538; 00-042-1408

- **Identified Patterns List-**

Visible	Ref. Code	Score	Compound Name	Displacement [°2Th.]	Scale Factor	Chemical Formula
*	01-075-1538	93	Metacinnabar	0.000	0.932	Hg S
*	00-042-1408	46	Vermilion	0.000	0.390	Hg S

- **Plot of Identified Phases-**



- Considering the width of diffraction peaks, the crystalline form of the compound was predicted. The XRD patterns of the Tamra Bhasma are represented in above graphics. The wide diffraction peaks were observed having

2θ—around 26.3825, 30.5781, 43.7465 and 51.8088 etc are indicative of Metacinnabar (HgS)& Vermilion (HgS).

DISCUSSION-

- ***Samanya Shodhana* of *Tamra***

After *Shodhana* in *Tila taila*, weight of *Tamra* was found increased and this was may be due to some oil was still sticking to it. In other medias of *Shodhana* except *Tila taila* weight of *Tamra* was found decreased. After complete *Samanya Shodhana*, the weight of *Tamra* was 460 gm with 8% loss. The reason for the loss may be due to removal of impurities from *Tamra*. The colour change of medias of quenching suggestive of the release of impurities into media. During *Shodhana*, colour of *Tamra* became blackish brown. This may be because of the fact that during red hot state, *Tamra* reacts with atmospheric oxygen and steam to form Cupric oxide (CuO) which is black in colour. [17] The metallic form of *Tamra* gets converted to compound form (CuO); thus, its heat conductivity is reduced which is the reason why *Tamra* flakes take more time to become red hot as the *Shodhana* procedure advances. [18] 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. Protection from smoke of media (mainly *Tila taila*) during heating process was taken by wearing mask.

- ***Vishesha Shodhana* of *Tamra***

In *Vishesha Shodhana*, components of *Kanji* may pierce through the micropores and cracks created during *Samanya shodhana* and may produce the required change specific to *Tamra* for further process. [19] After *Vishesha Shodhana* the weight of *Tamra* was 456gm with 0.86% loss. After complete *Shodhana (Samanya & Vishesha* process, the total weight loss was 44gm i.e., 8.8% loss. Decrease in the weight of *Tamra* may be due to removal of some impurities present in the *Tamra* and handling loss. *Shuddha Tamra* should be collected after drying *Pottali* to prevent the loss.

- ***Marana* of *Shuddha Tamra***

As *Putapaka* was done by traditional method, there was direct contact with heat. So, all the procedures were done with optimum care to avoid physical injury. The making of the *Chakikras* should be done immediately after *Bhavana*. For *Tamra Marana, Kajjali* was used, because *Rasamarita Bhasma* are best in quality. [20] The trituration was done with *Kajjali* and *Nimbu Swarasa* was almost for 8 days (48 hours) for 1 *puta*, as it was reported in one of the research study that more trituration needed less no. of *Puta* and *Marana* will be quicker. [21] Instead of *Gajaputa* as mentioned in classics, *Laghu puta* were used for *Tamra Marana*. [22] Total 3 *Puta* were required for *Marana* of *Tamra*. Each *Putapaka,* same amount of *Kajjali* was added as per reference. Some *Chandrika* were observed on inner side of upper *Sharava* after 1st puta may be due to *Parada* from *Kajjali* was separate because of heating. During *Marana* process increase in weight was 338%, it observed due to addition of same quantity of *Kajjali* for every *puta*.

- ***Amrutikarana* of *Tamra Bhasma***

After *Amruti*karana, 30 gm weight loss was found upto 3 *puta* with 7.14% loss. It may be due to the removal of *shlishta dosha* from *Tamra bhasma*. After 3 *puta* weight of *bhasma* remains stable.

- ***Tamra Bhasma Pariksha-***

Organoleptic test of *Tamra bhasma* shows that *Sparsha* of *Tamra bhasma* was smooth, *Slakshna* due to micro fineness of *bhasma*. *Varna* of *Tamra bhasma* was black due to *marana* with *Kajjali*. *Tamra bhasma* was tasteless and *Nirgandha*. After 1st *Puta*, *Rekhapurnatva* was positive, after 2nd *puta Varitaratva* was 100% positive. After 3rd Puta *Amla Pariksha* was negative. So, it indicates that after each *Puta* progression of *Marana* process. Lustre is the physical character of metals. When metal is transformed to compound form, its lustre is lost. *Tamra bhasma* found *Nischandra* after 3rd puta. *Rekhapurnatva* indicates fineness of particles or reduction in particle size. After 1st puta, *Tamra bhasma* passes this test. *Varitaratva* is evident that *bhasma* are having more density than water to dip in water, but *bhasma* floats on water. This is due to increased surface area and tension. It was observed 100% after 2nd puta. *Apunarbhava Pariksha* is carried out to check the stability of *Bhasmas*. An unstable metallic compound can be reduced to metallic state during this test by carbon reduction process on temperature at which it is formed. *Tamra bhasma* passes this test after 3rd puta. *Nirutthatva Pariksha* is carried out to check any free metal remains the *bhasma*. *Tamra bhasma* passes this test after 3rd puta.

- **XRF analysis of *Tamra Bhasma*-**

XRF of *Tamra Bhasma* shows HgO with 35.7 %, SO_3 with 48.4%, CuO with 13.5% and other component in traces. HgO and SO_3 was found in *Tamra bhasma* due to use of *Kajjali* for *Marana* of *Tamra*.

- **SEM analysis of *Tamra Bhasma*-**

SEM analysis of *Tamra Bhasma* have shown distribution of particles in clusters form with irregular sharped flakes and agglomeration of nano-particles.

- **XRD analysis of *Tamra Bhasma*-**

In XRD analysis of *Tamra Bhasma*, Metacinnabar (HgS)& Vermilion (HgS) were observed as main components. 93 peaks of Metacinnabar and 46 peaks of Vermilion were observed at different angle of ^{0}2Th.The Intensity of highest peak position of Metacinnabar was 26.4067 at 1.1520 ^{0}2Th with 3.37248 d-spacing and tip width 1.3824. The Intensity of highest peak position of Vermilion was 43.8030 at 1.1520 ^{0}2Th with 2.06508 d-spacing and tip width 1.3824. Higher presence of Metacinnabar (HgS)& Vermilion (HgS) in *Tamra bhasma* may be due to use of *Kajjali* (HgS) for *Marana* of *Tamra*. It is indicative of *Yogavahi* and *Rasayana* properties in *Tamra bhasma*.

CONCLUSION-

Preparation of *Rasamarita Tamra bhasma* required 3 *puta* only with 338% weight gain. All *bhasma Pariksha* passes after 2nd puta and *Vishesha Pariksha* passes after 3rd puta. Rasamarita *Tamra Bhasma* noted HgO as the main constituent and another component in traces. It is also showing the distribution of particles in clusters form with irregular sharped flakes and agglomeration of nanoparticles. XRD analysis of *Tamra Bhasma* shows, Metacinnabar (HgS) & Vermilion (HgS) were the main components.

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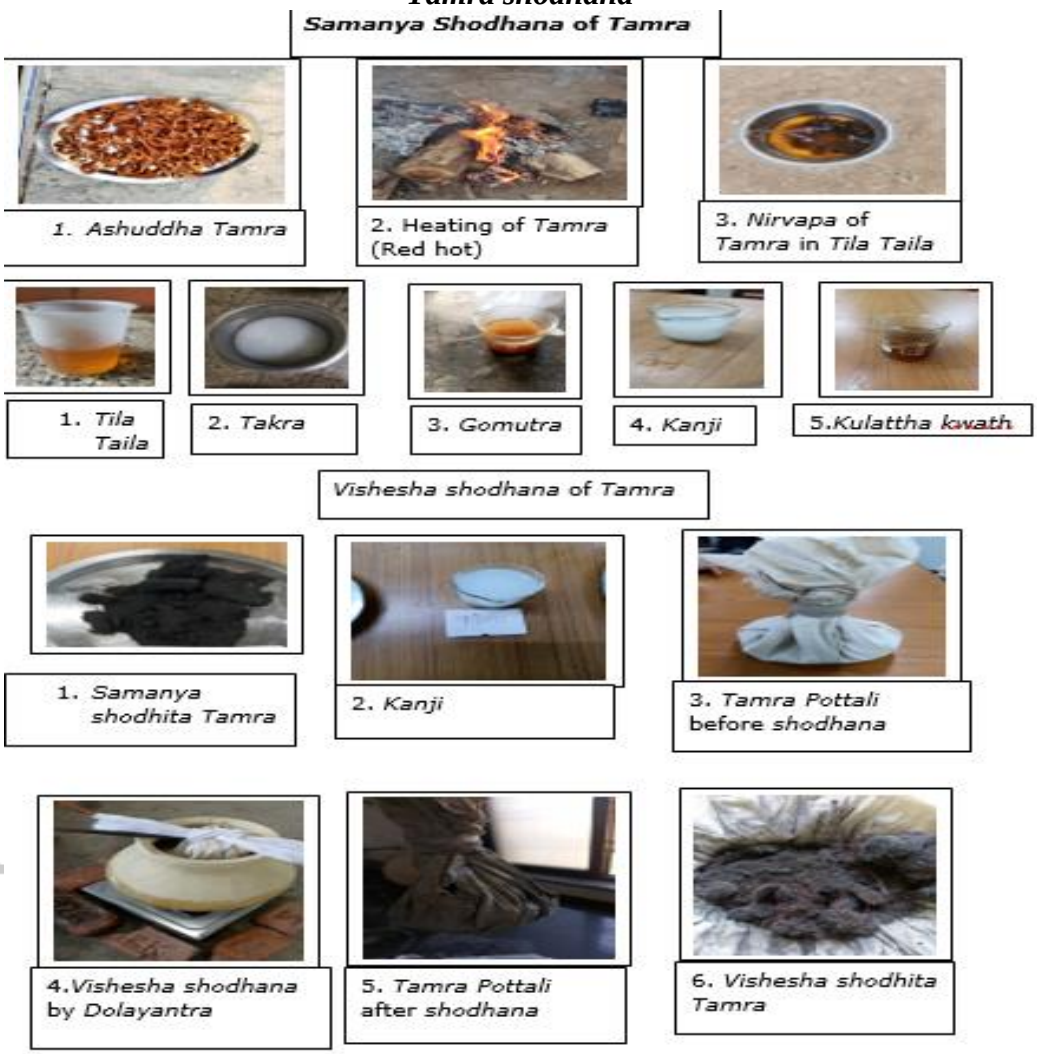
Tamra shodhana-



Tamra Marana-

Marana of Tamra

1. Shuddha Tamra

2. Kajjali

3. Nimbu swarasa

4. Tamra with Kajjali lepa

5. Trituration with *Nimbu swarasa*

6. Chakrika before puta

7. *Sharava-Samputa*

8. *Putapaka*

9. *Chakrika* after 1st *puta*

10. *Chakrika* after 2nd *puta*

11. *Chakrika* after 3rd *puta*

12. Final *Tamra bhasma*

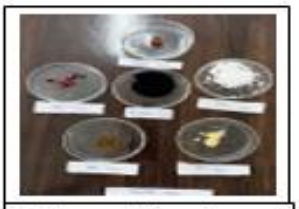
Tamra Bhasma Pariksha and *Amrutikarana-*

Tamra Bhasma Pariksha

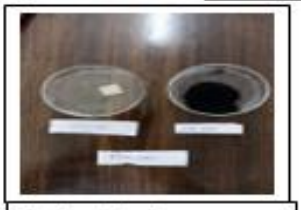
1. Rekhapurnatva

2. Varitaratva

3. Amla Pariksha in curd (After 72 hrs)



4. Apunarbhavatva

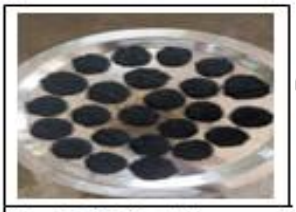


5. Nirutthatva

Tamra Bhasma Amrutikarana

1. Kumari Swarasa

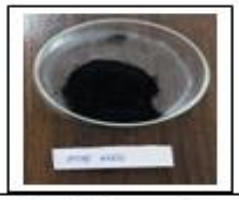
2. trituration with Kumari Swarasa



3. Chakrika before puta

4. Chakrika after 1st puta

5. Chakrika after 7th puta



6. Final Tamra bhasma