ORIGINAL RESEARCH PAPER

Ayurveda

COMPARATIVE PHARMACEUTICO-ANALYTICAL STUDY OF *TAMRA BHASMA* PREPARED BY *TAMRA PATRA* AND COPPER POWDER.

KEY WORDS: *Tamrapatra,* copper powder, *tamra bhasma,* copper nanoparticles.

Dr. Nikhil Chaudhari M.D. Scholar, Rasashastra and Bhaishajya Kalpana, Dr. G. D. Pol Foundation's Ayurvedic Medical College & P.G. Institute, Kharghar, Navi Mumbai.

Dr. Ninad Sathe Prof. & P.G. Guide, Rasashastra and Bhaishajya Kalpana, Dr. G. D. Pol Foundation's Y.M.T. Ayurvedic Medical College & P.G. Institute, Kharghar, Navi Mumbai.

ABSTRACT

In present study tamra bhasma is prepared by using two different form of *nepalaka tamra* i.e. *patra* (foil of thickness 0.05 mm) and powder. Both forms of raw materials are processed into *samanya shodhana*, *vishesh shodhana* and *marana* according to the classical reference. *Patra* form of *tamra* became more brittle and powdered similar to the original powered copper sample after *samanya shodhana*. During *marana* procedure after each *puta chakrika* of both the forms were easily breakable and made into powder. Both forms of *Tamra bhasma* passes all *bhasma pariksha* with *dadhi pariksha* after the 8th *puta*. SEM analysis at resolution 100 nm and magnification 75000× reported that particle size of *patra* form (31.3 nm) is more reduced than powder (75.8 nm), but powder form showed uniformity of particle size as compared to the *patra* form. By comparing tamra bhasma prepared from both form it is observed that both samples stand better to use as a raw material.

INTRODUCTION.

Copper is said to have originated from the semen of *kartikeya* (son of lord shiva). According to available literature *nepalaka* and *rakta varna tamra* is consider best compared to *mlechha* and *krishna*. According to *lakshanas,* best variety copper is very smooth, soft, reddish in color, heavy and does not change its properties by application of heat.

Though numbers of methods are described in literature, *tamra bhasma* preparation has always been a practical problem. Moreover, improperly prepared (*apakwa*) tamra bhasma has been quoted as poison because of its hazardous effects on the body. *Ayurveda prakasha* have quoted *ashtamahadoshas* to indicate its toxic potential. therefore, it is extremely important to prepare *tamra bhasma* of good quality by following the classical procedures.

The process of *bhasmikarana* of metals can be classified into *shodhana*, *mardana*, *marana*, *putapaka*. The bhasma has more surface area due to microfine size (compared to their elemental form) to increase bio-absorption in the GIT. So as to manufacture such important ayurvedic formulation different fundamental aspects such as qualitative, quantitative, processing techniques with scientific approach should be considered to standardize the process.

In the classical text *rasatarangini, kantakavedhi patra* form of raw material is mentioned for preparation of *bhasmas* like *suvarna, rajata* and *tamra*. But in present era most pure form of copper is not easily available in *kantakavedhi* form and to reach the nano-fine size of bhasma, present study aimed at preparation of tamra bhasma using two different forms of raw tamra i.e. *kantakavedhi tamra patra* form and powder form; comparative study of both the bhasma to evaluate which raw material is better.

Final products were analyzed by classical tests, physicochemical parameters, and by applying some advanced analytical techniques.

MATERIAL AND METHOD.

A. Collection of raw material.

Kantakavedhi tamra patra (Sample:1: copper foil of size 1x1in. and thickness 0.05mm) and copper powder (sample:2) was procured from the market. It was analyzed for its copper content by XRF analysis at Varsha Bullion & Elemental Analab, Mumbai-02.

B. Preparation of *tamra bhasma*.

Both the samples of *tamra* were individually subjected to *samanya shodhana* (general purification/ detoxification), *vishesha shodhana* (special purification/ detoxification), *marana* (calcinations/incineration) procedure according to the following references:

- *Samanya shodhana - rasatarangini* chapter 15/7.
- *Vishesh shodhana - rasachandanshu* chapter 473.
- *Marana - rasatarangini* chapter 17/25.
- Process of *samanya shodhana* of *Tamra*:

Samanya shodhana of *tamra* was carried out by *nirvapa* (heating till red hot and quenching) in *kaddali kanda swarasa*, prepared as per the references of *sharangadhara samhita*. Sample 1 of *tamra patra* was heated to red hot stage with a princess torch and quenched in liquid media for 7 times. Sample 2 of copper powder was heated to red hot stage in an iron vessel and quenched in liquid media for 7 times using a *pithaharayantra.* Temperature at the time of red hot stage was taken by a pyrometer. Each time fresh liquid media gravimetrically equal to the *tamra* was taken.

b. Process of *vishesha shodhana* of *tamra*:

Vishesha shodhana of *samanya shodhita tamra* samples was done by individual *swedana* (stewing/boiling) with *gomutra, limbu rasa* and *tankanakhara* for 1 *prahara* (3 hours) in SS vessel. It was then washed with warm water and dried.

c. Process of preparation of *kajjali*:

Parada shodhana was done as per the classical reference of *rasatarangini* chapter 5/27-30.

Gandhaka shodhana was done as per the classical reference of *rasatarangini* chapter 8/7-12.

Preparation of *samaguna kajjali* was done as per the classical reference of *rasatarangini* chapter 6/107. Equal quantity of *shuddha parada*, and *shuddha gandhaka* were taken in a *khalva yantra* (mortar and pestle) and triturated. It was continued until the powder became black, smooth, and lusterless.

d. Process of *marana*:

Vishesh shodhita tamra samples were subjected to individual *marana* (calcinations/incineration) as per the reference of *rasatarangini* chapter 17/25. *Samaguna kajjali* equal to the amount of *shuddha tamra* was taken in *khalvayantra*, *nimbu swarasa bhavana* (wet trituration with lemon juice) was given. When paste like consistency appeared, *shuddha tamra* was added in it and triturated. After pelletization and drying in shade, it was kept in *sharava* (earthen saucer) and covered by another *sharava* and *sandhibandhana* (junction sealed by double fold of *multany mitty* smeared clothes) was done and subjected to *gajaputa* (incineration pit) of size 57cm×57cm×57cm by using total 200-250 number of cow dungs for each *puta*. Pyrometric analysis of *gajaputa* was observed.

C. Analysis of final product:

1. Organoleptic parameters: *varna* (colour), *rasa* (taste), *sparsha* (touch), *gandha*(odour).
2. Classical tests: *rekhapurnatva, varitara, unama, nishchandrata, apunarbhavatwa; avami*, *niswaduta* and *dadhi pariksha* (curd test).
3. Modern physicochemical parameters: LOD, total ash value, acid insoluble ash and water-soluble ash.
4. Scanning electron microscopy (FEG-SEM-EDX).

OBSERVATION AND RESULT.

Table 1. XRF Analysis of Tamra Patra (sample 1).

Element.		Mass (%)	Intensity (cps/µA)	Formula	Mass (%)
Silicon	Si	0.00	0.000	SiO_2	0.005
Phosphorus	P	0.01	0.003	P_2O_5	0.027
Sulphur	S	0.01	0.004	SO_3	0.020
Chromium	Cr	0.10	0.702	Cr_2O_3	0.121
Nickel	Ni	0.00	0.000	NiO	0.000
Copper	Cu	99.91	746.611	CuO	99.663
Arsenic	As	0.08	0.366	As_2O_3	0.083
Tin	Sn	0.08	0.218	Sn O_2	0.082
Oxygen	O_2	20.153			

Table 2. XRF Analysis of Copper powder (sample 2).

Element.		Mass (%)
Phosphorus	P	0.00
Copper	Cu	99.99

Table 3. Showing loss of sample.

Process.	Sample 1 (Patra).			Sample 2 (Powder).		
	Weight before (gm)	Weight after (gm)	Loss.	Weight before (gm)	Weight after (gm)	Loss.
After samanya shodhana.	200	199	1	200	180	20
After vishesha shodhana.	199	178	21	180	160	20

Table 4: Showing the weight loss in gajaputa for Sample 1 (Patra).

No. of puta.	Weight of shuddha tamra (gm).	Weight of Kajjali (gm).	Total weight (gm).	Weight after puta (gm).
1st puta.	178	356	534	208
2nd puta.	200	52	252	201.6
3rd puta.	196	49	245	175.91
4th puta.	172	43	215	149.2
5th puta.	144	36	180	140
6th puta.	136	34	170	132
7th puta.	128	32	160	124.96
8th puta.	120	30	150	112.2

Table 5: Showing the weight loss in gajaputa for Sample 2 (Powder).

No. of puta	Weight of shuddha tamra (gm)	Weight of Kajjali (gm)	Total weight (gm)	Weight after puta (gm).
1st puta.	160	320	480	183.05
2nd puta.	180	45	225	186.07
3rd puta.	184	46	230	167.94
4th puta.	164	41	205	136.01
5th puta.	132	33	165	133.54
6th puta.	128	32	160	108.37
7th puta.	104	26	130	99.38
8th puta.	96	24	100	82.4

Table 6: Showing the weight loss in both samples after gajaputa.

	Sample 1 (Patra).	Sample 2 (Powder).
Initial weight (gm).	178	160
Weight after marana (gm).	112.2	82.4
Loss (gm).	65.8	77.6

Table 7: Showing Bhasma Pariksha

Parameters.	Sample 1 (Patra).								Sample 2 (Powder).							
	Puta.								Puta.							
	1.	2.	3.	4.	5.	6.	7.	8.	1.	2.	3.	4.	5.	6.	7.	8.
Rekhapurnatva.			+	+	+	+	+	+			+	+	+	+	+	+
Varitara.					+	+	+	+					+	+	+	+
Unama.					+	+	+	+					+	+	+	+
Nishchandrata.						+	+	+						+	+	+
Apunarbhavatwa.							+	+							+	+
Dadhi pariksha.								+								+

Table 8: Showing Organoleptic characters.

No. of Puta.	Sample 1 (Patra).				Sample 2 (Powder).			
	Colour.	Taste.	Touch.	Odour.	Colour.	Taste.	Touch.	Odour.
1.	Grey	Metallic	Rough	Odourless	Grey	Metallic	Rough	Odourless
2.	Blackish green	Metallic	Rough	Odourless	Blackish green	Metallic	Rough	Odourless
3.	Blackish, green and brown tinge.	Metallic	Smooth	Odourless	Blackish green	Metallic	Smooth	Odourless
4.	Brownish black	Tasteless	Smooth	Odourless	Blackish green	Tasteless	Smooth	Odourless
5.	Brownish black	Tasteless	Smooth	Odourless	Blackish, green and brown tinge.	Tasteless	Smooth	Odourless
6.	Brownish black	Tasteless	Smooth	Odourless	Brownish black	Tasteless	Smooth	Odourless
7.	Brownish black	Tasteless	Smooth	Odourless	Brownish black	Tasteless	Smooth	Odourless
8.	Blackish brown.	Tasteless	Smooth	Odourless	Blackish brown.	Tasteless	Smooth	Odourless

Table 8: Showing Physio-Chemical Analysis.

Sr.no.	Parameter	Sample 1 (Patra).	Sample 2 (Powder).
1.	L.O.D.	0.42	0.40
2.	Total ash %.	97.36	97.51
3.	Acid insoluble ash %.	91.25	91.38

SEM ANALYSIS: At resolution 100 nm and magnification 75000×.

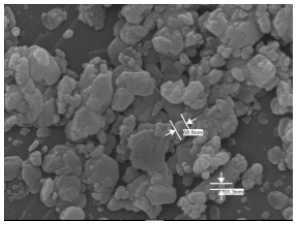

Fig.1: Sample 1 (Patra).

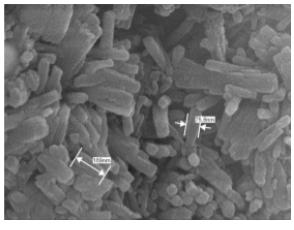

Fig.2: Sample 2 (Powder).

DISCUSSION.

During the *samanya shodhana* the *patra* were getting uniform heat compared to powder. Powder was binding to each other while heating and converted into harder granules. At end of *samanya shodhana* the weight loss is more in powder than that of patra. In *vishesh shodhana* the loss in weight of both samples is similar which may be due to indirect heat. *Patra* became more brittle and some particle converted into small pieces after *samanya*

shodhana and then to powder after *vishesh shodhana*. As for the *marana* procedure *lepa* application of *kajjali* is mentioned but both sample were converted to fine pieces so it was difficult to apply *kajjali lepa* hence, uniform mixed for *nimbu rasa bhavana*. *Chakrika* made were kept in *sharava* and subjected for *puta* after *sandhibandhan*. Same procedure was followed for next *putas*. According to reference 3 *gajaputas* are mentioned but after 3 *puta* both the sample didn't pass the *bhasma pariksha* so subjected for further *puta*.

During this *marana* procedure after 1st *puta* both forms were easily breakable and easily made into powder. At the end of 8th *puta* the both forms of sample passed all the *bhasma pariksha* along with *dadhi pariksha*. After 8th puta SEM analysis of both the samples were done. Particle size of *patra* form reached 31.3nm and powder form of *tamra bhasma* reached 75.8 nm.

CONCLUSION.

Considering all the above parameters and lesser particle size as its absorption rate is more so it can be concluded that *patra* form of copper as a raw material is better but considering the uniformity of particle size in sample powder form of copper seems to be better as raw material for preparation of *tamra bhasma*.

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