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COMPARATIVE EVALUATION OF LOHABHASMA PREPARATION THROUGH TWO DIFFERENT METHODS

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ABSTRACT

Loha bhasma is a widely used medicament in Ayurveda. It has proven its clinical application in various disease conditions like anemia, colic, liver cirrhosis, leukemia etc. *Rasasastra* treatises have mentioned various methods for *loha bhasma* preparation. Physico chemical properties of *Loha bhasma* prepared by two different methods are evaluated here. The adopted way of *marana* was quite different in both methods. One is exothermic and the other is endothermic. Physico chemical evaluation helps to ascertain the difference in chemical composition, external morphology of two *bhasmas*. The raw material used was 100 mesh size iron powder. It was first subjected to *Sodhana* and thereafter *Marana* in two different ways. In the first method, *sodhita Loha* was grinded with one tenth part of *Hingula* and *kumari swarasa* was subjected to *marana* under traditional method. In the second method *Swayamagni* was prepared by grinding *Sodhita Loha choorna* and *kajjali* in which *sulphur* is double in quantity of mercury and grinded the above mixture in *kumari swarasa* for six hours. After that it was made into a bolus shaped mass, covered with castor leaf, kept inside a copper vessel and dried under sunlight. Then buried in a heap of husk for three days and filtered through a cloth. Final products were subjected to *Bhasmapareeksha* as per PLIM and with XRD, ICP-OES, XRF, AAS, and PARTICLE SIZE ANALYSIS. XRD analysis revealed the crystalline nature of *bhasma* prepared through first method and amorphous nature of *Swayamagni Loha bhasma*. The particle size reduction of *Bhasma* in micro meter was confirmed through dynamic light scattering.

Keywords: Loha bahsma, Swayamagni lohabhasma, XRD, Particle size analysis.

INTRODUCTION

Enriched geography in case of drug collection, process related variable and variation in methodology adopted to formulate an Ayurvedic drug is chief causative agent for non-uniform quality aspect of Ayurvedic formulation. Physico chemical evaluation is essential to ascertain the chemical composition, elemental analysis and the external morphology of the metallic medicines. *Loha bhasma* is extensively used herbomineral preparation in Ayurveda for *pandu, rajayekshma* etc .Over the past 10 years major advances have been made in identification of new proteins related with iron metabolism[1].

MATERIALS AND METHODS

Raw material: 2 kg of Iron metal powder (100 mesh size). Iron powder can help to increase the

contact of *drava dravya* at the time of *nirvapa*. The results from ICP-OES of raw iron powder shows 58% of iron and 16% of carbon which can probably equalize it with steel variety of iron.

Method

1750 gram of Iron powder was heated in an iron pan until it became red hot and immediately plunged into one litre of *Taila* (sesame oil) taken in a bronze vessel. After self-cooling, the *loha* was taken out and washed with hot water. It was repeated for seven times. For each time fresh *taila* was taken. The same procedure was carried out in *takra* (buttermilk), *gomutra* (cows urine), *aranala* (sour gruel) *and kulathakashaya* (horse gram decoction) successively .*Aranala* was prepared by 2 kg coarse wheat powder kept in six liter of water in a mud pot [2] . This was properly sealed and left for seven days. For the purpose of *visesha sodhana* (specific purification), 1896 gram of *Loha choorna* after *samanya sodhana* was subjected to *nirvapa* in *triphala kashaya. Triphala kashaya* has to be prepared with 2 kilo gram each of *hareethaki, vibheetaki, amalaki* boiled in 48 liter of water and reduced to 12 liter [3].

HINGULA MARITHA LOHABHASMA [4].

250 gram of *Hingula* and ginger juice was triturated up to complete drying of the product. This was repeated for seven times.[5] 250 gram of purified *loha* was taken in a *khalwa yantra* and powdered finely.25 gram of purified *hingula* (1/10 of *loha* taken) and 200 ml of *kumari swarasa* were added to powdered *lohachoorna*. It was then grinded for four hours. 34 numbers of *chakrikas* were prepared from that and dried in shade. These *chakrikas* were kept in *sharava* and *sandhibandhana* was done properly using multani mud smeared cloth. Then *sharava* was kept for drying. For each *putapaka* 1/10 part of *hingula* was added and *hingula* was not added for ninth and tenth process. Traditional method was selected for *marana*. Fuel used was 600 to 650 gram of outer fibrous covering of coconut shell (exocarp) for one time heating process.

SWAYAMAGNI LOHABHASMA [6]

Parada sodhana[7]

Mardana was done 100 gram mercury with *kumari swarasa*, *triphala kwatha*, *trikatu kwatha*, *chitraka kwatha* and *nimbu swarasa* successively each for 12 hours.

Preparation of Kajjali

Kajjali was prepared by continuous grinding of 90 gram of purified mercury and 180 gram of sulphur for 24 hour. It is tested for *varitaratva, rekhapoornatva* and *nichandratva*.

Preparation of *Svayamagni Lohabhasma.*

Four leaflets of *kumari* were collected from the herbal garden. Approximately 300 ml of juice was squeezed from leaflets. Purified *loha choorna* and *kajjali*, both in equal quantity were taken in a *khalva yantra*. Grinding of above mixture was done continuously by adding required quantity of aloevera juice. Fumes were noticed at the onset of drying of the mixture. Grinding with pressure was sufficient for drying and fumes formation. After six hours of grinding, the mixture was shaped into bolus form, covered with *eranda patra* (castor leaves) and kept inside copper vessel. On the next day it was kept under strong sunlight for one and half hour. Thereafter copper vessel (along with *eranda patra* and bolus) was covered with copper plate and well tied with copper wire. It was then kept within heap of husk for three days. On the fourth day the bolus was taken out and powdered thoroughly, filtered through a cloth and obtained a fine powder.

Fig 1. Hingula maritha loha bhasma

Fig 2. Swayamagni lohabhasma

RESULTS

Organoleptic characters are given in the **Table 1.1**

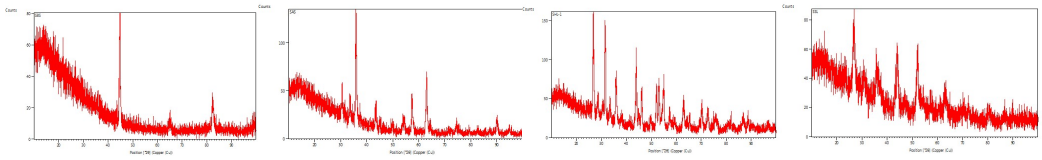
Sample	Colour	Odour	Taste	Touch
Raw Iron	Grey	Pungent	Metallic	Rough, powdery
Sodhitha Loha	Black	Pungent	Metallic	Rough, powdery
Hingula maritha Loha bhasma	Light reddish Brown	Nil	Nil	Smooth
Svayamagni Loha bhasma	Dark brown Mahagony	Nil	Nil	Smooth

Acid insoluble ash, water insoluble ash and P^H is given in the **Table 1.2**

	Acid insoluble ash	Water insoluble ash	P^H
After Sodhana	73.61%	100%	4.85
Hingula maritha	48%	30%	5.53
Svayamagni	100%	80%	3.8

XRD analysis of sample before *sodhana*, after *sodhana*, *Hingula maritha loha bhasma, Swayamagni Lohabhasma* is given in the order A,B,C,D

A) **B)** **C)** **D)**



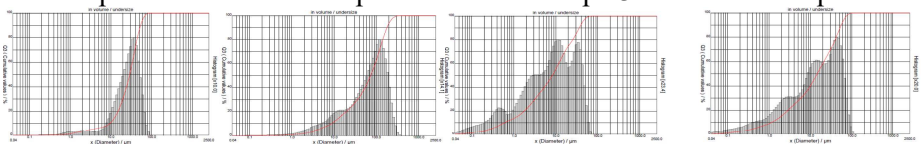
ICP-OES – Raw iron powder is Iron 58 %, carbon 16%, Silica 12%, Alumina 6%, Calcium 4%, Magnesium 2%
XRF values are given in the **Table 1.3**

After Sodhana		Hingula maritha bhasma		Swayamagni Bhasma	
Fe_2O_3	94.70%	Fe_2O_3	27.97%	SO_3	52.52%
SiO_2	1.96%	Re	24.52%	Fe_2O_3	29.98%
Al_2O_3	0.69%	As_2O_3	20.36%	Re	9.75%
K_2O	0.62%	Hg	13.06%	SO_3	5.16%
P_2O_5	0.51%	SO_3	8.41%	GeO_2	1.53%
MgO	0.42%	GeO_2	4.27%	SiO_2	0.50%
CaO	0.40%	SiO_2	0.49%	Al_2O_3	0.24%
SO_3	0.22%	K_2O	0.30%	K_2O	0.08%
Na_2O	0.17%	Al_2O_3	0.15%	CaO	0.06%
CuO	0.03%	CaO	0.14%	MnO	0.04%
ZnO	0.02%	MnO	0.08%		
MnO	O.O6%	MgO	0.06%		

Atomic absorption spectroscopy for mercury was done in both samples shows the results within a limit of 0.5.

Dynamic light scattering of raw iron powder, *sodhita loha, hingula maritha lohabhasma, swayamagni loha bhasma* are given in graphs 1,2,3,4 successively.

Graph 1 Graph 2 Graph 3 Graph 4



Mean diameter in micro meter before sodhana is 83.5 and after sodhana is 85.16.Mean diameter of hingula maritha loha bhasma is 13.95and svayamagni loha bhasma is 22.22.

DISCUSSION

Sodhana include seven times *nirvapa* in different media*Taila* is a non-aqueous solution, so there is less chance to form an oxides or hydroxides of Iron. After *taila nirvapa* metallic lusture was lost and seen as blackish color because of presence of carbon compounds.*Takra* is an aqueous solution, here may be a chance to form oxides of iron which can be seen as some reddish iron particles after *takra nirvapa*. *Gomutra* may reduces most of the silica present in *Loha choorna.* Phytic acid present in Aranala is a good chelating agent. The studies reveals that gallic acid content of *Kulatha kashaya* reduces toxic trivalent Iron. *Triphala kashaya* convert *Loha choorna* into a more bio compatable form.

In the first method *Hingula maritha loha bhasma*, light reddish brown coloured bhasma was obtained. Here the reaction given was an edothermic process. In *Swayamagni* the reaction between iron and sulphur is an exothermic. In exothermic reaction products will be more stable than the reactants and the excess energy emitted as fumes ,heat etc.

ICP-OES for raw iron powder and XRF for all other samples was done for elemental analysis. On XRD *Hingula maritha loha bhasma* contains with HgS, FeS, α Fe $_2O_3$. *Swayamagni* identified with peaks corresponds to βHgS and kajjali due to its amorphous nature. But on XRF analysis it shows presence of iron oxides and sulphur oxides. Elemental analysis implies that after sodhana the percentage of silica which was 12% for raw iron was reduced to 1.96 after *sodhana*. The copper zinc which was present in trace amount in *sodhitha loha choorna* was totally absent after *Bhasma* formation. Atomic absorption spectoscopy not detected any water soluble mercury within the limit of 0.5 in both samples. Particle size analysis on four samples by using dynamic light scattering shows that after Bhasma formation particles are there below 0.5 micrometer.

CONCLUSION

The presence of α Fe $_2O_3$, Fe $_3O_4$, FeS, HgS etc in different proportion can have a role for that particular action of *bhasma.* The structure of *Swayamagni Loha bhasma* was difficult to reveal in XRD analysis, but on XRF it clearly shows the presence of Fe $_2O_3$, which indicates the process of *Bhasmeekarana* had occurred in it. By comparing particle size analysis, it is seen that range of particle size was seen reduced from 100 µm to 1µm after *sodhana* and below 1 µm after *bhasmeekarana.* Further analysis with higher techniques and clinical studies are essential to find out the activity of these *bhasmas* prepared through different methods.

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