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CONCEPT OF AMRUTIKARANA WITH SPECIAL REFERENCE TO LOHA BHASMA

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ABSTRACT

Amrutikarana is a special procedure described for *Bhasmas* for the removal of the left over *Doshas* in order to make the *bhasma* more therapeutically safe & effective.This study was taken up to carry out *Amrutikarana* of *Loha Bhasma* & Physico-chemical Analysis of *Amrutikaruta Loha Bhasma. Amrutikarana of Loha bhasma* was done by heating it with specially prepared *Triphala kashaya* on *mandagni* till all the moisture content was lost. Percentage of iron has increased in the *Amritikruta Loha* with significant decrease in particle size. Functional groups were almost similar before & after *Amrutikarana*.

Keywords: *Loha Bhasma; Amrutikarana; Amrutikruta Loha Bhasma;* XRD; SEM-EDAX; FTIR.

INTRODUCTION: *Rasa Shastra*, the drug and Pharmaceutical preparations, is a very individualized system of *Ayurvedic* medicine. Sage Nagarjuna famed as father of *Rasashastra* is considered to be the first person to use *Parada* for its alchemic purposes who claimed "*siddherase karisyaami nirdaridryam idham jagat*"[1]. The imperishable fundamentals of *Ayurveda,* which were laid down by the great sages of the olden days, are still applicable because of their scientific eternal background. The *Bhasma Kalpana* is one of the thermodynamics based pharmaceutical concept by which a metallic ore or a metal itself can be converted into Nano-sized biocatalysts which are in colloidal state like Brownian motion[2], hence its bio availability will be optimum. *Loha bhasma* is one such versatile preparation having indications in wide range of diseases.

Rasaadi dravyapaakanam pramana jnapanam putam |
Nesto nyunaadhikah paakah supakvam hitamoushadham ||[3]

In the preparation of any *Bhasma* the quantum of heat given should neither exceed nor be lesser than which is required. Even when prepared according to classics, the drug which are exposed to more *putas* have the tendency of retaining the ill effects of *Agni*. In such cases the role of *Amrutikarana* is important.

Concept of *Amrutikarana*

Lohadinam Mrutanam Vaishishtadoshapanuttaye |
Kriyate Yastu Samskaram Amrutikaranam Matam ||[4]

The method by which the left over *Doshas* of the *Mruta Lohas* are eliminated is called *Amrutikarana*. It is expected to bring following changes in the *Bhasma.*

1. Reduction in *Rukshata, Tikshanata and Agneyatva*- Unwanted qualities imbibed in *Bhasma* due to the process of *Marana.*
2. Increase in the Potency.
3. The drug processed in this method becomes *Amrutatulya*. Also if at all any of the *doshas* are left out in *Marana* it gets nullified in *Amrutikarana* process.

- *Amrutikarana* is a special procedure described only for *Bhasmas* of *Abhraka, Tamra* and *Loha*; and also described by few authors only.
- The process *Amrutikarana* is explained only by texts written after 13th century.
- The definition of *Amrutikarana* given by *Ayurveda Prakash* and *Rasatarangini* differ in their meaning but apparently means of enhancing the safety and efficacy of the *Bhasma.*
- The term *'Amrutikarana'* is used by classical texts like *Rasatarangini, Ayurveda Prakasha* and *Anandakanda* only.
- *Rasaratna Samucchaya,* though does not mention the term *Amrutikarana,* but in the context of *Tamra Marana,* a process involving the *Mruta tamra* is described which is claimed to remove the eight impurities of *Tamra bhasma.* Similarly special procedures are described after the *Marana* of *Abhraka, Swarnamakshika* & *Loha* which has been termed as *Amrutikarana* in *Rasatarangini*.
- The author of *Rasa Tarangini* opines this procedure to be extended for *Lohadi bhasmas,* but explained the procedure for *Abhraka and Tamra* only.
- *Anandakanda* has included this under the 5 *Samskaras* of *Abhraka.*
- *Yadavaji Trikamaji Acharya,* author of *Rasamruta* opines that it removes the eight bad effects of *Tamra.*

Amrutikarana- Prayojana

Mritampyaravindantu hi amrutikaronojbhiktam|
Sevitam dashayatyastou doshanaashu vishopamaan ||
Tasnmrutasya taamrasya doshashatkam nivruttaye |
Amrutikaranam yatnaad vidyaadbhishagagrini || [5]
Dvigune triphala kwathe tulya pistavaapi ayorajah |
Vispachenmadhyapaakin sarva vyadhijarapaham || [6]

Loha bhasma along with *triphala kwatha* in equal quantity or double the amount heated on *mandagni* till the liquid portion evaporates.

Reference	**Ingredients**	**Procedure**
Ayurveda Prakasha-3/280	*Loha bhasma* – 1 part *Triphala kwatha* – 2 parts	Together heated on moderate fire till all liquid evaporates.
Aanandakanda amruteekarana vishranti 7/122-124 B.R.R.Su	*Loha bhasma* – 1 part *Goghruta* – 1 part *Triphala kwatha* prepared with 5 *pala Triphala*	Heated in *Tamra patra*, fried using iron ladle on mild flame.
Aanandakanda -kriyakarana vishranti 5/56 *Brihat Rasa Raja Sundara*	*Loha bhasma – 1 part Goghruta*	Heated in *Lohapatra* (iron vessel)

Rasa Jala Nidhi-vol.3- 1, *Aanandakanda -kriyakarana vishranti*-5/61-63	*Loha bhasma* – 5 *pala* *Triphala* decoction prepared with 5 *pala* of *Triphala churna Goghruta* – equal to *Kashaya*, *Sita* (sugar candy) equal to *bhasma*	*Loha bhasma* is heated along with the *kashaya* and *ghruta.* When the liquid exhausts completely, equal quantity of *Sita* is added.
Rasa Jala Nidhi	*Loha bhasma- 1 pala* Jaggery - 4 *palas*	*Loha bhasma* is to be mixed by heat with jaggery & made into pills of a *Kola pramana*. One such pill may be used in diseases with suitable accompaniments.

MATERIALS & METHODS:

Loha Bhasma Prepared By Classical *Puta* Method[7]

Materials:

- *Hingula*-1/12th part of *Loha*- 120g
- *Loha* after *sthalipaka* - 1435g
- *Kumari swarasa* - 710ml
- Cow dung cakes - 22 kgs i.e 245 cowdung cakes

Method: *Loha Marana* was carried out in different stages viz:

- *Mardana* with *Hingula.*
- *Bhavana* with *Kumari swarasa.*

1. Preparation & drying of *Chakrikas.*
2. *Sharava Samputa* formation.
3. Subjecting to *Gajaputa.*

Loha was subjected to 16 *Gajaputas* to obtain properly prepared *Loha Bhasma* which satisfied all the classically told *siddhi lakshanas* i.e endpoints like *Varna*(Colour), *Rekhapurnata* (Filling into the furrows of the finger), *Varitara* (ability to float on water), *Niruttha* (no free metal content in the *bhasma*) [Table 1].

- Intial Wt of *Loha* Taken for *Trividha Lohapaka* : 860g
- Total Weight of *Loha* before *Marana* : 1435g
- Total Weight of *Loha* after *Marana* : 1168g
- Loss of weight : 267 g
- Total wt gain of *Loha*:(1168-860)= 308g
- % of Gain : 35.81%

Preparation of *Triphala Kwatha* for *Amrutikarana*[6]

Duration: 5 hrs**Drugs:** *Triphala* (coarse powder) : 1100g; Water : 8800 ml

Equipments: Gas stove, stainless steel vessel, measuring mug, cloth, spatula, and weighing machine.

Procedure: *Triphala kwatha choorna* was taken equal to that of *loha* (obtained after 16th puta i.e. 1100g) & 8 parts of water was added and boiled on *mandagni.* It was reduced to 1/4th. Initially it was stirred to avoid charring. It was strained by clean cora cloth.

Amrutikarana:

Materials: *Loha Bhasma* : 1100g
Triphala kwatha : 2200 ml

- *Loha bhasma* was taken in an iron Pan to it *Triphala kashaya* was added and stirred well to ensure uniform mixing. This was heated on *mandagni* till all the moisture content was lost.
- Then it was allowed to self-cool and then powdered.

Observation:

- After 1 hr *Triphala kwatha* started sticking to *bhanda.*

- Vigorous stirring was required till the end of the procedure after the 1st hour to avoid charring of *Triphala.*
- It took 3hrs to become completely fumeless *(Nirdhuma)*
- When the fumes stopped, the whole mixture turned to black colour.

OBSERVATION & RESULTS:

Table 1: Classical Parameters for analysis of *Loha Bhasma & Amrutikruta Loha Bhasma*

Sl.no.	Name of Pariksha	*Loha Bhasma*	*Amrutikruta Loha Bhasma*
1	*Varna*	Purple	Black
2	*Rekha purnata*	Positive	Smooth, Soft
3	*Varitaratva*	Positive	Positive
4	*Niruttha*	Positive	Positive

Table 2: *Lakshanas* of *Amrutikruta Loha Bhasma*

Parameters	Observations
Color	Jet black
Taste	Tasteless
Odour	Characteristic odour of *Triphala*
Touch	Coarse lumps
Luster	---

- ***Loha Bhasma Amrutikarana*:**

Total Weight of *Loha bhasma* before *Amrutikarana* : 1100g
Total Weight of *Loha bhasma* after *Amrutikarana* : 1300g
Weight gained : 200g

Table 3: Comparison of Physical & Chemical Parameters of *Loha Bhasma & Amrutikruta Loha Bhasma*

Parameters	*Loha Bhasma*	*Amrutikruta Loha Bhasma*
Colour	Purple	Black
Taste	Astringent	Astringent
Odour	Odourless	Odourless
Touch	Amorphous	Amorphous
Total Ash, w/w	99.75%	96.00%
Acid insoluble ash, w/w	1.90%	3.10%
Water soluble ash, w/w	0.50%	2.00%
Loss on drying at 110^0C, w/w	Nil	0.85%
pH	6.84	10.69
Total Iron	34.52%	31.70%
Ferric	18.89%	16.85%
Ferrous	15.63%	14.85%
Mercury	-	-
Sulfur	14.69%	15.80%

Table 4: XRD Results of *Loha Bhasma& Amrutikruta Loha Bhasma*

Sample	Compound Name	Chemical Formula	Crystal Structure
Loha Bhasma	Hematite	Fe_2O_3	Trigonal
	Marcasite	FeS_2	Orthorhombic
	Magnetite	Fe_3O_4	Cubic
Amrutikruta Loha Bhasma	Hematite	Fe_2O_3	Trigonal
	Magnetite	Fe_3O_4	Cubic

Table 5: Comparative SEM EDX results of *Loha Bhasma, Amrutikruta Loha Bhasma*

Loha Bhasma		***Amrutikruta Loha Bhasma***	
Element	**Mass %**	**Element**	**Mass %**
C	4.03	**C**	9.04
O	14.01	**O**	4.86
Mg	0.67	**Mg**	-
Si	0.62	**Si**	0.50
S	0.28	**S**	0.30
Ca	0.75	**Ca**	0.93
Fe	79.64	**Fe**	83.56
K	-	**K**	0.82
Hg	-	**Hg**	-
Au	-	**Au**	-

Table 6: FTIR Peaks of *Loha Bhasma*

Sample – *Loha Bhasma*				
Sample peaks Cm^{-1}	**Standard PeaksCm^{-1}**	**Specific type of Bond**	**Bond**	**Functional groups**
2844.59	2830–2695	Medium	H–C=O: C–H stretch	Aldehydes
	3000-2850	Medium	H-C-H (stretch)	Alkanes.
	3400-2400	Medium	O-H (broad) stretch	Carboxylic Acids
1051.44	1250–1020	Medium	C–N stretch	Aliphatic Amines
	1320–1000	Strong	C–O stretch	Alcohols, Carboxylic Acids, Esters, Ethers
553.70	690–515	Medium	C–Br stretch	Alkyl Halides
	850–550	Medium	C–Cl stretch	Alkyl Halides
	785-540	Medium	C-X	Chloride
472.98	<667	Medium	C-X	Bromide, Iodide

Table 7: FTIR Peaks of *Amrutikruta Loha Bhasma*

Sample – *Amrutikruta Loha Bhasma*				
Sample peaksCm^{-1}	**Standard Peaks Cm^{-1}**	**Specific type of Bond**	**Bond**	**Functional groups**
3817.85	>3000	Weak to Medium	N-H	Secondary Amines
3218.10	3500–3200	Strong,	O–H stretch, H–bonded	Alcohols, Phenols

		Broad		
	3400-2400	Medium	O-H (broad) stretch	Carboxylic Acids
	3500-3100	Medium	N-H (stretch)	Primary and Secondary Amines and Amides.
1576.21	1650-1566	Medium	C=C stretching	Cyclic Alkene
	1640-1550	Medium	N-H bending	Amide
562.49	690–515	Medium	C–Br stretch	Alkyl Halides
	850–550	Medium	C–Cl stretch	Alkyl Halides

Table 8: Showing Particle Size Results of *Loha Bhasma, Amrutikruta Loha Bhasma*

	Effective Diameter(nm)		
Sample	**Mean diameter(nm)**	**Standard error**	**Effective diameter(nm)**
Loha Bhasma	779.4 nm	56.2	777.7
Amrutikruta Loha Bhasma	507.4 nm	16.3	508.4 nm

Table 9: Showing NPST Results of *Loha Bhasma, Amrutikruta Loha Bhasma*

Sample	***Loha Bhasma* [LB]**	***Amrutikruta Loha Bhasma*[LBA]**
I phase (0-5min)	Dark blue solid central spot Light blue middle segment white peripheral segment with thin green margin	Wide Deep Blue solid central Spot, Dark Blue Periphery
II Phase (5-20min)	Dark blue solid central spot Light blue middle segment white peripheral segment with thin green margin	Wide Deep Blue solid central Spot with Green margin, Dark Blue Periphery
III Phase (4hr)	Dark blue central spot Light blue middle irregular segment surrounded by white ring Green peripheral segment	No change in central & middle segment. Cream outer peripheral segment appeared.
After 24 hrs	No Change	No change in central & middle segment. Cream outer peripheral segment widened.
After 48 hrs	No Change	No Change

Concept of *Amrutasara Loha:* Propounded by *Nagarjuna.* In this context complete process of *loha samanya shodhana* (general purification), minimal amount of *loha* to be taken, its corresponding quantity of *Triphala* to be taken, *trividha paka* (Three types of Heating) and the steps involved in *Amrutikarana of Loha* (Nectarization of Iron), but specific naming of each procedure has not been done. *Prakshepaka dravyas* and their individual utility in *shodhana* (purification) *& marana* (incineration) *of loha* has been told ex:

Triphala (equal quantity of Phyllanthus emblica, Terminalia chebula, Terminalia bellirica), *trikatu* (equal quantity of Zingiber officinale, Piper nigrum, Piper Longum), *chitraka* (Plumbago zeylanica), *kantakramaka (musta*- Cyperus rotundus*), vidanga* (Embelia ribes), *jatiphala* (Myristica fragrans), *jatikosha, ela* (Elettaria cardamomum), *kankkola* (Piper cubeba), *lavanga* (Syzygium aromaticum)*,jeeraka* (Cuminum cyminum) *and Krishna jeeraka* (Carum carvi*).* These powders (total) should be added equal to *loha.*Among them *triphala, trikatu and vidanga* are essential as they remove the defects of iron and others should be added according to the *prakruti.* While *jatiphala* to *lavanga* may be added according to the availability. *Kantakramaka* alone removes all defects of iron.

Specific quantity of *ghrita* (ghee) for *paka, Marana dravyas* are also described.

It is said that iron powder which appears like pollens of *ketaki* (Pandanus odorifer) when strained through cloth is considered standard. *Loha* is said to be taken in the pan of *loha, pittala*(brass), *kamsya*(bronze) *or tamra* (Copper) pasted firmly with mud & heated on mild fire of wood. (*mrudu vahni)*Three types of *loha paka* & their *lakshanas* are explained as follows

Mrudu, Madhyama and khara paka, applicable in *pitta, vata and kapha* respectively. The *madhyma paka* is applicable to all.

Trividha Paka Lakshana:

1. *Mrudu paka* – the product sticks to the ladle and can be removed easily.
2. *Madhyama paka* – the product attached to ladle gets separated sometimes easily and sometimes with difficulty.
3. *Khara paka* – that which does not stick to the ladle.

To store such a *loha* specific utensil in which ghee has been stored for long duration as the roughness of utensil is removed or in utensil in which cow is milked in case iron vessel is not available, has been mentioned. Preparation of *Lohaabhraka* has been told to be done using *Abhraka* in 1/4, 1/2, equal, double, triple, fourfold or fivefold quantity. Here particular *Abhraka marana shodhana vidhi, Bhojana sevana kala, pathya* are explained. This preparation is quite saturating. It alleviates *pitta* and promotes strength and lustre. It also controls thirst and hunger if *Abhraka* is mixed in maximum quantity. It is rubbed in a smooth iron mortar adding honey in proper quantity and ghee a little more than honey. When it attains clay like consistency, it should be taken.

Dose- *Vriddhi & Hrasa krama*

- 1-3 days 2 *ratti*
- 4-6 days – 2 *ratti* – 2+2= 4 *ratti*
- 7-9 days – 3 *ratti* – 4+3 = 7 *ratti*
- 10-12days – 5 *ratti* – 7+5 = 12 *ratti*
- 13-15 days – 5 *ratti* – 12+5= 17 *ratti*
- 16-18 days - 5 *ratti* – 17+5= 22
- 16-21 days - 5 *ratti* – 22+5= 27
- 22-24 days - 5 *ratti* – 27+5 = 32
- 25-27 days - 5 *ratti* – 32+5 = 37
- 28 -30 days - 5 *ratti* – 37+5= 42
- 31-33 days - 5 *ratti* – 42+5= 47

Followed by *Hrasa karma* (waning dose) is the same manner. Out of the dose of eight grams, three grams should be taken each morning and evening and the remaining two grams in noon.

It should be followed by water or milk as *Anupana* (Vehicle). After washing the mouth, betel with camphor should be chewed. Apart from that in cases of constipation, intake of hot milk or water of tender coconut fruit acts as laxative. If these fail, warm water added with

Yavakshara should be taken. Warm decoction of *Triphala* mixed with *Yavakshara* is stronger than the above.

DISCUSSION:

***Amrutikarana*:** This is a special process adopted only for the *Bhasmas* of metals like *Tamra, Abhraka & Loha.* The method by which the left over *Doshas* of the *Mruta Lohas* are eliminated is called *Amrutikarana*. It is expected to bring following changes in the *Bhasma.*

- Reduction in *Rukshata* (Roughness), *Tikshanata* (intense/strong) *and Agneyatva* (hot potency) - Unwanted qualities imbibed in *Bhasma* due to the process of *Marana.*
- Increase in the Potency.

Probably it has been told for only those *bhasma* which in the quantum of heat required to attain the *bhasma siddhi lakshans* are very high. Due to excess exposure to *agni*, imbibing of certain unwanted properties like *rukshata, ushnata, tikshnata* might occur which ultimately results in decreased therapeutic efficacy or decreased *rasayana* property or in certain cases burning sensation etc. Hence to counteract these, drugs like *Goghrita, Triphala, Kumari swarasa* (Juice of Aloe vera) have been chosen for *Amritikarana*. All these drugs are having the property to mitigate *ruksha, ushna & tikshna guna* and are the same drugs used either for *shodhana or marana.* But during this process it is indicated that there will be *Varnahani*. The reason behind this can be revealed by referring to the periodic table. Iron is a transition element (4^{th} period), forms (III) and (II) types of oxides. These oxides of an element may transform to one or other type on heating.

Iron forms three types of oxides.

1. Iron (II) Ferrous oxide – FeO (black powder produced by heating iron oxalate in absence of air)
2. Iron (III) Ferric oxide – Fe_2O_3 (Red powder prepared by heating iron hydroxide in strong heat)
3. Iron (II,III) Ferroso-Ferric Oxide- Fe_3O_4&
   Ferrous Sulphide- FeS-Sludge coloured.

Due to continuous heating probably Ferric oxide gets converted to ferrous oxide in the presence of carbon leading to *bhasma* becoming black coloured. In the present study the percentage of Ferric oxide has reduced in *Amrutikruta Loha Bhasma*as compared to *Loha Bhasma.*

Iron (III) oxide + carbon → iron + carbon dioxide

$2Fe_2O_3(s) + 3C(s) \rightarrow 4Fe\ (l) + 3CO_2\ (g)$

$Fe_2O_3 + CO \rightarrow 2FeO + CO_2$ (at 500-600° C)

$3Fe_2O_3 + CO \rightarrow 2Fe_3O_4 + CO_2$ (at 400° C)

Marana using *Ariloha* media is considered as inferior probably due to the residual remains of the second along with the primary metal. Here it can be taken as the formation of Ferrous Sulphide. But FeS is not found in *Amrutikruta Loha Bhasma,* probably due to the conversion of S into SO_2 when roasted in the presence of oxygen. Hence the claims about removal of residual impurities/toxicities in the drug by the process of *Amrutikarana* are found correct. After the process of *Amrutikarana* weight gain is observed. This might be due to imbibing of organic moieties into *loha bhasma* & open air roasting process. The Functional Groups in both the samples are almost similar but there is significant reduction in the Particle size of the *Amrutikruta* sample.

CONCLUSION: *Amritikarana* has been told only for three metals which require more number of *putas* for their

bhasmikarana. Hence the procedure is required to reduce the *tikshnata and rukshata* which is produced by *Agni* and to make it more assimilable to the body. *Amrutikaruta Loha* has increased percentage of Iron and the Particle size has also reduced significantly. Ferrous sulphide is absent in the *Amrutikruta Loha* and Iron is present more in the ferroso-ferric form. To attain these changes probably the process of *Amrutikarana* was told for *Loha*. Further comparative experimental and clinical studies can be taken up to provide validation to the process.

Figures:

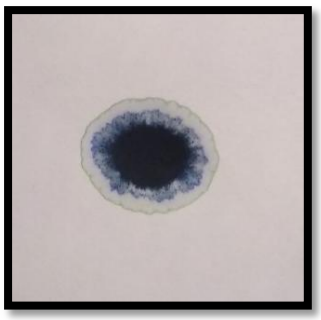
Loha bhasma and Triphala Kashaya

Adding of Triphala Kashaya for Amrutikarana

Complete Immersion in Kashaya

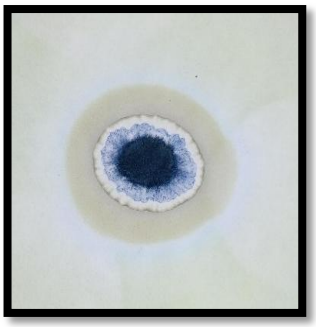
White Fumes Seen

Nirdhuma

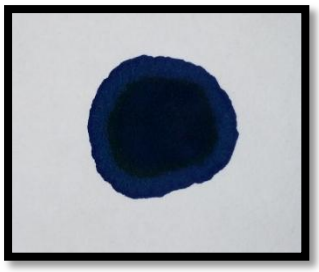


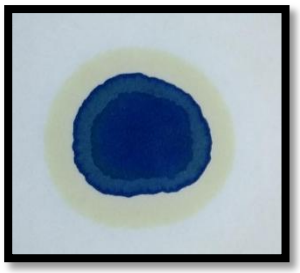
LB after 5 mins

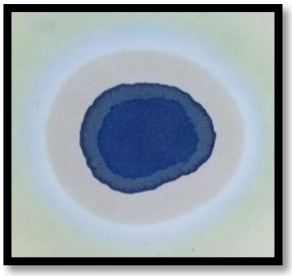
LB after 4 hrs



LB after 24 hrs


LBA after 5 mins


LBA after 4 hrs


LBA after 48 hrs

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