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BRIEF REVIEW OF LAUHA MARANA W.S.R. TO PHYSIO CHEMICAL CHANGES

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ABSTRACT

Introduction -Marana is the procedure which purified and detoxified material and converted into easy assimilation, absorbable and adaptable form. Loha bhasma is mineral based Ayurvedic medicine. It contains elemental iron microfine particle prepared through the process of calcination under high temperature. Marana brings many physio chemical changes like reduction in particle size to gain biological benefit. Aims and Objectives- To do detailed study on Lauha Marana,To Evaluate chemical changes during Marana procedure in lauha bhasma Discussion - Lauha should not be taken less than 5 Pala and more than 13 Pala for processing. Kant lauha and Tikshna lauha is considered as best raw material for lauha bhasma preparation. Lauha marana or incineration process mostly follow Trividha paka method that are Bhanupaka, Sthalipaka and Putapaka. Triphala contains ascorbic acid which increases the bioavailability of Iron by converting Fe3+ to Fe2+. Repetition in heating and cooling just like in samanya and vishesh shodhana causes disruption in compression tension equilibrium and leads to increased brittleness, reduction in hardness, and finally reduction in the particle size. During Bhanupaka the ultraviolet radiation present in the sunlight reduces the oxidation state of Fe in the presence of Vitamin C present in the Triphala decoction thereby improving the bioavailability. Conclusion- Lauha bhasma is a mixture of ferrous oxide, Ferrous Sulphide, Ferric Oxide and other trace element.

KEYWORDS: Lauha bhasma, Marana, Trividh paka.

INTRODUCTION

In the 8th century AD the Indian alchemist Nagarjuna first introduced the use of metals and minerals like *Swarna* (Gold), *Rajat, Tamra, Abhrak, Makshika, Rasa* as medicinal agent. In Ayurveda, metals are used in many preparations after transforming the metal into non-metallic forms called as bhasma. *Bhasma* are unique preparations involving metallic / mineral preparations calcined along with various herbal ingredients using heat to transform metals into nontoxic organometallic form. These complexes should neither contain free metal nor contain free organic constituents, whose presence in *bhasma* indicates improper calcination. In the Samhita period *Lauha* was used in the form of fine powder called as *Ayaskriti.* Later in Rasashastra classical text explain the *shodhana* (Purification) and *marana* (incineration) methods.

Iron is an essential element for almost all living organisms as it participates in a wide variety of metabolic processes, including oxygen transport, deoxyribonucleic acid (DNA) synthesis and electron transport.[1] *Loha bhasma* is mineral based Ayurvedic medicine. It contains elemental iron microfine particle prepared through the process of calcination under high temperature. In Ayurveda *Lauha bhasma* is used for *Meha, Shula, Aama, Arsha, Gulma, Pleeha, Yakrit, Kshaya, Pandu, Udarda*.[2]

Metals and minerals present in the environment having useful and harmful impact on the living organism present on this universe. Biological benefit can be achieved by bringing physicochemical changes in naturally available metals and mineral particle size, structure and chemical form of the drug are the physio- chemical qualities that have close relation with different biological activities. *Rekhapurnatva* (Fineness), *Arasa* (Testlessness), *Shighravyapia* (Quick absorption) and *Mrutani Lohani Rasibhavanti* (Good bio availability) these are the properties of proper *marita bhasma*.[3,4]

Marana brings many physio chemical changes like reduction in particle size to gain biological benefit. *Marana* is the process which convert the purified metals

and minerals into *bhasma* (Ash) after subjecting them to lavigation and incineration is called as *Marana*.[5] In the present study, detail study done on *lauha Marana* by using classical reference and research study conducted.

AIMS & OBJECTIVES

- To do detailed study on *Lauha Marana*
- To do Literary review on *Lauha Marana*
- To Evaluate chemical changes during *Marana* procedure in *lauha bhasma.*

Concept of Marana

The process of making the purified metals and minerals in to a fine ash like powder by subjecting them to *Bhavana* and applying required quantity of heat is known as *Marana*. It is process in which metals like as *Lauhadi Varga* are purified and detoxified materials are converted in to easy assimilation, absorbable and adaptable form.

Types of Marana[6]

***Marana* process is divided in to 4 categories based on various drug mixed for *Marana*.**

1) *Parada Marita: Parada and Parada* compounds (Kajjali, Rasasindura, Hingula) are used for *Marana* process. *Parada* is considered as best for the *Marana* process because it helps into break down of particle size. *Parada* has *yogavahi, sukshamastrotogamitwa, jaramrutunashaka* properties. *Parada marit Bhasma* is considered as best because during *Marana* process substance acquires the properties of *parada.*
2) *Vanaspati* (Herbal drugs) *marita*: Herbal drugs are used for *Marana* process considered as moderately better. Herbal drugs are *amliya and kshariya* in nature, after incineration some materials of herbal drugs remained in the drugs hence that can affect the therapeutic uses of main drug. Hence it is considered as moderately better.
3) *Gandhaka marita*: It contains *Gandhaka* and it compounds like *Haratala*, *Manahshila* etc. These drugs are toxic in nature. Hence it considered as kanishtha (low) category.
4) *Arilauha marita*: These are antimetals and produce unwanted qualities in *Bhasma*, hence it not recommended for incineration.

Different Procedures of Marana

1. *Putapaka* Method

Shodhit drug is mixed with *maraka dravya* and levigated with particular liquid media till doughy mass formed. Pellets were prepared from doughy mass and kept in *sharava* after drying. Another *sharava* is placed over it and junction is sealed with mud smeared cloth. This *sharava samputa* is subjected to puta for incineration.

2. *Kupipakwa* Method

Shodhit drug is levigated with *Bhavana dravya* for certain period. Then *kachakupi* was prepared by applying mud smeared cloth. *Kachakupi* placed in *valukayantra* for heating for certain time period, after self-Cooling bottle was broken and prepared drug is collected from bottle.

3. *Niragni* Method

Shodhit drug is mixed with *kajjali* and it is subjected to levigation for certain period. Then dough placed in Copper saucer, covered by specific leaves and placed in sunlight to dry. After this it is covered with another saucer which is sealed by mud smeared cloth. This *sharava samputa* is kept in *dhanyarashi* for specific period.

Lauha Maraka Gana Dravya

In *Rasatarangini*, different *Maraka Dravyas* were mentioned as per the indication of that *Bhasma.*

***Vatahara Gana*[7]**

Eranda moola, Rasna, Dashamoola, Prasarini, Mudgaparni, Mashaparni, Shatamooli, Punarnava, Ashvagandha, Amruta, Mamsi, Bala, Nagabala.

***Pittanashaka Gana*[8]**

Ushira, Nira, Simhika, Kirata, Shatavari, Patola, Candana, Amruta, Saroja, Talamoolika, Parpata, Shalmali, Sita.

***Kaphanashaka Gana*[9]**

Rasna, Marica, Avika, Nagini, Vishva bheshaja, Eranda, Pippali Moola, Tulasi, Shrungavera, Bharngi, Raktarka, Kusuma, Murva, Shigru, Bibhitaki

Steps of *Marana* process

To prepare good quality of *Bhasma, Marana* process may divide into following steps

1. *Shodhana*
2. *Jarana* (for putilohas)
3. *Bhavana* (mixing with marana drugs)
4. *Chakrikanirman* (pelletisation and smaputikaran)
5. *Shoshanam* (drying)
6. *Puta* (application of desired heat by puta or in furnace)
7. *Swangshita* (self cooling)
8. *Kuttanam* (pestling)
9. Repetition of whole process (till desired character achieved i.e it passes all Bhasma parikshas).

***Lauha Shodhana* and *Marana matra*[10]**

For *shodhana* and *marana* of *Lauha*, minimum 5 *pala* ie. 235g and maximum 13 *pala* ie 600g of *lauha* should be taken. Less than 5 *pala* and more than 13 *pala* are not advised.

Lauha* for *Marana

In traditional literature, *kanta lauha* (magnetite Fe ore) and T. *lauha* (Fe turnings) is considered as best raw material for *lauha bhasma* preparation.[11]According to *Ayurved Prakash*, *tikshna Lauha* should be used, especially old broken pieces of *yantra and shastra*.[12]

Suitable *Lauha* form for processing

The small pieces of *Tikshna Lauha* which are obtained during preparation of weapons like swords etc. *Lauha*

patra (Iron leaves prepared by hammaring) *Churna* of *Lauha* can be taken to prepare *Lauha Bhasma.*

Samanya Shodhana* of *Lauha

This method is used for all metals. Metal is heated till red hot stage then quenched 7 times in each liquid media ie. *Til Tail, Takra, Gomutra, Arnal and Kulattha Kwath repectively.(Til tail Takra Gomutra Arnal Kulattha kwath*)

Vishesha Shodana of Lauha

The *Vishesha Shodhana* method is followed after *Samanya Shodhana* of *Lauha* to remove all the *Doshas* of *Lauha*.

Table 1: Vishesha Shodhana Methods of Lauha.

Sr. No	Drug and Media	Procedure	Repetition	Reference
1	*Triphala Quath*	*Nirvapa*	*7*	*RRS, RT, RSS, AP*
2	*Kadalimula jala*	*Nirvapa*	*7*	*RSS, RT*
3	*Triphala kwath+ Gomutra*	*Nirvapa*	*7*	*RT*
4	*Sashaasruj + Triphala kwath*	*Lepana then Nirvapa*	*7*	*RT, AP*
5	*Arka dudgha + Triphala kwath*	*Lepana then Nirvapa*	*7*	*RT, AP*
6	*Samudra lavan+Triphala kwath*	*Lepana then nirvapa*	*7*	*RRS*
7	*Sasha rakta*	*Lepana and Taap*	*3*	*RRS*
8	*Sasha rakta+ kshar amla*	*Lepana then nirvapa*	-	*AP*
9	*Chinch patra swaras/kwath*	*Nirvapa*	*7*	*RRS*
10	*Triphala kwathin Gomutra*	*Nirvapa*	*7*	*RRS*

Table 2: Methods of Marana of Lauha.

Sr. No.	Drug and Media for ***Bhavana***	Procedure	Repetition	Reference
1	*Hingula + stanya*	*Putapaka*	-	*Rasarnavam*
2	*Triphala Kwath*	*Bhanupaka*	7	*RT, RSS*
3	*Triphala Kwath/Hastikarna /satamulika/ Bhringaraj-Rasa*	*Stalipaka*	-	*RT, RSS*
4	*Triphala Kwath*	*Putapaka*	10 -1000	*RT, RSS*
5	*Hingula and Jambira Rasa*	*Nirvapa*	-	*RSS*
6	*Triphala Kwath prepared by Gomutra*	*Putapaka*	21	*RRS*
7	*Triphala Kwath*	*Putapaka*	4	*RRS*
8	*Oudan and Triphala Kwath*	*and Putapaka*	5	*RRS*
9	*Guda, Gandhaka and Triphala Kwath*	*Putapaka*	20-30	*RRS*
10	*Gandhaka and Kumari Vari*	*Niragni Paka*	-	*RRS*
11	*Suta and Gandhaka*	*Putapaka*	20	*RRS*
12	*Hingula-1 part and Nari Stanya and Hingula-1/20 part and Triphala Kashaya, Jambira Rasa and Arnal*	*Putapaka*	2 + 38	*RRS*
13	*Parada Bhasma- ¼ part or Makshika / Gandhaka / Parada - 1 part, Shasha Rakta, Kshar, Amla Dravya*	*Putapaka*	-	*RRS*
14	*Suddha Parada – 1 part Gandhaka - 2 part and Kumari Swarasa*	*Niragni Paka*	3 days	*RRS, AP*
15	*Makshika Bhasma- ¼ part, Nimbuka Vari*	*Putapaka*	3	*RT*

***Lauha Niruthitkarnam*[13]**

Lauha bhasma is taken with *Goghrut* and *Gandhak* in equal amount in *khalva yantra* and then given *bhavana* with *kumari swaras*. *Bhavana* is given till it dried, then *churna* is kept in *sarav* and *samutikaran* is done. Then subjected to *Gajaputa,* and *bhasma* becomes *Niruthita.*

Table 3: Research studies conducted on *Lauha Bhasma* and their Conclusions.

Sr. No.	Research Studies Conducted	Samanya Shodhan	Vishesh Shodhan	Marana Procedure	Conclusion
1	Pharmaceutical study of *Lauha Bhasma* Neetu Singh An International Quarterly Journal of Research in Ayurveda Ayu 2010 Jul-Sep; 31(3): 387–390.	*RRS- Nirvapan* seven time in *tila taila, takra, gomutra, kanji and kulattha kwatha*, simultaneously	*RRS- Triphala quath Nirvap* 7 times	*RT-Bhanupaka, Sthalipaka and Putapaka. Bhanupaka- Triphala quath*(1:1:2=1/4) *Sthalipaka-Triphala quath*1:3:16= 1/8 *Putapaka- Triphala quath* Batch I-800^{o}C Batch II-600^{o}C	Batch I-"*Pakwajambu phala varna"* on 22 *Puta* and 70 % *varitara* Batch II-"*Pakwajambu phala varna*" on 20 *Puta* and 75 % *varitara* Conclusion temperature of 600°C in the EMF is to be maintained for 1 h for preparing proper *Lauha Bhasma*.
2	Standard manufacturing procedure of *Teekshna lauha bhasma* Thakur Rakesh Singh Journal of Ayurveda and Integrative Medicine Volume 7 Issue 2	RRS- *Nirvapan* seven time in *tila taila, takra, gomutra, kanji and kulattha kwatha*, simultaneously	RRS- *Triphala quath* 1 Kg each-24 Lt water = ¼ *Nirvap* 7 times	*RT-Bhanupaka, Sthalipaka and Putapaka. Bhanupaka-Triphala quath* (1:1:2=1/4) *Sthalipaka-Triphala quath*1:3:16= 1/8 *Putapaka-Triphala quath* EMF- 650^{o}C maintain for 1 hr repeated 20 times	"*Pakwajambu phala varna*" on 20 Puta temp. maintained 650^{o}C up to 1 hr in EMF
3	Pharmaceutical Preparation of *Lauha Bhasma* Manoj Kumar Dash, Namrata Joshi IJAPR | March 2019 | Vol 7 | Issue 3	AFI- *Nirvapan* three time in *tila taila, takra, gomutra, kanji and kulattha kwatha*, simultaneously	RT- 20/18 quenched in *Gomutra* mixed *Triphala kwatha*. repeated for seven times	*Bhanupaka - RT* 20/22-24 *Triphala quath* (1:1:2=1/4) *Sthalipaka- RT* 20/26 *Triphala quath* 1:3:16= 1/8 *Putapaka-* 20/31-39,52 *Triphala quath* 1:1:2:1/4 EMF- 750^{o}C-35 Puta next 25 Puta-700^{o}C temp. *Amritikaran – Rasa Kamdhenu Grahani chikitsa/* 173 175*Triphala kwatha Go-ghrita*	The study showed an increase in weight of *Lauha* after *Bhanupaka* and *Stahlipaka* i.e.,, 216% and 105.3% due to addition of solid content of *triphala* ,After *Puta paka*, 63%weight gain due to addition of *triphala* ash.
4	Pharmaceutical and analytical study on *Loha bhasma* Rajendra prasad ML International Journal of Ayurvedic Medicine, 2010, 1(1), 47-59	(RRS 5/29 RRS- *Nirvapan* seven time in *tila taila, takra, gomutra, kanji and kulattha kwatha*, simultaneously	R.R.S 5/102-103 *Triphala quath Nirvap* 7 times	*Banupaka:* (RSS 1/302-304) 1:1:2:1/4 Repeated 3 times *Sthalipaka: RSS*1/309-310 *Putapaka:(RSS*1/343 *Sh. Hingula*- 1 P *LauhaChurna*-12P *Gajaputa* -7	*Trividha paka* process for *Loha bhasma* enhances the *guna* of it and reduces the size of the particles. Tests of the ayurvedic parameters of *bhasma* like *Apunarbhava, Nirutta* and the NPST proved the fineness of *Lohabhasma*.
5	Effect of No of Puta on Particle Size of *Lauha Bhasma* Bajaj Nisha wjpmr, 2018,4(12), 149-154	*RRS* 5/29 *RRS- Nirvapan* seven time in *tila taila, takra, gomutra, kanji and kulattha kwatha*, simultaneously	-	*RRS*-Levigation with *triphala kwath* prepared with gomutra. Puta given in EMF-600 to 850^{o}C in 4 samples Sample 1 -5 *Puta*	The particle size of *kant lauha Bhasma* was found to be decreasing while increasing the number of *Puta*. It denotes that more the number of *Puta* results

				Sample 2-10 *Puta* Sample3- 20 *Puta* Sample 4-30 *Puta*	in finer *bhasma*. Thus, 32 Puta is more convenient to form superior *Bhasma of kant lauha* in.
6	Characterization of *Lauha Bhasma* Bhargava Subhash Chandra www.ijam.co.in 2013	Batch A-*Teekshna Lauha* Batch B-*Kant Lauha* Batch C – *Kant Lauha Rasaratna Sammuchhaya*	*Rasendra sar Sangraha*	*Rasendra Sar Sangraha Bhanupaka Sthalipaka Putapaka* Batch A-20 *Puta* Batch B-18 *Puta* Batch C- 18 *Puta*	In case if *tikshna lauha* the iron is converted into two different form of iron oxide i.e. Meghamite and Hematite. In case of kanta lauha Magnetite.
7	A Comparative Experimental Evaluation Of Hepatoprotective Activity Of *Dhatri Lauha* Prepared With And Without *Lauha Bhasma*." Dr. Alka Yadav G A C ,Dept. of Rasashastra, Nanded, 2019	*RRS* 5/11 *RRS- Nirvapan* seven time in *tila taila, takra, gomutra, kanji and kulattha kwatha,* simultaneously	*R.R.S* 5/102-103 *Triphala quath Nirvap* 7 times	*Rasa Tarangini* 9/12 *Sh. Hingula*- 1 P *Lauha Churna*-12P *Gaja puta* -7	EMF maximum temp of 750^{o}C is required for one hr.

Table 4: Shows Physio Chemical changes in different Research Study.

Sr. No	Article	Raw material analysis	Ayurvedic Analysis	Physio chemical analysis-
1	Standard manufacturing procedure of ***Teekshna lauha bhasma*** Thakur Rakesh Singh Journal of Ayurveda and Integrative Medicine Volume 7 Issue 2	Elemental analysis – XRF- Fe- 98.10% Si - 0.40 Al - 0.13 Ca - 0.074 Mn - 0.75 Others elementsa-0.54	*Rekhapurnatvam* -It enters into the ridges of the finger -positive Varitaratvam – 80% *bhasma* was floating on the water surface – positive *Nirdhumatvam, Nischandratvam, Apunarbhava*- Positive Color- Pakva jambu phala varna Taste-Tasteless	**XRF/ XRD** Texture- Amorphous Loss on drying (%) - 0.31 Ash value (%) -98.15 Acid insoluble ash (%) - 27.50 Water soluble ash (%) - 30.26 Particle size SEM - 100–500 nm XRF- Fe- 70.26, Si - 0.96, Al - 0.31, Ca - 1.50, Mn - 1.63, Others elementsa-XRF P, Cl, Ni, Ar, S, K, Tb, Sm, W, Dy, Cu, Zn, Gd, Co, Rb, Sr, Ti, Er, Ga, Y, and Na -0.54
2	Pharmaceutical and analytical study on *Loha bhasma* Rajendra prasad ML International Journal of Ayurvedic Medicine, 2010, 1(1), 47-59	Fe- 96.82% Mn- 0.83% Cr- 1.03% C-0.25% Si- 0.22% Ni- 0.32 % P-0.02% S-0.08% Mo-0.15% Mg- 0.08% Ca- 0.05% K- 0.06% Na-0.08%	*Apunarbhav Test* *Niruttha test*	Ash Value-98.24% Water sol-1.56% Acid Sol- 98.44% Numburi phase spot test- proved the fineness of Lohabhasma. SiO2-9.07 %, Fe2O3-89.48%, CaO- 0.11%, MgO- 0.88%, Na2O-1.01 %, K2O-0.17% , Cl- 0.05%, So4-0.02%
3	Estimation of Heavy and trace elements in Ayurvedic Drug (*Lauha Bhasma*) Alternative Medicine for Anemia by AAS and ICP-OES Ashwini A, B. R. Kerur	Commercially available Ayurvedic Medicine *louha bhasma* of four brands were procured from		AAS- Total of 9 elements were found in loha bhasma in various proportions Mg, Al, K, Ca, Cr, Mn, Cu, Zn along with Fe these elements available in trace amount and vary from 5 to 62% ICP-OES- ALB – As, Cd, Hg, Pb are found PLB – Pb

	IJRAP	Ayurvedic medicine and labelled as PLB, BLB, ALB, DLB		In DLB and BLB all other elements are found except mercury which is not detected. Sodium, Potassium, Tin and Chlorin are observed in all the four brands
4	Characterization of *Lauha Bhasma* Bhargava Subhash Chandra www.ijam.co.in 2013	E-Dax (Batch) A-91.26% small amount of Al, Mn etc B-94.49% and Oxygen – 5.51 C- 94.66% FTIR-Meghamite	SEM- Batch A Particle size 2-4 µm and particle range 100 -500nm B- Particle size- 100 – 300 nm C- Particle size- 100 – 300 nm	Loss on drying- Batch A -0.30% Batch B- 0.35% Batch C- 0.35% Ash Value – Batch A- 99.10% Batch B- 98.50 % Batch C – 98.50 % Acid Insoluble Ash-Batch A- 25.50 % Batch B- 15.20 % Batch C- 15.10 % E Dax-Batch A - percentage Higher of Fe (58.72%), O (19.76%) & K (6.14%) Iron oxide and potassium salt B-92.45% C- 89.84%iron is converted FTIR- Batch A-Meghamite and Hematite B- Fe2O3 peaks
5	A comparative Pharmaceutico Pharmacoclinical study of *Lauha bhasma and Mandura Bhasma* w.s.r. to its *panduhara* effect Dr. Prashant Kumar Sarkar		Sample VMD (µm) - 07.8 X10(µm) - 01.46 X50(µm) - 05.50 X99(µm) - 039.69	Loss on drying-0.31% Ash value- 99.63% Acid insoluble Ash- 27.80% Carbon Disulphide Soluble-0.09 % AESICP Analysis - Iron (Fe)227470 (Mn) 3720 (Zn) 113 (S) 20200 (P) BDL mg/kg XRD-Major Phase Iron oxide (FeO & Fe2O3) Minor Phase - Iron Sulphide (FeS)Iron manganese oxide Hydroxide
6	"A Comparative Experimental Evaluation Of Hepatoprotective Activity Of *Dhatri Lauha* Prepared With And Without *Lauha Bhasma*." Dr. Alka Yadav GAC ,Dept. of Rasashastra, Nanded, 2019	XRD- Compound formed, Peak score, Chemical formula Calcite 62 C1CaO3 Magnetite low 43 Fe3O4 Quartz low 26 O2Si1	*Rekhapurnatva, Varitar, Unama, Niswadu, Dantagre Kachakachabhav, Apunarbhav, Niruttha* all positive	LOD (110°C)- 0.53 % LOI (850°C) – 3.2 % Density – 2.1 gm/ml ASH- 98.23 % AIA – 35.10 % pH – 6.8 % Fe- 68.90 % XRD- 7 th Puta Hematite 73 Fe2O3, *Lauha* is converted into oxide form after Marana, SEM -surface become spongy and marginal, EDS - *Lauha Bhasma* mainly contains Fe, O.
7	Effect of No of *Puta* On Particle Size Of *Lauha Bhasma* Bajaj Nisha wjpmr, 2018,4(12), 149-154			

Parameter	Particle Size			
	Sample 1	Sample 2	Sample3	Sample4
X10	1.97µm	1.89µm	1.91 µm	1.42µm
X16	2.85µm	2.72µm	2.76µm	1.97µm
X50	9.91µm	9.59µm	9.36µm	5.29µm
X84	45.67µm	48.34µm	35.77µm	15.88µm
X90	61.34µm	67.11µm	43.46µm	28.60µm
X99	173.25µm	134.75µm	71.55µm	67.70µm
SMD	6.09µm	5.93µm	5.86µm	4.26µm
VMD	23.86µm	23.41µm	16.83µm	10.36µm

8 Standardisation and bioavailability of Ayurvedic drug *Lauha bhasma* Part-1 Physical and Chemical Evaluation P.R.P Varma and Prasad Ancient Science of Life Vol. No.17 Oct. 1995 Pg No. 129

	Lauha bhasma		Particle Number per unit Wt. 'N'	Surface area per Unit wt Sw'		Loss on ignition
	Sahastraputti		1.130 x 109	1.901 x 10 3 cm2/G		1.56 %
	Sataputi		3.714 x 108	1.009 x 10 3 cm2/G		3.44%
	Ordinary		2.265 x 108	0.460 x 10 3 cm2/G		3.56%
	Lauha	Total iron	Ferrous	Ferric	%Ferrous	% Ferric
Ordinary	30.1	25.82	5.2	20.45	17	68
Satputi	29.9	24.39	0.745	23.646	2.49	79.085
Sahastraputi	34.7	29.668	0.792	28.876	2.283	83.215

DISCUSSION

Marana is the procedure which purified and detoxified material and converted into easy assimilation, absorbable and adaptable form. On the basis of drug mixed for *marana*, this process devide into four catagories *parade marit, vanaspati marita, gandhak Marit and arilauha Marit. Parada marit bhasma* consider best in all. *Putapaka* Method, *Kupipakwa* Method and *Niragni* Method are procedure used to prepare different *bhasma.* In which *Putapaka* Method procedure commonly used to prepare *bhasma.* In *Rasatarangini* different *Marana gana* are given.

Acharya Vaghabhata mentioned that for *shodhana* and *marana* process of *lauha, Lauha* should not be taken less than 5 *Pala* and more than 13 *Pala*. According to *Rasatarangini for marana* purpose *kant lauha* and *Tikshna lauha* is considered as best raw material for *lauha bhasma* preparation. Old Brocken pieces of yantra and shastra can be used to prepare *lauha bhasma.*

The chief aim of *Shodhana* process is not only to eliminate physical and chemical impurities but also to enhance the efficacy of drug, reduce the hardness of structure and also to convert metal into desirable form for further study. *Shodhana* process is divided as *Samanya and Vishesha Shodhana*. *Samanya Shodhana* is done for drugs of one group. E.g. *Samanya shodhana* for dhatu. *Vishesha Shodhana* is done specifically for the drugs. E.g. *Lauha shodhana* in *Triphala kwath. Samanya Shodhana* of *lauha varga* mentioned in *Rasratnasammuchhaya, Sharangdhar Samhita* and AFI. *Acharya Sharangdhar* mensioned *shodhana* as a heating and quenching in *taila, takra, kanji, gomutra and Kullatha quath* media for three – three times. Mostly all the studies which were conducted on the *lauha bhasma* follow *rasaratna sammuchhaya* method i. e. heating and quenching in same media for seven times. Decrease in weight of *Lauha* after *shodhana* in each liquid media is observed except in Til tail. This may be because, after *shodhana* some part of *Lauha* was converted fine, which was difficult to collect as sediment of *Lauha* was observed in liquid media.[14] In some studies *shodhana* process weight gain was observed, it may be due to addition of contents of quenching media.

Heating and quenching seven times in *Triphala quath* ref of RRS follow in most of the research studies for *vishesh shodhana* but some also follow the ref of *gomutra and triphala quath. Kadalikand swarasa, chincha kshar, shasak rakta* these are media advised by another author for *vishesh shodhana. Nirvapa and Nivarpa* after *Lepana* these are two procedure used for *Vishesh Shodhana*. After *Vishesha Shodhana* in *Lauha*, there is further reduction in the particle size due to Tannins and Acidic nature of *Triphala kwath. Triphala* contains ascorbic acid which increases the bioavailability of Iron by converting Fe3+ to Fe2+[14] Repetition in heating and cooling just like in *samanya and vishesh shodhana* causes disruption in compression tension equilibrium and leads to increased brittleness, reduction in hardness, and finally reduction in the particle size.[15]

During incineration or Marana metals are converted into its mixed oxides. Zero valiant metal state is converted to metal oxides of higher oxidation state, by this process. Toxic nature of the resulting metal oxide is completely destroyed while medicinal properties are introduced in this process.[16] For *Lauha marana* or incineration process mostly follow *Trividha paka* method that are *Bhanupaka, Sthalipaka and Putapaka*. There is also one method mostly used for *bhasmikarana* is *hingula marit lauha bhasma* because of decrease of no of puta, only seven puta have to be given for proper *bhasma* formation. *Bhanupaka, Stalipaka, Putapaka, Nirvapa, Niragni Paka* these are the procedure used for the *Bhasmikarana. Parada, gandhak, Makshik bhasma, oadana, guda, kumari rasa, nari stanya,jambiri rasa* these are media used for prcessing of *lauha marana*. Minimum three and maximum thousand puta can be given for bhasmikarana. Maximum No of *puta* are enrich the *bhasma guna* as a *rasayana* property. Analysis of report of raw material and *bhasma* elucidates gradual reduction of grain size, increase in regularity and uniformity of the grain with increase the number of *putas*. It means process generates uniformity, regularity and gradual reduction in size. In SEM irregular aggregates of various sizes and shapes with nano structure on the surfaces.[17]

The role of sunlight during *bhanupaka* has very specific reason. It has been widely established that the metallic Fe is toxic.[18] Hence, Fe supplements should contain Fe in the form of complex. The ultraviolet radiation present in the sunlight reduces the oxidation state of Fe in the presence of Vitamin C present in the *Triphala* decoction thereby improving the bioavailability.[19]Triphala is a mild laxative and thereby counteracts the constipating property of Fe and thus be beneficial due to which ancient scholars of Ayurveda might have mentioned *Triphala* in maximum *lauha bhasma* preparations.[20]

Total ash value determine purity of *bhasma* indicate absence of free organic moieties. Lower acid-insoluble ash indicates higher bioavailability of the drug 21 and lower value of loss on drying indicates the absence of moisture in the drug.

Triphala is used as an organic media to convert metal Iron (*Lauha*) into a herbomineral complex. *Triphala* mainly consists of tannins, gallic acid, ascorbic acid (Vitamin C), and phenolics. Ascorbic acid increases the bioavailability of iron by converting Fe3+ to Fe2+, while phenolics can reduce the iron by binding to it. The presence of ascorbic acid or a lack of dietary tannins has both been suggested as contributing to clinical/ pathological iron storage disease.[22] *Triphala* is a mild laxative and thereby counteracts the constipating property of iron and thus is beneficial. This may be the reason due to which Acharyas might have recommended

Triphala in a maximum number of *Lauha* formulations.[23]

Lauha bhasma is a mixture of ferrous oxide, Ferrous Sulphide, Ferric Oxide and other trace element. Ferrous oxide and Ferrous Sulphide in *bhasma* black in colour. Ferric oxide in *bhasma* red in colour. If XRF of *lauha* consist of minor elements. These get oxidised during puta and remain as integral part if final *bhasma.* On assay it was found to contain about 85 % of total iron compound. Remaining portion (about 15 %) in the *lauha bhasma* is expected to consist of mainly siliceous matter because it is prepared in earthen pot with repeated ignition.

Samples of *Lauha Bhasma* are found to contain a greater proportion of ferric oxide,79.16 % and 83.29 % for *Satputti* and *sahastraputti* respectively. However, the proportion of ferrous oxide (17.5%) in the case of ordinary *lauha bhasma* is more than *shatputti and sahastraputti* sample, the total amount of iron remaining same. *Sahastraputi lauha bhasma* consisting of very fine particle which is about four times more than the of ordinary *lauha bhasma* whereas *shatputti bhasma* accounts for twice the specific surface area than ordinary *bhasma.* Similarly, with respect to ordinary *lauha bhasma* the particle no of *sahastraputti* and *shatputti bhasma* account for 5 times and 1.6 times respectively.[17]

CONCLUSION

- *Samanya Shodhan* and *Vishesh Shodhan* increases brittleness, reduction in hardness, and finally reduction in the particle size of *Lauha*.
- *Trividhpaka* is a general method used for *bhasmikarana* of *Lauha Bhasma*. *Triphala* which is used in *Trividh paka* mainly consists of tannins, gallic acid, ascorbic acid, and phenolics. Ascorbic acid increases the bioavailability of iron by converting Fe3+ to Fe2+, and mild laxative and thereby counteracts the constipating property of iron and thus is beneficial.
- *Rekhapurnatva*, *Varitaratva* indicates physical changes and *Pakwajambuphalvarna, Nischandratva, Nirdhumatva and Apunarbhav* denotes chemical changes in *lauha bhasma.*
- *Lauha bhasma* is a mixture of major phase - Ferric Oxide, ferrous oxide, in minor phase - Ferrous Sulphide, and other trace element in various proportion Mg, Al, K, Ca, Cr, Mn, Cu, Zn etc in oxide form.

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