



Research Article

PHARMACEUTICAL PREPARATION OF LAUHA BHASMA

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ABSTRACT

In the present research paper, the pharmaceutical preparation of *Lauha bhasma* (calcined iron) is being presented. The various procedures adopted in the preparation of *Lauha bhasma* includes *Samanya Shodhana* (common purification process for iron) and *Vishesha Shodhana* (specific purification process for iron), *Lauha marana* by *Bhanupaka* (Heating of iron under sunrays) *Sthalipaka* (Heating of iron in a vessel) and *Putapaka* (incineration of iron). *Lauha* was finally subjected to the process of *Amriikaran* (nectarization). The process of *Putapaka* was undergone in electric muffle furnace (EMF) and was repeated for sixty times each under identical conditions, at the temperature of 750^o C till 35th *Putapaka* and thereafter at 700^o C till the end of the *Marana* process i.e. 60 *Putapaka*. During the processing of iron, *Triphala kwatha* (decoction of three myrobalan) has been used as liquid media for *Vishesha Shodhana*, *Bhanupaka*, *Sthalipaka* and *Putapaka*. The study showed an increase in weight of *Lauha* after *Bhanupaka* and *Sthalipaka* i.e., 216% and 105.3%, respectively. It may be due to addition of solid content of *Triphala kwatha*. After *Putapaka*, 63% weight gain was observed in final product which may be attributed to addition of ash from *Triphala kwatha*. The *Bhasma* obtained fulfils all criteria and was found safe for oral administration.

KEYWORDS: *Lauha*, *Shodhana*, *Marana*, *Putapaka*, *Lauha bhasma*.

INTRODUCTION

In Ayurveda on analyzing the medicines prescribed in various diseases condition *Pandu roga* is one such disease condition where *Lauha* i.e. Iron, have been prescribed unrestrainedly. Pharmaceutical operations in the present study include preparation of *Lauha bhasma*. In the present study *Lauha bhasma* are prepared adopting standard methods advocated in A.F.I. a government approved official formulary with some desired amendments following instructions quoted in legal notice of A.F.I. without deviating the mentioned formula. (A.F.I.-Part-I, Ed.-2nd).

Materials and methods

Procurement of Raw material

Iron turnings, Teel oil, *Triphala*, *Kulattha* were collected from dept. of *Rasashastra* NIA, Jaipur.

Pharmaceutical processing

Preparation of accessory drugs: *Takra*^[1], *Kanji*^[2] and *Kulattha kwatha*^[3] were prepared as per classics for the process of *Samanya Shodhana*. *Triphala kwatha* in varying proportion is advocated in various procedures involved in the processing of *Lauha*. But as in A.F.I. the text followed for pharmaceutical operations, the recommended proportion for

preparation of *Kwatha*^[4] specifically for *Bhanupaka* and *Putapaka* are not practically possible and hence amended accordingly. The proportion suggested in A.F.I. as well as of adopted in the processing. Figure 1 showing different pharmaceutical processes involved in the pharmaceutical operations.

Preparation of *Lauha Bhasma*

Lauha Shodhana (Purification of Iron)

Samanya Shodhana of *Lauha*^[5]

Material required

Ashuddha Lauha (impure iron)-1.0 kg, *Tila taila* (sesamum oil) -4.5 L (1.5L for single quenching), *Takra* (butter milk)-4.5 L (1.5L for single quenching), *Kanji* (sour gruel)-4.5 L (1.5L for single quenching), *Gomutra* (cow's urine)-4.5 L (1.5L for single quenching), *Kulattha kwatha*- 4.5L (1.5L for single quenching).

Method of preparation

Iron turnings were heated red hot by means of a manual blower. The prescribed liquid media was divided into three equal parts. Red-hot iron turnings were quickly quenched into the vessel containing liquid media and the vessel was immediately covered

with a lid. The same procedure is repeated for 2 more times. The same procedure was then repeated thrice with other prescribed liquid media. Specific changes were duly noted.

Vishesha Shodhana (specific purification of Iron)^[6]

Ingredients

Lauha churna–1 kg, *Triphala kwatha*-5.25 L (prepared) + *Gomutra*-10.5 L (1.5 L for each quenching).

Method of preparation

Required quantity of *Triphala kwatha* and *Gomutra* as specified above were mixed and divided into seven equal parts. Iron was made red hot as in previous procedure and was then quenched in *Gomutra* mixed *Triphala kwatha*. The same process was repeated for seven times.

Features noted on Quenching

Fragmentation was further accelerated and the metal became lighter than before due to incorporation of extract of *Triphala*. pH of *Triphala* + *Gomutra kwatha* remained unaltered after quenching.

Bhanupaka of Lauha^[7]

Ingredients

Shuddha Lauha (purified iron), *Triphala kwatha* (decoction of three myrobalan).

Method of preparation

Lauha was mixed with *Triphala kwatha* and was exposed to roasting under sun rays. The process was repeated for seven times consuming fresh *Triphala* in each repetition.

Observations

Sthalipaka of Lauha^[8]

Material required: *Bhanupakwa Lauha*-1.5 kg, *Triphala kwatha*- 9 L

Method of preparation

Lauha churna obtained after *Bhanupaka* was taken in a stainless steel vessel and kept over fire. *Triphala kwatha* was added to it and the material was given intense heat till all the water was evaporated.

Putapaka of Lauha^[9]

Ingredient

Sthalipakwa Lauha- 2.240 g, *Triphala kwatha* - Q.S

Method of preparation

2.240 g of *Sthalipakwa Lauha* was taken for *Putana* assuming it to contain nearly 400 g of iron (According to previous calculation). Temperature was given by means of muffle furnace settled at constant rate and temperature. Required quantity of *Lauha* to be calcined was taken in the wet-grinder. To it an equal quantity of *Triphala* made in decoction form was added. The mixture was then levigated at the constant temperature and frequency for about 4 hours. The material was mixed thoroughly with the help of spatula in between the process. After complete levigation, the material was transferred to a plastic sheet. The material was uniformly spread and was cut into quadrangular pieces of approximately 2x2x1 cm in dimension. Pellets thus formed were dried properly and weighed. Pellets then were kept in an earthen basin (*Sharava*) and covered by another basin making a *Samputa* of it. The *Samputa* thus formed was joined properly by mud plastering and dried. The *Samputa* was then placed in a muffle furnace at a constant rate of flow of heat and settled at desired temperature. After attaining the desired temperature, *Samputa* were given heat treatment for one more hour as maintenance. *Samputa* were then left in the muffle furnace for self-cooling and taken out next day. This whole process was repeated for 60 times. After completion of 60 *Putana* pellets were powdered to fine powder and filtered through double-layered cloth. *Bhasma* procured after *Putana* was washed with distilled water till the water assumed the neutral pH.

Amritikarna of Lauha^[10]

Ingredient: *Lauha bhasma* (calcined Iron)--100g, *Triphala kwatha* (decoction of three myrobalan)-160 ml, *Go-ghrita*-80 gm.

Method of preparation

Clarified butter was melted in a stainless steel vessel over the hot plate. To it *Lauha bhasma* and required quantity of *Triphala kwatha* was added and the whole of the material was subjected to roasting to burn off extract of *Triphala* and *Ghrita* till only *Lauha bhasma* is left. *Bhasma* thus obtained was powdered, filtered and subjected for *Bhasma pariksha*.

Observations

Physical description of the material was noted down in each *Putana*. The Tables 1–4 show explanation and difference in weight of the material before and after every pharmaceutical procedure.

Table 1: Proportion of *Triphala kwatha* recommended in A.F.I. and adopted in the processing of various processes undergone in the preparation of *Lauha bhasma*

Procedure	Recommended Proportion in AFI				Reference text	Proportion Adopted				Reference text
	Lauha	Triphala	Water	Water reduced to		Lauha	Triphala	Water	Water reduced to	
<i>Vishesh Shodhana</i>	← Not Specified →					1	1	8	1/4	A.P.-3/242
<i>Bhanupaka</i>	1	1	2	1/4	AFI, Part - Ist, 18:14 (RT- 20/18)	1	1	8	1/4	
<i>Sthalipaka</i>	1	3	48	1/8	AFI, Part- Ist 18:14 (RT - 20/24)	1	3	48	1/6	(Same as AFI)
<i>Putapaka</i>	1	1	2	1/4	AFI, Part - Ist 18:14 (RT - 20/28)	1	1	8	1/4	
<i>Amritikarana</i>	← Not specified →				-	1	1	4	1/4	R.K.D.(<i>Grahini Chikitsa</i>)

Table 2: Showing amount of *Triphala* consumed during various processes undergone in the preparation of *Lauha bhasma*

Procedure	Triphala	Water	water reduced to	Comment
<i>Vishesh shodhana</i>	3.2 kg	25.6 L	6.4 L	Used for seven quenching
<i>Bhanupaka</i>	1 kg	8 L	2 L	This amount is further reduced accordingly Same procedure was repeated for 7 times
<i>Sthalipaka</i>	4.5 kg	72 L	9 L	used in single <i>Paka</i>
<i>Putapaka</i>	400 g	3.2 L	800 ml	This amount is further reduced for proper levigation. Procedure is repeated for 60 more times for each levigation
<i>Amritikarana</i>	160 g	640 ml	160 ml	

Table 3: Showing observation during *Putana*

No. of <i>Putana</i>	Weight of Pellets			Temperature (°C)	Consistency of calcined pellet	Colour of the calcined pellet	Sample(g)	Observation
	Before Calcination (g)	On drying (g)	After calcination (g)					
1 st	750 750 750		170 175 160	750	Very Friable	Mostly black with some orangish hue	5	✓ Pellets breaks on touch.
2 nd	505		470	750	Friable	Orange brown	-	
3 rd	470	618	450	750	Soft	Orange brown	-	✓ Most of them were black in colour.
4 th	450	624	455	750	Soft	Orange brown	-	
5 th	455	622	439	750	Soft	Light brown with blackish hue	5	✓ After 2 nd <i>Putana</i> colour changed to orangish brown,
6 th	434	613	430	750	Soft	Light brown/blackish	-	

7 th	430	621	430	750	Soft	Light brown/blackish	-	friability started decreasing. ✓ After 4 th <i>Putā</i> friability absent but pellets were soft enough to powder easily. ✓ Till 7 th <i>Putā</i> decrease in weight was observed due to ignition of extract of <i>Triphala</i> incorporated in the previous processes. ✓ After 8 th <i>puta</i> , all pellets were of same light brown colour. Total loss = 1.794 g (1 st -10 th <i>Putā</i>)
8 th	430	628	432	750	Soft	Light brown	-	
9 th	432	623	434	750	Soft	Light brown	-	
10 th	434	624	436	750	Soft	Light brown	5	
11 th	431	627	435	750	Soft	Light brown	-	✓ Pellets were soft and light brown in colour during 11-20 <i>Putā</i> . ✓ Gradual increase in weight was observed. Gain in weight = 34 g (11 th -20 th <i>Putā</i>)
12 th	435	625	438	750	Soft	Light brown	-	
13 th	438	625	442	750	Soft	Light brown	-	
14 th	442	631	445	750	Soft	Light brown	-	
15 th	445	629	448	750	Soft	Light brown	5	
16 th	443	614	446	750	Soft	Light brown	-	
17 th	446	630	449	750	Soft	Light brown	-	
18 th	449	629	451	750	Soft	Light brown	-	
19 th	451	629	454	750	Soft	Light brown	-	
20 th	454	614	460	750	Soft	Light brown	5	
21 st	455	638	459	750	Soft	Light brown	-	✓ Although <i>Bhasma</i> was getting finer than before
22 nd	459	638	463	750	Soft but powdered difficulty	Light brown	-	

23 rd	463	626	469	750	Soft but powdered difficulty	Light brown	-	even than pellets showed a relative hardness. ✓ Gain in weight = 45 g (21 st -30 th <i>Puta</i>)
24 th	469	635	474	750	Hard	Light brown	-	
25 th	474	647	479	750	Powdered with difficulty	Light brown	5	
26 th	474	650	479	750	Powdered with difficult	Light Brown	-	
27 th	479	634	482	750	Powdered with difficulty	Light Brown	-	
28 th	482	660	486	750	Powdered with difficult	Light Brown	-	
29 th	486	680	490	750	Powdered with difficult	Light Brown	-	
30 th	490	657	495	750	Powdered with difficulty	Light brown	5	
31 st	490	678	494	750	Powdered with difficulty	Light brown	-	
32 nd	494	667	500	750	Powdered with difficulty	Light brown	-	
33 rd	500	675	504	750	Powdered with difficulty	Light brown	-	✓ Pellets became hard enough to powder. ✓ Temperature was reduced at 36 th <i>Puta</i> to 700, which causes decrease in hardness but powdering was still difficult. ✓ Temperature was further reduced to 650 resulting in soft and fine pellets easy to powder. Gain in weight =40 g (31 st -40 th <i>Puta</i>)
34 th	504	678	507	750	Powdered with difficulty	Light brown	-	
35 th	507	683	510	750	Powdered with difficulty	Light brown	5	
36 th	505	634	508	700	Powdered with difficulty	Light brown	-	
37 th	508	648	512	700	Powdered with difficulty	Light brown	-	
38 th	512	678	516	700	Somewhat soft	Light brown	-	
39 th	516	678	520	650	Softer than before	Dark brown	-	
40 th	520	692	525	650	soft	Dark brown	5	
41 st	520	694	524	650	soft	Dark brown	-	

42 nd	524	678	528	650	soft	Dark brown	-	the temperature once again the pellets started getting soft but further after 49 th <i>Putā</i> incomplete incineration was evident as seen in the form of blackish material left after <i>Putā</i> . Gain in weight = 48 g (41st -50th <i>Putā</i>)
43 rd	528	674	531	650	soft	Dark brown	-	
44 th	531	682	535	650	soft	Dark brown	-	
45 th	535	679	539	650	soft	Dark brown	5	
46 th	534	702	540	650	soft	Dark brown	-	
47 th	540	678	546	650	soft	Dark brown	-	
48 th	546	675	552	650	soft	Dark brown	-	
49 th	552	680	559	650	soft	Dark brown	-	
50 th	559	683	563	650	soft	Dark brown/Blackish	5	
51 st	558	680	561	650	soft	Dark brown/Blackish	-	
52 nd	561	688	564	650	soft	Dark brown/Blackish	-	
53 rd	564	690	569	650	soft	Dark brown/Blackish	-	
54 th	569	717	574	650	soft	Dark brown/Blackish	-	
55 th	574	698	577	700	soft	Chocolate brown	5	
56 th	572	714	575	700	soft	Chocolate brown	-	
57 th	575	724	578	700	soft	Chocolate brown	-	
58 th	578	699	582	700	soft	Chocolate brown	-	
59 th	582	712	588	700	soft	Chocolate brown	-	
60 th	588	726	592	700	soft	Chocolate brown	-	

Table 4: Showing changes observed during *Bhanupaka*

Repetition	Heat treatment (hrs.)	Wt. of <i>Lauha</i> (g)		Wt. gain (g)	<i>Triphala kwatha</i> consumed (ml)	<i>Kwatha</i> reduced to (ml)
		Before	After			
1	6	1000	1310	310	2000	500
2	6	1310	1600	290	2000	500
3	6	1600	1920	320	2000	750
4	6	1920	2230	310	2000	750
5	6	2230	2560	330	2000	1000
6	6	2560	2860	300	2000	1000
7	6	2860	3160	300	2000	1000

Table 5: Showing changes observed during Sthalipaka

Wt. of Lauha		Increase in wt. (kg)	% Increase	Total Amount of Triphala consumed (kg)	Extract of Triphala added /100 gm	Total time spent (hrs.)
Before Sthalipaka (kg)	After Sthalipaka (kg)					
1.5	3.080	1.580	105.3	4.5	35	10.20

Table 6: Showing observation during Amritikarana

Wt. of Lauha bhasma		Wt. Changed (g)	% Changed	Colour	Consistency	Total time consumed
Before Amritikarana (g)	After Amritikarana (g)					
100	100	-	0%	Chocolate brown brighter then earlier	Soft and fine powder	12 hrs. 10 min.

Figure 1: Showing Procedure involved in the Pharmaceutical operations



DISCUSSION

The processing of *Lauha* was started with *Shodhana* (purification) process, which was undergone in two steps viz. *Samanya Shodhana* (general purification) as well as *Vishesha Shodhana* (specific purification). The liquid media chiefly required for processing the *Lauha* viz. *Kanji*, *Kulattha kwatha* and *Triphala kwatha* etc. have been manufactured by the guidelines given in Ayurvedic formulary of India. The *Kanji* after completion has become strongly acidic which was confirmed by the change of pH from 6.5 to 3.5. The final liquid has changed to translucent because the particles of cooked rice dispersed coarsely throughout the liquid. For preparation of *Kulattha kashaya*, 16 times water was used in preparation of decoction to ensure better extraction of active principles. The *Triphala kwatha* has been processed following the method mentioned in AFI. However it has been observed that the quantum of water mentioned was not sufficient to prepare *Kwatha* specifically mentioned for *Bhanupaka* and *Putana*, hence the *Kwatha* has been prepared by modifying the water proportions strictly following the legal notice mentioned in A.F.I. The *Lauha* after subjecting to general purification process has become more brittle and reduced to coarseness. Its colour changed from grayish black to black owing to the interaction with atmospheric air or incorporation of burn extract of the liquid media used for quenching. For the same reason there was a net weight gain of 5% was observed after the *Shodhana*. The purified *Lauha*, by means of general and specific methods, has been subjected to *Bhanupaka*. After *Bhanupaka* a remarkable increase in the weight (216%) of the final content has been noticed and this weight gain is due to the presence of solid content added from the decoction of *Triphala*. The *Bhanupakwa Lauha* was then undergone intense heat treatment with *Triphala kwatha* in open atmosphere the *Bhanupakwa Lauha* was then subjected resulting in a blackish violet coarse powder with net gain in weight of 105.3%. Thus, obtained *Lauha* has been finally subjected to *Putana* and this *Putapaka* has been repeated for sixty times each under identical conditions, at the temperature of 750° C till 35th *Putana*. Thereafter as the pellets started getting hard due to increase in fineness resulting in strong crystal attraction and Therefore temperature was again changed at varying degree for next coming *Putana*s till the resultant pellets once again became soft. This temperature was observed to be 700° and was maintained till the end of the *Marana* process i.e. 60 *Putana*. The pellets become soft from 3rd *Putana* onwards and remained same till the end of 60 *Putana*. The initial black colour was changed to light brown colour after

7th *Putana* and this light brown colour was again change to dark brown after 40 *Putana*. Finally the colour has changed to chocolate brown at the end of 55th *Putana* even after 60th *Putana* that became more pronounced after *Amritikarana*. An apparent increase of 63% in the final weight of the *Lauha bhasma* was noticed and it is attributed to the presence of *Triphala* in ash form. The net *Bhasma* procured after *Putana* was tasted salty and thus subjected to *Kshalana* (washing) with distilled water till the water acquired neutral pH. A net loss of 15.03% was seen after washing. On analysis the residue obtained after washing was found to be devoid of iron, thus it may be presumed to be a result of either water soluble extract of *Triphala* added to the *Bhasma* on successive levigation or the salt present in the water used in the preparation of *Triphala kwatha*. Therefore, the probable reason is required to be studied further. Further this *Lauha bhasma* was subjective to the process of *Amritikarana*. The net product obtained was shining brown in colour without any change in weight. The *Bhasma* prepared with the methodology described above was also undergone for toxicity study and was found to be safe for oral administration^[11]. Safety of Ayurvedic preparations specifically *Bhasma* depends on pharmaceutical processing involved. In Ayurveda, metals/minerals used in therapeutics are first converted into herbomineral compounds after pharmaceutical processing which helps not only in reducing the particle size of these metals minerals but also helps in their bodily assimilation and metabolism. During pharmaceutical processing of *Lauha bhasma*, right from *Shodhana* till *Amritikarana*, *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^[12]. Excess Iron causes Iron overloading in the body and can damage the liver, heart, and pancreas and irritate the stomach and gut, causing constipation and diarrhoea. In other words, the various constituents of *Triphala* have antagonizing activity and thereby too much iron absorption is prevented^[13]. In Ayurvedic texts, terms like *Viśaghna*^[14] (antitoxic), *Giridoṣa nashaka* (remover of metallic properties) are abundantly used for *Triphala*, and this is an indication of the above phenomenon. *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 *Acaryas* might have recommended *Triphala* in a maximum number of *Lauha* formulations.^[15]

CONCLUSION

By observing it is evident that *Lauha bhasma* is better prepared at a temperature of 750°C upto 35 *Putra* and 700°C upto 60 *Putra* in an EMF. Organoleptic evaluation of *Lauha bhasma* after 60 *Putra* showed it to be chocolate brown smooth tasteless powder without any odour complies the test for *Rekhapurnatwa*, *Varitaratva*. These tests were found to be even more pronounced with *Lauha bhasma* subjected to *Amritikarana* which may be due to roasting of the *Bhasma* in *Ghrita* (clarified butter) resulting in a extra softness, brightness in *Lauha bhasma* which floats even better due to the surface tension exerted by the globules of fat. More over as the *Varitaratva*, *Rekhapurnatva* are the features indicative of lightness and fineness thus, in turn are suggestive of transformation of metallic properties to much extent.

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