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Access this article online
Website: www.ayujournal.org
DOI: 10.4103/0974-8520.77157
Quick Response Code:

Pharmaceutical Chemistry

Pharmaceutical study of *Lauha Bhasma*

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Abstract

In the present research paper, the work done on pharmaceutical study of *Lauha Bhasma* conducted in the Department of *Rasa Shastra* under the postgraduate research programme is being presented. The pharmaceutical processing of *Lauha Bhasma* was performed by following *samanya shodhana*, *vishesha shodhana* and *marana* of *Lauha*. Under the process of *marana*, three specific pharmaceutical techniques were followed, viz. *bhanupaka*, *sthalipaka* and *putapaka*. During the *putapaka* process, an electric muffle furnace (EMF) was used. The temperature of *puta* was studied in two batches, viz. in Batch I, a temperature of 800°C was maintained whereas in Batch II, a temperature of 600°C was maintained. The purpose behind selecting two temperatures was to validate the process of *marana* of *Lauha* and to determine an ideal temperature for the preparation of *Lauha Bhasma* in EMF. It is found that after 20 *puta* at a temperature of 600°C, the *Lauha Bhasma* was prepared properly. The entire characteristic of *Lauha Bhasma*, like "*pakwa jambu phala varna*," *varitar*, etc. was attained at 600°. At a temperature of 800°C, the process could not be carried out smoothly. The pellets turned very hard and brassy yellow in color. The desired color was attained only after decreasing the temperature in further *puta*.

Key words: Ayurveda, electric muffle furnace, *Lauha, marana, puta, shodhana*

Introduction

Ayurveda is a holistic and divine science. *Rasa Shastra* and *Bhaishajya Kalpana* are part of Ayurveda wherein the pharmaceutical technology is explained. *Lauha* (iron) is a very essential element of the body system for treating many diseased conditions as well as for physiological existence. In the present work, the pharmaceutical study of *Lauha* was conducted in the Department of *Rasa Shastra* under the postgraduate research programme. For this purpose, raw material (iron turnings) was collected from the Department of Metallurgy, IT, BHU.

Materials and Methods

Procurement of raw material

Iron turnings were collected from IT, BHU; *Tila taila* and *Triphala* were collected from the Ayurvedic pharmacy, BHU; *Gomutra* (cow's urine) was collected from the dairy farm, Institute of Agricultural Sciences, BHU; and *kulattha* was collected from Mes's Gola Dinanath, Varanasi.

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Pharmaceutical processing

Samanya shodhana of *Lauha*

a) Preparation of accessory drugs: *Takra*,[1] *Kanji*[2] and *Kulattha kwatha*[3] were prepared as per classics for the process of *Samanya shodhana*.
b) Process of *Shodhana*:

Ingredients:

Main drug – *Lauha*, 700 g.

Accessory drugs – *Tila taila*, 5 L; *Takra*, 5 L; *Gomutra*, 5 L; *Kanji*, 5 L; *Kulattha kwatha*, 5 L.

Procedure – The iron turnings were heated till they turned red hot and were dipped (seven times) in different media, i.e. *tila taila*, *takra*, *gomutra*, *kanji* and *kulattha kwatha*, simultaneously.[4]

Vishesha shodhana of *Lauha*

Ingredients – *Triphala*, 2 kg; water, 16 L.

Procedure – *Triphala* was boiled along with the above-mentioned quantity of water till reduction to 1/4th of the original volume of water. Using this, *kwatha* was prepared and the process of nirvapa was adopted and repeated seven times for the process of *vishesha shodhana*.[5]

Marana of *Lauha*

Marana of *Lauha* was performed according to the process described by *Rasa Tarangini*.[6] It is completed in three steps. They are: *Bhanupaka*, *Sthalipaka* and *Putapaka*.

Bhanupaka: *Bhanupake tu lauha tulya triphala dvigunam jalam. Padathamavasesitanch ath varakwatham prayojayet*.[7]

Method – *Triphala*, along with double the amount of water, was boiled till it reduced to 1/4th the volume of water. The prepared *kwatha* along with *lauha curna* was kept in sunlight until complete drying. It took a maximum of 4 days for complete drying of the *triphala kwatha*. On drying, *Triphala kwatha* prepared by the above process was again added and dried in sunlight. The process was repeated seven times.

Sthalipaka: *Sthalipake trigunita vara, sodasikamjalam. Astabhaga avsisitamch kwathamanam vidhiyate*.[8]

Method – *Kwatha* was prepared by taking *triphala* three times the amount of *Lauha* and 16-times the quantity of water was added to it. The whole material was boiled in a stainless steel vessel to reduce the volume to 1/8th of the original volume of water. *Kwatha* prepared by the above method is put into an iron vessel along with the *Lauha churna* procured after *bhanupaka*. The container is now kept on a heating device and the whole material is boiled on intense heat. On complete drying of the material, *kwatha* prepared by the above method is again added and subjected to heat. The whole process is repeated seven times.

Putapaka: Two separate batches of *Lauha Bhasma* preparation were decided upon, one at 800°C and the other at 600°C.

Putitasyaysoabhave tat tat rogaghna bhesajeh. Triphala putitam loham sarvatra viniyojayet.[9]

Lauha Bhasma should be prepared by triturating with specific media according to the disease and subjecting to *puta*, but, in case of unavailability of the specific media, the *Bhasma* prepared by *triphala kwatha* only can be used everywhere.

Up to the process of *Sthalipaka*, a common method was adopted. After that, the material was divided into two batches, Batch I was prepared at a temperature of 800°C and Batch II was prepared at a temperature of 600°C.

Puta was given to the material of two batches up to the completion of *Bhasma*.

Observations

Two batches of *Bhasma* were prepared, one at a temperature of 800°C and another at a temperature of 600°C. The purpose behind selecting two temperatures was to validate the process of *marana* of *Lauha* and to determine an ideal temperature for the preparation of *Lauha Bhasma* in an electric muffle furnace (EMF).

Physical characteristics of the material were noted down before and after each *puta*. The Tables 1-3 show observations and variation in weight of the material before and after each pharmaceutical procedure.

Discussion

For the process of *samanya shodhana* and *vishesha shodhana*, the process of *nirvapa* was adopted. For *samanya shodhana*, the iron turnings were heated till they were red hot and then they were dipped in different media, i.e. *Tila Taila*, *Takra*, *Gomutra*, *Kanji* and *Kulattha kwatha* (seven times). At each time of dipping, sufficient quantity of media was taken, which was approximately 500 ml. The average temperature of the heating device (hearth) was 1250°C. The average temperature of the surface of the pan was 900°C and the average temperature of the red hot iron turning was 750°C during the procedure.

The use of a particular media and particular sequence is notable. The probable concept behind using such variation may be removal of impurities from the drug in a particular acidic or alkali media.

Shodhana process along with purification/potentiation leads to reduction of particle size. Marked reduction in particle size, i.e. ratio of small: large particles, was obtained 50:50 by weight up to *shodhana* in *kanji*.

Immediate cooling leads to microscopic cracks. Mild steel consists of two major phages, ferrite and pearlite. For attaining hardness, this is heated and cooled down slowly. On immediate cooling, it gets converted to martensite, which is hard and brittle.[10]

After the process of *Bhanupaka*, there was a huge gain in the weight, of approximately double of the original weight, which may be due to accumulation of *triphala kwatha* residues.

For the process of *Sthalipaka*, *triphala* was taken in a quantity three-time that of *Lauha churna* for preparing *kwatha* as compared with *Bhanupaka*, where the amount was equal that of *Lauha churna* taken before. Therefore, a higher gain in weight, nearly 2.5-times from the original weight, was observed.

Regarding the excessive use of *Triphala* in the processing of *Lauha*, we can say that it mainly consists of tannine and ascorbic acid. The absorption of food iron can be greatly influenced by other constituents in the diet, such as ascorbic acid (vitamin C) and phenolics. Ascorbic acid increases the bioavailability of iron by converting Fe^{3+} to Fe^{2+}, while phenolics can reduce the bioavailability of iron by binding to its phenolics (e.g., tannins). Excess of ascorbic acid and/or a lack of dietary tannins have both been suggested as contributing to clinical/pathological iron storage disease. Too much iron is toxic. It can damage the liver, heart and pancreas and irritate the stomach and gut, causing constipation or diarrhea. In other words, this may also be taken as the various constituent of *Triphala* is antagonizing the function of one another. Thus, too much absorption is prevented.

The process of *Putapaka* was carried out at two temperatures. The various works carried out on conventional *puta* show the range of temperature for *Gajaputa* to range from 800° to 1,000°C. Therefore, the temperature of 800°C was decided for preparation of *Lauha Bhasma* for Batch I. Observing research work done on *Lauha Bhasma* in BHU and in other institutions, the other temperature was decided at 600°C.

In the first batch (800°C), up to the 4th *puta*, pellets were very fragile and were broken down even by touch, and the color of brownish-red was attained. In the 5th *puta*, the pellets were very hard and in the 6th *puta*, they was brassy-yellow in color (Plate 1), suggestive of the formation of an entirely new compound that was undesirable as color of *Lauha Bhasma* is indicated "*Pakwajambu phala varna*"or brownish-red.

On further *puta*, the temperature was reduced to 700°–600°C, and it was observed that the concentration of the yellow compound of iron decreased and gradually converted to the desired color of *Lauha Bhasma* after 22 *puta*.

Table 1: Weight of the material after *samanya shodhana*, *vishesha shodhana*, *bhanupaka* and *putapaka*

Pharmaceutical procedure	Media	Initial weight (in g)	Final weight (in g)
Samanya shodhana	*Tila taila*	700	730
,,	*Takra*	720	740
,,	*Gomutra*	730	820
,,	*Kanji*	810	815
,,	*Kulattha kwatha*	805	800
Vishesha shodhana	*Triphala kwatha*	790	800
Bhanupaka	,,	790	1,550
Sthalipaka	,,	1,540	3,510

Table 2: Weight of material of Batch I and Batch II before and after *Puta*

No. of *puta*	Batch I		Batch II	
	Initial weight (in g)	Final weight (in g)	Initial weight (in g)	Final weight (in g)
1st *puta*	2,000	870	1,300	575
4th *puta*	490	411	300	290
7th *puta*	340	340	270	225.22
10th *puta*	310	292.64	225.95	197.61
13th *puta*	260	240.94	201.58	183.77
16th *puta*	243.23	226.39	170	172.24
19th *puta*	216.98	225.64	188.44	186.28
20th *puta*	225.64	228.12	186.28	184.74
22nd *puta*	230	227		

Table 3: Observations of Batch I and Batch II after *puta*

Puta	Batch I	Batch II
1st	Surface shiny blue-brown color. On trituration, whole material changed to black color	Bluish-black coloration
4th	Pellets fragile, color more close to *Lauha Bhasma*	Pellets fragile, color of pellet blackish-red
6th	Metallic hard conversion of material, brassy-yellow coloration of pellets	Color more toward red, pellets very fragile
9th	On reducing the temperature after the 6th *puta* (up to 600°C), pellets on the surface get a brown coloration, but on breaking there is still a brassy-yellow color	Blackish-red coloration, 30% *varitar*
12th	Brownish-red coloration attained, but pellets still very hard	Color maintained, pellets mild hard
16th	Color maintained, reduction in hardness of pellets	Color maintained, pellets soft
18th	Color maintained and pellets were now soft	Color and softness maintained *varitar* up to 55–60%
20th	Color and softness of pellets maintained	*Bhasma* passed all physical and chemical tests of *Bhasma pariksha*. 75% *varitar*
22nd	Color and softness could be seen. *Bhasma* was approximately 70% *varitar*	

In the second batch, the process was carried out smoothly, except mild hardness of the pellet that got lowered by a slight decrease in the temperature.

Conclusion

By observing two batches, it is evident that *Lauha Bhasma* is better prepared at a temperature of 600°C in an EMF. In Batch I, it took 22 *puta* for the preparation of *Bhasma* and was 70% *varitar*. Batch II took 20 *puta* for complete conversion of the material to the *Bhasma* form, and was 75% *varitar*. Hence, it is revealed that a temperature of 600°C in the EMF is to be maintained for 1 h for preparing proper *Lauha Bhasma*.

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हिन्दी सारांश

लौह भस्म का निर्माणात्मक अध्ययन

नीतू सिंह के. आर. सी. रेड्डी

प्रस्तुत शोध पत्र में लौह भस्म का निर्माणात्मक अध्ययन किया गया है। लौह भस्म का निर्माण सामान्य शोधन, विशेष शोधन एवं मारण विधि से किया गया। मारण क्रिया के अन्तर्गत तीन विशिष्ट प्रक्रिया भानुपाक, स्थालीपाक एवं पुटपाक विधि के द्वारा लौह भस्म का निर्माण किया गया। पुटपाक विधि के लिए विद्युत तापयंत्र का प्रयोग किया गया एवं भस्म का निर्माण दो विभिन्न तापक्रमों ८०० से ० एवं ६०० से ० पर किया गया। दो विभिन्न तापों के चयन का उद्देश्य लौह मारण विधि का मानकीकरण एवं विद्युत तापयंत्र में लौह भस्म निर्माण के लिए उपयुक्त तापक्रम निर्धारण करना है। यह पाया गया कि ६०० से ० तापक्रम पर लौह की उत्तम भस्म निर्मित होती है।