Int J Ayu Pharm Chem

www.ijapc.com
e ISSN - 2350-0204
Volume 8 Issue 3
5/10/2018

Greentree Group Publishers

Int J Ayu Pharm Chem

RESEARCH ARTICLE

www.ijapc.com

e-ISSN 2350-0204

A Study of *Hingula Shodhana* using XRF

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ABSTRACT

All *rasdravyas* (metals or minerals), before they are being used in the preparation of any Ayurveda formulations, have to undergo a primary procedure called *Shodhana*. According to *Rasatarangini*, *shodhana* of *Hingula* is done by giving *bhavana* (trituration), 7 times, of *Nimbuka swarasa* (lemon juice) followed by *prakshalana* (washing) with water and drying. In the present study, *shodhana* of *hingula* was done by the above method given in *Rasatarangini*. *Ashuddha* (Raw) *Hingula* samples were taken out before starting the procedure, and later on after 1st, 3rd and 7th *bhavana* and finally after *prakshalana* and drying. XRF (X-Ray Fluorescence) analysis was done for the above samples and the results were tabulated for this study. Mass % of As was found to decrease after subsequent *bhavanas*. Also, elements like Fe and Ca which were initially absent in *ashuddha* (raw) *hingula* were identified in the samples after *bhavana* and their mass % found to increase with subsequent *bhavanas* and decrease after *prakshlana*. At the end of *shodhana* procedure, *ashuddha hingula* was reduced to fine powder of *shuddha hingula*.

KEYWORDS

Hingula, *Bhavana*, Trituration, Lemon Juice, XRF

Greentree Group

Received 00/00/18 Accepted 00/00/18 Published 10/05/18

INTRODUCTION

Rasashastra is a branch of Ayurveda which employs the use of metals and minerals in the preparation of therapeutic drugs. Most of these *rasadravyas* (metals and minerals) being toxic in nature, have to undergo certain procedures mentioned in *rasashastra* literature to make them suitable to be used as therapeutic drugs for internal consumption. *Shodhana* is the first among the many procedures and it involves mainly purification, partial or complete detoxification and preparation of the *rasadravya* for further processes[1]. *Hingula,* which is identified as cinnabar (HgS) in authoritative *Rasashastra* literature, is a commonly used *rasadravya* in Ayurveda therapeutics. According to different *Rasagranthas* (classical *rasashastra* literature) *Hingula shodhana* is done by trituration in different media for a specified period of time. In the present study *Hingula shodhana* is done by seven *bahvanas* (seven times trituration) of *Nimbuka swarasa* (Lemon Juice) according to the reference of *Rasatarangini*[2].

MATERIALS AND METHODS

Ashuddha (Raw) *Hingula,* 310g (Figure 1) was procured from the local market. A sample of 2gm was taken out for XRF (X-Ray Fluorescence) analysis, and 300 gm *Hingula* was labelled HN to be used for *shodhana* procedure.

Figure 1 *Ashuddha* (Raw) *Hingula*

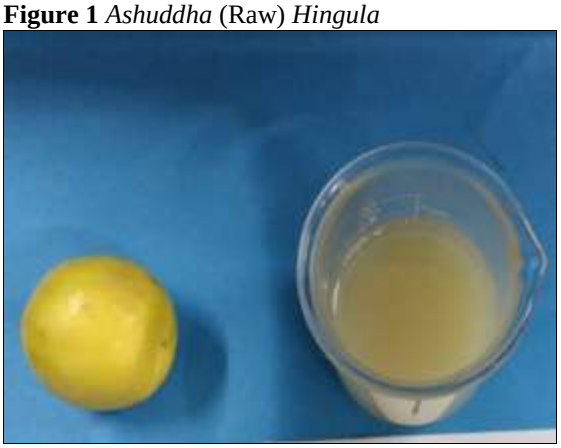

Figure 2 *Nimbuka* and *Nimbuka swarasa*

Hingula Shodhana

Shodhana procedure for HN was performed in a mortar and pestle by a process called *bhavana*. According to *Rasatarangini,* the procedure that involves trituration of powdered substances (like metals, minerals etc.) with a liquid media till the added liquid dries up is termed as *bhavana*[3]. As per the reference, HN was subjected to seven times *bhavana* with *Nimbuka swarasa* (Figure 2)[2]. First HN was taken in a mortar and pestle and grounded to fine powder. Lemon juice (300 ml) was added to it such that HN powder in the mortar was just submerged

in the juice. Trituration was done (Figure 3) till the contents in the mortar were dried up.

Figure 3 *Bhavana* of *Nimbuka swarasa*

After complete drying, a sample (2 gm) was taken out for XRF analysis and labelled as HN 1st. Again 300 ml lemon juice was added to the contents in the mortar after 1st *bhavana* and again triturated till dried. This marked the completion of 2nd *bhavana*. Similar procedure was carried out further for 5 times (quantity of lemon juice used at each *bhavana* given in Table 1), i.e., as per *Rasatarangini*, a total of 7 *bhavanas* of lemon juice were given[2]. Samples for XRF were taken after 3rd and 7th *bhavana* (2 gm each) and labelled as HN 3rd and HN 7th respectively. After 7th *bhavana*, *prakshalana* procedure was done. For this clean purified water was added to the above mortar and the mixture was thoroughly mixed and stirred using the pestle and later on allowed to sediment. After sedimentation, the water at the top was carefully decanted and the fine *hingula* powder sediment at the bottom was dried. This is *shuddha hingula* obtained from *Nimbuka swarasa bhavana* method (Figure 4). A sample of 2 gm was taken for XRF analysis and labelled as HN Wash.

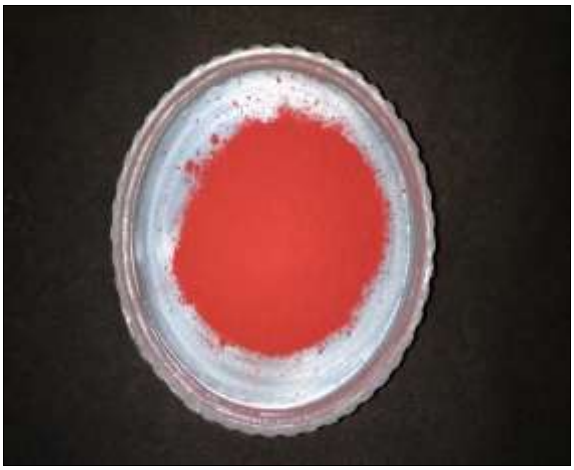

Figure 4 *Shuddha hingula* by *Nimbuka swarasa bhavana* method

OBSERVATIONS

The observations of this study have been tabulated in Table 1 and Table 2.

Table 1 Quantity of liquid media used for each *bhavana* process and the time required for the same

Sr. No.	*Bhavana*	HN Quantity of Lemon juice used in ml	Time taken for *bhavana* in hours (hrs)
1.	1st	300 ml	5 hrs
2.	2nd	300 ml	5 hrs
3.	3rd	250 ml	5 hrs
4.	4th	210 ml /	4 hrs
5.	5th	210 ml	4 hrs
6.	6th	210 ml	4 hrs
7.	7th	210 ml	4 hrs

RESULTS OF XRF ANALYSIS

X-ray fluorescence (XRF) spectrometry is an elemental analysis technique. XRF is based on the principle that individual atoms, when excited by an external energy source, emit X-ray photons of a

characteristic energy or wavelength. By counting the number of photons of each energy emitted from a sample, the elements present may be identified and quantitated[4]. Results from XRF analysis of the samples taken during this study have been tabulated in Table 3.

DISCUSSION

In this method of *shodhana* (*bhavana* by lemon juice), it was observed that *hingula* was reduced to very fine powdered form. Thus reducing the particle size is one of the objectives behind the *shodhana* by trituration method as smaller particle size ensures greater surface area when the drug enters the body thus improving efficacy.

Table 2 In-process observations made during the *shodhana* of HN

Sr. No	Observations	HN
1	Odour emitted while triturating	Distinct pungent
2	Colour of decanted water removed post *prakshalana* and sedimentation	Clear and Straw coloured initially and At the end Yellowish orange
3	Appearance of *Shuddha hingula*	Fine powder
4	Colour of *Shuddha hingula*	Red
5	Smell of *Shuddha hingula*	Very light- pungent
6	Initial weight	300 gm
7	Total weight lost in Sampling	8 gm (4 samples taken, 2 gm each)
8	Final weight at the end of *shodhana*	284 gm

Table 3 Qualitative and Quantitative analysis of elements in samples taken during *shodhana* of HN in Mass%

Element	*Ashuddha hingula*	HN 1st	HN 3rd	HN7th	HN Wash
Hg	87.58	91.03	91.39	88.41	88.86
S	8.19	0.78	4.58	7.27	7.07
As	4.23	3.71	3.67	3.22	3.49
Ca	-	0.06	0.12	0.41	0.22
Fe	-	0.11	0.25	0.68	0.19

Use of lemon juice as a media for *bhavana*, might have a therapeutic role as well, but its assessment was beyond the scope of this study. Arsenic (As) levels in *ashuddha* (raw) *hingula* and after subsequent *bhavanas* reveals that in this method of *shodhana*, As levels show a decreasing trend. *Ashuddha hingula* contained Mercury (Hg), Sulphur (S) and As. But after *shodhana* with lemon juice, the elements Calcium (Ca) and Iron (Fe) were identified. Their Mass% kept on increasing with subsequent *bhavanas* and finally showed a reduction after *prakshalana*. It was hypothesized that these elements might be present in lemon juice. A review of research work done on lemons confirmed this[5].

CONCLUSION

Shodhana of *hingula* by seven times *bhavana* with lemon juice facilitates in the reduction of its particle size. XRF analysis of *ashuddha* HN and *shuddha* HN reveals that the Mass % of As has reduced. Arsenic being toxic, it can be hypothesized that this method of *shodhana* reduces the toxicity of *hingula*. Also Ca and Fe which are useful to human body are seen to be added during *shodhana*. This addition might have a therapeutic role. The present study has given a new approach of looking at the process of *Hingula shodhana*. It has also raised some new research questions and finding a definitive answer to these becomes the scope of further studies.

REFERENCES

1. Gangadhar Vishnushastri Puranik. Ayurvediya Aoushadhikarana. 2nd Edition, Part 1. Shree Dhootpapeshwara Ayurveda Vidyalaya Samiti, Mumbai. Pg No. 99.

2. Sadanand Sharma. (Eleventh Edition: 1979, Reprint: 2009). *Rasatarangini*, with *Prasadanee vyakhya* of Haridutta Shastri and *Rasavidnyana* hindi commentary by Ayurvedacharya Pandit Dharmananda Shastri. Motilal Banarasidas, Delhi. Pg 202, Shloka No. 16- 17.

3. Sadanand Sharma. (Eleventh Edition: 1979, Reprint: 2009). *Rasatarangini*, with *Prasadanee vyakhya* of Haridutta Shastri and *Rasavidnyana* hindi commentary by Ayurvedacharya Pandit Dharmananda Shastri. Motilal Banarasidas, Delhi. Pg 21, Sholka No. 49.

4. James M. Guthrie, Jeffrey R. Ferguson. (2012). Overview of X-ray Fluorescence. www.http://archaeometry.missouri.edu/xrf _overview.html accessed on 15 April 2018.

5. Somayeh Sadat Fakoor Janati, Hamed Reza Beheshti, Javad Feizy, Niloofar Khoshbakht Fahim. (2012). Chemical composition of lemon (*citrus limon*) and Peels its considerations as animal food. GIDA 37 (5): Pg 267-271.