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Research Article

TO STUDY THE QUALITATIVE ANALYSIS AND IMAGES OF *HINGUL* DURING THE *SHODHAN* PROCESS

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ABSTRACT

Rasaacharya were well known about the toxic effect produce due to use of mineral in their impure form. For removing this toxic effect they mentioned various *Shodhan* (purification) processes in their books. *Shodhan* process plays a very significant role in purification of *Rasa dravya* like *Hingul* for internal administration. In this study *Shodhan* of *Hingul* by *Kshalan* process is performed which is mentioned in book of Rasatarangini. Because of the need of purification & standardization in Ayurveda we do ICP-AES for Elemental qualitative analysis and FEG-SEM for images.

After doing ICP-AES test there are elements like Yttrium (Y), Zirconium (Zr), Vanadium (V), Ytterbium (Yb), in the sample of first *Kshalan* water, which were done after completion of seven *Bhavana*. These elements were not found in the sample of Raw *Hingul* and sample of after seven *Bhavana* of *Hingul*. After doing repeated *Kshalan* process these elements were not found in any sample except the first *Kshalan* water sample. In the water sample of first *Kshalan,* found 23 elements and after the seven *Kshalan,* and got only 16 elements. Hence the impurities may be removed after the *Kshalan* process.

After doing a FEG-SEM test we found there are changes in the images and particle in each step of *Shodhan* process of different samples. Because of continuous Bhavana particle size were reduced.

KEYWORDS: *Hingul, Shodhan,* Purification Process, Qualitative Analysis, ICP-AES, FEG-SEM.

INTRODUCTION

Rasashastra is one of the important Branch of Ayurveda, more inclined towards pharmaceutical and pharmacological angles of different methods of collection, purification, preparations, preservation, standardization and therapeutically utilization of Mercury, Mercurial compounds, Metals, Minerals, Herbo-mineral and Metallo-mineral compounds. From Vedic period to *Samhita* period there was less use of Herbomineral drugs but, from the period of Nagarjuna, compounds of Herbo-mineral drugs are used profusely.[1]

Ayurvedic compound formulations are divided into two groups i.e., *Rasaaushadhi* (Mercurial, Metalo-mineral, Herbo-mineral) and *Kastaaushadhi* (Herbal). *Rasausadhis* are appreciated for their smaller dosages, effectiveness and long durability. Since then this branch of Ayurveda has been playing an important and major role in curing the ailing human being.

Many types of drug preparatory methods on the basis of *Murchit parad, Kharaliya kalp, Bhasma, Pisti, Parapati*, *Pottali, Kupipakva rasayana* etc. are explained in Rasashastra. [2]

Shodhan (Purification) is one of the important procedure which is done before the preparation of any *Rasa kalpa*. [3] Improper *Shodhan* of *Rasa Aushadhi* have delirious toxic effects on the human body. It is essential to validate, standardize and study in details the various aspects of pharmaceutics with the structural changes taking place before, during and after the *Shodhan* procedure mentioned in our Rasashastra texts.

Hingul (Cinnabar) is one of the most widely used entities, used in preparation of various formulations. Just as it is highly efficacies similarly it is toxic as well. Hence, the need to standardize the process of *Shodhan* of *Hingul. Kshalan* (washing) is one of the unique procedures done after trituration of *Hingul* with lemon juice. This process is explained in *Rasa Tarangini*.[4] Hence, the need to validate the process. My study shall focus on the necessity of the *Kshalan* process, whether it makes the *Shodhit Hingul* more potent for internal use. This shall be done by analyzing the analytical aspects of *Hingul* before and after *Kshalan* (wash with water) procedure and note the difference between the two.

MATERIAL AND METHOD

Hingul shodhan by *Kshalan* process were carried out in Department of Rasashstra & Bhaishajya

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Process of *Hingul shodhan* was done in two steps namely trituration of *Ashudha Hingul* with lemon juice and repeated *Kshalan* (washing) of triturated *Hingul*. [5]

The *Hingul* was procured from genuine dealer and Lemon for lemon juice was obtained from market.

Equipment: Mortar and pestle, glass jar, stirrer, DI water, Measuring Cylinder.

Process of *Hingul shodhan*

At first unpurified *Hingul* (cinnabar) was powdered in an mortar with an pestle. Then this *Hingul* powder was triturated with Lemon juice for seven times (seven *Bhavana*). After completion of seven times trituration, *Hingul* turns crystalised to powder form and its pH was highly acidic. Then do seven times *Kshalan* (washing) with DI water of this triturated *Hingul*. after *Kshalan*, *Hingul* become a very smooth dark red in colour, lusterless and pH comes near the neutral. The process was completed in 14 days and the final product called *Shudha Hingul* obtained.

The raw *Hingul*, seven times triturated *Hingul, Kshalan* liquid and *Shudha Hingul* obtained from the above process was taken for analysis.

Modern parameters for analysis of *Hingul*

ICP-AES, FEGSEM was performed in IIT Bombay for obtaining the elemental qualitative analysis and images.

1) ICP-AES

Inductively Coupled Plasma-Atomic Emission Spectrometry (ICP-AES) is an emission spectrophotometric technique, exploiting the fact that excited electrons emit energy at a given wavelength as they return to ground state after excitation by high temperature Argon Plasma. The fundamental characteristic of this process is that each element emits energy at specific wavelengths peculiar to its atomic character. The energy transfer for electrons when they fall back to ground state is unique to each element as it depends upon the electronic configuration of the orbital. The energy transfer is inversely proportional to the wavelength of electromagnetic radiation.

Although each element emits energy at multiple wavelengths, in the ICP-AES technique it is most common to select a single wavelength (or a very few) for a given element. The intensity of the energy emitted at the chosen wavelength is proportional to the amount (concentration) of that element in the sample being analyzed. Thus, by determining which wavelengths are emitted by a sample and by determining their intensities, the analyst can qualitatively and quantitatively find the elements from the given sample relative to a reference standard.

Method:

1) Take 0.1 gm of sample and nitric acid 3 to 4 ml.

2) Then prepared a mixture of sample and nitric acid

3) Then this mixture is put on hot plate for 5 to 10 min heating at 60° to 70°

4) Then cool the mixture.

5) Then this mixture put in volumetric flask and adds 25 ml of distilled water in it.

6) Then this prepared sample in ICP-AES machine for analysis.

Simultaneously make the blank solution also.

1) For preparation of blank solution, take 4 ml nitric acid and add distilled water in it till marking of volumetric flask.

Note: do this procedure for every sample.

Samples for ICP-AES

1) First sample (H): Raw cinnabar (*Hingul*)

2) Second sample (HB7): Seven times triturated sample of (*Hingul).*

3) Third sample (A): *Hingul* powder after first *Kshalan*

4) Fourth sample (A1): Water sample of first *Kshalan*

5) Nineth sample (G): *Hingul* powder after seventh *Kshalan*

6) Tenth sample (G1): Water sample of seventh *Kshalan*

7) Eleventh sample: Lemon juice

Result:

Table 1: Detected elements in given samples

Sr.no	Name of the sample	Detected elements	No. of detected elements
1.	Raw *Hingul*	As, B, Ba, Ca, Cr, Fe, Hg, Mg, Mn, Na, Ni, P, S, Si, Zn	15
2.	Seven times triturated sample of *Hingul*	Al, As, B, Ba, Ca, Cr, Cu, Fe, Hg, K, Mg, MnMo, Na, Ni, S, Si, Sr, Ti, Zn	20
3.	Hingul powder after first *Kshalan*	Al, As, B, Ba, Ca, Cr, Cu, Fe, Hg, Mg, Mn, Na, Ni, S, Si, Ti, Zn	17
4.	Water sample of first *Kshalan*	Al, As, B, Ba, Ca, Co, Cr, Fe, Hg, K, Mg, Mn, Na, Ni, P, S, Si, Sr, V, Y, Yb, Zn, Zr	23

5.	*Hingul* powder after four *Kshalan*	Al, As, B, Ba, Cr, Cu, Fe, Hg, Mg, Mn, Na, Ni, S, Si, Ti, Zn	16
6.	Water sample of fourth *Kshalan*	Al, As, Ba, Ca, Cu, Fe, Hg, K, Mg, Mn, Na, S, Si, Sr, Zn	15
7	*Hingul* powder after five *Kshalan*	Al, As, B, Ba, Ca, Cr, Cu, Fe, Hg, Na, Mg, Mn, Ni, S, Si, Ti, Zn	17
8	Water sample of fifth *Kshalan*	Al, As, B, Ba, Ca, Cu, Fe, Hg, K, Mg, Na, S, Si, Sr, Ti, Zn	16
9.	*Hingul* powder after seventh *Kshalan*	As, B, Ba, Ca, Cr, Cu, Fe, Hg, Mg, Mn, Na, Ni, S, Si, Ti, Zn	16
10	Water sample of seventh *Kshalan*	Al, As, B, Ba, Ca, Cu, Fe, Hg, K, Mg, Na, S, Si, Sr, Ti, Zn	16
11	Lemon juice	B, Ba, Va, Cu, Fe, Hg, K, Mg, Mn, Na, Ni, P, S, Si, Sr, Ti, Zn	17

2) FEG-SEM is essentially a high magnification microscope, which uses a focused scanned electron beam to produce images of the sample, both top-down and, with the necessary sample preparation.

Ionized atoms can relax by electron shell-to-shell transitions, which lead to either X-ray emission. The X-rays emitted are characteristic of the elements in the top few μm of the sample and are measured by the EDX detector.

There are 8 samples for imaging

1) First sample: Raw *Hingul* (A)

2) Second sample: Seven times triturated sample of *Hingul* (B)

3) Third sample: *Hingul* powder after first *Kshalan* (C)

4) Fourth sample: Water sample of first *Kshalan* (D)

5) Fifth sample: *Hingul* powder after five *Kshalan* (E)

6) Ninth sample: *Hingul* powder after seven *Kshalan* (F)

7) Tenth sample: Water sample of seven *Kshalan* (G)

RESULTS

In this test we obtained different microscopical images of *Hingul* during purification (*Shodhan*) process.

Smaller partical size provide more specific surface and affect the therapeutic efficiency of drug having low solubility in body fluids and enhance the dissolution rate of soluble drugs. [8]

DISCUSSION

Shodhan is a process by which Minimisation or removal of toxic effect of the drug, Conversion of hard material into soft and brittle (*Bhanguratwa*) so as to proceed for further pharmaceutical techniques, Impregnation of organic qualities of *Bhavana dravya* in to the drug. It Increase the therapeutic efficacy of the drug. The impurities of the substance cause several diseases and shows toxic effect. So it is advisable to administer the drug in pure form. The impure *Hingul* contains several impurities. The following diseases and symptoms will be caused if impure *Hingul* is used internally. Due to intake of Unpurified cinnabar (*Hingul*) produces blindness (*Andhyatwa*), impotency (*Klaibya*), skin diseases (*Kustha*), giddiness (*Bhrama*), heaviness (*Gourav*) and *Prameha.* [7]

Because of these diseases and symptoms, *Hingul* before used in medicine, purification of *Hingul* is very essential. After purification it becomes palatable. Regarding the cinnabar (*Hingul*), different purification methods have been described by different authors. The main aim is to have a prepared pure drug for human use.

ICP-AES: In ICP-AES study there are some elements which are present in sample of first *Kshalan* which are removed after washing (*Kshalan*) and are not found in next samples.

After doing study of those elements which were removed after first *Kshalan* i.e., Yttrium (y), Zirconium (zr), Vanadium (v), Ytterbium (Yb), it is proved that they are harmful for the body in higher concentration.

FEG-SEM: In this test the result obtained was different microscopical images and change in particle size of *Hingul* during purification (*Shodhan*) process. The changes in particles are observed after *Bhavana* and *Kshalan* process.

CONCLUSION

In the test like FEG-SEM we obtained different microscopical images of *Hingul* from the different samples which are collected during *Shodhan* process. Hence the FEG-SEM help to know the changes happening during the process.

Kshalan process helps to remove toxic substance or elements, which is seen in samples of ICP-AES study, which is the primary aim of *Shodhan* i.e., *Dravya dosha nivaranam.*

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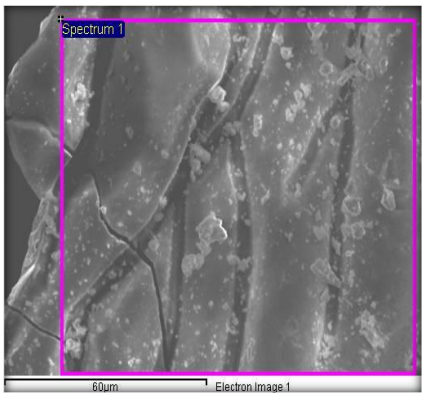
FEG-SEM different microscopical images and particle size of *Hingul*



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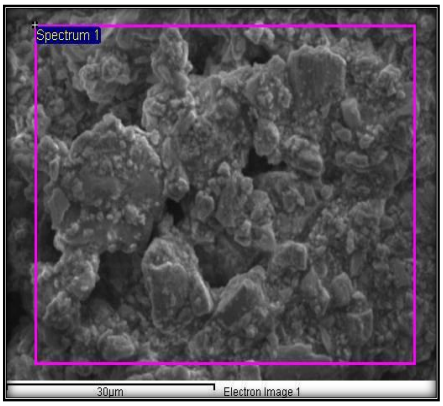

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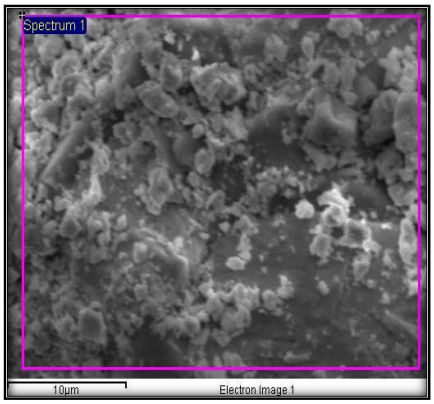

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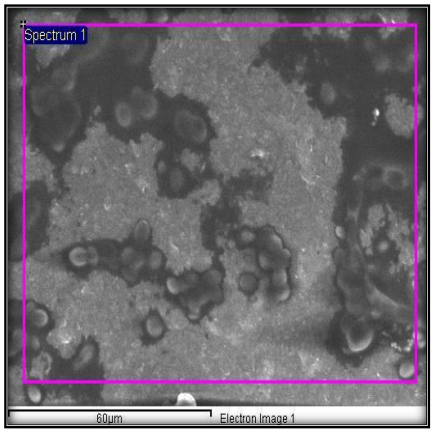

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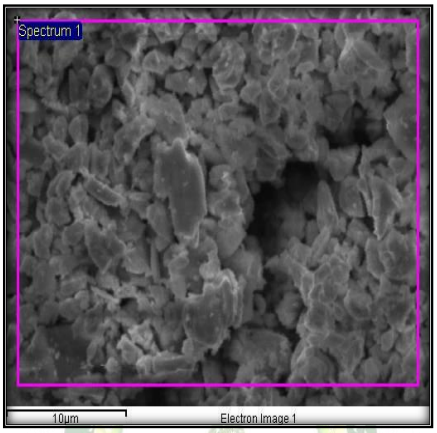

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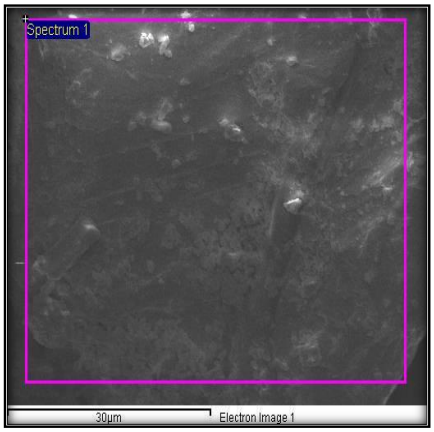

Fig. (F)

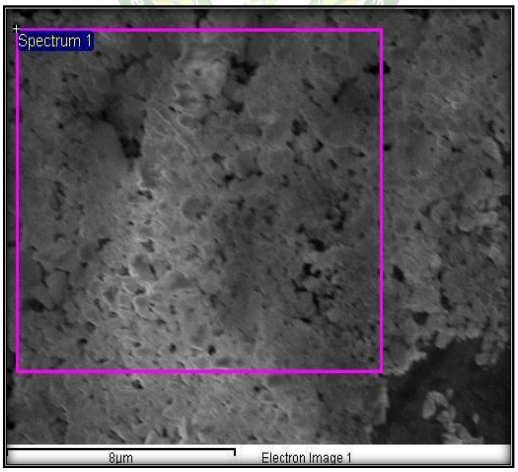

Fig. (G)