ABSTRACT:

The metals available in nature are in various forms and in combination with undesired other elements, or in improper and non-consumable form. These forms are unwelcome by the internal milieu of the human body. All modifications and development in Rasa Sastra are for the purpose of making these foreign and wild elements, body friendly and tamed to provide maximum benefit. The basic processes adopted for the same as found throughout the texts are of Shodhan and Marana. Shodhana (Purification) is the essential step to be performed on substances especially related to Rasashastra. The Shodhana treatment is not only a method which takes away the physical & chemical impurities from the mineral but also it potentiates the mineral by adding useful ingredient into it. The Puti-Lohas, which have now been accepted, are the Naga (Lead), Vanga (Tin) and YasSad (Zinc). Yashad, being not known clearly to the world till the fourteenth century. The present paper gives the details of analytical study of different Shodhana procedures with special reference to Yashad.

Key words: Shodhan, Yadhad, Dhatu

INTRODUCTION: The metals form a big group of inorganic elements that make up the bodybuilding tissues. The metals available in nature are in various forms and in combination with undesired other elements, or in improper and non-consumable form. These forms are unwelcome by the internal milieu of the human body. All modifications and development in Rasa Sastra are for the purpose of making these foreign and wild elements, body friendly and tamed to provide maximum benefit. The basic processes adopted for the same as found throughout the texts are of Shodhana and Marana. Shodhana (Purification) is the essential step to be performed on substances especially related to Rasashastra. Marana (Inceration of minerals) is always preceded by shodhana treatment. In short, shodhana treatment means; to remove unwanted part of the drug; to control/ eradicate toxic ingredients, to potentiate the drug, to regulate the action of the drug. A category of Dhatu in Rasa Sastra is the one of PutiLoha. Puti meaning of low quality, putrefied, giving some undesirable smell, not up to the mark, reflecting lesser qualities or low qualities than their category of substances or not having their constitution as per their ideal category. The Puti-Lohas, which have now been accepted, are the Naga (Lead), Vanga (Tin) and Yashad (Zinc). Yashad, being not known clearly to the world till the fourteenth century. The present paper gives the details of analytical study of different Shodhana procedures with special reference to Yashad.

Yashad: In a very destructive war between the Deva and Asura, from the body of three Daityas, two types of Kharpura were given rise to, Jasada and Savaka. From among these, Jasada is to be used for Rasayana Karma. Scattered references of Yashad being called Rasaka and vice versa
left the medieval period unaware of existence of Yashad as a separate metal. All this reflects a lethargic attitude of the medieval workers - the Rasa Shastris of the medieval period, so much so that, it was not till the fourteenth century that Ayurveda Prakasha dared to explain its individual separate existence. With such a prolonged history of the workers ferreting about for grasping that looked like Naga or Vanga, the discovery of Yashad - Zinc opened a wide Vista of progress in the medical field with some of the information about presence of Zinc in the human body now discovered².

**Concept of shodhana:** The process of Shodhana is designed for the very alteration of the original properties of a substance. The ancient Ayurvedic Texts like Charaka Samhita have defined the concept of Shodhana³. It says that Karana (Processing) is the refinement of the natural products which means imparting other properties. The concept of Shodhana treatment was highly accepted by the Pioneers of Rasashastra (8th Century A.D.) especially for the Purification of Herbomineral drugs. The purification treatments were basically meant to reduce the toxicity level to a body-sustainable limit². Shodhana treatments ultimately result into desired effects. The Shodhana treatments include medium of acidic nature (eg. Lemon, Butter-milk, Kanji), alkaline nature (eg. Churnodaka) and of neutral nature (eg. water). These treatments are performed with or without the help of heat given for a specified time. Many a times the heating treatment is followed by dipping into cold fluids (eg. churnodaka, decoction, milk etc.). This makes the mineral brittle, reduces particle size and thus exposes maximum drug to the purifying medium. These treatments loosen/wash/evaporate the toxic ingredients into the liquid medium and thus minerals become less toxic. The Shodhana treatment is not only a method which takes away the physical & chemical impurities from the mineral but also it potentiates the mineral by adding useful ingredient into it. In fact Ayurvedic Shodhana treatment is incorporation of organic substances (Herbs or drugs of animal origin) into inorganic substances. This incorporation not only helps in the faster absorption into body fluids but also makes it suitable for further process of Marana, Amrutikarana, Lohitikarana & Satvapatana.

**MATERIALS AND METHODS:** The required quantity of Yashad was procured from Shah Metals and chemicals shop, Mumbai. The material required is as follows:

- i. Ashuddha yashad,
- ii. churnodaka,
- iii. godugdha,
- iv. nirgundi swaras
- v. Pithar yantra
- vi. Palika Yantra
- vii. Pair of tongs
- viii. Gas burner

The procedure of the purification of Yashada is carried out by three different methods mentioned in Rasatarangini². Here the very common Dhalana procedure for shodhana is followed. In which the material is heated up to its melting point, after melting of the material it should be immediately poured with the help of Pitharyantra, in to a liquid medium which is maintained at room temperature. In case of Yashada, all the three methods suggest its quenching in liquid media after melting 7 times, i.e. the same procedure of melting and quenching should be repeated. Method 1 – Dhalana of Yashad was done in churnodaka⁴. Method 2 – Shodhana was done by Godugdha⁵. Method 3 – The nirgundipatra swaras was used as a liquid medium and Dhalana of Yashad was done seven times⁶. All these procedures were carried out and observations were noted.

**OBSERVATIONS:**
Observations and results: All the procedures of Yashad shodhana were
carried out in the departmental laboratory of Y.M.T. Ayurvedic medical college, Kharghar, Navi Mumbai. Procedures were keenly observed and noted. During the process of dhalana of liquefied Yashad (Zn) into pitharyantra containing different liquid forms, a specific sound was noted. Initially it took 6-7 minutes for melting of Yashad (Zn). The time taken for 2nd and 3rd step was comparatively more. Each time a greyish black coloured scum was formed over the surface while melting the Yashad (Zn) on daarvi. Smoke was observed during successive heating. Yashad (Zn) was collected at bottom of the pitharyantra with a big mass and some powder particles. Along with shodhit yashad, some black coloured particles were seen adhered to it which may be due to nirgundi swaras.

Table no.1: Physical changes /variations in Yashada after three types of shodhana.

<table>
<thead>
<tr>
<th></th>
<th>Weight(g)</th>
<th>Weight loss after shodhana(g)</th>
<th>Colour</th>
<th>Form</th>
<th>Smell during Dhalana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raw Yashada</td>
<td>100</td>
<td>-</td>
<td>Greenish silver</td>
<td>Rod</td>
<td>-</td>
</tr>
<tr>
<td>In churnodaka</td>
<td>30</td>
<td>2</td>
<td>Greyish silver</td>
<td>mass</td>
<td>-</td>
</tr>
<tr>
<td>In godugdha</td>
<td>30</td>
<td>1.21</td>
<td>Silver</td>
<td>Small pieces</td>
<td>Godugdha</td>
</tr>
<tr>
<td>In Nirgundi swarasa</td>
<td>30</td>
<td>7.8</td>
<td>Bright silver+ yellow tinge</td>
<td>Small pieces</td>
<td>Herb smell</td>
</tr>
</tbody>
</table>

The elemental analysis was done with the help of X-ray Fluorescence (XRF). The XRF method depends on principles involving interaction between electron beam and X-ray with samples. The analysis of major and trace element in material by XRF is made possible by the behaviour of atom when they interact with radiation.

Table no.2 Elemental analysis of Yashada by XRF in Mass %.

<table>
<thead>
<tr>
<th>Elements</th>
<th>Raw Yashada %</th>
<th>Churnodakashodhit(%)</th>
<th>Godugdhashodhit (%)</th>
<th>Nirgundiswarasa</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ca Calcium</td>
<td>-</td>
<td>1.20</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Ni Nickel</td>
<td>0.46</td>
<td>0.16</td>
<td>0.04</td>
<td>0.18</td>
</tr>
<tr>
<td>Zn Zinc</td>
<td>99.54</td>
<td>98.96</td>
<td>99.77</td>
<td>99.60</td>
</tr>
<tr>
<td>Fe Iron</td>
<td>-</td>
<td>0.05</td>
<td>0.07</td>
<td></td>
</tr>
</tbody>
</table>

DISCUSSION: In the procedure of shodhana the physical and chemical characteristics of raw Yashad changes at different stages. It is found that, after the shodhana procedure the reduction in weight of Yashad was minimum in Godugdha and maximum in nirgundi swarasa. i.e the weight loss was 1.21g and 7.8 g respectively. The loss of weight may be observed due to high temperature, removal of impurities and loss during dhalana process. After the shodhana of yashad by three different method, hardness of all the shodhit samples was reduced. But it was significantly reduced in godugdha. Yashad is converted into soft and brittle form. Lustre was reduced in significant manner in godugdha shodhit yashad only. Colour changes during and after shodhana were different and specific for every method as mentioned in table no. 1.

In the XRF elemental analysis of Yashad as mentioned in table no. 2, it was found that in the procedure of Yashad shodhan by godugha and nirgundi swarasa; Zinc (Zn) content was more as compared with shodhana done in churnodaka. Also some amount of Iron was obtained in two method due to use of iron pot during procedure of melting. In the procedure of shodhana of yashad by churnodaka very
a few amount of calcium found in its XRF analysis. The total percentage of the Zn found increased in the samples of godugdha and nirgundi swarasa shodhit yashad. It may be due to the decrease in the percentage of nickel elements. Probably, processing with Godugdha purifies Yashada to the optimal level. Amount of all other impurities decreased. Hence, greater percentage of Yashada is recorded.

**CONCLUSION:** In the view of materials and methods used for shodhana and the results obtained from the organoleptic and chemical analysis it can be concluded that the main objective of shodhana procedure i.e. purification of raw drug and removal of unwanted parts can be achieved. Shodhana is the initial and very important stage of bhasmikarana (incineration) procedure. Here it can be clearly seen that the process of shodhana of yashad provides perfect platform for the bhasmanirmana. The changes in hardness, colour and shape were very significant in above mentioned procedures. The weight loss of yashad was minimum in godugdha and maximum in nirgundiswarasa, increased softness and brittleness that is maximum reduction in hardness was obtained after shodhana in godugdha which can help in bhasmikarana of yashad. Maximum Zinc (Zn) percentage 99.77% was obtained by godugdhashodhana. Here it can be concluded that the shodhana of yashad in godugdha is better than other two type of shodhana.
Ashuddha Yashad

Yashad Shodhan: Churnodaka

Yashad Shodhan: Godugdha

Yashad Shodhan: Nirgundi Swarasa

Temperature assessment

Dhalana

Shuddha Yashad: Churnodaka

Shuddha Yashad: Godugdha

Shuddha Yashad: Nirgundi Swarasa
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