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PHYSICO-CHEMICAL ANALYSIS OF YASHAD IN VIEW OF THREE DIFFERENT SHODHANA METHODS

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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 *Rasashastra* 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 a*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 *Yashad* (Zinc).*Yashad*, being not known clearly to the world till the fourteenth century. The present papergives 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 incombination with undesired other elements, or in improper and non-consumable form.These forms are unwelcome by the internal milieu of the human body. Allmodifications and development in *Rasa Sastra* are for the purpose of making theseforeign and wild elements, body friendly and tamed to provide maximum benefit. Thebasic processes adopted for the same as found throughout the texts are of *Shodhana* and *Marana*[1]. *Shodhana* (Purification) is the essential step to be performed on substances especially related to *Rasashastra. Marana* (Incineration 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 uptothe mark, reflecting lesser qualities or low qualities than their category of substancesor 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 *Kharpara* 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 discovered[2].

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 *Shodhana*[3]. 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 limit[2]. *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 swarasa*
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 *Rasatarangini*[2]. 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 *churnodaka*[4].

Method 2 – *Shodhana* was done by *Godugdha*[5].

Method 3- The *nirgundipatra swaras* was used as a liquid medium and *Dhalana* of *Yashad* was done seven times[6].

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.*

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

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 %.

Elements	Raw *Yashada* %	*Churnodakashodhit*(%)	*Godugdhashodhit* (%)	*Nirgundiswarasa*
Ca Calcium	-	1.20	-	-
Ni Nickel	0.46	0.16	0.04	0.18
Zn Zinc	99.54	98.96	99.77	99.60
Fe Iron	-	-	0.05	0.07

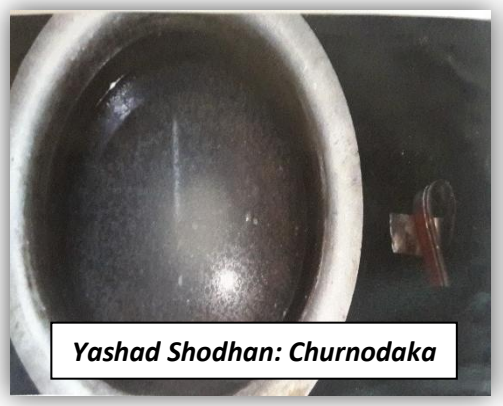
DISCUSSION: In the procedure of *shodhana* the physical and chemical characteristics of raw *Yashad* changes at different stages.It is found that, after the *shodhana* procedure the reduction in weight of *Yashad* was minimum in *Godugdha* and maximum in *nirgundi swarasa*. i.e the weight loss was 1.21g 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

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

ShuddhaYashad : Churnodaka

Shuddha Yashad : Godugdha

Shuddha Yashad : Nirgundi Swarasa

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