

## Original Research Article

### **Comparative Pharmaceutical and Analytical study of Chapal Shodhan (Purification process) with special reference to Bismuth and Selenium.**

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#### **ABSTRACT**

Rasashastra is the branch of science which deals with alchemic preparation or metal and mineral medicinal formulation explained in ancient texts of Ayurved. Rasashastra explained group of drugs in different names on the basis their therapeutic application and binding capacity of drug with Mercury. Chapal one among the group of Maharasa which is having potent therapeutic properties like immune modulator, analgesic, rejuvenator and aphrodisiac. Due to lack of identification, difficulty in procurement and confusion in synonyms and vernacular names, Chapal placed in controversial drugs. Some opines Chapal as Bismuth and some says Selenium. To overcome from these controversies to confirm the type of drug this comparative study is undertaken. Comparative study given nearer conclusion that Chapal can be Selenium, after observing organoleptic properties and symptoms experienced by the person during the purificatory process.

*Keywords: Chapal, Purification, Bismuth, Selenium, Rasashastra, Maharasa*

#### **1. INTRODUCTION**

In Rasashastra during the formulation of medicines Shodhana and Maran has been given more importance. These both processes which are considered highly necessary for converting the metals, metalloids & minerals into the suitable form, which they could be administered internally for achieving their therapeutic values<sup>1</sup> Without subjecting to the purification processes the drugs of mineral & plant origin could not be used for internal administration<sup>2</sup>, and if at all they used internally they are likely to produce various harmful or toxic effects in the body<sup>3</sup>. Hence in Rasashastra & Bhaishajya kalpana shodhana process plays very important role while preparing medicine.

To remove the impurities of drug acharyas have mentioned different methods like Mardana, Kshalana, Nirvapanadi karmas are done that are called Shodhana. To remove the dosha (impurities) of dravya (medicinal substances) is called Shodhana. Shodhana is a type of chikitsa (treatment) for the Removal of Doshas from body with respect to Ayurved. In Aushudikaran (In drug process) Shodhana means only separation of additional drugs. It depends upon structure of dravya (Drug), ingredients, impurities, properties & some kind of chemical change also. Shodhana is combinations of processes which removes unwanted material from the drug & controls toxic effect then enhance the properties of drug. While considering the shodhana process the substance which has to be purified is called as Shudhidravya/shodhya dravya. And the substance with which it is treated for purification called Shodhana dravya.

**NEED OF STUDY:** By Shodhana process which all changes are going to taking place are not mentioned in our Rasagranthas. Hence it is the need evaluate the importance of shodhan (purification) of Chapal is undertaken.

**TYPES OF SHODHAN** Mainly two types are explained. They are Samanya shodhan & Vishesh shodhan.

1. **Samanya shodhan (General purification):** It is generally applied for the drugs which are come into the category of Maharasa (Metalloids), Uparasa (Inorganic/ metallic salts), Ratna(Precious stones), Dhatu(Metal) and Poisonous drugs .The drugs comes under one group may have some similar types of impurities. By the process of Samanya shodhana general impurities can be removed. E.g. Dhatu- Samanya Shodhan. – By different alkaline media.

2. **Vishesh shodhan (Specific/ special method of purification):** It is specifically applied for the drugs which contain high concentration of metallic/ mineral compounds. Each drug of the group may have different types of impurities. Which are vary from substances to substances & are removed by Vishesh Shodhana.

Chapala is a substance; mineral in origin and it is included in Maharasa group of drug. There are many literatures were found in rasashastra, but the explanation of Chapala is given in very few rasashastra text. Rasarnava the earliest book to mention the properties and action of Chapala is salient about its occurrence..

In this text we can get the explanation regarding origin, types, properties, qualities, methods of shodhana (purification), marana (incineration), satwapatana, pharmacological action, and therepeutical indication of Chapala. But as time passed, uses of Chapala become less and gradually disappeared. Now a day there is no specific mineral or metal, which termed as Chapala.

The present days scholars of Rasashastra have different opinions regarding Chapala. Some of them try to specify Bismuth as Chapala, others opine Selenium should be considered as chapala. To rule out these differences of opinions proper identification by classical and modern method, pharmaceutical, pharmacological study should be carried out. In this regard pharmaceutical and analytical study of Chapal is conducted to both the samples of Bismuth and Selenium.

## 2. MATERIAL AND METHODS

Importance of Chapal Shodhana:

Impure Chapala (Bismuth / Selenium) if it is used internally it causes 11 types of complications as explained in lakshmeeswara tantra.

They are Vomiting, loss of appetite, Headache, weakness, Burning sensation, Difficulty in breathing, mouth ulcers, palpitation, Sweating, Abdominal pain and jaundice.

Purificatory processes of Chapal is mentioned different by different acharyas as follows

Table 1: Chapal shodhana according to different Acharyas (Different scolars)

Sl. No.	Name of the text book & Author	Sanskara	Drugs used
1	Rasa ratna samuchchaya <sup>5</sup>	Bhavana or swedana	Jambeera Karkotaki Sringavera
2	Rasa jala nidhi <sup>6</sup>	Bhavana	Jambeera Karkotaki Sringavera
3	Rasamritam <sup>7</sup>	Bhavana	Jambeera Karkotaki Sringavera
4	Bruhat Rasa Raja sundara <sup>8</sup>	Mardana	Visha Upavisha Dhanyamla
6	Ayu-Prakasha <sup>9</sup>	Swedana or	Vandyakarkota

		Bhavana	Adraka Nimbuka
6	Bharat Bhaishajya Ratnakara <sup>10</sup>	Bhavana	Matulunga swarasa
7	Rasamitra <sup>11</sup>	Bhavana	Triphala kwatha

Among these processes, the process mentioned in Rasaratna samucchaya<sup>5</sup> is considered best for purification.

**Method:**

Both the samples of Chapal – Bismuth and Selenium were subjected for trituration along with the juices of Jambeer (Citrous fruticosa), Vandya Karkotaki (Momordica dioica ) and Shrungavera (Zingiber officinale) for 7-7 times each in mortar and pestle. Total 21 times the drugs are processed to get purified Chapal.

**Procedure**

- 1) Ashodhit Chapala is taken in khalwayantra made in to fine powder.
- 2) The bhavana of Jambeera is given 7time.
- 3) After each bhavana Shuddha Chapala is dried and subjected for next bhavana.

**Observation:**

Observations regarding bhavana(Purificatory) procedure are mentioned as follows

Table2: Organoleptic properties of Bismuth after each trituration with Juice of Citrous fruticosa

No. of Trituration	Observation				
	Colour	Lustare	Odour	Touch	State of drug in mardhana
1	Ash color	+++	Rotend egg	Sandy	Smooth
2	Dull ash	+	"	Sandy	Smooth
3	Blackish	-	Unpleasant	Sandy	Smooth
4	Slite black	-	Not significant	Sandy	Smooth
5	Black	-	Lemon	Smooth	Smooth , Unctuous
6	Dark ash	-	Lemon	Smooth	Smooth Unctuous
7	Ash colour	-	Lemon	Smooth	Smooth.

Table 3 : Organoleptic properties of Selenium after each trituration with Juice of Citrus fruticosa

No. of Trituration	Observation				
	Colour	Lustare	Odour	Touch	State of drug in mardhana
1	Dark black	-	Purified irritative	Smooth	Sticky & hard to mix
2	Black	-	Unpleasant	Sticky	Sticky / Unctuous
3	Black	-	"	"	Sticky & Gummy
4	Carbon black	-	"	"	"
5	Light black	-	Leman	Smooth	Stickiness

					reduced
6	Black	-	Odourless irritative	Smooth	Smooth
7	Black	-	Lemon		Smooth

**2) Shodhana of Chapala by using Vandya Karkotaki moola swarasa (Juice of Momordica dioica).**

Table 4: Organoleptic properties of Bismuth after each trituration with Juice of Momordica dioica

No. of Trituration	Observations				
	Colour	Lusture	Odor	Touch	State of drug
1	Ashcolour	-	-	Rough	Sandy
2	Carbon black	-	Bitter smeel	Rough	Sandy
3	"	-	"	Smooth	Smooth
4	Black	-	"	Smooth	Smooth unctuous
5	Darkash	-	Bitter	Smooth	Smooth unctos.
6	Darkash	-	Pungent	Smooth	"
7	Black	-	Bittersmell	"	Smooth

Table 5 : Organoleptic properties of Selenium after each trituration with Juice of Momordica dioica

No. of Trituration	Observations				
	Colour	Lusture	Odor	Touch	State of drug
1	Dark black	-	Pungent	Smooth	Sticky & heavy for mardana
2	"	-	Pungent	Sticky	Unctuous like resin
3	"	-	"	"	"
4	Slight black	-	Bitter smell	"	"
5	Greenish black	-	"	"	"
6	Black	-	"	Smooth	Smooth unctoness reduced
7	Black	-	"	Smooth	Smooth

**3. Shodhana of Chapala by using Adraka swarasa (Juice of Ginger).**

Table 6 : Organoleptic properties of Bismuth after each trituration with Juice of Ginger.

No. of Trituaration	Observations				
	Colour	Lusture	Odor	Touch	State of drug
1	Darkish color	+	Sweet smell that of ingredient used for bhavana	Rough	Sandy
2	Black	+	"	Smooth	Sandy
3	Black	-	"	Smooth	Sticky & smooth
4	Carbon black	-	"	Smooth	Smooth
5	Dark black	-	"	Smooth	Smooth

6	Dull black	-	“	Smooth	Smooth
7	Dull black	-	“	Smooth & fine	Smooth

**Table 7 : Organoleptic properties of Selenium after each trituration with Juice of Ginger.**

No. of Bhavana	Observations				
	Colour	Lusture	Odor	Touch	State of drug
1	Dark black	-	Sweet smell of ingredient	Smooth	Sticky to triturate
2	Dark black	-	“	Sticky	“
3	Dark black	-	“	“	“
4	Dark black	-	“	“	“
5	Dark black	-	“	“	Stickiness reduced
6	Shiny black	-	“	Smooth	Smooth
7	Dark black	-	“	Smooth	Smooth

### 3. RESULTS AND DISCUSSION

#### Observation and Analytical result

**Table 8: After Jambheera swarasa Bhavana.**

Properties	Before shodhana		After shodhana	
	B <sub>1</sub>	S <sub>1</sub>	B <sub>2</sub>	S <sub>2</sub>
<b>Weight</b>	180 grams	170 grams	160 grams	185 grams
<b>Colour</b>	Ash colour	Dark black	Black	Dull black
<b>Luster</b>	Metallic	No luster	Reduced	No luster
<b>Touch</b>	Crystalline	Amorphous	Crystalline	Fine powder
<b>Odour</b>	No smell	Rotund	Fragrant	Fragrant

**Table 9: After Vandhya karkotaki moola swarasa Bhavana.**

Properties	Before shodhana		After shodhana	
	B <sub>2</sub>	S <sub>2</sub>	B <sub>3</sub>	S <sub>3</sub>
<b>Weight</b>	150 grams	160 grams	135 grams	170 grams
<b>Colour</b>	Black	Dull black	Carbon Black	Greenish black
<b>Luster</b>	Resinous	No luster	No luster	No luster
<b>Touch</b>	Crystalline	Fine powder	Crystalline	Fine powder
<b>Odour</b>	Fragrant	Fragrant	Bitter smell	Fermented

**Table 10: After Shrungavera swarasa Bhavana.**

Properties	Before shodhana		After shodhana	
	B <sub>3</sub>	S <sub>3</sub>	B <sub>4</sub>	S <sub>4</sub>
<b>Weight</b>	130grams	160 grams	128 grams	158 grams
<b>Colour</b>	Carbon Black	Greenish black	Black	Dull black
<b>Luster</b>	No luster	No luster	No luster	No luster

<b>Touch</b>	Crystalline	Fine powder	Smooth	Fine powder
<b>Odour</b>	Bitter smell	Fermented	Like ginger	Pungent

**ANALYTICAL RESULTS:**

Table 11: Showing the analytical results of Selenium

Sample	pH	Total ash	LOD	Acid insoluble ash
<b>S<sub>1</sub></b>	5	98.3%	0.4%	0.13%
<b>S<sub>2</sub></b>	3.5	97.8%	1.394%	0.46%
<b>S<sub>3</sub></b>	5.92	97%	4.17%	0.61%
<b>S<sub>4</sub></b>	5	98%	2.2%	0.37%

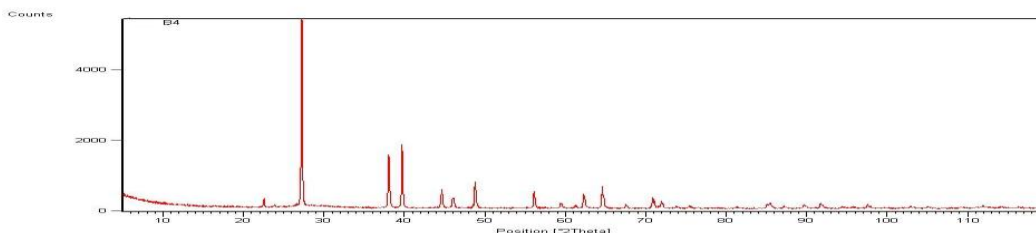
( S1 – Impure Selenium, S2 – Processed Selenium with Citrous juice, S3 – Processed selenium with momordica juice, S4 – Processed Selenium with Ginger juice)

Table 12: Showing the analytical results of Bismuth

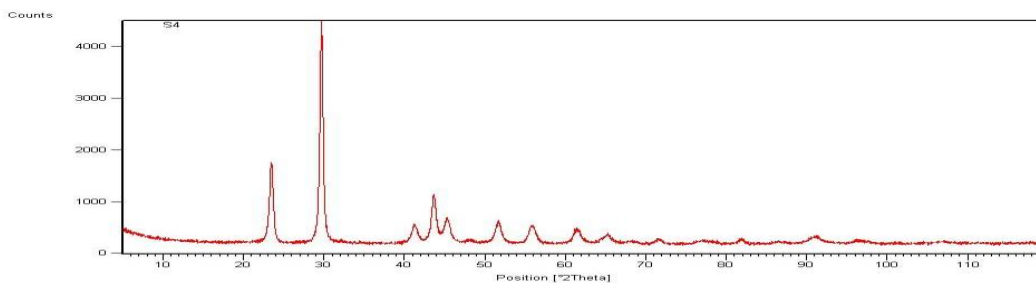
Sample	pH	Total ash	LOD	Acid insoluble ash
<b>B<sub>1</sub></b>	7.5	99%	0.15%	30.77%
<b>B<sub>2</sub></b>	4.28	97.80%	0.64%	41.20%
<b>B<sub>3</sub></b>	7.12	98.37%	2.36%	51.37%
<b>B<sub>4</sub></b>	8	98.12%	2.3%	34.70%

( B1 – Impure Bismuth, B2 – Processed Bismuth with Citrous juice, B3 – Processed Bismuth with momordica juice, B4 – Processed Bismuth with Ginger juice)

**Fig 1: XRD of Shodhita Chapala (Complete processed Bismuth)**



**Fig2: XRD of Shodhita Chapala (Complete processed Selenium)**



## **Discussion:**

Authenticated samples are subjected for shodhana process. As there are many references for purification of Chapala among those purification of Chapala by giving the bhavana of Jambheera, Karkotaka, & Ardraka according to Rasaratna samucchaya. This method is mainly selected to increase the fineness and therapeutically efficacy of Chapala as the shodhana drugs are in acidic and alkali in nature. The bhavana is given for 21 days by giving the 7 bhavanas of each bhavana dravya. In Anandakanda while explaining the shodhana, acharyas says the bhavana should be repeated till Chapala looks dull, lusterless, (Murchitavat) and devoid of curious smell like decaying horse or reddish. Before subjecting Bismuth for shodhana it is of dark grey coloured, lustrous crystal. After 21 bhavanas almost turned in to black, lusterless, soft and minute crystals. Similarly Selenium is black coloured amorphous powder turned to dull black, lusterless fine powder. These changes may be because of continuous friction and the phases (Acidic & Alkali) of bhavana dravyas.

The drugs which were used for purification helps to remove bad odour (rotten egg smell), sliminess, reduces the elemental impurities and make the drug suitable for internal administration. When we compare the elemental percentage of Selenium and bismuth before and after purification there is decrease in the elemental form of drugs and increased organic salt of same compound.

According to Lakshmeshwara tantra and Rasaraja Lakshmi it is mentioned that, during purification of chapal the person who is doing trituration he will feel raise in body temperature, Thirst, burning of eyes and nose, weakness. As the process of shodhan continues these symptoms are going to reduce. In last trituration there will be no abnormal symptoms are going to find during the process. During the shodhan procedure of Bismuth no such symptoms were noticed but while doing shodhan of Selenium all the above stated symptoms were experienced. When these changes are compared with classical parameters the changes that were observed at the processing of Selenium found same.

The analytical study shows that, pH of Bismuth is changed from 7.5 to 8, whereas pH of Selenium remained same 5.

## **4. CONCLUSION**

Shodhan (Purification) process is an essential phase of drug process which helps to detoxify the adverse effect of drug. It also makes Chapal suitable for further process of incineration. By this comparative study we can say that Selenium may be considered as Chapal

## **ETHICAL APPROVAL (WHERE EVER APPLICABLE)**

Not Applicable.

## **NOTE:**

The study highlights the efficacy of "Ayurved" which is an ancient tradition, used in some parts of India. This ancient concept should be carefully evaluated in the light of modern medical science and can be utilized partially if found suitable.

## **COMPETING INTERESTS DISCLAIMER:**

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research

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