

## PHARMACEUTICAL STUDY OF RAJATA BHASMA BY TWO DIFFERENT METHODS

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## ABSTRACT

*Rasaausadhis* are the backbone of *Ayurveda* therapeutics. *Bhasma Kalpana* comprises of conversion of metals and minerals into suitable and acceptable form. In *Rasa Shastra*, *Rajata* (Silver) stands as an important metal. *Rajata* in itself is comparatively less explored and best advocated in classical texts for *Medha*, *Smritikara*, *Naadi Daurbalyahara*, *Rasayana* and others. But *Rajata* cannot be directly indicated for consumption. It needs to undergo various classical procedures like *Shodhana* and *Marana* to make it fit for the body when given internally. Thus *Rajata* is converted into *Rajata Bhasma* after it undergoes *Shodhana* and *Bhasmikarana* procedures where it is processed with organic matter, followed by the *Putra Samskara* which convert it into micro fine powder. *Rajata Bhasma* is a very popular organo-metallic preparation. Keeping above things in consideration, the present study was designed to compare two different methods of preparation of *Rajata Bhasma* given in the classical *Ayurvedic* texts prescribed in the Drug and Cosmetic Act, namely *Rasa Tarangini* and *Ayurveda Prakash* respectively.

**KEYWORDS:** *Rajata Bhasma*, *Shodhana*, *Nirvapana*, *Marana*.

## INTRODUCTION

In the current kinetic era, *Rasaausadhis* are the backbone of *Ayurveda* therapeutics. *Rasaushadhis* are used as an instant savior of ailments. *Bhasma Kalpana* comprises of conversion of metals and minerals into suitable and acceptable form. *Bhasmas* are unique dosage form of *Rasa Shastra* as they have great therapeutic value. They get absorbed easily in the body even in very small doses and are quite effective. Nowadays, nanotechnology is an evolving topic of research and scientific world. *Bhasmas* are one of the earliest approaches of using nanoparticles for curing the disease. They are the concept of reduction in particle size of metals and minerals by treating with herbal juices or decoction and exposed for certain quantum of heat for several times as per *Putra* mentioned in *Ayurvedic* classical texts. The nano-size particles are totally different from original particles in chemical composition and structure. The therapeutic effect of *Bhasma* may attribute to a large surface area of materials and small particle size by which they can transport easily to specific target sites. In *Rasa Shastra*, *Rajata* (Silver) stands as an important metal. It is classified under group of *Shuddha Loha*, *Saara Loha*. The use of *Rajata* for internal purposes has been widely mentioned in classical texts and it is also used for preparing various formulations. Internally as medicine it is administered in the forms of *Bhasma* and foils. *Rajata Bhasma* is a very popular organo-metallic preparation. The pharmaceutical work on classical *Ayurvedic* formulations is always

knowledgeable and interesting. Moreover, *Rajata* in itself is comparatively less explored and best advocated in classical texts for *Medha*, *Smritikara*, *Naadi Daurbalyahara*, *Rasayana* and others. But *Rajata* cannot be directly indicated for consumption. It needs to undergo under various classical procedures like *Shodhana* and *Marana* to make it fit for the body when given internally. Thus *Rajata* is converted into *Rajata Bhasma* after it undergoes *Shodhana* and *Bhasmikarana* procedures where it is processed with organic matter, followed by the *Putra Samskara* which convert it into micro fine powder. Various methods of *Shodhana* and *Marana* are available in the classical *Ayurvedic* texts. Keeping above things in consideration, the present study was designed to compare two different methods of preparation of *Rajata Bhasma* given in the classical *Ayurvedic* texts prescribed in the Drug and Cosmetic Act, namely *Rasa Tarangini* and *Ayurveda Prakash* respectively. In the preparation of these samples, various procedures were adopted which are described here in detail along with the particulars of equipments used in this phase of study. These samples were prepared in the PG Department of *Rasa Shastra* and *Bhaishajya Kalpana* of R.G.G.P.G. Ayurvedic College, Paprola.

## MATERIALS AND METHODS

### Procurement of Raw Drugs

- *Ashuddha Parada*, *Ashuddha Gandhaka* and *Ashuddha Hartaala* were procured from *Charak Ayurvedic Pharmacy, Paprola*.
- MMT Certified 99.9% pure Silver (*Rajata*) was procured from Jewelers.
- *Ghrithkumari* and *Nimbu* were procured locally.

### Samanya Shodhana of Rajata

- Reference – R.R.S. 5/29
- Principle – *Nirvapana* (heating and quenching)

### EQUIPMENTS

Iron tongs, Gas stove, S'S" Containers, S'S" Tray, Spatula, Measuring cylinder, Weighing-machine, Gloves.

### INGREDIENTS

1. *Ashudha Rajata Patra* – 123.8 gm

### Media for quenching

1. *Tila Taila* – 3.5 l
2. *Takra* – 3.5 l
3. *Gomutra* – 3.5 l
4. *Kanji* – 3.5 l
5. *Kulattha Kwatha* – 3.5 l

### PROCEDURE

*Ashudha Rajata Patras* were taken and kept on gas flame with the help of iron tongs and heated till it became red

hot. When *Rajata Patras* became red hot, they were quenched in 500 ml of *Tila Taila* which was already kept in S'S" vessel. After self-cooling, *Rajata Patras* were taken out of the vessel and same process was repeated for 6 more times. The process of heating and quenching was repeated with *Takra*, *Gomutra*, *Kanji* and *Kulattha kwatha* in sequential order. Every time fresh and same amount of *Shodhana Dravya* was taken. Time for red hot stage, weight of *Rajata Patra*, color and volume of each media was recorded with each step of procedure. After completion of process, *Samanya Shodhita Rajata* was washed with water and stored in a container.

## OBSERVATIONS AND RESULTS

### In Tila Taila

- In the initial phase of *Shodhana*, it took 45 seconds to turn a *Rajata Patra* into red hot stage but later it was reduced to 38 sec, 33 sec, 32 sec, 32 sec, 30 sec, 29 sec respectively.
- Crackling sound was produced on immersing in the *Tila taila* for few seconds.
- After the first *Nirvapana*, each time when *Rajata Patra* immersed in *Taila* there was a blackish discoloration as *Rajata Patra* catches fire due to the presence of *Tila Taila* on it and reddish tinge was observed in *Tila Taila*.
- Temperature of *Tila Taila* was suddenly raised and color became blackish brown.
- Metallic lustre of *Rajata Patra* was lost.
- Some fumes were observed after quenching.

**Table 1: Showing the result of Samanya Shodhana of Rajata in Tila Taila.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes Observed
<i>Rajata</i>	123.8 gm	123.8 gm	0 gm	<i>Rajata Patra</i> became soft and blackish discoloration was present.
<i>Tila Taila</i>	3.5 l	3.3 l	200 ml	Blackish brown color

### In Takra

- *Rajata Patra* took 25 sec approximately to turn into red hot every time.
- Crackling sound was produced every time on *Nirvapana*.
- During first time of quenching, blackish discoloration disappeared and pinkish tinge appeared on *Rajata Patra*.
- While performing quenching in *Takra*, color of *Rajata Patra* changed from pinkish to black then white and finally red hot every time.
- After completion of this stage, *Rajata patra* turned light coppery in color, soft and some *Patras* started breaking into smaller pieces.
- Blackish tinge was observed in *Takra*.

**Table 2: Showing the result of Samanya Shodhana of Rajata in Takra.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes observed
<i>Rajata</i>	123.8 gm	123.5 gm	0.3 gm	<i>Rajata patra</i> became soft, thin and started to break into pieces.
<i>Takra</i>	3.5 l	3.240 l	260 ml	Blackish tinge was present over it

### In Gomutra

- *Rajata Patra* took 19 sec approximately to get red hot.
- Color of *Rajata Patra* became light coppery to coppery white with blackish spots on it.
- Brittleness of *Rajata Patra* was increased after *Shodhana*.
- Color of *Gomutra* changed from yellowish to dark brown.
- A pungent smell was coming out during quenching.

**Table 3: Showing the result of *Samanya Shodhana* in *Gomutra*.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes Observed
<i>Rajata</i>	123.5 gm	123.4 gm	0.1 gm	<i>Rajata Patra</i> became coppery white in color with black spots on it, very brittle and soft.
<i>Gomutra</i>	3.5 l	3.376 l	124 ml	Yellowish to dark brown in color.

**In *Kanji***

- *Rajata Patra* took approximately 15 sec to get red hot.
- Color of *Rajata Patra* changed from coppery white to dull white with coppery tinge.
- *Rajata Patra* became very brittle and some *Patras* were transformed into very small pieces.
- Color of *Kanji* became light yellowish.
- A specific burning smell was produced during quenching

**Table 4: Showing the result of *Samanya Shodhana* of *Rajata* in *Kanji*.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes Observed
<i>Rajata</i>	123.4 gm	123.2 gm	0.2 gm	Dull white in color with coppery tinge, thin, brittle and converted into very small pieces.
<i>Kanji</i>	3.5 l	3.280 l	220 ml	Yellowish color with less <i>Amla Gandha</i> .

**In *Kulattha Kwatha***

- Very small pieces of *Rajata* were placed in iron ladle and heated on LPG flame till it became red hot.
- Color of *Rajata* became dull white with little coppery tinge.
- Color of *Kulattha Kwatha* changed from brown to dark brown and became thicker in consistency.
- An unpleasant smell was coming out during quenching.

**Table 5: Showing the result of *Samanya Shodhana* of *Rajata* in *Kulattha Kwatha*.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes Observed
<i>Rajata</i>	123.2 gm	122.9 gm	0.3 gm	<i>Rajata</i> became dull white in color with little coppery tinge and very small in size.
<i>Kulattha Kwatha</i>	3.5 l	3.330 l	170 ml	Dark brown in color and thick in consistency.

***Vishesh Shodhana* of *Rajata* –**

- ❖ Reference – R.T. 16/10-12
- ❖ Principle – *Nirvapana* (heating and quenching)

**INGREDIENTS**

1. *Samanya Shodhita Rajata* – 122.9 gm
2. *Nimbu Swarasa* – 3.5 l
3. Luke warm water – Q.S.

**EQUIPMENTS**

Long Handled Iron Ladle, Stainless Steel Vessels, Iron rod, Weighing Machine, L.P.G. Stove, Spatula, Measuring cylinder.

**Table 6: Showing the result of *Vishesh Shodhana* of *Rajata* in *Nimbu Swarasa*.**

Drug	Initial Wt.	Final Wt.	Wt. Loss	Changes Observed
<i>Rajata</i>	122.9 gm	122.8 gm	0.1 gm	<i>Rajata</i> became dull white, soft, lusterless, brittle and very small in size
<i>Nimbu Swarasa</i>	3.5 l	3.420 l	80 ml	Light green to yellow

**PREPARATION OF *RAJATA BHASMA I***

- ❖ Reference – R.T. 16/17-21
- ❖ Principle – *Marana* (Incineration)

**OBSERVATIONS AND RESULTS**

- *Rajata* took approx. 15 sec to turn into red hot.
- Hissing sound was observed on quenching in *Nimbu Swarasa*.
- *Rajata* became dull white in color and completely lusterless.
- Brittleness of *Rajata Patra* was increased and its particle size was reduced.

**EQUIPMENTS**

Granite *Khalva Yantra*, Weighing Machine, Measuring Cylinder, Knife, Spoon, Stainless Steel Tray, Cow-dung Cakes, Pyrometer, *Sharava*, *Multani Mitti*, Cotton Cloth.

**INGREDIENTS**

1. *Shudha Rajata Patra* – 60 gm
2. *Shudha Parada* – 60 gm
3. *Shudha Gandhaka* – 60 gm
4. *Shudha Hartaala* – 60 gm
5. *Nimbu Swarasa* – 200 ml

**Sub- Processes**

- Formation of *Rajata Pishti*
- Addition of *Shudha Gandhaka* and *Shudha Hartaala*
- *Chakrika* Preparation
- *Put* (Calcination)
- Reprocessing the calcined material for subsequent *Put*

**Formation of *Rajata Pishti*****EQUIPMENTS**

Granite *Khalva Yantra*, Spoon, Weighing Machine

**INGREDIENTS**

1. *Shudha Rajata Patra* – 60 gm
2. *Shudha Parada* – 60 gm
3. *Nimbu Swarasa* – 200 ml

**PROCEDURE**

- In a *Khalva Yantra*, *Shudha Rajata* was mixed with equal quantity of *Shudha Parada* and triturated well till the formation of amalgam.
- Then *Nimbu Swarasa* was added and again triturated well for 24 hours.
- After that, *Nimbu Swarasa* was washed away with water.

**OBSERVATIONS**

- After 1 hour of trituration, *Rajata* started mixing into *Parada* and became semi-solid in consistency which was light grey in color.
- On the second day of trituration, amalgam became solid in consistency and then *Nimbu Swarasa* was added and trituration was continued.
- After 24 hours of trituration, particles of *Rajata* were completely mixed into *Parada* and then *Nimbu Swarasa* was washed with water.
- The size reduction of *Rajata* was found due to continuous trituration and finally it was converted into lustrous coarse powder.
- At the end of this process, greyish colored powder was formed.

**Addition of *Shudha Gandhaka* and *Shudha Hartaala*****EQUIPMENTS –**

Granite *Khalva Yantra*, Spoon, Stainless Steel Tray, Weighing Machine.

**INGREDIENTS**

1. *Rajata Pishti* – 120 gm
2. *Shudha Gandhaka* – 60 gm
3. *Shudha Hartaala* – 60 gm

**PROCEDURE**

- *Shudha Gandhaka* was added to *Rajata Pishti* and triturated was done in *Khalva yantra*.
- After some time, *Shudha Hartaala* was also added to the mixture and triturated for 28 hours.

**OBSERVATIONS**

- In the initial hours of trituration, the color of the material was greenish yellow which changed into greenish grey color after 12 hours of trituration.
- After 28 hours of trituration, *Gandhaka* and *Hartaala* were completely mixed in the *Rajata Pishti* and the material was blackish grey in color.

***Chakrika* Preparation**

- When the material was triturated well, then small quantity of water was added to the material and again trituration was done till the paste became dough like in consistency.
- Then *Chakrikas* were prepared by hands and kept for drying under sunlight.
- After complete drying, these *Chakrikas* were weighed and placed inside a *Sharava* and another *Sharava* was kept inverted over it and the joint between the *Sharavas* was sealed with mud (*multani mitti*) smeared cloth and again kept for drying.

***Putapaka* (Calcination)**

- After drying, the *Sharava Samputa* was subjected to *Laghuputa* with the help of cow-dung cakes weighing 2.5 kg in such a manner that 2/3<sup>rd</sup> of the pit was covered with cow-dung cakes and then *Sharava Samputa* was placed and covered by 1/3<sup>rd</sup> the cow-dung cakes.
- After self-cooling of cow-dung cakes, *Sharava Samputa* was taken out and *kapadmitti* was removed and *Sharava Samputa* was opened cautiously.
- The obtained material was weighed and observations were recorded.

**Reprocessing the calcined material for subsequent *puta***

- In 2<sup>nd</sup> and 3<sup>rd</sup> *puta*, *Shudha Parada*, *Shudha Gandhaka* and *Shudha Hartaala* were added in the proportion of ½ and ¼ of the obtained material respectively.
- From 4<sup>th</sup> *Put* onwards, *Shudha Parada*, *Shudha Gandhaka* and *Shudha Hartaala* were added in the proportion of 1/8<sup>th</sup> of the obtained material.
- The last *Put* given was an open *Put* in which the joint between the *Sharavas* were not sealed with mud smeared cloth.
- This whole process was repeated for 18 times using end product of previous *Put*.

**OBSERVATIONS**

- Average time taken for burning of cow dung cakes was 3 hours and time taken for complete self-cooling was 12 hours.

- Maximum temperature recorded was 628°C.

**Table 7: Quantitative Observations during process of preparation of Rajata Bhasma I.**

No. of Puta	Wt. of Rajata before Puta (gm)	Wt. of ingredients added (gm) (Sh. Parada + Sh. Gandhaka + Sh. Hartaala)	Amt. of Nimbu swarasa added (ml)	Wt. of dried Chakrika (gm)	Duration of Mardana	Max. temp. of Puta (°C)	Wt. of Rajata Bhasma after Puta	Wt loss/gain in Rajata bhasma (gm)
1	60	60 + 60 + 60	200	239	52	500	86	+26
2	86	43 + 43 + 43	150	215	16	504	110	+24
3	110	27.5 + 27.5 + 27.5	120	194	16	500	94	-16
4	94	12 + 12 + 12	120	130.5	10	580	80	-14
5	80	10 + 10 + 10	115	111	10	568	71	-9
6	71	8.9 + 8.9 + 8.9	105	98	10	544	72.5	+1.5
7	72.5	9 + 9 + 9	95	100	10	521	69	-3.5
8	69	8.6 + 8.6 + 8.6	85	94.5	10	561	70	+1
9	70	8.75 + 8.75 + 8.75	80	96.5	10	628	64	-6
10	64	8 + 8 + 8	80	88	10	546	61.4	-2.6
11	61.4	7.6 + 7.6 + 7.6	75	84.2	10	563	62	+0.6
12	62	7.75 + 7.75 + 7.75	75	85	10	508	60.5	-1.5
13	60.5	7.5 + 7.5 + 7.5	75	83.6	10	587	57	-3.5
14	57	7.1 + 7.1 + 7.1	75	79	10	565	55.5	-1.5
15	55.5	6.9 + 6.9 + 6.9	75	76.5	10	550	54	-1.5
16	54	-	75	54.5	6	531	53	-1
17	53	-	75	50.5	6	460	51.5	-1.5
18	51.5	-	70	49.5	6	422	50.5	-1

**Table 8: Organoleptic Characters of the end product obtained after each Puta of Rajata Bhasma I.**

No. of Puta	Color	Odor	Touch	Rekhapurnata	Nishchandrata	Varitarata (Approx.)
1	Black	Odorless	Soft & brittle	Negative	Negative	Negative
2	Brownish black	Characteristic	Hard	Negative	Negative	Negative
3	Brownish black	Odorless	Soft	Positive	Negative	Negative
4	Greyish black	Odorless	Soft	Positive	Negative	Negative
5	Steel grey	Odorless	Slightly hard	Positive	Negative	Negative
6	Dark grey	Odorless	Soft	Positive	Negative	Negative
7	Greyish black	Odorless	Soft	Positive	Negative	Negative
8	Greyish black	Odorless	Soft	Positive	Negative	Negative
9	Steel grey	Odorless	Slightly hard	Positive	Negative	Negative
10	Steel grey	Odorless	Soft	Positive	Negative	60%
11	Dark grey	Odorless	Soft	Positive	Negative	60%
12	Greyish black	Odorless	Soft	Positive	Positive	70%
13	Black	Odorless	Soft	Positive	Positive	75%
14	Greyish black	Odorless	Soft	Positive	Positive	80%
15	Greyish black	Odorless	Soft	Positive	Positive	90%
16	Black	Odorless	Soft	Positive	Positive	95%
17	Black	Odorless	Soft	Positive	Positive	100%
18	Black	Odorless	Soft	Positive	Positive	100%

## RESULT

- End Product Obtained – Rajata Bhasma I
- Weight of Rajata Bhasma I – 50.5 gm
- Total Puta Applied – 18
- Color – Black
- Taste – Slightly bitter
- Odor – Odorless
- Touch – Soft

- Varitarata – 100%
- Rekhapurnata – Positive
- Nishchandrata – Positive

## Preparation of Rajata Bhasma II

- ❖ Reference – A.P. 3/107-108
- ❖ Principle – Marana (Incineration)

**EQUIPMENTS**

Granite *Khalva Yantra*, Weighing Machine, Measuring cylinder, Knife, Spoon, *Sharava*, Cotton Cloth, *Multani mitti*, Stainless Steel Tray, Cow-dung cakes.

**INGREDIENTS**

1. *Shudha Rajata Patra* – 60 gm
2. *Samaguna Kajjali* – 60 gm
3. *Ghritkumari Swarasa* - 100 ml

**PROCEDURE**

- In a *Khalva yantra*, equal quantity of *Kajjali* (60 gm) by weight of *Shudha Rajata Patra* was taken and levigated with *Ghritkumari Swarasa*.
- After 6 hours of levigation, *Kajjali* got consistency like that of paste and then it was applied on *Shudha Rajata Patra* and kept for drying.
- After drying it was weighed and kept in *Sharava* which was covered by another *Sharava* and joint was sealed by double layer of *Multani Mitti* smeared cloth and again kept for drying.
- Then *Sharava Samputa* was subjected to *Laghuputa* with the help of 2.5 kg of cow-dung cakes.
- After self-cooling of cow-dung cakes, *Sharava* was taken out and *Kapadmitti* was removed, material was collected and observations were recorded.
- In the 2<sup>nd</sup> and 3<sup>rd</sup> *Putra*, *Kajjali* was added in the proportion of ½ and ¼ of the obtained material respectively of the previous obtained material and

levigation was done with *Kumari Swarasa*. When the material became dough like in consistency, then *Chakrikas* were made.

- From 4<sup>th</sup> *Putra* onwards, *Kajjali* was added in the proportion of 1/8<sup>th</sup> of the obtained material of the previous *Putra* and levigated with *Kumari Swarasa*.
- The last *Putra* given was the open *Putra* in which joint between the *Sharavas* was not sealed with mud smeared cloth.
- This whole process was repeated for 17 times using end product of previous *Putra*.

**OBSERVATIONS**

- After first *Putra*, the pieces of *Rajata Patra* became fragile.
- After 1<sup>st</sup> *Putra*, the inner surface of the *Sharava* which was used to cover was Shiny Silver in color.
- Initially, *Chakrikas* were not formed properly but after 4<sup>th</sup> *Putra* *Chakrikas* were prepared properly.
- In subsequent *Putra*, the amount of *Ghritkumari Swarasa* required for *Bhavana* was decreased.
- Time taken for burning of cow-dung cakes was about 3 hours and for self-cooling of cow-dung cakes, it took 12 hours approximately.
- The peak temperature observed was 650°C.

**Table 9: Quantitative Observations during process of preparation of *Rajata Bhasma II*.**

No. of <i>Putra</i>	Wt. of <i>Rajata</i> before <i>Putra</i>	Wt. of <i>Kajjali</i>	Amt. of <i>Ghritkumari Swarasa</i> added	Wt. of dried <i>Chakrika</i>	Duration of <i>Mardana</i>	Max. temp. of <i>Putra</i>	Wt. of <i>Rajata Bhasma</i> After <i>Putra</i>	Wt. loss/gain in <i>Rajata Bhasma</i>
1	60	60	120	121	6	547	100	+40
2	100	50	150	150	6	498	81	-19
3	81	20.25	130	102.5	6	508	86	+5
4	86	10.75	120	98	6	560	83	-3
5	83	10.5	120	94.5	6	524	82	-1
6	82	10.25	100	94	6	479	80.7	-1.3
7	80.7	10	100	92	6	583	77.6	-3.1
8	77.6	9.5	95	87.5	6	650	69	-8.6
9	69	8.63	100	78	6	534	67	-2
10	67	8.3	100	76	6	542	64	-3
11	64	8	100	73	6	478	62	-2
12	62	7.75	95	71	6	550	59.5	-2.5
13	59.5	7.5	90	68	6	494	58.8	-0.7
14	58.8	7.35	100	66	6	525	56.5	-2.3
15	56.5	7	100	65	6	480	58.2	+1.7
16	58.2	7.25	100	66	6	518	56	-2.2
17	56	-	100	58	6	430	57	+1

**Table 10: Organoleptic Characters of the end product obtained after each *Putra* of *Rajata Bhasma II*.**

No. of <i>Putra</i>	Color	Odor	Touch	<i>Rekhapurnata</i>	<i>Nishchandrata</i>	<i>Varitarta</i> (Approx.)
1	Shiny black	Odorless	Rough & brittle	Negative	Negative	Negative
2	Greyish black	Odorless	Soft	Negative	Negative	Negative
3	Greyish with	Odorless	Soft	Negative	Negative	Negative

	slight red tinge					
4	Black	Odorless	Soft	Positive	Negative	Negative
5	Greyish black	Odorless	Soft	Positive	Negative	Negative
6	Greyish black	Odorless	Soft	Positive	Negative	Negative
7	Steel grey	Odorless	Slightly hard	Positive	Negative	Negative
8	Greyish black	Odorless	Soft	Positive	Negative	Negative
9	Black	Odorless	Soft	Positive	Negative	Negative
10	Black	Odorless	Soft	Positive	Negative	Negative
11	Greyish black	Odorless	Soft	Positive	Positive	60%
12	Steel grey	Odorless	Soft	Positive	Positive	65%
13	Dark grey	Odorless	Soft	Positive	Positive	70%
14	Greyish black	Odorless	Soft	Positive	Positive	85%
15	Greyish black	Odorless	Soft	Positive	Positive	95%
16	Black	Odorless	Soft	Positive	Positive	100%
17	Black	Odorless	Soft	Positive	Positive	100%

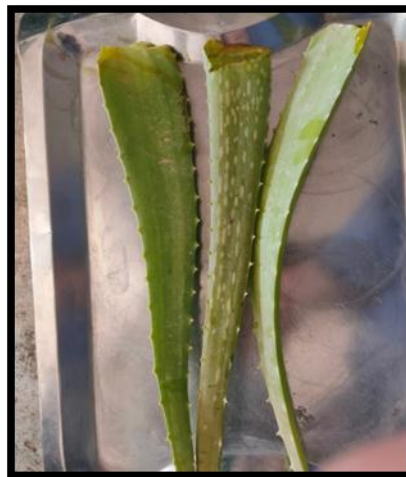
**RESULT**

- End Product Obtained – *Rajata Bhasma II*
- Weight of *Rajata Bhasma II* – 57 gm
- Total *Puti* Applied – 17
- Color – Black
- Taste – Tasteless
- Odor – Odorless
- Touch – Soft
- *Varitarata* – 100%
- *Rekhapurnata* – Positive
- *Nishchandrata* – Positive

**RAW MATERIAL OF RAJATA BHASMA****Rajata****Parada****Gandhaka****Hartaala**



Nimbu



Ghritkumari

**SAMANAYA SHODHANA OF RAJATA**



Nirvapana in Tila Taila



Nirvapana in Takra





Nirvapana in Gomutra



Nirvapana in Kanji



Nirvapana in Kulattha Kwatha

**VISHESH SHODHANA OF RAJATA**



**Nirvapana in Nimbu Swarasa**

**PREPARATION OF RAJATA BHASMA – I**



**Shudha Rajata & Shudha Parada**



**Rajata Pishti**



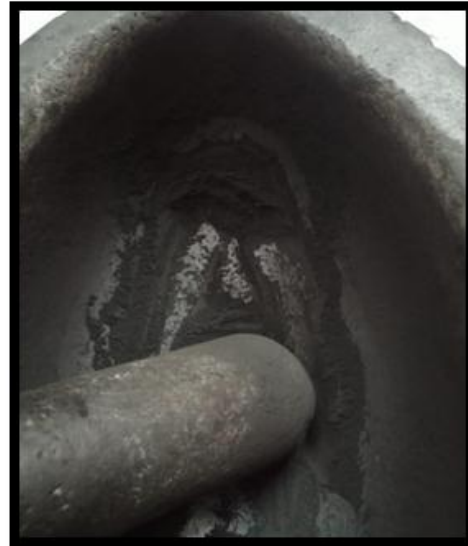
**Trituration with Shudha**



**Gandhaka**



**Addition of Shudha Hartaala**



**After Trituration**



**Chakrika Preparation**



**Sharava Samputa**



**Laghu Puta**



**After Puta**



After 1st Puta



After 11th Puta



After 18th Puta

**PREPARATION OF RAJATA BHASMA – II**



Shudha Rajata



Kajjali



Ghrithkumari Swarasa



Levigation of Kajjali



Rajata + Kajjali



Kajjali lipta Rajata Patra



Laghu Puta



After Puta



After 1st Puta

Bhavana for 2<sup>nd</sup> Puta

Chakrika preparation



After 10th Puta

After 17<sup>th</sup> Puta

Rekhapurnata



Varitarta

## DISCUSSION

The purpose of *Shodhana* is not only to remove impurities but also to potentiate the therapeutic efficacy of the drug material. The method of *Nirvapana* was adopted for the *Shodhana* of *Rajata*. Various classical texts had mentioned *Samanya Shodhana* of *Rajata* in *Tila taila*, *Takra*, *Gomutra*, *Kanji*, *Kulattha Kwatha* but

lot of *dravyas* had been mentioned for the *Vishesh Shodhana* of *Rajata*. *Samanya Shodhana* was done by the above mentioned drugs but *Vishesh Shodhana* of *Rajata* was done by *Nimbu Swarasa*.

During the process of *Shodhana*, various changes were observed like decrease in metallic lustre after quenching in each media and characteristic sound and odour was

produced during quenching in each media which suggest the reaction in each media. When *Rajata* was heated to red hot stage, then it was instantly quenched in liquid media. Instant quenching was important, repeated immediate cooling after heating leads to breaking of the material. During the process of *Shodhana*, the color of *Rajata* became blackish. This was because during red hot stage, *Rajata* reacts with atmospheric oxygen. After every cycle of *Shodhana*, weight of *Rajata* was decreased which might be due to the extremely small particle size. After the completion of *Shodhana* process, *Rajata* became soft, brittle, reduced to very small pieces and metallic lusture was lost completely.

The *Marana* of *Rajata* was done by two different methods given in two different texts i.e. *Rasa Tarangini* and *Ayurveda Prakash* respectively. In the present study, the traditional method was followed for *Marana* process. In the preparation of *Rajata Bhasma I*, first of all *Rajata Pishti* was formed with equal quantity of *Shudha Rajata* and *Shudha Parada* and then it was levigated with *Nimbu Swarasa* and washed with water. After that equal quantity of *Shudha Gandhaka* and *Shudha Hartaala* were also added and trituration was continued till the formation of homogenous mixture and then *Chakrikas* of uniform size and thickness were prepared and dried properly and subjected to *Laghu Puta* with the help of cow dung cakes weighing 2.5 kg. After self-cooling of cow-dung cakes, *Sharava Samputa* was taken out and the obtained material was weighed and observed. In 2<sup>nd</sup> and 3<sup>rd</sup> *Putas*, *Shudha Parada*, *Shudha Gandhaka* and *Shudha Hartaala* were added in the proportion of ½ and ¼ of the obtained material respectively. From 4<sup>th</sup> *Putas* onwards, *Shudha Parada*, *Shudha Gandhaka* and *Shudha Hartaala* were added in the proportion of 1/8<sup>th</sup> of the obtained material. Total 18 *Laghuputas* were given for the preparation of *Rajata Bhasma I*.

*Rajata Bhasma II* was prepared with the reference of *Ayurveda Prakash* 3/107-108. First of all, equal quantity of *Kajjali* by weight of *Shudha Rajata Patra* was taken and levigated with *Ghritkumari Swarasa*. When *Kajjali* got consistency like that of paste and then it was applied on *Shudha Rajata Patra* and dried well. It was then subjected to *Laghuputa* with the help of 2.5 kg of cow-dung cakes. After self-cooling of cow-dung cakes, *Sharava Samputa* was taken out and the obtained material was weighed and observed. In the 2<sup>nd</sup> and 3<sup>rd</sup> *Putas*, *Kajjali* was added in the proportion of ½ and ¼ of the obtained material respectively and from 4<sup>th</sup> *Putas* onwards, *Kajjali* was added in the proportion of 1/8<sup>th</sup> of the obtained material of the previous *Putas* and levigation was done with *Kumari Swarasa* till the paste became dough like in consistency. After levigation, *Chakrikas* of uniform size and thickness were prepared and dried properly and subjected to *Laghu Puta*. Total 17 *Laghuputas* were given for the preparation of *Rajata Bhasma II*.

*Marana* is the process of compounding. During trituration, *Rajata* disintegrated with mercury when amalgamated which enhance the surface area of *Rajata* which facilitated the compounding process. During *Marana* process, decrease in weight was observed which could be due to handling loss occurring during trituration or in the preparation of pellets or due to the oxidation of the material during *Putas*. The color of both the *Bhasmas* was black which indicates the formation of sulphides and oxides of Silver.

## CONCLUSION

Two batches of *Rajata bhasma* had been prepared. *Rajata Bhasma I* was prepared according to the reference of *Rasa Tarangini* and *Rajata Bhasma II* was prepared according to the reference of *Ayurveda Prakash*. Although the method of preparation of *Rajata Bhasma I* and *Rajata Bhasma II* was different but the analysis of both the *Bhasmas* showed almost same results with slight variations. The ingredients of *Rajata bhasma I* were *Shudha Rajata Patra*, *Shudha Parada*, *Shudha Gandhaka*, *Shudha Hartaala* and levigated with *Nimbu Swarasa* whereas the ingredients of *Rajata bhasma II* were *Shudha Rajata Patra*, *Samguna Kajjali* and levigated with *Ghritakumari Swarasa*. In *Rajata bhasma I*, *Shudha Rajata Patra* was converted into *Rajata Pishti* by adding *Shudha Parada* and then other ingredients were added to it but in *Rajata bhasma II*, *Kajjali* levigated with *Ghritakumari Swarasa* was directly applied on *Shudha Rajata Patra* and subjected to *Laghu Puta*. Both the *Bhasmas* were subjected to *Laghu Puta* and the range of temperature was between 450 to 650°C. 18 *Laghu Putas* were given to *Rajata bhasma I* and 17 *Laghu Putas* were given to *Rajata Bhasma II*. Both the *Bhasmas* were black in colour. The yield of *Rajata Bhasma I* was 84.2% and the yield of *Rajata Bhasma II* was 95%.

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