



Pharmaceutical Study Of Swarna Makshika Satva Bhasma

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Abstract: *Rasashastra* came out during the medival period like a golden chariot when people needed instant & best cure. The specialized procedures like *Shodhana*, *Satvapatana*, *Marana*, *Amritikarana*, *Lohitikarana* etc, were developed and it resulted with ultimate *yogas* like *Bhasma*, *kupipakwa rasayana*, *parpati rasayana* etc, all these come under one roof called *rasaushadhis*, due to their lesser dose, quicker action¹ on dreadful diseases. *Rasaushadis* occupied a superior status among *ayurvedic* formulations. Converts deadly toxic substances in to safe and potent therapeutic agent. *Ayurvedic* classics claimed that *Satva Bhasma* of any mineral is ten times more potent therapeutically in comparison to its parent mineral *Bhasma*. Conceivably due to complicated pharmaceutical procedure of *Satvapatana* and their conversion in to *Bhasma*, practice of *Satva Bhasma* in therapeutics is very limited. *Rasa* Scholars have developed number of methods for *Satva* extraction and *Satva Marana*. It is necessary to find out the standard manufacturing procedure for *Satva* extraction and *Satva Marana* which ensures the quality, safety, efficacy and reproducibility of the products for their global acceptability. This paper aims to make available Standard Manufacturing Procedure of *Swarna Makshika Satvapatana* and *Satva Bhasma*. *Shodhana* was done by *Nirvapa* method with *Triphala kwatha*, this method repeated for 21 times. *Gandhaka* and *Tankana* was found advantageous as flux in *Satvapatana* process of *Swarna Makshika*. *Satva shodhana* done by *Nirvapa* method with *Triphala kwatha*. *Kajjali* as a *Marana* media and 3 *Gaja Putas* given. *Amritikarana* by *panchamrita*, and *Triphala kwatha* as a media for *Lohitikarana* about 5 *varaha puta* were required to get red colour of *Swarna Makshika Satva Bhasma*.

Index Terms - Amritikarana, Bhasma pareeksha, Lohitikarana, Swarna Makshika Shodhana, Satvapatana, Satva Shodhana, Satva Marana.

I. INTRODUCTION

Ayurveda is a system of indigenous medicine which systematizes and applies the knowledge about health and disease. After the development of *Rasashastra*, *Ayurveda* made a land mark in the history of medicine by making judicious effective use of Herbo-mineral preparations in the treatment of many diseases without any untoward effects with high degree safety and efficacy. *Swarna Makshika* is one among the *Maharatas*, on reviewing the *Ayurvedic* classics it is evident that the therapeutic use of *Swarna Makshika* has been in practice since *Samhita* period. *Swarna Makshika* is the most abundant copper bearing mineral containing mainly Copper, Iron and Sulphur along with trace elements like Ag, Au, Pt, Pd, Cr, Sb etc, which has been given very much importance in both *Deha Vada* and *Dhatu Vada*². *Satvapatana samskara*³ as elucidated in classics is achieving the essence of metals and minerals from their original source, it is a smelting process in which *Satva* is obtained. *Satva* is rich in main ore from which it is derived and also contains many other trace elements which make it unique. *Bhasma* prepared from *satva* (*satvabhasma*) is much more potent therapeutically than the whole *Rasadravya bhasma*. *Marana* is the process in which repeated *Bhavana* and *Putapaka* treatment divides compound form leaving their elemental nature completely and converts it to finest particle and also convert it into organo-metallic mineral compound which when used internally would

be absorbed into the system easily. In our classics, it has been claimed that *Satva Bhasma* of any mineral is ten times more potent in comparison to its parent mineral *Bhasma* in regards of therapeutic efficacy.

II. MATERIALS & METHODS:

Raw *Swarna Makshika* was procured from khetri mine situated at Gujarat. Other allied material i.e. *Parada*, *Gandhaka*, *Tankana*, *Thriphala bharada*, *Nimbu swarasa*, *godugdha*, *gritha* were procured from the local market.

III. METHODOLOGY:

a) *Shodhana of Swarna Makshika*⁴:

- Pieces of *Swarna Makshika* were weighed to 3kg and taken in an iron pan and kept on intense fire till the pieces become red hot and then immersed in *Thriphala kwatha*. This procedure repeated for 21 times.

Result:

Total amount of <i>Triphala kwatha</i>	: 18,900ml
Colour of <i>Swarnamakshika</i> after <i>nirvapa</i>	: Brown (powder)
Weight of <i>Swarnamakshika</i> before <i>Nirvapa</i>	: 3 kg
Weight of <i>Swarnamakshika</i> after 21 <i>nirvapa</i>	: 2.589 kg

b) *Shodhana of Gandhaka*⁵:

- The process of *Gandhaka Shodhana* was done in 4 sets
- For the first set of *Gandhaka Shodhana*, 1Kg *Ashuddha Gandhaka* was taken & pounded in stone mortar. Earthen pot was taken and filled with required quantity of *Godugdha* & *Gritha*. A single layered cotton cloth was tied at the mouth of the lower pot containing *Godugdha* & *Gritha*. *Gandhaka* was powdered & was spread over the cloth. Another similar pot was placed upside down over the lower pot and *Damaru yantra* was prepared. Joint of 2 pots were sealed with mud-smeared cloth & dried under shade.
- A small pit was dig according to the size of the pot, *Damaru Yantra* was placed in that pit. 10 *Vanyopalas* were taken & arranged properly over the base of upper pot and ignited. *Vanyopala* were burned completely and the apparatus was allowed to selfcool. After selfcooling ash collected over the pot is cleaned and apparatus was taken out from pit.
- Sandhi Bandhana* was removed, and the cloth tied over the mouth of lower pot was separated out carefully to avoid spilling of impurities in lower pot. *Godugdha* was removed & *Shuddha Gandhaka* was collected from the bottom of the Lower pot. Collected *Shuddha Gandhaka* was washed with hot water until it gets completely free from *Godugdha* & *Gritha*, dried and collected. Same procedure was repeated in other 3 sets.

Result: Initial weight of *Ashuddha Gandhaka* : 6 kg

Final weight of *Shuddha Gandhaka* obtained : 5 kg 987 gms

c) *Shodhana of Tankana*⁶:

- 4 kg of *Ashuddha Tankana* was taken in a clean vessel. The vessel was placed over mild fire & heated with regular stirring. When the drug loses all its moisture and became light & fluffy (*Utpullikarana*) like popcorn, the heating was stopped & stored.

Result: Weight of *Ashuddha Tankana* : 4 kg

Weight of *Shuddha Tankana* : 2kg 546 gms

d) *Swarna Makshika Satvapatana*⁷:

- Equal parts of *shuddha Swarna Makshika* & *Shuddha Gandhaka* are taken in an iron vessel and cooked over intense heat for 12 hrs. During roasting sulphur fumes were liberated from the mixture in the form of oxides of sulphur. The roasting was continued till the fumes of sulphur subsided and the material turned to reddish brown. After *swangasheeta*, it was weighed and to that yield, half part of *Shuddha Gandhaka* and half part of *shuddha Tankana* were added and homogeneous mixture was prepared.

- 25 number *Musha* of graphite was taken and preheated at 200°C-250°C for one hour in *Koshti*. Then half the part of *Musha* was filled with the mixture and heated at around 1600 °C with the help of blower to extract the copper like *Satva* of *Swarna Makshika* then it was left for *swangasheeta*.
- The *Satva* was collected at the bottom with a luster appearance and over which slag was deposited which could be removed with the slight hit.
- The time taken in *Satvapatana* of *Swarna Makshika* was approximately 3 hours.

Result: weight of *Swarnamakshika Satva* - 267 gms

Weight of Slag - 1kg 961 gms

e) ***Swarna Makshika Satva Shodhana*⁸:**

- *Swarna Makshika Satva* were weighed to 267 gms and taken in an iron pan and kept on intense fire till the pieces become red hot and then immersed in *Thripala kwatha*. This procedure repeated for 21 times.

Result: Weight of *Swarna Makshika Satva* after *Shodhana*: 237 gms

f) ***Parada Samanya Shodhana*⁹:**

- 500 gms of *Ashuddha Parada* was taken in *Khalwa Yantra* and to which equal quantity of *Nishtusha Lashuna Kalka* was added and trituration was continued. After getting the uniform mixture of *Lashuna Kalka*, *Ashuddha Parada* and *Saindhava lavana*, the *Khalwa Yantra* was placed over sand bath to bring the effect *Tapta Khalwa*.
- The temperature of *Tapta Khalwa* was maintained at around 50°C. Trituration was continued till the whole *Lashuna Kalka*, *Parada* and *Saindhava lavana* together formed the homogenous mixture. When the mixture turned completely blackish grey in colour and lustre free, *Khalwa Yantra* was taken out from sand bath. The mixture was washed with hot water and *Shuddha Parada* was collected from the mixture.

Result: Initial weight of *Ashuddha Parada* : 500gms

Final weight of *Shuddha Parada* : 454gms

g) ***Preparation of Kajjali*¹⁰:**

- *Shuddha Parada* and *Shuddha Gandhaka* were taken in equal quantity and triturated in *Khalwa yantra*. After 30 minutes of trituration mixture turned greyish in color. Trituration was continued till it attained jet black color with loss of shining particles in it (*Samyaka Kajjali Lakshana*).

Result: Total weight of *Kajjali* obtained : 898 gms.

h) ***Swarna Makshika Satva Marana*¹¹:**

- *Swarna Makshika Satva* were weighed to 223gm and mixed with equal quantity of *kajjali* was triturated in *khalva yantra* and levigated with *nimbu swarasa* to make it suitable for *chakrika* formation. Properly dried *chakrikas* were put into *sharava* and subjected to *gajaputa*. Total 3 *gajaputa* were required to get genuine *Swarna Makshika Satva Bhasma*.

Result: Weight of *Swarna Makshika Satva Bhasma* after 3 *gaja puta*: 192 gms

Table No 1: Showing the physical description of sample of *Swarnamakshika satva bhasma*

Sl. no	Tests	Observations
1.	Appearance	Very Fine powder
2.	Colour	Black
4.	Odour	Characteristic
5.	Taste	Tasteless

Table No 2: Table showing *Bhasma Parikshas* done after every *Puta*.

<i>Bhasma parikshas</i>	First <i>Gaja puta</i>	Second <i>Gaja Puta</i>	Third <i>Gaja Puta</i>
<i>Slakshanatva</i>	Negative	Positive	Positive
<i>Rekhapurnatva</i>	Negative	Positive	Positive
<i>Varitara</i>	Negative	Negative	Positive
<i>Nishchandratwa</i>	Negative	Negative	Positive
<i>Uttama</i>	Negative	Negative	Positive
<i>Amla pariksha</i>	Negative	Negative	Positive
<i>Niswadu</i>	Negative	Negative	Positive

i) *Swarna Makshika Satva Bhasma Amritikarana*¹²:

- *Swarna Makshika Satva Bhasma* after 3 *gajaputas* was taken in an iron pan placed over *teevragni*. Exactly equal quantity of *panchamruta* was added to *Satva Bhasma* & the mixture was covered with *sharava* and *teevragni* (800-840 °C) was given continuously. When it became *nirdhooma* the iron pan was removed from *agni*. Left for *swangasheeta* for one day. Next day the *Satva bhasma* was collected & weighted.

Result: Weight of *Swarna Makshika Satva Bhasma* after *Amritikarana*: 182 gm

j) *Swarna Makshika Satva Bhasma Lohitikarana*¹³:

- *Swarna makshika satva bhasma* after *Amritikarana* were weighed to 182 gms and was triturated in *khalva yantra* and levigated with *Triphala kwatha* to make it suitable for *chakrika* formation. Properly dried *chakrikas* were put into *sharava* and subjected to *varaha puta*. Total 7 *varaha puta* were required to get red colour of *Swarna Makshika Satva Bhasma*.

Result: Weight of *Swarna Makshika Satva Bhasma* after *Lohitikarana*: 174 gm

IV. PRECAUTIONS:**1. During *Shodhana*:**

- As shown in the table, quantity of *Triphala kwatha* was taken for total immersion of *Swarna makshika*.
- Care was taken to avoid the spilling of mixture from iron vessel.
- Care was taken to avoid the adherence of mixture to iron vessel.

2. During *Satvapatana*:

- Crucible should be preheated up to 200-250 °C for one hour to make it heat resistant.
- Crucible should be filled up to half level to avoid splitting of material during boiling.

3. During *Marana*:

- *Mardana* was done properly till it attained consistency of forming *Chakrika*.
- The dried *Chakrikas* were placed uniformly without overlapping.
- The sealing of the gap between the 2 *Sharavas* was done properly.
- Pyrometer was placed just below the *Sharava sampata* to record the exact temperature obtained by the *Sharava sampata*.
- Thinner/ Kerosene oil impregnated cow dung cakes were ignited and placed at all corners of *Puta* so that the cow dung cakes get ignited from all sides uniformly.
- The *Samputa* was removed with care after *Swanga Sheeta*.
- Care was taken while scrapping the outer part of *Sharava*, so that particles will not enter inside.

V. OBSERVATION & RESULT:

Table No 3: Time and temperature pattern with observations of extraction of *Swarna Makshika Satva*

Minutes of heating	Temp in $^{\circ}$ C	Observations
0	35	-
30	250	Green yellow fumes appeared
45	450	Green yellow fumes increased
60	650	Green yellow fumes decreased
75	850	Absence of fumes
90	950	Matter around crucible start melting
107	1105	All matter become in molten stage
120	1230	Bluish red colour flame with bubble started like <i>bijavarta</i>
137	1350	White flame appeared with crackling sound (<i>Suddhavarta</i>)
150	1400	<i>Suddhavarta</i>
180	1600	<i>Suddhavarta</i>
		Kept for <i>swangasheetta</i>

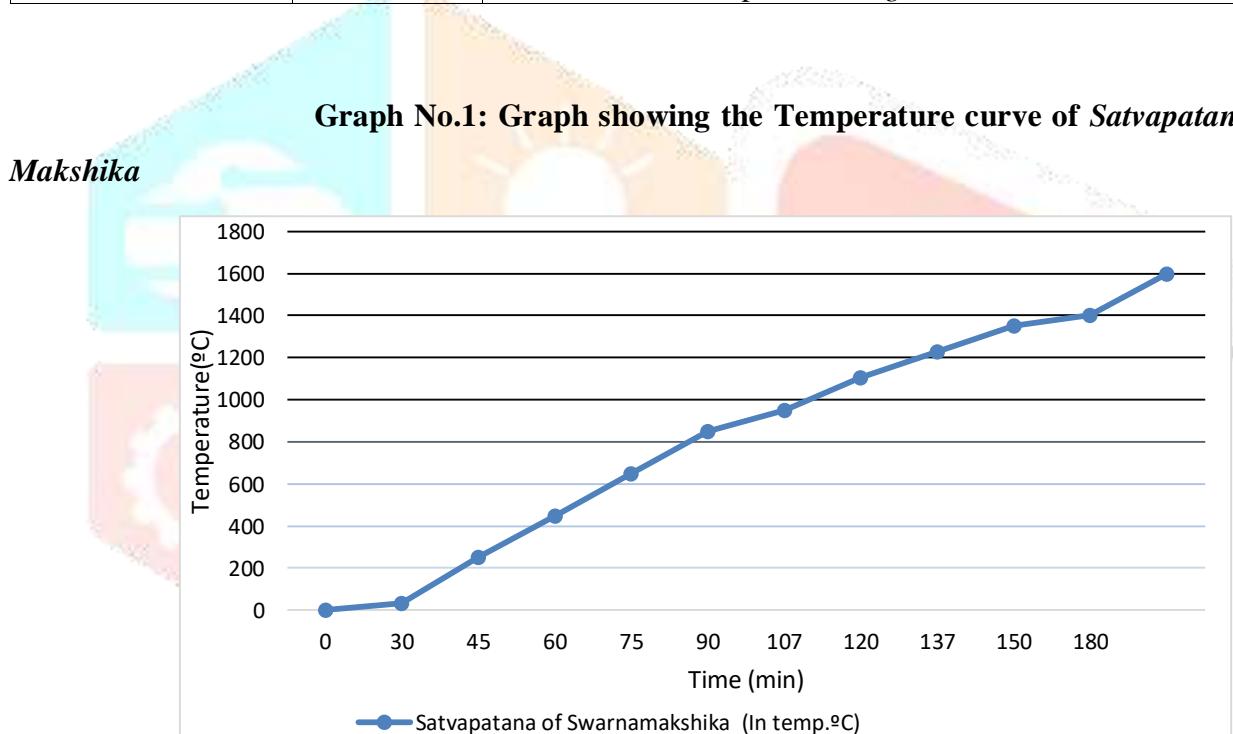


Table No .4: Table showing observations found during *Swarna Makshika Satva Marana* process.

Observations	First Puta	Second Puta	Third Puta
Type of Puta	<i>Gaja Puta</i>	<i>Gaja Puta</i>	<i>Gaja Puta</i>
Weight of <i>Swarnamakshika satva + Kajjali</i> (in gms)	223+223	215+108	199+100
<i>Nimbu swarasa</i> (in ml)	100 ml	80 ml	80 ml

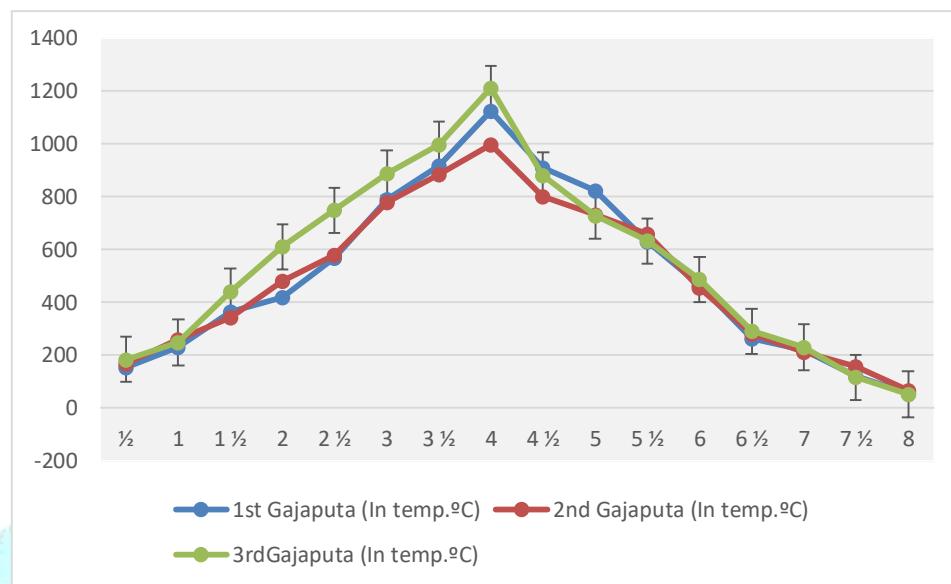
<i>Vanyopalas (in Kgs)</i>	121 kgs	121 Kgs	121Kgs
Weight of <i>Chakrikas</i>(before)in gms	457gms	320gms	300gms
<i>Yield obtained(After Marana)in gms</i>	215 gms	199gms	192 gms
Peak Temperature(in °C)	1124°C	998°C	1210°C
Peak temperature maintained (in min.)	20 min	15 min	20 min
Color (before)	Jet black	Black	Black
Color(After)	Dull Black	Black	Black
Smell	Metallic	No odor	No odor
Taste	<i>Amliyata++</i>	<i>Amliyata+</i>	Absent
Touch	Rough++	Rough+	Absent
Luster	Shining particles++	Shining particles +	Absent
Findings after Marana	<i>Chakrikas</i> were found lighter in weight.	<i>Chakrikas</i> were found lighter in weight.	<i>Chakrikas</i> were more lighter in weight.

Table No. 5: Table showing Temperature pattern in 3 Gaja Putas.

Hours	1st Gaja Puta (In temp.°C)	2nd Gaja Puta (In temp.°C)	3rd Gaja Puta (In temp.°C)
0	34	34	32
½	152	166	184
1	228	260	248
1 ½	365	344	440
2	420	480	610
2 ½	569	578	748
3	788	779	889
3 ½	918	885	998
4	1124	998	1210
4 ½	910	801	880
5	821	733	727
5 ½	631	660	632
6	467	455	486
6 ½	261	280	290
7	220	210	230

7 ½	120	155	115
8	56	67	52

Graph No.2: Graph showing the Temperature curve of 3 Gajaputas.



VI. OBSERVATIONS:



Raw Swarnamakshika Kwatha



Red hot



Nirvapa in Triphala

Kwatha



Pachanakarma of Swarna makshika in Shu Gandhaka



Filling of makshika, gandhaka, tankana



*Shuddhavarta Lakshana
the Slag*



Crusible was taken out from Bhatti



Pouring



After swangasheeta



Swarnamakshika Satva



Satva Particle in Slag



Slag



Red hot of Satva



Satva Nirvapa in Triphala Kwatha



Powder of Shodhita Satva



*Satva Mardana with kajjali&nimbuswarasa
Satva Bhasma*



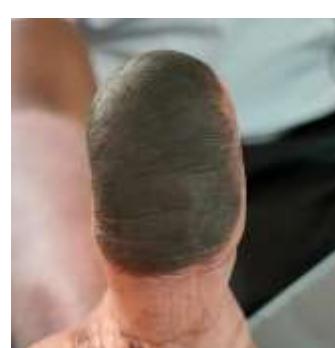
Gaja Puta



Swarnamakshika



Varitara



Rekhapurnata



Amla Pareeksha



Amritikarana of Satva Bhasma



Amritikruta of Satva Bhasma



Lohitikruta of Satva Bhasma

VII. DISCUSSION & CONCLUSION:

- Initially *Swarna Makshika* was heavy hard and metallic in nature but after 1st *nirvapa* itself noticeable changes was observed in compactness, metallic texture and heaviness. Became more and more brittle in successive *nirvapas* and also became soft and lighter. Due to the intense heating some bonds may be loosen and by sudden quenching to cold media with plenty of organic acids may break the bonds and this can be attributed to the gradually increased brittleness. After quenching in the *Triphala kwatha* there was a fair chance of reaction with media resulting in the chemical changes in the *Swarna Makshika* and resulting in detoxification of *Swarna Makshika*. Liberation of free iron and its reactions with organic acids and various alkaloids may have attributed to the dark black color of *Triphala kwatha* after *nirvapa*.
- *Gandhaka* was purified in one time no need to repeat this process no. of times as mentioned in other process. As compare to *Dalana* method and other methods, there is less amount of weight loss seen in *Patana* method. Large amount of *Gandhaka* can be purified by this method at a time. 0.22% of loss was found after *Shodhana*.
- *Tankana Shodhana* was done by *Utpullikarana* method. During the procedure of *Utpullikarana*, the 10 molecules of water bonded with water of crystallization are broken down and is melted & evaporated. After which *Tankana* becomes *Kundavat* (Bloomed flower).
- *Satvapatana* is often compared with metallurgy but only difference between them is metallurgy aims in extraction of 99% pure metal while in *Satvapatana*, is aimed at extraction of essence of ore. While extraction of *Satva* from *Swarna Makshika*, Bluish red colour flames with bubbling was seen like *bijavarta* at 1230 °C, White flames appeared with crackling sound (*Suddhavarta*) was started at 1350 °C and end up with 1600 °C. Copper resembling *Satva* of *Swarna Makshika* (*Sulva Nibham*) was extracted out at the bottom of the *musha* over which spongy like slag was collected. Since the yield is dependent on the concentration of copper in ore, the *satva* obtained in the *Satvapatana* procedure is about 10.34%. It is said that copper pyrite ore contains Cu around 5% to 13%. In the present study irrespective of concentration procedures the quantity of *satva* obtained is satisfactory.
- *Satva Shodhana* was carried out to bring it into brittle form and to remove the impurities, so *Swarna Makshika Satva* was again subjected to *Shodhana* with *Triphala Kwatha* used in *Nirvapa* method. Due to the intense heating some bonds may be loosen and by sudden quenching to cold media with plenty of organic acids may break the bonds and this can be attributed to the gradually increased brittleness. As compare *Swarna Makshika shodhana*, the *Swarna Makshika Satva* was break it self and quickly brittle. After quenching the *Swarna Makshika Satva* in *Triphala kwatha* there was a fair chance of reactions resulting in the chemical changes in the *Swarna Makshika Satva* and resulting in detoxification of *Swarna Makshika Satva*.
- *Samanya Shodhana* was done by triturating *Ashuddha Parada* with *Nistusha Lashuna Kalka* and *Saindhava lavana*. Sand bath was used to give *taptha khalva* effect as per the procedure. During trituration, some watery and oily secretions were seen in the mixture. *Lashuna*- organic source of Sulphur, plays an important role in this step. Allyl disulphide present in *Lashuna* reacts with Mercury producing blackish color in the product. In the process of trituration, allicin organic sulphur present in *Lashuna* reacts with Mercury. This is a redox reaction where one undergoing oxidation and the other undergoing reduction. The electron changes in oxidant and reductant forms the basis of ionic electron method for balancing ionic equations. Later the *Parada* was procured back after doing *prakshalana* with *Ushna jala*.
- *Shuddha Parada* reduced into small particles while triturating with *Shuddha Gandhaka* quickly. This is due to the strong affinity of the Mercury towards Sulphydryls or thiols. The Mercury atom or

molecule will tend to bind with any molecule present, that has Sulphur or Sulphur-hydrogen combination in its structure. After 35 hours of trituration it became jet black in colour (*Kajjalabha*) and fulfilled all *Kajjali Siddhi Lakshana*. This black colour might be due to the formation of black sulphide of mercury. Constant and consistent pressurized trituration has its definite role to play in pharmaco- dynamic properties of *Kajjali*. It is accountable to the timed release and sustained release of the active molecules of the drug. Trituration was done till the attainment of *Nischandratwa*, this indicates the reduction in the amount of free mercury in *Kajjali*.

- *Swarna Makshika Satva Bhasma* was prepared by subjected for 3 *Gajaputas*. *Slakshnatva* and *Rekhapoornatwa* became positive from 2nd *Gajaputa* and became completely *varitara* after 3rd *Gajaputa*. *Amla dadhi pareeksha* was positive after 2nd *Gajaputa* and became negative after 3rd *Gajaputa*.
- The sample used for the present study i.e *Swarna Makshika satva* contains 79.89% Copper. *Amritikarana* was done in order to remove the *doshas* which may persist even after *marana*.
- The colour of the *Satva bhasma* turns to black colour after *Amritikarana* of *Satva Bhasma*. The *Satva bhasma* regains its original colour after 7th *Putra*.

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