A COMPARATIVE PHARMACEUTICAL STUDY ON MRIDU AND KHARA SATVAPATANA W.S.R. TO TUTTHA (MRIDU) MAYURA PICCHA AND BHUNAGA (KHARA) SATAVPATANA

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ABSTRACT
Various pharmaceutical procedures i.e. Shodhana (Purification), Marana (Incineration), Satvapatana (Extraction of metal from mineral) etc. converts deadly toxic mineral, metallic substances into safe and potent therapeutic agent. Satvapatana is well described pharmaceutical process. The main aim of Marana & Satvapatana is to enhance the properties of the drug. This study aims to pharmaceutical approach of Tuttha, Mayura Piccha and Bhunaga Satvapatana according to Rasatarangini. And to evaluate the temperature and fuel needed in which Tuttha, Mayura Piccha and Bhunaga gives the features of Bijavarta and Shuddhavarta. For Tuttha Satvapatana quantity of fuel consumption is comparatively less while in Mayura Piccha high and in Bhunaga Satvapatana fuel consumption is comparatively higher for one attempt of procedure. For Bijavarta and Shuddhavarta Tuttha needed 1280°C and 1320°C respectively and only one attempt needed for Satvapatana. While for same Mayura Piccha needed 1420°C and 1590°C respectively and two attempt needed for Satvapatana and Bhunaga needed 1440°C and 1620°C respectively for same features and two attempts were needed for Satvapatana. Bhunaga & Mayura Piccha Satva (denoted Khara Satva) obtained by 2 repeated attempt of Satvapatana. In Khara Satva where Satva may not obtain in one attempt, the finished product is triturated again with subjected drugs & heated. Comparatively yield percentage of Satva is higher (5%) in Tuttha, while it is lower and lowest in Mayura Piccha (0.5%) and Bhunaga (1%) respectively.

Keywords: Satvapatana, Tuttha, Mayura Piccha, Bhunaga.

INTRODUCTION
Development of Pharmaceutics in the field of Ayurveda found the use of formulations of metals, Minerals and Animal Origin in Ayurvedic therapeutics in the form of Bhasmas, Satva, Satva Bhasmas Different types of Metal, Mineral, Animal Origin and gems need to undergo a processing called Marana & Satvapatana. The main aim of Marana & Satvapatana is to enhance the properties of the drug, to induce new properties, to bring out the Atyanta Sukshmatva i.e. finest form of Bhasma and pure...
form Satva and to bring Guna Vishishtatva. Satva denoted “purity, literally, existence, reality” and brightness. Satvapatana is an important process which applies after Shodhana. So various trace elements are added and molecular changes have been seen in the particular drug during the procedure of Shodhana to Satvapatana. To obtain the metallic part from the Minerals/Ores/Compounds with the help of Dravaka Gana by strong heating in Koshthi (Specially prepared Fired place), here Satvapatana is Smelting process\(^1\). According to Rasaratna samucchya any mineral compound, animal origin or any ore is mixed and rubbed with the drugs prescribed in Kshara Varga, Amla Varga and Dravaka Varga. Then it is kept in a closed crucible and heated intensively, in a Kosthi (furnace). By this, the metallic essence portion of that compound can be obtained, which is nothing but Satva\(^2\). After Satvapatana potency of these drugs remains for longer period. Satva requires minimal dose & easy for administration. Abhraka Satva form is eight time more potent than Abhraka Patra form\(^3\). In context of Tamra Rasatarrangini and Rasaratna samucchya have been mentioned about Sasyaka, Mayura Piccha and Bhunaga Satvapatana. All main classics of Rasashastra have mentioned that copper is obtained as a Satva from Tuttha, Mayura Piccha and Bhunaga Satvapatana. Their Satva may be used as a source of Tamra. Tuttha, Mayura Piccha & Bhunaga Satva denoted as Tamravatam or Tamrarupam in various Rasa classics.

Satva is said to be two types: Metallic and Herbal. Rasauhashi (Jangama and Mineral drugs) contains metallic Satva while Kashtha Aushadhi contains herbal Satva. The process of Satvapatana always needs strong heat but some drugs releases their essence in low temperature. So according to time, temperature and fuel needed for Satvapatana, Metallic Satvapatana is divided in two types – Mridu and Khara.

i. **Mridu Satva** – The drug which releases their Satva in low temperature (below 1000\(^\circ\)C like Tuttha)

ii. **Khara Satva** – The drug which releases their Satva in very High Temperature above 1300\(^\circ\)C and need repeated attempt e.g. Bhunaga and Mayura Piccha etc [4].( R.R.S.5/224)

In present study Tuttha is mineral ore for Satvapatana while Bhunaga and Mayura Piccha are animal origin. Procedure of Satvapatana including Satvanam Mridukarnam, and important of Satvapatana is described in Rasaratna Samuchchya but exact time of heating, amount of fuel, temperature and how much quantity of Satva/percentage of yield is not mentioned.

**Aim and Objectives**

1. To pharmaceutical approach of Tuttha, Mayura Piccha and Bhunaga Satvapatana according to Rasa Tarangini.
2. To evaluate the temperature in which Tuttha, Mayur picccha and Bhunaga gives the features of Bijavarta and Shuddhavarta.
3. To evaluate the amount of fuel needed for Tuttha, Mayura Piccha, Bhunaga Satvapatana.
4. To evaluate the percentage yield of Satva.
5. To compare pharmaceutical differences between Mridu (Tuttha) and Khara (Mayura Piccha and Bhunaga) Satvapatana.

**Material and Method**

**Apparatus for Satvapatana:-** Rasa classics have mentioned Andha musha [closed crucible] and Angar Koshthi for Satvapatana but Rasaratnakar in Bhunaga Satvapatana also a reference of Chhidra musha and Patal Koshthi was found. Among them Andha musha and Satvapatana Koshthi [Angar Koshthi] can be considered better for the Satvapatana where intensively strong heating is needed. Use of Andha musha, the coal derived from the wood of Madhuka and Khadira, Angar Koshthi and Vanknaala (blower) is appropriate to get intensively strong heat which is need to obtained Satva. Materials mostly used for Satvapatana are Kshar Varga, Amla Varga and Dravak Varga, Una [wool]
250 ml of warm water was required for Nirmalikarana of 500 gm of Tuttha, this process was completed in 2 days and obtained bright shiny, dark-en blue colour of Nirmalikrita Tuttha in crystal form, weight was 480gm. Nirmalikarana process was done by using boiling and filtration method [yield 96%].

2. Tuttha Shodhana
Impure Tuttha [500gm] was weighed and triturated for 1st Bhavana, 370 ml of lemon juice was added cautiously, the paste was subjected for continuous trituration and same process was repeated for 5 times and total 10 hour Bhavana were given in 5days. 810 ml lemon juice required for total procedure. Process was done by using Bhavana and Mardana method and obtained dull blue colour of Shuddha Tuttha in smooth and powder form with smell of lemon juice, weight was 640gm (yield 128%).

3. Ball [Pinda/Vataka] formation for Tuttha Satvapatana
Shuddha Tuttha and Ashuddha tankana weighed equally (each 300gm). 600gm of mixture triturated with lemon juice, for 1st Bhavana 400ml of lemon juice was added cautiously, the paste was subjected for continuous trituration and same process was repeated for 3 times and total 06 hour Bhavana was given in 03 days, 700 ml lemon juice required for total procedure. Process was done by using Bhavana and Mardana method and obtained whitish blue colour of smooth paste with smell of lemon weight was 710gm (yield 118.33%), ball (Pinda /Vataka) was made by above mixture and completely dried in next one day.

4. Tuttha Satvapatana
Pinda of Tuttha [400gm] was kept in closed crucible, crucible and lid dish sealed by mud and clay, after drying this was kept in mid part of Koshthi between fuels for strong heating ,after total liquefying of ball, (time taken 7.30hour product was taken out, the product was found deposited mostly at the bottom and very little in surrounding of crucible, had crystalline like appearance which contain shiny particle, weight was 120gm [24%], grinding of finished product in stone motor and pestle was done and weight of shiny particle which had metallic property weight was 10gm. Graphical presentation of Temperature pattern of Tuttha Satvapatana is shown in Fig.1.

5. Mayura Piccha Jarana
120gm of Mayura Piccha Varti made by using of 60gm of Mayura Piccha & 60gm of Ghrita, this was fired in an iron pot, black colour of oily-sticky powder obtained with having foul smell, weight was 45gm(yield 37.5%),the procedure was completed in 30 min. Process was done by using Jarana method.

200gm of Mayura Piccha Masi triturated with 200gm of subjected drugs (jaggery, Guggul, Tankana, sesame oil cake, wool and dried small fish) cautiously mixture was subjected for continuous trituration for two days (6hour), obtained darken black colour of smooth paste of mixture, weight was 390gm.(yield 97.5%) Process was done by using Bhavana and Mardana method. Ball made by paste & completely dried in next 2 days.

7. Mayura Piccha Satvapatana
390gm of Mayura Piccha Masi Pinda [mixture along with Satvapatana drugs ] kept in closed crucible, crucible and lid dish sealed by mud and clay, after drying this was kept in mid part of Koshthi between fuels for strong heating, after stoppage of liquefying of mixture (time taken7.30hour tem.1590ºc) crucible left for self-cooling (21hour). Graphical presentation of Temperature pattern of Mayura Piccha Satvapatana is shown in Fig.2.
Result: For Satvapatana total 150 gm of mixture/compound was taken. Total 10 mg of Satva (essence) was obtained. It means percentage yield was 20.5%. After that finished product was taken out, finished product was found deposited mostly at the bottom and very little in surrounding, looked like ash and no any Satva like particle present, so procedure was again repeated with above ash, and finally the finish product had crystalline like appearance which contained shiny particle, grinding of finished product in stone mortar and pestle was done and weight of shiny particle which had metallic appearance was 1gm. Satvapatana was done by using extraction method with applying strong heating.

8. Bhunaga Masi formation /Jarana:-
3.6 kg of Bhunaga burnt in an iron pot and obtained black colour of smooth powder Masi, weighed was 600 gm this process is completed in 30 minutes process was done by using Jarana method [yield 16.7%] cause of weight loss of Bhunaga is due to animal origin and has very higher percent of water.

9. Ball [Pinda/Vataka] formation for Bhunaga Satvapatana:-
400gm of Bhunaga Masi triturated with subjected Satvapatana drugs [jaggery, Guggul, Tankan, sesame oil cake, Wool, dried small fishes] cautiously the mixture was subjected for continuous trituration for 2 days [6 hour] obtained darken black colour of smooth paste of mixture weight was 390gm [yield 97.5%], process was done by using Bhavana and Mardana method ball made by the paste and complete dried for next 2 days.

10. Bhunaga Satvapatana-
390gm of Pinda of Bhunaga Masi mixture kept in closed crucible, crucible and lid dish sealed by mud and clay after drying this was kept in mid part of Koshthi between fuels for strong heating after liquefying of most part of ball (time taken7.30hour tem.1620ºc) where it stopped to melt crucible left for self-cooling (21hour) after this finished product was taken out, finished product was found deposited mostly at the bottom and very little in surrounding of crucible looked like ash and no any Satva like particle present so procedure was again repeated with above ash and finally found the finish product had crystalline like appearance which contain shiny particle weight of 110gm [yield 29%], grinding of finished product in stone mortar and pestle was done and shiny particle which had metallic appearance, weight was 2gm.

Observation
A comparative graphical presentation of temperature pattern of Mridu and Khara Satvapatana are shown in Fig.1, 2 & 3.
Fig.2: Graphical presentation of temperature pattern in *Mayura Piccha Satvapatana*

Fig.3: Graphical presentation of temperature pattern in *Bhunaga Satvapatana*

### Table 1: Comparison of fuel quantity used for one attempt of procedure

<table>
<thead>
<tr>
<th>Types of fuel</th>
<th>Quantity used in <em>Tuttha Satvapatana</em></th>
<th>Quantity used in <em>Mayura Piccha Satvapatana</em></th>
<th>Quantity used in <em>Bhunaga Satvapatana</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Mine Coal</td>
<td>20 Kg</td>
<td>30 Kg</td>
<td>38 Kg</td>
</tr>
<tr>
<td>Cow dung</td>
<td>6 Kg</td>
<td>8 Kg</td>
<td>8 Kg</td>
</tr>
<tr>
<td>Wood Coal</td>
<td>4 Kg</td>
<td>6 Kg</td>
<td>8 Kg</td>
</tr>
<tr>
<td>Wood</td>
<td>4 Kg</td>
<td>4 Kg</td>
<td>4 Kg</td>
</tr>
<tr>
<td><strong>Total quantity</strong></td>
<td><strong>34 Kg</strong></td>
<td><strong>48 Kg</strong></td>
<td><strong>58 Kg</strong></td>
</tr>
</tbody>
</table>

### Table 2: Comparative observation of pharmaceutical process

<table>
<thead>
<tr>
<th>S.No.</th>
<th><em>Tuttha Satvapatana</em></th>
<th><em>Mayura Piccha Satvapatana</em></th>
<th><em>Bhunaga Satvapatana</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yellowish fumes started coming out at 830° c after 1 hour of procedure, which stop to come out in next 1 hour.</td>
<td>Blackish fumes started coming out after 1 hour of procedure at the temperature of 850°c, which stop to come out in next 1.30 hour.</td>
<td>Blackish fumes started coming out after 1 hour of procedure at the temperature of 850°c, which stop to come out in next 1 hour.</td>
</tr>
</tbody>
</table>
2. After 2.30 hour of procedure mixture became semi solid at the temperature of 1130ºc - 1250ºc
   After 3.30 hour of procedure mixture became semi solid at the temperature of 1300ºc - 1380ºc.
   After 3.30 hour of procedure mixture became semi solid at the temperature of 1300ºc - 1380ºc.

3. After 5 hour crucible seen red hot at the temperature of 1260ºc
   After 5 hour crucible seen red hot at the temperature of 1400ºc
   After 5 hour crucible seen red hot at the temperature of 1400ºc

4. After 5.30 hour smelling started and blue flame appeared [Bijavarta] at 1280ºc
   After 6.30 hour of procedure smelting started and blue flame appeared at 1420ºc [Bijavarta]
   After 6.30 hour of procedure smelting started and blue flame appeared at 1440ºc [Bijavarta]

5. After 7 hour white flames appeared at the temperature of 1320ºc
   After 7 hour white flames appeared at the temperature of 1580ºc
   After 7 hour white flames appeared at the temperature of 1580ºc

6. After 7.30 hour of procedure mixture completely melt and white flame increased (Shuddhavarta) at the temperature of 1350ºc
   After 7.30 hour of procedure white flame increased (Suddhavarta) and the mixture mostly melt and now stop to melt at the temperature of 1590ºc
   After 7.30 hour of procedure white flame increased (Suddhavarta) and the mixture mostly melt and now stop to melt at the temperature of 1620ºc

7. Time for self-cooling of crucible, 18 hour
   Time for self-cooling of crucible, 21 hour
   Time for self-cooling of crucible, 21 hour

8. Satva obtained in one attempt
   Satva obtained in two attempt
   Satva obtained in one attempt

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**Table 3:** Comparison of yield percentage of Satvas

<table>
<thead>
<tr>
<th>Raw drug</th>
<th>Shuddha Tuttha</th>
<th>Mayura Piccha Masi</th>
<th>Bhunaga Masi</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>200gm</td>
<td>200gm</td>
<td>200gm</td>
</tr>
<tr>
<td>Satva obtained</td>
<td>10gm</td>
<td>1gm</td>
<td>2gm</td>
</tr>
<tr>
<td>%</td>
<td>5%</td>
<td>0.5%</td>
<td>1%</td>
</tr>
</tbody>
</table>

**Table 4:** Appearance and Color of Tuttha, Mayura Piccha and Bhunaga Satva in classics

<table>
<thead>
<tr>
<th>Tuttha Satva</th>
<th>Mayura Piccha Satva</th>
<th>Bhunaga Satva</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamrakam (A.P. 4/44)</td>
<td></td>
<td>Shonditabindu (A.P. 4/56)</td>
</tr>
<tr>
<td>Tapayajsamam(Rakta &amp; mridu)</td>
<td></td>
<td>AbharvataSatva (A.K. 2/228-229)</td>
</tr>
</tbody>
</table>
DISCUSSION
For Tuttha Satvapatana quantity of fuel consumption is comparatively less while in Mayura Piccha high and in Bhunaga Satvapatana fuel consumption is comparatively higher for one attempt of procedure. As described in Table No.1. For Bijavarta and Shuddhavarta Tuttha needed 1280\(^{\circ}\)C and 1320\(^{\circ}\)C respectively and only one attempt needed for Satvapatana. While for same Mayura Piccha needed 1420\(^{\circ}\)C and 1590\(^{\circ}\)C respectively and two attempt needed for Satvapatana and Bhunaga needed 1440\(^{\circ}\)C and 1620\(^{\circ}\)C respectively for same features and two attempts were needed for Satvapatana which is shown in Table No.2. Comparatively yield percentage of Satva is higher in Tuttha, while it is lower and lowest in Mayura Piccha and Bhunaga respectively. As observed in Table No.3. Appearance and color of these three Satav’s are like to Tamrarupam, Tamramayam, Raktabham and Indragopasamkasham same as denoted in discussed classical references.(Table No.4)

CONCLUSION
Satvapatana is such procedure which is performed by strong heating temperature because of All Rasa Aushadhi gives their metallic essence after their melting points. The additional drugs (Satvapatana drugs) having Ushna, Snigdha, and Khara Guna with Insulating and the Binding properties which help in Satvapatana. Homogenous trituration is allowed by Khara and Snigdha Guna. Pinda formation is allowed by Snigdha and the binding properties. Strong heating is allowed by Insulating property and Ushna Guna. In Satvapatana, time of heating, number of heating amount of fuel and temperature is not mentioned by Rasacharya may be due to variations in drugs but to observe of Satvapatna some features are clearly mentioned which indicates sign of obtaining Satva i.e. Bijavarta, Suddhavarta and Ekkoliska. Mridu Satva (Tuttha Satva) is obtained easily by one process. Bhunaga & Mayura Piccha Satva (denoted Khara Satva) obtained by 2 repeated attempt of Satvapatana. In Khara Satva where Satva may not obtain in one attempt, the finished product is triturated again with subjected drugs & heated by using blue lamp or with Gas welding apparatus facilitate to obtain Satva easily with better yield. In present study we obtained Satva as a bright shiny particle immersed in Glass/plastic like crystal structure. We may facilitate the Satvapatana process by using closed crucible with a small hole in center; it allows coming out of fumes and for observing of Bijavarta & Suddhavarta.

REFERENCE

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Conflict Of Interest: None Declared