Pilot Study on Antardhuma Rasasindura
A Forgotten Ambrosia

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ABSTRACT

Rasasindura is a famous Ayurvedic Kupipakwa Rasayana formulation containing Mercury and Sulphur as major ingredients. Now a day’s Bahirdhuma Rasasindura is in common practice but final product is expensive and yield is less. Moreover the Sulphur fumes which come out during the preparation pollute the environment.

This study was focuses on preparation of Rasasindura in Antardhuma process and performing analytical tests to the sample. Medicine was prepared in traditional Valuka yantra Kupipakwa (sand bath) method. Final product was Red in colour as mentioned in classical text. Common household stove was used to specify that Antardhuma Rasasindura can be prepared on small scale by the practitioner himself with ease.

XRD, EDX, essay for mercury and sulphur were conducted on the product. Analytical tests confirmed Cinnabar and Sulphur in the sample. Sulphur content was more when compared to Bahirdhuma method ensures safety of the product. Increase in Sulphur content increases the efficacy of Mercurial medicine with regard to Gandhaka Jaarana point of view.

Antardhuma Rasasindura preparation is simple, economical, better yielding, eco friendly and superior to Bahirdhuma method.

Keywords: Rasasindura, Mercury, Antardhuma, Jaarana, Murchana, Kupipakwa.

INTRODUCTION:

Rasasindura is a famous Ayurvedic Rasayana formulation which is used in achieving quick results in small doses. It is prepared by Kupipakwa in Valuka yantra (sand bath) method which is one of the best methods adopted for metallic medicinal preparations, especially for Gandhaka (Sulphur) Jaarana (digestion).

Rasasindura is “Sa Gandha, Sa Agni, Murchana” of Mercury [1]. It is of two types- Antardhuma and Bahirdhuma. In this process Jaarana of Sulphur takes place which makes Mercury highly potentiated [2].

Purpose of present study: Though Antardhuma Rasasindura is not uncommon in classical literature, now a day’s Bahirdhuma Rasasindura is commonly practiced. Bahirdhuma Rasasindura product is expensive and yield is also less. Moreover the Sulphur fumes which come out during the preparation pollute the environment.

AIMS AND OBJECTIVES:

1) Pharmaceutical preparation of Samaguna Gandhaka Jaarita Rasasindura (equal amount of Sulphur digested Rasasindura) by Antardhuma process
2) To illustrate the importance of Sulphur in Jaarana procedure.
3) To re-establish the superiority of Antardhuma Jaarana in comparison to Bahirdhuma Jaarana with special reference to Classics.

MATERIALS AND METHODS:

Materials used:
• Purified Mercury: 45 grams
- Purified Sulphur: 45 grams
- Borosilicate Glass flask with glass stopper: 150 ml
- *Valuka yantra* (sand bath)
- *Vahni Mrttika* as sealing material (Rock salt, fuller’s earth and Iron Oxide)
- Household Gas stove with cylinder
- Pyrometer with Thermocouple

**Method:**
- Equal quantities of purified Mercury and purified Sulphur were taken in *khalva yantra* (mortar and pestle) and triturated for a day to prepare 90 grams of *Samaguna Gandhaka Kajjali*[^3] (58% MetaCinnabar + 42% Sulphur) with *Kajjalabha* (black colour), *rekhapuranatwa* (entering minute pores of fingers) and *nischandratwa* (lustreless) properties.
- *Kacha Kalasa*[^4] (borosilicate Glass flask with short narrow neck) of 150 ml volume was taken with a glass stopper. Single layer of *Kapadmitti* (cotton cloth dipped in slurry of fuller’s earth) was applied over the flask.
- Borosilicate glass flask was selected as it is thermo stable and chemically non reactive. As per classical text if we fill exactly 1/3rd part with Kajjali in the flask there is zero possibility of any kind of blast.
- One third part of the 150 ml flask was filled with *Kajjali*, which was 90 grams calculated basing on its density. Glass stopper was placed and sealed with *Vahni Mrttika*[^5].
- It was placed in *Valuka yantra* (sand bath) and kept over a household gas stove. *Krama Agni* (controlled increase of temperature) was given for one day. After self cooling the flask was evenly broken and dark red coloured *Antardhuma Rasasindura* formed over inner walls of the flask around the neck region was carefully collected.

**Table No. 1: Showing the temperature range of *Krama Agni*[^6]**

<table>
<thead>
<tr>
<th>Agni (flame/heat)</th>
<th>Standard temperatures of <em>Krama Agni</em></th>
<th>Experimental temperatures (8 hours each)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Mrudu</em> (mild)</td>
<td>Till 250°C</td>
<td>211°C (8th Hour)</td>
</tr>
<tr>
<td><em>Madhyama</em> (moderate)</td>
<td>250°C to 450°C</td>
<td>434°C (16th Hour)</td>
</tr>
<tr>
<td><em>Tivra</em> (severe)</td>
<td>450°C to 650°C</td>
<td>574°C (24th Hour)</td>
</tr>
</tbody>
</table>

**OBSERVATIONS:**
- *Valuka yantra* *Kupipakwa Antardhuma Rasasindura* was *kanthastha* (formed at neck of flask), as the temperature ranged up to *Tivra Agni* (574°C at 24th hour).
- Colour of final product was dark red and after powdering colour was pale red.
- Final drug output was 98.4%. 90 grams of *Kajjali* was converted into 88.60 grams of *Antardhuma Rasasindura*.
- There was no residue at the bottom assuring temperature was given for sufficient time period.
- Slight pungent gas was smelled after breaking the flask, probably of SO₂ (Sulphur dioxide). Sulphur may have reacted with the Oxygen molecules, as only 1/3rd of the flask was filled and remaining 2/3rd space were occupied by air.
- Single layer of *kapadmitti* (cotton cloth dipped in Fuller’s earth) was tolerable.
RESULTS:

Analytical results:

1) Graph No.1: Showing XRD pattern of *Antardhuma Rasasindura*:

<table>
<thead>
<tr>
<th>Angle 2 theta position</th>
<th>D Spacing (Å)</th>
<th>Intensity in Counts</th>
<th>Relative Intensity (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>23.108</td>
<td>3.84584</td>
<td>814</td>
<td>47.5</td>
</tr>
<tr>
<td>25.868</td>
<td>3.44149</td>
<td>344</td>
<td>20.1</td>
</tr>
<tr>
<td>26.536</td>
<td>3.35636</td>
<td>1485</td>
<td>86.7</td>
</tr>
<tr>
<td>27.751</td>
<td>3.21214</td>
<td>362</td>
<td>21.2</td>
</tr>
<tr>
<td>28.207</td>
<td>3.16114</td>
<td>606</td>
<td>35.4</td>
</tr>
<tr>
<td>31.232</td>
<td>2.86157</td>
<td>1712</td>
<td>100.0</td>
</tr>
<tr>
<td>34.198</td>
<td>2.61986</td>
<td>144</td>
<td>8.4</td>
</tr>
<tr>
<td>37.885</td>
<td>2.37291</td>
<td>188</td>
<td>11.0</td>
</tr>
<tr>
<td>43.626</td>
<td>2.07306</td>
<td>398</td>
<td>23.3</td>
</tr>
<tr>
<td>45.809</td>
<td>1.97922</td>
<td>521</td>
<td>30.4</td>
</tr>
<tr>
<td>51.780</td>
<td>1.76414</td>
<td>332</td>
<td>19.4</td>
</tr>
<tr>
<td>52.763</td>
<td>1.73355</td>
<td>455</td>
<td>26.6</td>
</tr>
<tr>
<td>54.642</td>
<td>1.67831</td>
<td>435</td>
<td>25.4</td>
</tr>
</tbody>
</table>

- Major peaks were found to be Cinnabar (HgS) and Sulphur (S₈)
- Mercury in free state was not found in the sample
- Sharp peaks with high intensity indicate crystalline nature of sample

2) Graph No.2: Showing EDX Spectrum of *Antardhuma Rasasindura*:

Graph showing Mercury and Sulphur as major peaks:
3) **Quantitative analysis:**

- Mercury (Hg): 51.22%
- Sulphur (Bonded): 08.19%
- Sulphur (free): 40.57%
- So, Cinnabar (HgS) in the final product: 59.41%

**Critical Explanation:**

*Gandhaka Jaarana* refers to the contact duration of melted *Gandhaka* with *Parada* followed by bond formation and subsequent burning or evaporation of free Sulphur depending on Antardhuma or Bahirdhuma process.

In *Bahirdhuma Rasasindura* during *Jaarana* process *Gandhaka* burns out due to its reaction with oxygen and final product is HgS (artificial Cinnabar).

In *Antardhuma Rasasindura* during *Jaarana* process *Gandhaka* evaporates to form a sublimate and is evenly mixed physically (not chemically) with the HgS compound. Hence *Antardhuma Rasasindura* is a well blended mixture of Cinnabar and Sulphur.

The superior therapeutic qualities of Antardhuma Jaarana are clearly mentioned in classical texts. We can assume that Antardhuma Rasasindura attains superior therapeutic values due to the presence of sublimate of Sulphur.

The sublimated Sulphur concept can be explained by a reference from Ananda kanda text.

Ananda kanda[^21] mentioned the sublimation process of Gandhaka and named it as Gandhaka satwa (using the word Satwapatana for Gandhaka is not acceptable as Gandhaka itself is satwa rupa). Ananda kanda inner meaning was to obtain purest form of Sulphur by sublimation. Present day pharmaceutical industries prepare 99.99% pure Sulphur mainly through sublimation process. This pure sublimated Sulphur is no doubt therapeutically effective. This is explained below with an example:

Gandhaka sodhana is mainly done by Ghee and milk. The explanation we give is, Ghee removes the toxic substances from Gandhaka and floats over milk while Gandhaka sinks to the bottom. Practically even after repeated hot water washing of purified Gandhaka some amount of Ghee and milk particles will be attached to Gandhaka. Ghee smell is also felt. As per the concept toxins are taken by Ghee which is still in contact with Gandhaka and traces of milk particles compromise the sterility as there can be a chance of bacterial growth. The purest form of Sulphur can be obtained by the sublimation process mentioned by Ananda kanda as Gandhaka satwa which is therapeutically more effective.

- Bahirdhuma Rasasindura is HgS
- And Antardhuma Rasasindura is a well blended HgS + S
- This may be the first practical attempt of Kupipakwa Antardhuma Rasasindura.
DISCUSSION: Processing Mercury and Sulphur to form red coloured product similar to Rasasindura probably started from 8th century AD. They were prepared in Loha samputa (Iron vessels), Musha (earthen crucibles), Angara paka, puta paka methods, etc. Valuka yantra (sand bath) was first mentioned in Rasahridaya tantra (10th AD). Kacha Kupi (glass flask or bottle) was first mentioned in Rasendra chudamani (12th AD). Kacha Kupi in Valuka yantra for Kupipakwa was used from the period of Rasa prakasha sudhakara (13th AD). According to Rasendra cintamani Kupi (flask or bottle) can be made from glass, clay, gold, iron, silver. Rasasindura word first appeared in Rasendra cintamani (15th AD).

The very first instance of Gandhaka Jaarana was Antardhuma method processed in yantra similar to Musha yantra, described in Rasendra mangalam (8th AD). According to Rasahridaya Tantra the method of Parada Jaarana where there is no loss in Mercury should be followed, which is only possible in Antardhuma. The therapeutic attributes of Antardhuma Jaarana are ranking high to Bahirdhuma Jaarana due to the inadequate Gandhaka Jaarana in Bahirdhuma method. It reveals the superiority of Antardhuma.

Readable reference of Bahirdhuma Gandhaka Jaarana is seen in Rasendra Cintamani (15th AD) and Rasa Tarangini (20th AD). Clear emphasis on Bahirdhuma Rasasindura started from 17th century AD onwards where the use of Salaka (rod) in cleaning the blocked mouth of Kupi (bottle) is cited. This reveals that Antardhuma was the most common process frequently used in Rasasastra than Bahirdhuma for preparing Rasasindura or product similar in preparation with different names like Rasa bhasma, Kamadeva rasa, Udaya bhaskara rasa, Mruta suta, etc.

The present experiment is done using Glass flask with short narrow neck (Kacha Kalasa/Ghata). Glass flask was preferred over glass bottle as there will be no cleaning of Kupi mouth with Salaka (rod). More over surface area is more in flask which offers wide space for Rasasindura formation over the walls. Borosilicate flask was taken for convenience, as it is resistant to chemicals and its coefficient of thermal expansion is very low (32.5 x 10^-7 cm/cm/°C) compared to the regular soda lime bottle/ soft glass bottle (89 x 10^-7 cm/cm/°C).

Common household stove was used to specify that Antardhuma Rasasindura can be prepared in small scale by the practitioner himself with ease. Krama Agni of Mrudu, Madhya and Tivra Agni was maintained for 8 hours each. The product was collected after self cooling. The colour was dark red.

Analytical study revealed the presence of Cinnabar and Sulphur in the sample. Modern science listed Mercury under highly toxic metals. But the toxic levels of oral administered Mercury in the form of Cinnabar (HgS) are considerably low. Absorption of Cinnabar from the gastrointestinal tract is < 0.2% [18], very less compared to other non-Sulphur Mercurial compounds. Solubility of Cinnabar is 0.001g/L at 20°C, which is quite low compared with other Mercurial compounds like Mercuric chloride (30-70g/L at 20°C) [18]. Detoxification of Mercury is done with chelating agents like Dimercaptosuccinic acid (DMSA) (C_4H_6O_4S_2), Dimercapto-propane sulfonate (DMPS) (C_3H_6O_3S_3). All these compounds contain Sulphur and also food supplements.
containing Sulphur are recommended. Mercury has higher affinity towards Sulphur especially to thiols which leads to detoxification. Our body’s natural detoxification system also works under this relation with the help of thiol complexes like glutathione (C₁₀H₁₇N₃O₆S).

In Rasasastra, advantages of Mercurial medicines containing Sulphur and side effects of non-Sulphur Mercurial medicines are mentioned [19]. Sulphur may considerably decrease the accumulation of Mercury in the body in addition increases the efficacy of Mercurial therapeutic attributes. Mercury is considered to be Yogavahi (fast acting), particularly as a stimulant which penetrates quickly to minute parts of the body and increases the properties of herbal drugs used along even in minute quantities with its catalytic activity. So, Mercury need not be available for a longer period in the body to show its action. Non-Sulphur products of Mercury are toxic in higher doses compared to Rasasindura and cannot be used for a longer periods even in therapeutic doses due to the risk of accumulation. Samaguna Gandhaka Jaarana, Dviguna (double), Shadguna (six times), Astaguna (eight times), dwadasaguna (twelve times) [20], Sataguna (hundred times) and Sahasraguna (thousand times) are therapeutically superior in increasing order of Jaarana. So, according to Ayurveda more the Sulphur content safer and effective is the Mercurial medicine. In Antardhuma Rasasindura Sulphur percentage is higher compared to Bahirdhuma, which ensures the safety of Antardhuma Rasasindura.

CONCLUSION: As per the critical study Antardhuma method was most commonly followed by the Rasasastra Siddhas (practitioners) for Parada Jaarana and Sa-Agni Murchana with Gandhaka. References on the importance and therapeutically superior attributes of Antardhuma Gandhaka Jaarana are cited in the texts.

The preparation Antardhuma Rasasindura is simple, economical, eco friendly and better yielding compared to Bahirdhuma method. Toxicology and Clinical studies should be conducted to standardise the therapeutic dose and usage of Antardhuma Rasasindura.

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IMAGES OF ARTICLE

1) PURIFIED MERCURY
2) PURIFIED SULPHUR
3) KAJJALI

4) 150 ML GLASS FLASK WITH SINGLE LAYER OF KAPADMitti
5) SEALED FLASK WITH KAJJALI
6) VALUKAYANTRA KUPIPAKWA

7) MAXIMUM TEMPERATURE OF KUPIPAKWA
8) INTACT FLASK AFTER KUPIPAKWA
9) PRODUCT FORMED AT THE NECK OF THE FLASK

10) ANTARDHUMA RASASINDURA OUTER PART
11) ANTARDHUMA RASASINDURA inner PART