

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) which is one of the best methods adopted for metallic medicinal preparations, especially for *Gandhaka* (Sulphur) *Jaarana* (digestion).

Rasasindura is "Sa *Gandha*, Sa *Agni*, *Murcchana*" 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 Jarana* 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), *rekhapuranaatwa* (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

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

<i>Agni</i> (flame/heat)	Standard temperatures of <i>Krama Agni</i>	Experimental temperatures (8 hours each)
<i>Mrudu</i> (mild)	Till 250^0C	211^0C (8 th Hour)
<i>Madhyama</i> (moderate)	250^0C to 450^0C	434^0C (16 th Hour)
<i>Tivra</i> (severe)	450^0C to 650^0C	574^0C (24 rd Hour)

OBSERVATIONS:

- *Valuka yantra Kupipakwa Antardhuma Rasasindura* was *kanthastha* (formed at neck of flask), as the temperature ranged up to *Tivra Agni* (574^0C 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*.

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.

- 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 SO_2 (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*:

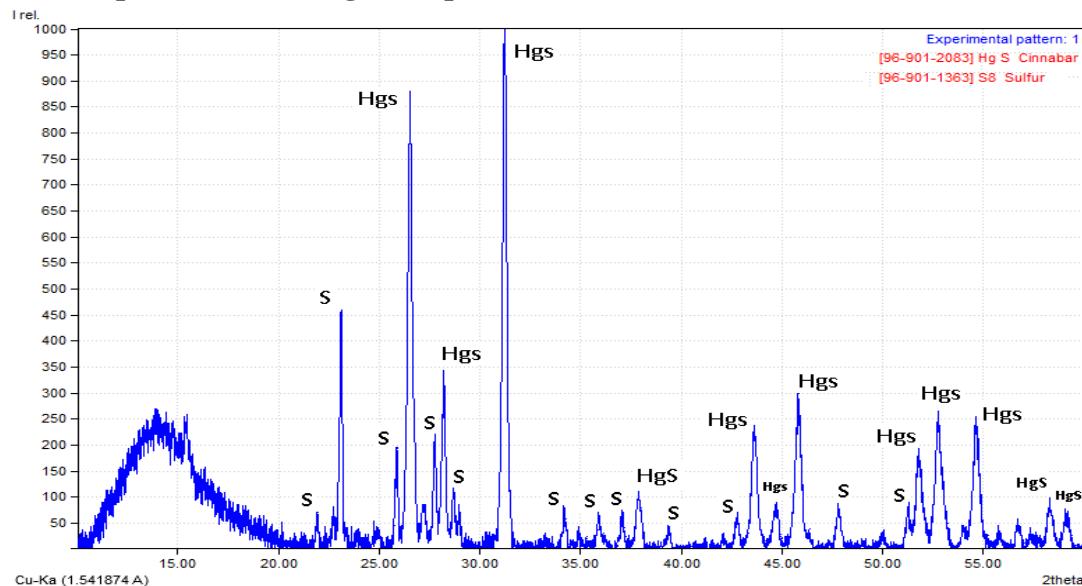


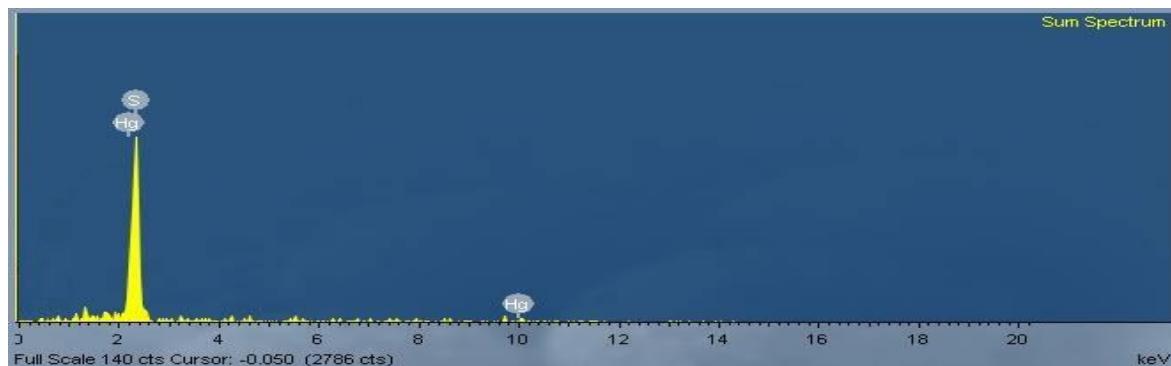
Table No.2: Showing XRD peak values

Angle 2 theta position	D Spacing (Å ⁰)	Intensity in Counts	Relative Intensity (%)
23.108	3.84584	814	47.5
25.868	3.44149	344	20.1
26.536	3.35636	1485	86.7
27.751	3.21214	362	21.2
28.207	3.16114	606	35.4
31.232	2.86157	1712	100.0
34.198	2.61986	144	8.4
37.885	2.37291	188	11.0
43.626	2.07306	398	23.3
45.809	1.97922	521	30.4
51.780	1.76414	332	19.4
52.763	1.73355	455	26.6
54.642	1.67831	435	25.4

- 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) ^[7]. *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 ^[8]. *Rasasindura* word first appeared in *Rasendra cintamani* (15th AD) ^[9].

The very first instance of *Gandhaka Jaarana* was *Antardhuma* method processed in yantra similar to *Musha yantra*, described in *Rasendra mangalam* (8th AD) ^[10]. According to *Rasahridaya Tantra* the method of *Parada Jaarana* where there is no loss in Mercury should be followed ^[11], which is only possible in *Antardhuma*. The therapeutic attributes of *Antardhuma Jaarana* ^[12] are ranking high to *Bahirdhuma Jaarana* ^[13] due to the inadequate *Gandhaka Jaarana* in *Bahirdhuma* method ^[14]. It reveals the superiority of *Antardhuma*.

Readable reference of *Bahirdhuma Gandhaka Jaarana* is seen in *Rasendra Cintamani* (15th AD) ^[15] and *Rasa Tarangini* (20th AD) ^[16]. 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 ^[17]. This reveals that *Antardhuma* was the most common process frequently used in *Rasashastra* 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 (32.5×10^{-7} cm/cm/ $^{\circ}$ C) compared to the regular soda lime bottle/ soft glass bottle (89×10^{-7} cm/cm/ $^{\circ}$ 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 $^{\circ}$ C, which is quite low compared with other Mercurial compounds like Mercuric chloride (30-70g/L at 20 $^{\circ}$ C) ^[18]. Detoxification of Mercury is done with chelating agents like Dimercaptosuccinic acid (DMSA) ($C_4H_6O_4S_2$), Dimercapto-propane sulfonate (DMPS) ($C_3H_8O_3S_3$). 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 ($C_{10}H_{17}N_3O_6S$).

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



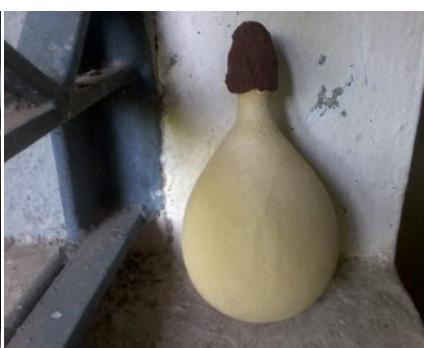
2) PURIFIED SULPHUR



3) KAJALI



4) 150 ML GLASS FLASK WITH SINGLE LAYER OF KAPADMINTTI



5) SEALED FLASK WITH KAJALI



6) VALUKAYANTRA KUPIPAKWA



7) MAXIMUM TEMPERATURE OF KUPIPAKWA



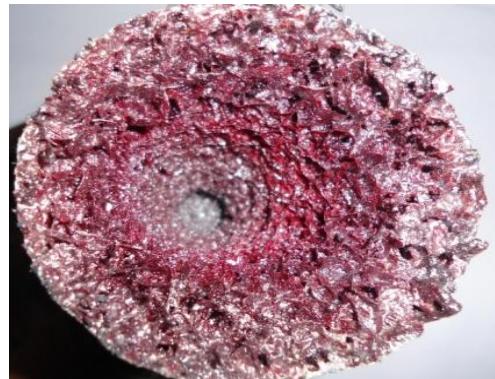
8) INTACT FLASK AFTER KUPIPAKWA



9) PRODUCT FORMED AT THE NECK OF THE FLASK



10) ANTARDHUMA RASASINDURA OUTER PART



11) ANTARDHUMA RASASINDURA INNER PART