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Research Article

A PHARMACEUTICAL STUDY OF *RASASINDOORA* IN PERSPECTIVE OF DIFFERENT TIME PATTERN

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ABSTRACT

In the system of Ayurveda, there are two basic categories of medicinal formulations- *Kashtaushadhi* (pure herbal) and *Rasaushadhi* (herbo-mineral). The standardization of *Rasaushadhies* through modern parameter gives an easy acceptance and can remove the negative propaganda about medicine containing *Parada* (mercury). *Rasasindoora* is widely prepared and clinically practiced by Ayurvedic fraternity. **Aims and Objectives:** The current study is planned to established the best pharmaceutical method of *Rasasindoora* in perspective of time and cost. **Materials and Method:** 250gm *Kajjali* was taken in every bach for the preparation of *Rasasindoora* by using EMF (electric muffle furnace) with the thought it gives desired and standard yield. In this study 3 batches of *Rasasindoora* were prepared in 16 hours, 11 hours and 8 hours. **Result:** *Rasasindoora* yield from Batch I, Batch II and Batch III are 50.84%, 51.76% and 50.48%. **Conclusion:** The average yield is 51.02% and yield from batch III (8hrs) is 50.48%, there is no major difference in % yield in all three batches. Thus, the best adopted method for the preparation of *Rasasindoora* is batch III (8hrs) due to lesser consumption of electricity, coal and time.

INTRODUCTION

In the system of Ayurveda, there are two basic categories of medicinal formulations- *Kashtaushadhi* (pure herbal) and *Rasaushadhi* (herbo-mineral). *Rasaushadhai* contains metals and minerals in the form of *Bhasmas* (incinerated metal or mineral) or compound form. For the purpose of to increase the effectiveness of herbal medicines, mercury or its constituents are intentionally added to Ayurvedic formulations as either major components or auxiliary agents. According to 'The Ayurvedic Formulary of India' mercury and lead are the most widely used heavy metals in the drug industry[1]. The herbo-mineral or metallo-mineral formulations were neglected and much confusion was created over their toxicity due to a lack of standardization, quality control, and chemical characterization.

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The standardization of *Rasaushadhies* through modern parameter gives an easy acceptance and can remove the negative propaganda about medicine containing *Parada* (mercury).

The term *Rasa* refers to mercury in *Rasashastra*, which is the backbone of the entire *Rasashastra* and with which a man can obtain *Jivanmukti* (life liberation). The name *Sindoora* is derived from the root *'Syandaprasravane,'* which means releasing characteristics. By combining the words *Rasa* and *Sindoora*, it is possible to derive the concept of a vermillion-colored substance created with *Rasa* (mercury) that cleanses deep-seated vitiation in the body. *Rasasindoora* has a close relationship with the colour red. *Rasasindoora* is a *Kupipakwa Rasayana* (*Parada Murchhana* - where's formulation prepared in a glass bottle which is smeared with mud and cotton cloth) widely prepared and clinically practiced by Ayurvedic fraternity. It always used in combination with other metallic *Bhasma* (incinerated metals) and herbal medicines. Treatments for syphilis, genital disorders, respiratory infections, and ageing in the form of aphrodisiacs and rejuvenators are all part of the therapeutic range[2]. *Rasasindoora* is already

reference of *Vajikaran* (aphrodisiac) herbo-mineral formulation. ED (erectile dysfunction) is defined by a National Institutes of Health consensus panel as the inability to achieve or maintain an erection sufficient for satisfactory sexual performance[3]. Ayurvedic medicines are subsequently looked after to treat problems like impotency. The current study is planned to establish the best pharmaceutical method of *Rasasindoora* in perspective of time and cost. The *Rasasindoora* will be prepare as available reference in Ayurvedic classic with little modification in perspective of time duration[4]. The study drug is a *Kupipakva Rasayana*, it made using *Samaguna-balijarana* (Hg:S in a 1:1 ratio) via *Sagandha saagni murcchana* by following *Bahirdhoompaddhati*. The method of manufacturing, by using EMF (Electric Muffle Furnace) selected for the preparation of *Rasasindoora* with the thought it gives desired and standard yield. However, the medicine must first be standardized and have its safety assessed before being used in clinical practice. Total 34 methods of preparations of *Rasasindoora* were found in different classical text books of *Rasashastra*[5].

METHODOLOGY

Material

Parada (mercury), *Gandhaka* (sulphur) were procured from local market of Jaipur. All pharmaceutical process was carried out in laboratory of PG Department of *Rasashastra* and *Bhaishajya Kalpana*, Post Graduate Institute of Ayurveda, DSRRAU, Jodhpur.

Equipment: *Kupi* (glass bottle coated with seven layers of mud smeared cloth, capacity 720ml), EMF (Inner length: 10.2cm, Breadth: 10.2cm, Depth: 25.3cm, maximum temperature: 850°C), iron rod (long and short), copper coin, cork, torch, knife etc.

Methods

Parada[6] and *Gandhaka*[7] were purified as per mentioned in Ayurveda treaties. Prepared *Kajjali* was wet grinded with decoction of *Vatajata* (arial roots of *Ficus bengalensis*). The preparation of *Rasasindoora* was categorized in three phases, namely, *Purvakarma* (preoperative), *Pradhanakarma* (operative) and *Pashchatakarma* (postoperative).

Purvakarma

Parada Shodhana (purification of mercury) was carried out by using the trituration process with *Churnodaka* (limewater). Following that, the same amount of *Lahasuna* (garlic) and *Saindhava lavana* were added and the mixture was pounded in a *Khalva Yantra* (mortar and pestle) until a black paste was formed. After that, wash it with warm water and keep it. *Gandhaka Shodhana* (purification of sulphur) was processed using the *Dhalan* (quenching) and *Galana* (filtering) methods, in which melted sulfur was put into milk-filled containers and covered with a new sheet of cloth. After being removed from the container, the filtered sulfur was cleaned with hot water. Two more times, the same approach was carried out. For the preparation of *Kajjali* (black sulphide of mercury) purified mercury and sulphur was taken in equal quantity and triturated in *Khalva Yantra* till mixture become black. *Kajjali* was wet grinded with the decoction of *Vatajata* (arial roots of *Ficus bengalensis*) until it becomes dry, it repeats for two times more. *Kajjali* was poured in 7 layered *Kanchakupi* (7 times smeared glass bottle with mud and cotton cloth). *Kanchakupi* placed in EMF (Electric Muffle Furnace).

Pradhanakarma

EMF switched on and heating of the furnace was started from room temperature and was gradually increase. Fumes increased with the rise temperature and fumes replaced by flame, which gradually increased in size and after that decreased.

Table 1: Heating Pattern

Batch	*Mridu agni* (Mild heat) (hrs)	*Madhyam agni* (Moderate heat) (hrs)	*Tivra agni* (Stern heat) (hrs)	Total duration (hrs)
I	2	10	4	16
II	2	6	3	11
III	1.30	4	2.30	8

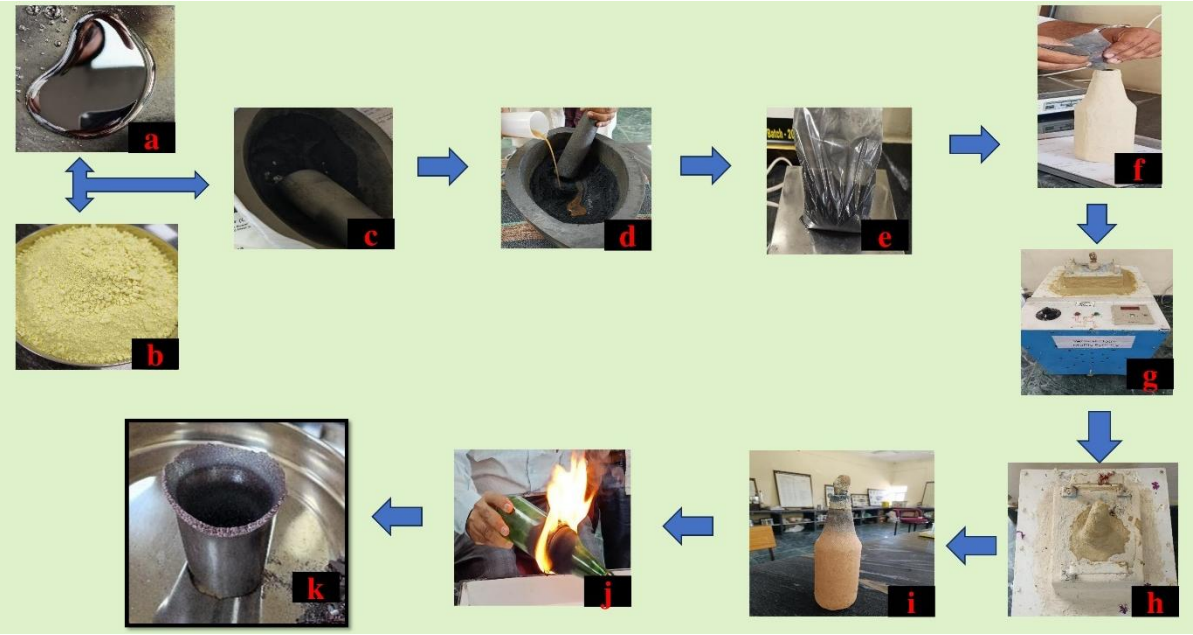

Figure 1: Pharmaceutical process of *Rasasindoora* (a) Purified mercury, (b) Purified sulphur, (c) *Kajjali*, (d) *Vatajata* decoction added in *Kajjali*, (e) Wet grinded *Kajjali*, (f) *Kajjali* filled in *Kanchakupi*, (g) *Kanchkupi* placed in EMF, (h) Corking, (i) *Kupi* removed from EMF, (j) Breaking of *Kupi* and (k) *Rasasindoora*

Pashchatakarma

Kanchakupi was taken out from EMF after self-cooling. The layers of mud smeared cloth were scraped with the help of knife. A thread was tied one inch below where the product was deposited at the neck of *Kupi*. The kerosene was sprinkled on tied thread with the help of syringe. When the thread was burnt, *Kupi* was wrapped by a wet cloth from where the thread was tied. The *Kupi* was externally tapped with knife and wooden piece till the product came out which was deposited at the internal surface of neck. Then the *Rasasindoora* was weighed and stored in an air tight glass container.

OBSERVATIONS AND RESULTS

Table 2: All three batches observation during preparation

S.No.	Heating grade pattern	Temperature range	Observations
1.	*Mridu agni* (Mild heat)	Room temp. – 250°C	• *Kajjali* start melting (190°C-220°C) • Mild fumes seen at bottle mouth (210°C -250°C)
2.	*Madhyam agni* (Moderate heat)	251°C – 550°C	• After seen the white-yellow fumes start the *Shalaka sanchalan* (270°C-310°C) • Yellow fumes seen and blue colour fumes inside bottle (310°C-350°C) • Yellow-orange flames seen 1-2 inch (360°C-380°C) and pungent smell of SO_2 • Bluish flame 3-4 inch (430°C-470°C) • Flames height increased 6-8 inch (490°C-520°C) • Flames height decreased, copper coin test negative • At 530°C flames completely disappear, copper coin test positive and S*heet shalaka* test positive. • Corking done and temperature set 550°C
3.	*Tivra agni* (Stern heat)	551°C – 670°C	• Gradually temperature increased and lastly EMF stopped

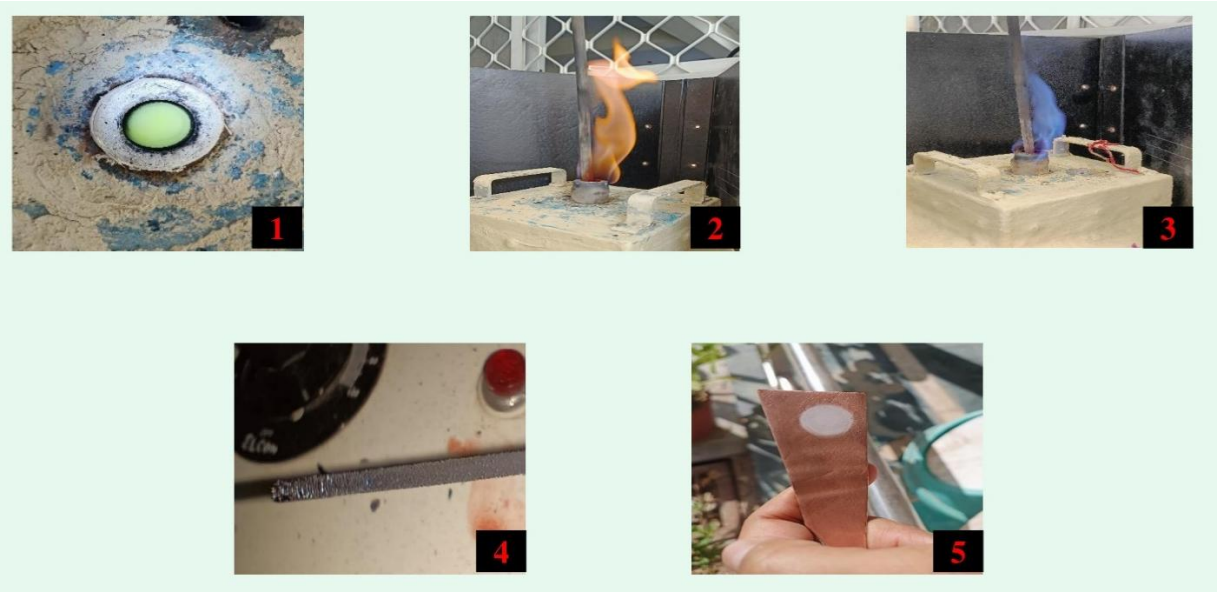

Figure 2: Observations: (1) Yellow fumes (2) Yellow-orange flames (3) Blue flames (4) Positive copper coin test (5) Positive *Sheeta shlaka* test

Table 3: *Rasasindoora* % yield

Batch	*Kajjali* (g)	*Rasasindoora* (g)	*Rasasindoora* yield (%)
I	250	127.1	50.84
II	250	129.4	51.76
III	250	126.2	50.48
Average	750	382.7	51.02

Figure 3: Final product (*Rasasindoora*): (A) Batch-I, (B) Batch-II and (C) Batch-III

Table 4: Organoleptic characters

Parameter	Batch- I	Batch- II	Batch- III
Shabdha (sound)	Not significant	Not significant	Not significant
Sparsha (touch)	Smooth, rough on internal side, after trituration becomes smooth	Smooth, rough on internal side, after trituration becomes smooth	Smooth, rough on internal side, after trituration becomes smooth
Roopa (colour)	Blackish red with shining, after trituration bright red	Blackish red with shining, after trituration bright red	Blackish red with shining, after trituration bright red
Rasa (taste)	No specific taste	No specific taste	No specific taste
Gandha (smell)	No specific smell	No specific smell	No specific smell

DISCUSSION

In purification of *Parad* (mercury) *Sudha* (lime) replaced with *Churnodaka* (lime water) to prevent the hard work. Because after trituration of mercury with *Sudha*, mercury extraction is very tough process. Physical and chemical impurities removed from *Gandhak shodhan* (sulphur purification). *Kajjali* (a black colour compound of mercury and Sulphur) preparation, during levigation of mercury (Hg) and Sulphur (S), the decoction of aerial roots of *Ficus benghalensis* acts as acidic media, which along with mild heat produced during grinding helps in the formation of mercury sulphide (HgS). Three different

batches were prepared in EMF. It was selected for the preparation of *Rasasindoora* because of its controlled temperature and heating rate. Seven *Kappadmitti* (mud smeared cloth) done on *Kanchakupi* (glass bottle) to make the bottle heat stable during process. All observations were almost similar in all three batches. So, Table no. 1 showing the temperature range with their observations. When yellow fumes seen then *Shalaka sanchalan* (red hot iron rod was inserted in *kupi*) was performed to prevent the bottle from bursting due to sulphur condensation at the neck. Yellow fumes indicate that's Sulphur completely melted and start evaporated in the form of Sulphur di oxide (SO_2). The ignition point of flame was between 380°C-400°C and disappearing point was 520°C-530°C. Corking was done after getting Chief Desire Characteristics (CDC), i.e., positive copper coin test and positive *Sheet shalaka* test, which means particles of mercury start evaporated and sticks on it. Final sublimated product i.e., *Rasasindoora* is deposited in the neck of *Kupi* is blackish red in colour. Table no. 1 showing total time for the processing of 3 batches of *Rasasindoora* i.e., processed in 16 hrs, 11 hrs and 8 hrs and time durations of heating grade pattern of mild, moderate and stern. *Agnisanskara* improves the strength of the link between Hg and S, making the compound more stable and demonstrating the significance of *Jaranasanskara*. *Samagunagandhak kajjali* containing mercury and Sulphur in 1:1 ratio. In final product (*Rasasindoora*) mercury and sulphur found 6:1 ratio. That means 1 molecule of sulphur is surrounded by 6 molecules of mercury. 5 parts of sulphur evaporated in the form of sulphur dioxide (SO_2). The *Rasasindoora* is in compact form and blackish red colour. When triturate the *Rasasindoora* in mortar and pestle we found bright red colour.

CONCLUSION

Rasasindoora yield from Batch I, Batch II and Batch III are 50.84%, 51.76% and 50.48%, when total time for processing was 16hrs, 11hrs and 8hrs and 5kg, 3.5kg and 2kg coal utilized. There is no major difference in % yield in all three batches. Thus, the best adopted method for the preparation of *Rasasindoora* is batch III (8hrs) due to lesser consumption of fuel, electricity and time.

Future Perspective

Analytical studies of all three batches are required to evaluate their difference in physicochemical parameters, elemental composition of compound and structural analysis.

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Conflicts of Interest: The author declares there are no conflicts of interest.

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