



Research Article

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PREPARATION OF RASASINDURA BY MODIFIED PORTABLE VALUKAYANTRA VIS-À-VIS TRADITIONAL METHOD

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ABSTRACT

Kupipakva Rasayana is the most potent preparation which is frequently used by Rasavaidyas. But traditional method of preparation of Kupipakva Rasayana seems to be quite complicated. Time duration, more manpower, more fuel, pollution and other obstacles add to negligence of its preparation. To overcome above obstacles, some alteration in the traditional method has been made without interfering concept behind the tradition. Rasasindura (Mercuric sulphide) was prepared by Modified portable Valukayantra vis-à-vis traditional method where detailed documentation of each and every step of procedure was done. To assess the quality of prepared medicine, both the samples were subjected to same Ayurvedic as well as modern parameters and results were interpreted. The study establishes efficacy and applicability of modified portable valukayantra in the preparation of Rasasindura (Mercuric sulphide).

Key Words: Rasasindura (Mercuric sulphide), Modified Portable Valukayantra, Traditional method

INTRODUCTION

Mercury has been given the prime importance in Rasashastra and is supposed to account for therapeutic superiority of the formulations containing it. However a word of caution is always pointed while describing the medicinal properties of mercury that it needs a characteristic processing 'Murchchhana Samskara' to be therapeutically effective.¹

The properties like small drug dose, rapid action, desired result, long shelf life, palatability made Kupipakva Rasayana to occupy superior position in ayurvedic therapeutics.² In traditional method of preparing Rasasindura (Mercuric sulphide), there are no specific and clear instructions regarding preparatory procedure. Moreover it is time consuming and needs more fuel along with manpower. The instrument used in the procedure, the medium of heat provided during procedure, time duration should be standardized according to present era. To overcome all these ambiguities and make the procedure easy to execute, some modification were done in instrument, medium of heat and heating pattern without interfering the concept behind the tradition. In this study Rasasindura (Mercuric sulphide) was prepared by Modified Portable Valukayantra [RSM] and by traditional method [RST] and detailed documentation of each and every operating procedure of Modified Portable Valukayantra was maintained so that someone with basic understanding can successfully reproduce the procedure and get the expected output.

Definition

Rasayana Prepared from parada (Mercury) in glass bottle by applying heat is termed as Kupipakva Rasayana.

- Kupi = Kachkupi (Glass bottle)
- Pakva = Agni paka (Prepared by heating)
- Rasa = Parada (Mercury)

- Ayana = Sthana (Place)

Aims and objective

- Modification in Traditional Valukayantra and development of Modified Portable Valukayantra (MPV)
- Preparation of Rasasindura (Mercuric sulphide) by traditional and modified methods
- To assess the feasibility and utility of Modified Valukayantra
- Developing a Standard Operating Procedure (SOP) of Kupipakva Rasayana preparation.

MATERIALS AND METHODS

The whole procedure of preparation of Rasasindura (Mercuric sulphide) (Rasatarangini 6/162-167) can be divided into three parts:

1. Preparatory Phase
2. Operational Phase
3. Post-heating Phase

Preparatory Phase

It includes:

Collection of Raw materials and equipment

Kachakupi³ (glass bottle wrapped with 7 layers of muslin cloth stripe smeared with Multan Clay), Modified Portable Valukayantra, Valuka (Sand), Loha Shalaka (iron rods), copper plate, pyrometer, torch, Mudra⁴ (seal cap), LPG burner and funnel

Shodhana (Purification) of ingredients

Parada (Mercury) and Gandhaka (Sulphur) were analyzed to confirm purity and then subjected to Shodhana according to classical references.^{5,6}

Preparation of Kajjali

Equal quantity of Shuddha Parada (Pure Mercury) and Shuddha Gandhaka (Pure Sulphur) were taken in

Khalvayantra.⁷ The mixture was triturated thoroughly until a fine black powder was obtained. Sufficient quantity of Vatankurswarasa (Juice of leaf buds of *Ficus benghalensis*) was added in the Kajjali and it was triturated until all swarasa got dried. In all, three Bhavana were given.⁸

Preparation of Modified Portable Valukayantra

Specially designed, Modified Portable Valukayantra was prepared. The model of Valukayantra is such that it does not deviate from the classical reference and concept

behind the tradition. Modified Portable Valukayantra is a unit which consists of following components:

- 1. Outer Iron Jacket** It is hollow rolled structure made up of thin iron sheet. It is attached to the main body encircling it distantly. Inner Iron Drum is surrounded by Outer Iron Jacket.
- 2. Inner Drum (Main Body)** Inner Drum is smaller so that it can get accommodated into Outer Iron Jacket. This is a thick walled cylindrical container made of cast iron. Inner Iron Drum is filled with sand.

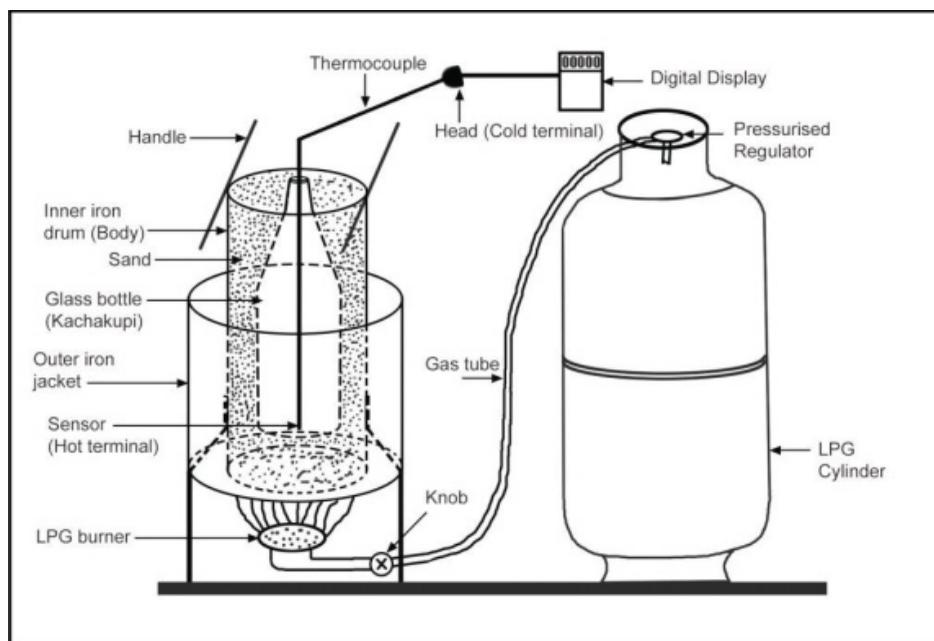


Figure 1: Modified Portable Valukayantra

Inner Iron Drum holds following parts in its cavity;

Glass Bottle (Kachakupi)

Kachakupi is placed inside the Inner Iron Drum. While placing the glass bottle; a 2 inch thick layer of sand is kept at bottom. Glass bottle is surrounded by sand upto its neck for uniform conduction of heat.

Sand

The sand of nearly uniform particles, sized 2-4 mm (which is neither very fine nor having big size pebbles) is taken.

Handles

A pair of handle is provided at the top of Inner Iron Drum so that it can be easily carried from one place to another.

Hollow Iron Pipe

It is fixed in Inner Iron Drum. Pyrometer is fixed inside the pipe. It prevents frequent insertion and extraction of pyrometer. It should be of minimal diameter to provide a path for pyrometer to be inserted.

LPG Burner

It is pressurized gas burner. The utility of LPG burner is that it provides heat targeted at the base of Inner Iron Drum resulting into less wastage of heat.

Pyrometer

It is the instrument used to determine the temperature during the procedure.

Kupibharana (Filling of glass bottle) and Rasasindura (Mercuric sulphide) Preparation

The Kupi (glass bottle) was filled up to the 1/3rd part by Kajjali (Product obtained by trituration of Mercury and Sulphur) so that there should be enough space inside Kupi for melting and boiling of Kajjali and also for the sublimation of compound which is going to be condensed and deposited in the neck of Kupi. In present study, Rasasindura (Mercuric sulphide) has been prepared by Bahirdhuma vidhi both by Modified Portable Valukayantra (RSM) as well as traditional method (RST) (Ref. R.T. 6/168-176).

Operational Phase

Maintenance of Kramagni and Temperature Measurement

Kramagni indicates the time limit for maintenance of heating pattern. Mrudu (mild), Madhyama (moderate) and Tivra (intense) Agni (Heat) was maintained for 6 hours each and the temperature patterns were recorded.⁹

Shalaka Sanchalana

Insertion of hot and cold iron rod and Observation of Fumes and Flames¹⁰

Hot Shalaka (Iron rod)

To burn extra sulphur deposited at the neck region of Kupi.

Sheet Shalaka (Cold iron rod)

To know the state of Kajjali i.e. whether it is in powder form, in melted form, in boiling state or in sublimation stage of product.

Fumes

All the characters of fumes like colour, odour, intensity etc. were noted. They turn from whitish to yellowish as the time progresses.

Flame

Timing of appearance of flame, its colour, duration and height were observed.

Paka Pariksha (Proper preparation test) and Corking of Kupi

The four parameters; absence of fumes from bottle, absence of flames, absence of sulphur like smell and red hot picture at the bottom indicates Samyaka Paka (Proper Preparation) of medicine.¹⁰

Confirmatory tests for Corking

- Sheet Shalaka Test (Cold iron test): Absence of sulphur like smell when the iron rod is inserted into bottle and smelled immediately; is suggestive of proper preparation of medicine.¹⁰
- Red Hot Pictures: Bottom of the bottle was like a red colour of the dawn when examined in darkness.¹⁰
- Copper Plate Test: In order to check and prevent loss of mercury this test is applied. If Mercury is started evaporating then it condenses on the cool copper plate leaving white spot on the plate.¹⁰

Mukhabandhan (Corking)

A piece of brick wrapped with muslin cloth being smeared with mixture of white cement and water is used for corking.¹¹

Post Heating Phase

Swangasheetikarana¹¹ (Self cooling): After completion of Tivra Agni (Intense Heat) the Valukantra was allowed to cool of its own.

Kupi Uddharana (Removal of bottle): After self-cooling the sand around the bottle was carefully removed and bottle was pulled out.

Kupibhedana¹² (Breaking of bottle) and storage of final product: By scrapping, the layers of Kapadmitti were removed and KUPI was cleaned with wet cloth, and the level of product was marked. A thread soaked in spirit was tied around the middle of KUPI just below the marking and set to fire. It was kept horizontal and rotated so that whole thread burns up completely. Then KUPI was wrapped in a wet cloth, which facilitate the breaking of KUPI from middle. Kanthastha Rasasindura (Mercuric sulphide) (Rasasindura (Mercuric sulphide) at neck) was observed as Dhaturapushpasankasham (funnel shaped). Then it was ground to form fine powder Rasasindura (Mercuric sulphide), which was Sindura varneeya (reddish brown) in colour.

OBSERVATIONS

The temperature ranges for maintenance of Mrudu, Madhyam and Tivra agni (heating pattern) were recorded as follows:

Table 1: Temperature range & Duration

Type of Agni	Temperature range	Duration
Mrudu	Room temperature – 230°C	6 hours
Madhyama	230°C – 450°C	6.5 hours
Tivra	450°C - 650° C	6 hours

Both the samples i.e. Rasasindura prepared by Traditional method and Rasasindura prepared by modified Portable Valukayantra were subjected to same Ayurvedic as well as Modern Parameters. The results recorded are noted below.

Table 2: Ayurvedic parameters

Parameters	RSM	RST
Varna (Colour)	Sindoora varniya (Bright Reddish brown)	Sindoora varniya (Bright Reddish brown)
Sparsha (Touch)	S+	S+
Rasa (Taste)	N+	N+
Shabda (Sound)	O+	O+
Gandha (Smell)	G+	G+
Rekhaapoorntva (Fineness)	R+	R+
Nishchandratva (Lusterless)	L+	L+
Rekha (Line mark)	RP+	RP+

Note: Code indicates the Parikshas.

S+ : Soft on touch

N+ : Niswadu in taste (tasteless)

O+ : Creates sound on breaking

G+ : Odourless

R+ : Powder enters in the finger creases of index finger and thumb

L+ : No lecture

RP+ : Red coloured line mark on white paper

Table 3: Modern parameters

Parameters	RSM	RST
Total Ash (% w/w)	0.34	0.25
Acid Insoluble Ash (% w/w)	0.01	0.02
Acid soluble Ash (% w/w)	0.32	0.23
Water Insoluble Ash (% w/w)	0.03	0.16
Water Insoluble Ash (% w/w)	0.30	0.09
Moisture content (%)	0.446	0.483
AAS – Mercury (%)	78.68	76.77
AAS – Sulphur (%)	12.71	5.45

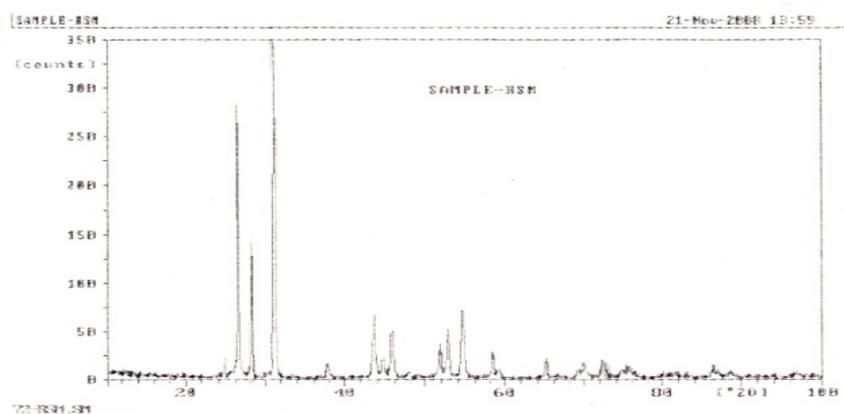
XRD Studies

Both samples (i.e. RST and RSM) are mono phasic and contain Mercuric sulphide HgS (PDF # 06 – 0256, Hexagonal system). The analysis showed that peak positions of RST have shifted to lower angle (Shift is very small) compared to # 06 – 0256, whereas the XRD peaks of RSM matches exactly with ICDD data. Both samples contain < 0.1 % Al, Ca, Mg Na and < 0.01 % Fe, Mn, Si and < 0.001 % Ag, Cu, Pb.

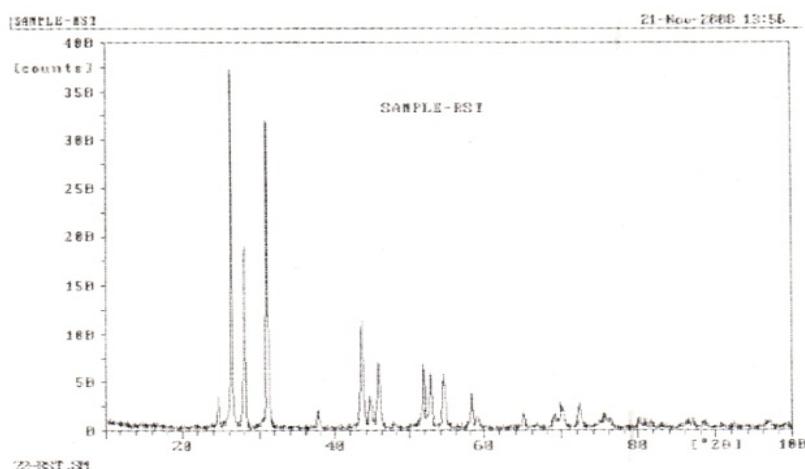
The Particle size is calculated using FWHM of the XRD peaks (using well known Debye-Scherer formula given below).

$$t = \frac{0.9 \cdot \lambda}{\beta \cdot \cos(\theta)}$$

where t is the particle size, λ is X-ray wave length (1.5406 Å), β is the full width at half maximum (FWHM) of the peak interns of radians and θ is the half peak position. The Particle size calculated for Rasasindura prepared by Traditional method was 69 nm and for Rasasindura prepared by modified Portable Valukayantra particle size was 51 nm.



XRD Pattern of RSM Sample



XRD Pattern of RST Sample

DISCUSSION

The present work was aimed at implying simplicity and uniformity in the preparation of Rasasindura (Mercuric sulphide). To serve this purpose development in the equipments like specially designed Modified Portable Valukayantra, uniform kachakupi, LPG gas burner (Instead of coal and wood), thermocouple for temperature measurement were made. In this method Valukayantra can be easily carried from one place to another place with the help of its handles. In Modified Portable Valukayantra, the heat can be stopped /minimized/ maximized/ kept constant with the help of knob of pressurized gas burner. In traditional Valukayantra there is no such provision for heat control due to which accuracy and continuity of heat provision cannot be maintained. The design of Modified Portable Valukayantra is very much compact and hence the flame of pressurized gas burner remain targeted to the bottom of inner iron drum which results into minimum loss of heat and fuel resulting into saving of fuel. In traditional Valukayantra it was very difficult to maintain constant heat and Kramagni (Heating pattern) due to manual addition of coal and firewood. On the other hand the

constant heat and Kramagni can be easily maintained by adjusting the knob of pressurized gas burner. In Modified Portable Valukayantra temperature was measured with the help of thermocouple. Though it could be possible to record the temperature in traditional method the fluctuating heat supply does not allow us for accurate and reproducible readings. In Modified Portable Valukayantra there is no need of extra man power as compared to traditional one for manual fuel control. Moreover instead of using wood or coal; LPG is used which creates less smoke resulting into less pollution. After preparation of Rasasindura (Mercuric sulphide) by both the methods, both the samples were subjected to same Ayurvedic (Subjective Parameters) and modern parameter (Objective Parameters) to see similarities and difference in the finished product. Both the samples found to have almost similar values of all the parameters. This shows that Modified Portable Valukayantra does not hamper the quality of product. Moreover all the operating procedures were written in sufficient detail which gives a definite sequence of processes involve in formation of Kupipukva Rasayana by which one can perform the work

scientifically to obtain definite expected output which in turn establishes SOP.¹³

CONCLUSION

The use of Modified Portable Valukayantra and traditional method for the Rasasindura (Mercuric sulphide) preparation yield almost comparable finished product as revealed through the observations recorded above.

This sop of Rasasindura (Mercuric sulphide) prepared by Modified Portable Valukayantra will substantially prove to be helpful for Rasavaidyas who believe in preparation of Rasaushadhis by their own as this method is easy to execute, require minimum manpower and can be done on household appliances (LPG gas).

Kramagni in terms of temprature and time duration can be easily defined by Table I. which gives clear and specific instructions regarding maintenance of Kramagni.

This SOP gives a definite sequence of processes involved in formation of Kupipakva Rasayana by which one can perform the work scientifically to obtain definite expected output. This new SOP with the help of Modified Portable Valukayantra was found to be more beneficial in following aspects.

- Portability: Easy for Transportation.
- Heat Regulation: Accuracy and Continuity in the heat provision can be achieved.
- Fuel Saving: Minimum heat loss.
- Time Saving: Less time is required compared to traditional method.
- Maintenance of Kramagni: It is easy to regulate Kramagni with the help of knob of gas burner.
- Pollution Control: Use of LPG causes less pollution.

In addition to above advantages at a time 2 to 3 Kupies can be placed in Modified Portable Valukayantra.

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