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Research Article

STANDARD MANUFACTURING PROCESS OF *DVIGUNA BALIJARITA RASASINDURA*

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ABSTRACT

Introduction: Preparation of herbo-mineral compounds in *Ayurveda* revolves around mercury, considered as the prime among all minerals. Sulphur is again an important element used in many disorders and applied substance in different *Ayurvedic* formulations, considered as the antidote for the harmful mercurial's. *Kajjali* is prepared by grinding mercury and sulphur. The prepared *Kajjali* used as a raw material for *Rasasindura* preparation with *Kupipakva* method. *Kupipakva* method is developed by ancient *Rasaacharya* for the preparation of heat treated mercurial. *Dviguna gandhak jarita parada* is considered more potent compare to *Samaguna bali jarita*.

Objective: To study *Kupipakva kalpana* with preparation of *Dviguna-bali jarita Rasa sindura*.

Methodology: Whole process is divided and performed as *Sodhana* of contents (*Hingula and gandhaka*), *Hingulotth parada* extraction, *Kajjali* preparation, preparation of *Dviguna balijarita Rasa sindura*.

Observation: *Hingula* after *Shodhana* became soft and lusterless compound and *Gandhaka* becomes granular and brittle. *Hinguloth parada* extraction by *Kanduka yantra* method shown more yield compared to other methods. *Kajjali* preparation took 96 hours of *Mardana* of contents with *Nischandra* property. It took 48 hours for *Dviguna Bali Jarita Rasasindura* preparation by *Kupipakva kalpana* method with a yield of 106g.

Conclusion: Preparation of *Dviguna Balijarita Rasasindura* needs more duration of heat treatment in every step of graded heating pattern of *Kupipakva kalpana*. The heating pattern is proportional to its therapeutic efficacy.

KEY WORDS: *Rasa sindura, Parada, Gandhak, Kajjali, Jarana, Murchana, Baluka yantra, Kupiyantra.*

INTRODUCTION

Therapeutic use of mercury and minerals is a specialty of *Ayurveda*. Contents of any herbo-mineral[1] formulation need *Sodhana* before its preparation. *Sodhana* means purification, detoxification, and size-reduction to fine particles (nano particles) and expose their maximum surface area for chemical and physical actions along with addition of organic contents of different materials applied for it like herbs, milk, and ghee etc. It is also important in development of organo-metallic compound makes them more acceptable in the body[2-3].

Parada murchana and *Jarana* are two important process of mercury through which its toxic effect is minimized and its *Rasayana* and therapeutic effect raised to great extent. Mercury is liquid at room temperature, having cohesive property within its molecules makes it a difficult substance to be taken as medicine. Ancient texts recommends to use mercury as medicine after *Marana* (being reduced/converted to ashes), after *Murchana* (being converted to some compound form), or *Bandhana* (being converted to some solid form) which imparts definite disease curing property in *Parada (Avyabhicahrita vyadhigatakatva)*[4]. *Kajjali*[5] is most common

form of *Parada-Gandhaka murchana*. It is prepared by grinding purified mercury and sulphur[6-7] without adding any liquid. Further it should be triturated by *Vata jata* (aerial roots of *Ficus-bengalensis*) decoction for *Rasasindura* preparation. [8-10]

The process in which mercury is made to consume various metals-*satva* and some metals in different proportions to make it highly potent for both *Lohavedha* (metallic transformation), and *Dhatuvedha* (metabolic-transformation) is termed as *Jarana. Murchana* and *Jarna* are two different process of mercury and are done for different purposes. Only in case of *Rasa sindura* and *Makardwaj* preparation they may be taken as synonymous. [11]

Kupipakv kalpana prepared in especially designed *Kupi* (clay cloth smeared glass-bottle) immersed in *Baluka yantra*, with graded heating as *Dipagni* for heating *Yantra, Mriduagani* (room temperature to 200^{o}C), *Madhyamagni* (200^{o}C to 400^{o}C), *Tivra-agni* for (400^{o}C to 650^{o}C) and *Swangshita* for completion of compound formation at room temperature. [12]

Methodology

Sodhana of contents

Sodhana of *Hingula* is performed by triturating it (*Bhavana*) with lemon juice for seven times, further washed with water and dried [13-14]. Soft lustureless and fine hingula is collected after its sodhana.

Hinguloth Parada Extraction

Suddha hingula wrapped in coarse cotton cloth, made into a ball form soaked with mineral oil, put on a stone in a steel trey allowed to burn covered with earthen pot and left over-night (*Kanduka yantra* method). Further it is triturated in lemon juice (*Nimbu-swarasa bhavana*) for three hours. It is then washed with distilled water, sieved through a four fold cotton cloth and dried. [15]

Sodhana of *Gandhaka*

Ashudha Gandhaka (crude sulphur) is taken and weighed and compounded into a coarse powder. It is then melted in ghee smeared ladle on low flame, carefully poured into the milk vessel through the cotton cloth. Simultaneously milk was stirred so as to avoid crystallization into a large mass. Further it is washed with hot water to make it free from the fat and fat content, sun dried and weighed. [16-18]

Kajjali Nirmana (*Kajjali*-preparation)

Purified mercury (hingulotha parada) 250g is taken in stone mortar added with 500g *Shudha gandhaka* gradually is triturated to get black powder of smooth consistency and free from lustrous particles of *Parada*. Total 680g *Kajjali* is completely prepared after 96 hours (in 36 days) of trituration. Further 350g *Kajjali i*s triturated with 350 ml of *Vata jata* (aerial roots of Ficus-bengalensis) decoction for 9 hours in three days with yield of 330g as final product. [19-21]

Rasa Sindura Nirmana

Preparation of rasa sindura is performed in kanch kupi (glass bottle smeared with clay and cotton cloth) imersed in baluka yantra (sand-bath). kanch kupi is filled with 300gms of *Bhavita Kajjali* with the help of a funnel further placed in *Baluka yantra* (sand bath)[22]. A pyrometer is inserted into the sand in *Baluka yantra* 3 inches above the base. Ignition is started and temperature of sand bath is maintained at room temperature to 200^{o}C for eight hours (1st step-stage of low temperature), further a temperature of 200- 450^{0}C maintained for another nine hours (2nd step-stage of moderate temperature). After corking the bottle, it is maintained at 450^{0}C to 600^{0}C (3rd step- stage of intense temperature). Later it is left for another 20 hours for complete cooling of it (The stage of cooling). Whole procedure took 48 hours, in between hot iron rod was regularly inserted to clean the bottle neck and avoid blockage by deposition of sublimed sulfur. Tests for the completion of preparation as copper plate test, *Shita Shalaka* test was done and corking done at appropriate time. After *Swangshita* (stage of cooling) *Kupi* is taken out from the apparatus and the *Kapadmitti* (clay and cloth layering) over the *Kupi* was removed carefully. Absolute shining material is collected. The compound turned maroon red on grinding weighed 106gms. The yield of *Rasa sindura* was 35% w/w and the color was maroon red. [23-26]

OBSERVATION AND RESULTS

Crude *Hingula* (HgS) is introduced for *sodhana* process in end-runner with 1100g pure (Soft, lusterless, & fine) *Hingula* is collected from1200g of impure sample, by using 2950 ml of lemon juice. A significant loss in weight (90g) from original amount is observed in the process of *Sodhana.* The duration of the whole process was 50 hours. *Suddha hingula* is then used for the extraction of mercury by *Kanduka-yantra* method with 470g small globules of mercury (*Suddha parada*) collected from 700g of *Suddha hingula*

inside earthen pot in the morning. Brittle and granular form of *Suddha gandhaka* is collected (610g from 700g crude sulphur) after *Sodhana* with 400g of ghee and 9 liters milk was used for purification process. The raw material for Rasa-sindura preparation (*Nischandra Kajjali*) is collected by triturating *Suddha parada* (1 part) and *Suddha gandhaka* (2 parts) for 96 hours. It is further triturated with *Vata-jata* decoction in granite *Kharala* as mentioned in the text, with slight modification as *Vata-jata* is commonly available unlike *Rakta-karpasa* flower. Beer bottle has been taken for the *kupi* and layering *Kapadmitti* of *Kupi* was done with cotton immersed in water soaked *Gachani* clay.

The heat applied in this process is in graded manner as *Mridu agani* (room temperature to 200^{o}C), *Madhyam agni* (200^{o}C to 400^{o}C), and *Tivra agni* for (400^{o}C to 650^{o}C) with minimum eight hour duration for every stage of *Paka*. Absolute shining material is collected. The compound turned maroon red on grinding weighed 106g. Maroon-red colored *Rasa-sindura* with a yield of 35% w/w is collected after the process.

DISCUSSION

Different *Acharya of Rasashastra* contributed a lot in the development of *Kupi pakva kalpana* in their texts. Earliest description of *Parada gandhaka jarna* is found in *Rasahridayatantra* (10th AD) as *Parada-bhasma*[27], more elaborated in texts like in *Rasaprakasa Sudhakar* by *Acharya Yashodhar Bhatt* [28]. Term *Rasa-Sindura* is contribution of *Rasendra Chintamani*[29]. It is also mentioned that *Bali-jarita parada* is essential for making mercury capable of destroying the disease along with *Dosa* (toxic effects of *Parada*) reduction to a great extent in the same text. *Kupipakva nirmana* is developed in relation to *Gandhaka jarana* as a means of effective, sustained and controlled heat application as per the requirement for a particular preparation.

Lemon juice used for *Hingula sodhana* is a combination of citric acid a weak tri-carboxylic acid removes the water soluble impurities of *Hingula* along with, it also makes them in fine particle form. Citrate salts of various metals are used to deliver minerals in biologically-available forms.

Gandhaka shodhana with milk and ghee makes it butter colored soft in touch along with removal of both water and oil soluble impurities. The temperature during the *Sodhana* was kept low so as to melt the *Gandhak* properly without burning it.

Hinguloth Parada (small globules of mercury) is extracted by *Kanduk Yantra* method by burning *Suddha hingula* wrapped in coarse cotton cloth. The cloth ball is covered with earthen pot so as to collect mercury globules in it. Upper layers of cloth burnt in first 30 minutes along with pungent smell of sulphur-dioxide. This method is found more effective as more yield of mercury (57%) from *Suddha-hingula*.

Kajjali preparation is started by adding one part mercury and two parts of sulphur and triturated in stone *kharal* for four to five hours daily till three and half months. The stone *Kharal* is made elevated from one side so as to lower the wastage. Water sprinkling is done on *kajjali* to avoid its loss.

Rasa sindura is prepared in *Kupi yantra* fixed in *Baluka yantra* introduced to graded heating pattern. Melting of *Kajjali* and starting of sulphur fumes are taken as sign of *Mridu-agani*. Appearance of profuse sulphur fumes, blocking of bottle neck by sulphur fumes and boiling of *Kajjali* are taken as sign of *Madhyam agani*. Appearance of flame at bottle mouth and formation of red compound at bottle bottom are taken as sign of *Tivra agni*. Dark red deposits of *Rasa sindura* are found in the neck of *Kupi yantra* after its cooling is collected and powdered.

Table 1: Heating pattern of *Kupipakva kalpana*

Sr. No.	Name of Heat Level	Effect of Heat Level	Temperature range
1.	*Dipagni*	For heating *Yantra*	-
2.	*Mriduagni*	Liquefaction of *Kajjali*	Room temperature–250^{o}C
3.	*Madhyaagni*	Sublimation of sulphur	200^{o}C - 450^{o}C
4.	*Trivragni*	Compound formation	450^{o}C – 650^{o}C
5.	*Swangshita*	completion of compound formation	Room temperature

Table 2: Observations during the *Hingula sodhana* process

S No.	No. of Trituration	Color	Consistency	Nimbu Swarasa Needed	Trituration Time
1.	*Ashudha Hingula*	Mercedes-red	Rough, lustrous,& solid	-	-
2.	1st	Deep orange	Soft, bright,& semisolid	450ml	8hrs
3.	2nd	Deep orange	Soft, Bright, sticky, & semisolid	350ml	7.30hrs
4.	3rd	Deep orange	Soft, Bright, sticky, & semisolid	400ml	7hrs
5.	4th	Deep orange	Soft, Bright, sticky, & semisolid	500ml	8hrs
6.	5th	Deep orange	Soft, Bright, sticky, & semisolid	500ml	6.30hrs
7.	6th	Deep orange	Soft, Bright, sticky, & Semisolid	300ml	7hrs
8.	7th	Deep orange	Soft, Bright, very sticky, & semisolid	450ml	6 hrs
9.	*Shudha Hingula*	Red	Soft, lusterless, & fine	-	-

Table 3: Observations during the *Gandhaka sodhana* process

Quenching	Features	Initial	Final
First	Weight	700g	685g
	Color	Sulphur yellow	Pale cream
	consistancy	powder	Granules and crystal
Second	Weight	685g	655g
	Color	Pale cream	Light fading of color
	consistancy	Granules and crystal	Small size granules
Third	Weight	655g	610g
	Color	Light fading of color	Primrose yellow
	consistancy	Small size granules	Small size brittle granule

Table 4: *Kajjali bhavana*

Characters	Kajjali before Bhavna	After Bhavna
Weight	350g	330g
Colour	Black	Black
Consistency	Smooth powder	Smooth powder
Smell	No specific smell	Smell of Vata jata kwath

Table 5: Preparation of *Rasa sindura*

Stages of Process	Effect/ Purpose	Duration	Procedure and Observation
The stage of low temperature	The liquefaction of material.	00.00hrs	Baluka Yantra put on furnace and ignition done.
		0030 hrs	Furnace is well ignited. Temp. 60^0 C- 250^0 C (Mandagni)
		0100hrs	Yellowish fumes started
		0200hrs	Yellow deposits start appearing on bottle mouth
		0200hrs-0500hrs	Fumes kept emanating
		0500hrs	On inserting RHIR blue flame appeared which disappeared after sometime
The stage of moderate temperature	Sublimation of sulfur	0800hrs-1500 hr	Temp. 300-450^0 C. Flame appeared spontaneously and remains outside the bottle mouth for about 1 hr then recedes to the neck, appearing only on insertion of RHIR. Fumes continued to emanate. Neck was cleared intermittently by inserting RHIR and tests for complete paka as CPT done intermittently- showed black deposits. Moderate heat continued till Paka

			stage.
The stage of corking	Beginning of compound formation (prevent escape of useful drugs)	1600-1730 hrs	Fumes almost stopped with RHIR nothing is felt at the base, on taking out is covered with white fumes, smell of sulfur not evident. Cu plate remained unchanged; bottom of the bottle was red hot. Temperature was reduced for half an hour and corking done.
The stage of high temperature	Formation of the compound	1730-2830 hrs	Intense heat given (*Tivragni*). Temperature between 450-600^{0}C
The stage of cooling	Proper complete processing	2830hrs-48hrs	Complete set up was left as such for spontaneous cooling the bottle was removed from *Baluka yantra* on cooling.

CONCLUSION

Preparation of *Dviguna Bali Jarita Rasasindura* needs more duration of heat treatment in every step of graded heating pattern of *Kupipakva kalpana*. The heating pattern is proportional to its therapeutic efficacy.

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Fig. no. 1 Preparation of *Dviguna bali jarita Rasa- sindura*


Crude *Hingula*


Hingula sodhana


Kanduka yantra


***Parada*n[mercury-globules]**


Parada


Gandhak shodhan


***Kajjali* preparation**


Kajjali


Kupi yantra


Rasa sindura paka


***Rasa sindura* in bottle neck**



***Rasa sindura* crystals and powder**