



PHARMACEUTICO-ANALYTICAL STUDY OF SWARNA VANGA

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ABSTRACT

The word 'Rasa Shastra' comprises of two words: 'Rasa' and 'Shastra.' Rasa stands for 'Mercury' while Shastra stands for 'Science.' Therefore 'Rasa Shastra' literally stands for 'Science of Mercury.' However this specialised branch of Ayurveda has a broad range of study. It deals with all the metals, minerals, mercury and other substances known as Rasa Dravayas. Pharmaceutical branch of Indian medicine which includes proper identification, collection, preservation and standardization of the drugs. In the field of Rasa Shastra, Shodhana and Marana are the most important processes for preparing a medicine. Rasa Shastra Shodhana is not only a chemical purification of substances, but also a specific method of addition and separation, which results in chemical and physical changes in the substances. Swarna Vanga is a type of Kupipakwa Rasayanas, indicated mainly in diseases such as Madhumeha (diabetes mellitus), Swasa (respiratory disorders), Pradara (menorrhagia), and as a Vrishya (aphrodisiac). and this is the product of complex chemical processes in which preparation of Kajjali and heating pattern plays most important role.

Keywords: Swarna Vanga, Vanga Bhasma, Kupipakwa rasayana, Shodhana.

Introduction

Rasa Shastra Shodhana is not only a chemical purification of substances, but also a specific method of addition and separation, which results in chemical and physical changes in the substances. The substances like metals in their natural form are too hard to break, or to be used for medicinal purposes. Therefore it is required that they should be modified in such a way so as to be used like a medicine. For this purpose Shodhana of these substances is the most important process which is done with some special procedures and can be used therapeutically.¹ It is done to detox the toxic effect of the drug, to make the heterogeneous parts of the substances into the homogenous ones, to remove impurities, to soften the hard material, to increase the properties of materials, and to make the substance suitable to the human body. There are many techniques of Shodhana of the materials like boiling with the liquids, trituration with and without heating, distillation, addition of certain material in liquefied state, filtering, heating and dipping, washing, trituration up to fine disintegration, addition of liquids and drying through trituration, drying in sun or fire, roasting, addition, and separation.² There are several metallic preparations, mainly in Bhasma form present in the market, but they are prepared by their own methods of preparations. So there is not any standard parameter to check their efficacy and authenticity. Dhatu Marana process can be classified into four parts, depending upon the media used. Swarna Vanga is a type of Talastha type of Kupi

Pakwa rasayana.³ In the preparation of Swarna Vanga, Vanga, Gandhaka and Parada Rasadravya are used. It is named due to the appearance of the final product, which is bright golden yellow in a color similar to that of gold. Kupipakwa was one such procedure developed mainly for Gandhi Jarana. Kupi was one of such apparatus. During such procedures, it became known to the peers that the same, with some slight variations can be used for therapeutic values. Vanga Bhasma⁴ is a popular preparation used by the Ayurvedic physicians commonly in Prameha Roga. There are 80 different methods available for preparation of Vanga Bhasma in our classics. But, in present study two different kinds of methods are adopted. One according to the reference of Rasamritum, which is very famous and commonly used in daily practice. Another method for preparation of Vanga Bhasma adopted is very unusual method i.e. Vastraputi Vanga Bhasma according to the reference of R.R.S. In the globalized world, there is an increased curiosity regarding safety and efficacy of various metallic and mineral preparations in Rasashastra. So, it is a need of time to pay attention for the establishment of Standard operating procedure (S.O.P.) of Ayurvedic dosage form, for Globalization of Ayurveda in a true sense. Now a days, Validation is considered as the term used more accurately replacing process Standardization and it is accepted globally more for Validation of any process. "Validation Master Protocol" (VMP) i.e. to have a well-documented plan of action related to the process of validation, in the first step. This study is an attempt to

formulate standard manufacturing procedure of Swarna Vanga and to develop its organoleptic and physicochemical standards.

The present study was carried out with the following Aims and Objectives:

1. To carry out Vanga Shodhana.
2. To carry out Preparation of Swarna Vanga.
3. To carry out Physico-chemical Analysis of prepared Swarna Vanga.

Materials and Methods.

Pharmaceutical Study: Swarna vanga was prepared as per reference of Rasa Tarangini Vanga (Tin), Parada (Mercury), Gandhak (Sulphur), Navasagara (Ammonium Chloride) and Kalmi Shora (Potassium Nitrate). It include following steps

1. Processing (Shodhana) of Raw Materials
2. Preparation of Vanga Pishti
3. Preparation of Kajjali for Swarna Vanga
4. Preparation of Swarna Vanga

1. Processing (Shodhana) of Raw Materials

A) Shodhana of Vanga:⁵

Equipment: Pithar yantra, long handle iron Darvi, SSvessels; gas Stove, measuring Vessle, weighing machine, pyrometre, thermometer (360°C)

Procedure of Samanya Shodhna: (Table no.1) Samanya Shodhana of Vanga, method of melting followed by pouring (Dhalana) sequentially in liquid media viz. Tila taila, Takra, Gomutra, Arnala, Kulattha Kwatha as depicted in Rasa Ratna Samucchya. (Table no.1)

Procedure of Vishesh Shodhana: (Table no.2) Raw Vanga -500g was taken on long handle iron Dravi and heated on Gas stove up to melting. Then it was immediately quenched in the Churnodaka 1 L, (Dhalana -melting and quenching) which was kept in a Pither Yantra. After collection of the Vanga from the media whole process repeated for six times more. Every time fresh and same amount of media was taken. Temperature of Churnodaka, Laddle, was noted. Weight of Vanga and volume of media was noted in each time. The same procedure was followed for the other batches.

B) Parada Shodhana:⁶ (Table no.3) For Shodhana of Parada 500g, trituration process (Mardana) was done in hot mortar (Tapta Khalwa) which hasten the process and may help in removing the Doshha of Parada more frequently. Loss of Parada during Samanya Shodhana might be due to removal of impurities and also might be due to various Parada Gati. For Parada vishesh Shodhana, double distilled Mercury from Merck company, was taken in a mortar. Paan Svaras Guice of Piper betel, Aadrak Svaras (juice of Zingiber officinalis) and Kshartray (combination of Yavakshara, Sarjikshara and Tankana) were added and triturated. The process was continued for three days and Parada was then washed with potable water.

C) Gandhak Shodhana:⁷ (Table no.4) For Shodhana of Gandhak, traditional method using cow's milk and clarified butter was employed. In this method,

Gandhak500g was heated up to its melting temperature and was poured through a double layered cloth into a vessel containing boiled milk. Gandhak settled on the bottom and assiduously huddha Gandhaka was thoroughly washed with hot water to remove remanent of Godugdha. Loss in weight might be due to removal of Impurities.

D) Navasagara Shodhana: (Table no.5) In Navasagara Shodhana, dissolution of Navasagara 1000g into water helps in removal of foreign material (Mala Doshha) present in it. While filtering through cloth, these Mala or Doshas are removed (physical impurities).

2. Preparation of Vanga Pishti: (Table no.6) Molten Shodhita vanga 100g was added to Shodhita Parada 50g to make Dhatu pishti. It was a soft, smooth, grey colour paste. It was observed that after adding molten rlmga to Parada, it lost its consistency and mixed with Vanga completely within 15 minutes. The amalgamated mixture was triturated with Nimbu Swarasa and Saindhava lavana followed by washing with water till the black colour of the water disappeared. The colour of mixture after 40 hours of trituration was light silver grey. Obtained material was again washed with hot water and kept for drying in sunlight for 2 days.

3. Preparation of Kajjali for Swarna Vanga: (Table no.8) 66.67 g Shuddha Gandhak was added to Vanga pishti and was subjected to the process of continuous trituration. During this process, the mixture changed from grey colour to dark grey colour. Trituration was done till this mixture became black, very fine and attains uniform consistency. 50gm Shuddha Navasagara was added in above mixture and again ttituated properly. Lastly, Shuddha 4.1 g Kami Shora was added in above mixture. This mixture was triturated properly. Trituration was done till mixture became black, very fine, uniform and lustreless. For better fineness and smoothness of Kajjali Mardana was continued up to 62 hours. During the process spillage was more due to the increased fineness of Kajjali.

4. Preparation of Swarna Vanga:⁸ (Table no. 9)

Prepared Kajjali was slowly filled in mud smeared bottle (Kanchkupi) upto 1/3rd level of Kanchkupi. Kupi was covered with 7 layer of Multani Mitti smeared cloth. Each layer was applied after complete drying of the previous one. The inner surface of the bottle was cleaned thoroughly before filling the Kajjali. The Kanchkupi containing Kajjali was put in a special apparatus known as Baluka Vantra (sand bath), for paka (heating). Heat treatment was given in gradual increasing way (Kramagni), The whole procedure took 18 hrs. After completion of Paka, corking of Kanchkupi was done cautiously and temperature was further maintained for 2 hrs and then was kept for self cooling. On gentle tapping at the level of string, the Kanchkupi broke into two parts. The material deposited at the base was collected by gentle tapping and with forceps. Absolute golden and light weighted material was collected. The obtained

Swarna vanga was washed with water to remove excess of Kshara added during preparation.

Analytical Study

Methods Opted For Analysis

I. Organoleptic methods

II. Physico-chemical parameters

a. Loss on drying,

b. Ash value

c. Acid insoluble ash

d. Water soluble extract

III. Physico-chemical changes in the liquid media before and after the process of Shodhana

IV. Melting point Determination

V. Elemental Analysis (EDAX)

VI. Quantitative inorganic assay

a. Determination of Tin

b. Determination of SnO₂

Observation and Results:

Table 1: Observations during Samanya and Vishesh Shodhana of Vanga

Initial wt of Vanga (in g)	800
Weight after Shodhana in Taila	795
Weight after Shodhana in Takra	775
Weight after Shodhana in Gomutra	755
Weight after Shodhana in Kanji	740
Weight after Shodhana in Kulatha Kwatha	700
Weight after Shodhana in Churnodaka	690
Weight Loss	110
% loss	13.75

Table 2: Observations during Vishesh Shodhana of Vanga

Sr no.	Wt. of Vanga (g) Before quenching	Wt. of Vanga (g) After quenching	Time taken for melting (Minutes)	Time taken for melting (Minutes)	Vol. of Churnodaka after quenching (ml)
1	500.0	535.2	3.27	46	960
2	535.2	523.8	4.14	46	980
3	523.8	545.0	4.53	46	960
4	545.0	540.8	5.49	46	960
5	540.8	543.0	5.21	48	960
6	543.0	541.6	6.20	48	960
7	541.6	554.0	6.56	46	930

Table 3: Showing observations during Samanya Shodhana of Parada

Total Duration in days for Shodhana	total time taken for Mardana	Weight of Parada before Shodhana in gm	Weight of Parada after Shodhana in gm	Weight loss in Gm.	% loss
3	24 hours	500	492	8	1.6

Table 4: Showing observations during Gandhak Shodhana

Initial Weight of Crude Gandhaka (in g)	Weight after 1 st Shodhana (in g)	Weight after 2 nd Shodhana (in g)	Weight after 3 rd Shodhana (in g)	Weight loss (in g)	% Loss
1000	500	960	950	50	5

Table 5: Showing observations during Navasara Shodhana

Initial weight of Navasara (in g)	Water added for dissolving (in ml)	Material obtained after complete drying (in g)	Loss in wt. (in g)	% loss
1000	3000	960	40	4

Table 6: Showing observations during Dhatu Pishti Preparation

Weight of Vanga (in g)	Weight of Parada (in g)	Weight of Dhatu. pishti (in g)	Weight of Pishti after trituration and washing (in g)	Weight Loss (in g)	% Loss
100	50	150	148	2	1.33

Table 7: Showing observation during addition of Gandhaka to Vanga Parad Pishti

Weight of Dhatu Pishti in Gm	Weight of Gandhaka in Gm	Weight of Kajjali in Gm	Loss in Weight in Gm	loss
148	66.67	208	6.67	3.107

Table 8: Showing observations during addition of Navasagara to above Parada, gandhaka & Vanga Pishti mixture

Weight of Kajjali in Gm	Weight of Navasagara in Gm	Weight of Kajjali after addition of Navasagara in Gm	Loss in weight in Gm	% Loss
208	50	252	6	2.381

Table 9: Showing procedure and observation in Swarna Vanga preparation

Stage of Process	Effect / Purpose	Duration	Time & Date	Temp	Procedure and Observation
The stage of low temperature	For Liquefaction of material	00.00 hrs.	4.30 a.m 09.09.16	25°C	Kanchkupi filled with Kajjali was kept in Baluka Yantra Heating process was started
	For Liquefaction of material	1hr	5:30am	110 °C	Temperature was Maintained.
Stage of moderate temperature	Sublimation of Navasagara	2hr	6:30am	280°C	Appearance of white fumes that signifies beginning of burning of Navasagara
	Liquification of material	3hr	7:30 am	420°C	On insertion of red hot shalaka. semi solid state of Kajjali was felt. White fumes continue to appear
	Start of Gandhak Jarana	4hr	8.30 am	465° C	White mixed yellow fumes appeared. Sulphur crystal started depositing around inner part of the neck, which was removed through red hot shalaka to avoid blockage of neck of the bottle.
	Gandhak jarana was in process	5 hr	9:30 am	465°C	Yellow fumes appeared.
		6hr	10:30 am	480°C	When red hot shalaka was inserted, blue flames appeared.
		7 hr	11.30 a.m	532°C	When red hot shalaka inserted, blue flames still persist.
		8 hr	12.30 a.m	544°C	When red hot shalaka inserted, blue flames still persist.
	Gandhak Jarana was in process	9 hr	1:30 pm	556°C	When copper coin was kept over the neck for 5 minutes and then removed turned black indicative of presence of sulphur and process of Gandhak Jarana
		10 hr	2:30 pm	580°C	Again copper coin test was done. It turned black indicating Jarana of Gandhak was still in process.
	Gandhak jarana was completed	11 hr	3.30 p.m	580°C	On Copper coin test, it turned white, now white crystals were adhered to copper coin indicative of complete Gandhak Jarana and evaporation of Hg.
		12. hr	4.30 p.m		Temperature was maintained for 4 hr
		16.00 hr	8.30 p.m upto 10:30p.m	650°C	Again copper coin test was done. It turned black indicating Jarana of Gandhak was still in process.

Table 10: Showing classical parameters for Swarna Vanga (SV)

Sr. no.	Parameter	Swarna Vanga
	Colour	(Varna) Golden (Swarnabha)
	Touch (Sparsh)	Fine powder
	Odour (Gandha)	Odourless
	Floating test (Varitarata)	Positive
	Fineness test (RekhaPurnatva)	Positive
	Grain floating test	Positive
	Tastelessness (Gatarasatva)	Positive

Table 11: Showing Physico-chemical analysis of Swarna vanga (SV)

Name of test	SV1	SV2	SV3	Mean (±SE)
pH value	7.56	7.57	7.62	7.5833±0.0185
Loss on drying at 110° C % w/w	4.48	4.51	4.21	4.4±0.0953
Estimation of Total Sulphur 1% w/w	18.80	17.95	17.70	4.4±0.0953
Estimation of free Sulphur % w/w	1.2628	1.2328	1.2624	1.2526±0.0099

Table 12: Showing percentage of Mercury in different samples of Swarna vanga

S.No.	Drug Sample	Mercury (micro gram/ml)
1	SV1	ND
2	SV2	ND
3	SV3	ND

Table 13: Showing percentage of Tin in different samples of Swarna Vanga

S.No.	Drug Sample	Tin %	Mean of Tin (\pm SE)
1	SV1	65.0	65.53 \pm 0.2905
2	SV2	66.0	
3	SV3	65.6	

Table 14: Showing results of XRD Study of 3 samples of Swarna vanga

Sample	d-Standard	d-identified	Name and composition
SV1	5.878	5.84108	Tin Sulphide SnS ₂
	2.944	2.92977	
	1.964	1.95704	
SV2	5.878	5.94038	Tin Sulphide SnS ₂
	2.944	2.91935	
	1.964	1.95335	
SV2	5.878	5.85438	Tin Sulphide SnS ₂
	2.944	2.93819	
	1.964	1.95988	

*Melting of Vanga**Vanga Dhalana***Figure 1:** Vanga Shodhana*Mixing with Paan Swaras**Mardana in Khabwa**Separation of Pure Parad**Wahing with hot Adrak Swarasa and Kshara Traya water***Figure 2:** Parada Shodhana



Figure 3: Swarna Vanga

Discussion

Through the history of the branch of Rasashastra, it can be known that it developed as a special branch when morbidity and mortality were on the rise. With its advent, came new metal, mineral and herbomineral combinations, formulations and procedures. For the preparation of Kupipakwa rasayana, Dhatu pishti nirmana, preparation of Kajjali and heating pattern are the most important factors to obtain best quality and maximum quantity of yield without any untoward effects. In Gandhak Shodhana the constituents of (Godugdha) may have role in detoxifying the Sulphur. The change in colour of Godugdha from white to yellowish cream and sulphur smell may indicate the dissolution of fat soluble sulphur content in the Godugdha. The process was repeated thrice to detoxicate it completely from any remainant Doshas The system of applying Kramagni or ladder step heating procedure is recommended to give suniform, slow and steady rise in temperature. By this, the ingredients are given enough time at each range of temperature allowing them for any kind of reaction to take place. The system

of applying Kramagni or ladder step heating procedure is recommended to give uniform, slow and steady rise in temperature. By this, the ingredients are given enough time at each range of temperature allowing them for any kind of reaction to take place. After 2 hours, slight white colour fumes with ushna, tikshna gandha came. This may be due to burning of Navasagara. After 3 hours, when red hot shalaka inserted, semisolid state of Kajjali felt. This may be due to melting of Kajjali, which is usually

between 420°C – 430°C. After 4 hours, dense yellow coloured fumes with smell of tikshna Gandhak came. This may be due to the temperature, which reaches the boiling point of Gandhak i.e. above 444 °C. At final stages, when temperature was increased up to 650 °C, sand like feeling was observed when copper wire was inserted inside the Kupi. Corcking was done and temperature was maintained for 2 hrs and then was kept for self cooling.

Conclusion:

Swarna Vanga is a type of Kupipakwa Rasayanas and this is the product of complex chemical processes in which preparation of Kajjali and heating pattern plays most

important role. Heating pattern for Swarna Vanga is standardized by preparing 3 sample with heating pattern as initial 2½ hour Mrudagni (upto 280°C), next 7½ hour Madhyamgni (280°C-580°C) followed by 8 hour Tivragini (580°C-650°C) in classical Baluka yantra. For preparation of Swarna Vanga, gradual rise in temperature is mandatory and especially for Swarna vanga, maximum temperature required should not exceed 600°C-650°C, as all required chemical reaction will be completed within this temperature range.

References:

1. Ras Tarangini, Pandit Kashinaraya-rashtina Motilal Banarasidas Publication, 11th edition .1979, Page no.22.
2. Shodhan Karanewala, Sanskrut Hindikosh ,Vaman Apte, Motilal Banarasidas Publisher, P.No.1031
3. Kashinath S. Delhi: Motilal Banarasidas; 8/68-73 Sadananda Sharma's Rasa Tarangini. 1; 2004; p. 449.
4. Kale, Babita, and Nilima Rajurkar. "Synthesis and characterization of Vanga bhasma." Journal of Ayurveda and integrative medicine 10.2 (2019): 111-118.

5. Kashinath S. Delhi: Motilal Banarasidas; 18/8-9. Sadananda Sharma's Rasa Tarangini.; 2004; p. 441.
6. Mishra S. N, Ayurvediya Rasa Shastriya, 10th edn. Varanasi, Chaukhamba, 2000, 201-204.
7. Chakrapanidatta, Ayurveda-dipika commentary, Charaka Samhita, edited by Yadavji Trikamji Acharya, published by Chaukhamba orientalia, Varanasi; reprint-2011.p, Pg-29
8. Gokarn, Rohit Ajith, Dhiraj Singh Rajput, and Pramod Yadav. "Pharmaceutical standardization of Svarṇa vaṅga." *Ancient science of life* 33.2 (2013): 97.