Research Article

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PHYSICO-CHEMICAL AND INSTRUMENTAL STUDY OF SAMAGUNA RASASINDUR (RED SULPHIDE OF MERCURY)

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ABSTRACT

In the system of Ayurveda, Mercurial medicines are playing major role in the treatment of various diseases. Scholars also described Rasachikitsa as best treatment. The present work illustrates the physico-chemical characteristics of Rasasindur obtained by the well defined processes in the Rasashastra text, which is prepared with the equal quantities of purified Parada and Gandhaka. X-Ray Diffraction is a technique for detecting the presence of diffraction peaks corresponding to various α -1, d-values which are characteristics of a given material. Samaguna Rasasindur analyzed by using X-Ray Diffraction (XRD) showed that, it contains strong lines of *Cinnebar syn.* (HgS), *Metacinnebar syn.* (HgS). Sharp crystals were very less in number in the Samaguna Rasasindur. In physicochemical analysis of Samaguna Rasasindur Mercury % was 83.68, Sulphur % was 13.38, Ash % was 0.49, Water soluble ash % was 0.24 and Acid insoluble ash % was 0.03.

Keywords: Samaguna Rasasindur, Red Sulphide of mercury, X-Ray Diffraction study, Physico-chemical analysis.

INTRODUCTION

Kupipakva rasayana is a unique and highly evolved pharmaceutical preparation of the four murchita parada yogas. Rasasindur is sagandha (with Sulphur), sagni (processing with heat), Kantastha (near the neck of the bottle), murchita parad yoga, which has Mercury (Parada), Sulphur (Gandhaka) as ingredients. Samaguna Rasasindur is a Kupi Pakva Rasayana which is also known as a Sindur Kalpana. It is added to different Parada Yoga (mercurial formulation). It can be prepared by adding half quantities, equal quantities, double quantities etc. of Gandhaka to Parada¹. By the internal administration, Rasasindur cures many disorders, pacifies the Kaphadosha and acts as Rasayana (rejuvenating). Further it is also used as Sahapana (taking together with the medicine)². In addition to above, it is also one of the prime ingredients in various Rasayoga (herbo-mineral formulation).

In the present study, Samaguna Rasasindur was prepared with the equal parts of purified Parada and Gandhaka. Parada was procured from Government Pharmacy Nanded, Maharashtra, India. Gandhaka was procured from local market of Nagpur, Maharashtra, India. All herbal and mineral material were thoroughly screened by experts of Rasashastra, Government Ayurveda College, Nagpur based on the Grahya Lakshanas (to be taken or accepted characters) mentioned in the Ayurvedic Classics. Structural and chemical characteristics of Samaguna Rasasindur by X-Ray Diffraction was carried out in the Sophisticated Analytical Instruments Facility, R. T. M. University Nagpur and Physico-chemical analysis was carried out in the Modern mineral processing laboratory and pilot plant, Indian Bureau of Mines, MIDC, Hingana Road, Nagpur.

MATERIAL AND METHOD

The present study includes preparation of Samaguna Rasasindur, its Physico-chemical analysis and instrumental study by X-Ray Diffraction method.

The raw material (viz., Parada and Gandhaka) were purified before converting them in to Kajjali.

Purification of the Ingredients

Purification of Parada (Mercury)

Parada (1000 gm) was taken with Chuna (lime powder 1000 gm) in a clean Khalva yantra (mortar and pestle) and grind it 8 hours daily for 3 days. The obtained material was washed with the help of lukewarm water for several times until clean and clear Parada was obtained. Then Lime purified Parada (940 gm) was taken with Rasona Kalka (paste of garlic 940 gm) Saindhava Lavana (saindhava salt 470 gm) in a clean Khalva yantra and grind it up to mixture obtained blackish colour for 36 hours. The obtained material was washed with the help of lukewarm water for several times until clean and clear Parada was obtained³. Approximately 920 gm Parada was obtained after this purification process.

Purification of Gandhaka (Sulphur)

Gandhaka (1000 gm) was taken in clean Khalva yantra and grind it until coarse powder of Gandhaka was obtained. A wide mouth Steel patra (stainless steel vessel) was taken and filled with 1.33 litres of Godugdha (cow's milk) then the mouth of vessel was covered by a cloth and tied by iron wire. 1000 gm of Goghrita (cow's ghee) was taken in a Aluminium vessel and it is kept on Gas shegadi and set on fire. After melting Goghrita, coarse powder of Gandhaka powder (1000 gm) was poured in Goghrita. Gandhaka was melted after 10 minutes then melted Gandhaka was poured in Godugdha containing vessels. Solidified Gandhaka was taken out and washed with lukewarm water until it was clean and clear. The

Gandhaka was taken in a Khalva yantra and grind it until it becomes fine. Then it was dried in sunlight. This purification process was carried out for another two times⁴. After the completion of third purification process 925 gm of purified Gandhaka was obtained.

Preparation of the Kajjali

Purified Parada and Gandhaka were taken in equal quantities (300 gm each) in a Khalva yantra and Mardana (grinding) was done until it becomes very fine black powder, like collyrium and the dazzling particles of Mercury completely disappear⁵. Approximately 540 gm of Kajjali was obtained.

Bhavana to the Kajjali

Kajjali (300 gm) was taken with Vatankur Swaras (150 ml juice of banyan leaf) in Khalva yantra and grind it until it was dried⁶. Approximately 310 gm Kajjali was obtained after this Bhavana Process.

Preparation of Samaguna Rasasindur

For Valuka yantra a wide mouth and narrow bottom with 2 cm hole centrally Ghata (earthen vessel) was taken and tied by iron wire. Kachakupi was made by a green coloured beer bottle which was covered by 7 layers of mud smear cloth (kapad mitthi). Kajjali (310 gm) was filled in Kachakupi by funnel. Then Kachakupi was placed on a hole of Ghata. Kachakupi was wrapped at

bottom with Multhani clay mud to avoid slippage. Mudgakara Valuka (sand 15.5 kg) was filled in Ghata around the Kachakupi upto neck of the bottle. This Valuka yantra was placed on Bhatti. Agni (Fire) was given in a Kramagni Paddhati. Temperature was noted every 30 minutes. Kupa mouth was cleaned by red hot iron rod (Appro. 1-1.5 cm diameter) time to time to avoid blockage. After 20 hours of Mrudu and Madhyamagni, Yellow fumes of Gandhaka was disappear, Kupa bottom was reddish in colour and copper coin test was positive, Mukhamudhrana (Corking) was done. Tivargni was given for next 6 hours. At this stage temperature was maintained upto 580-650°C. Then Kupa was removed from Valuka yantra after Swangashitalikaran (after 20 hours). The layer of mud smear cloth was removed by scrapping. Kupa was clean by wet cloth. Then the level of product was marked at neck. A thread soaked in kerosene was tied around the kupa just below the marking and set to fire. The Kupa was kept horizontal and rotated. The Kupa was wrapped in wet cloth thus it break. The Kanthastha (neck) product was collected⁷. (Figure 1) (Table 1) Approximately 155 gm Samaguna Rasasindur was obtained after this process. Temperature, time and observations are summarized in Table 1.

Table 1: Temperature time and observation during preparation of Samaguna Rasasindur

Sr. No.	Time	Temperature	Observation
1	8.20 am Day 1	20° C	Set on fire.
2	10.20 am	160° C	Slightly whitish fumes appear.
3	11.25 am	227° C	Yellowish Fumes
4	12.25 am	231° C	Yellowish fumes, Semisolid in nature Kajjali sticks to iron rod on Shalaka Sanchalan
5	2.30 pm	290° C	Yellowish fumes, Kajjali was melted in nature
6	4.30 pm	293° C	Intensity of Yellowish fumes increased.
7	8.45 pm	330° C	Profuse yellow fumes.
8	10.30 pm	442° C	Sulphur smell yellow fumes
9	12.45 am	510° C	Bluish flame appear.
10	2.30 am	535° C	Bluish flame of height upto 5 inch after red hot iron rod insertion.
11	3.30 am	540° C	Intensity of bluish flame decreased.
12	4.15 am	550° C	Kupa bottom appears reddish in colour.
13	4.25 am	530° C	Corking done, Tivargni started.
14	5.30 am	580° C	Trunadaha (Burning of grass) test positive
15	10.30 am	630° C	Fire was stopped.

Table 2: Samaguna Rasasindur showing relative intensity vs α -1 d-values

Sr. No.	Angle [°2 θ]	d-Value α 1 [Å]	Relative Intensity [%]
1	26.520	3.3582	100.0
2	28.215	3.1602	59.9
3	31.210	2.8635	98.5
4	23.075	3.8512	20.8
5	43.645	2.0721	23.7
6	45.765	1.9810	17.8
7	51.755	1.7649	14.7
8	52.755	1.7338	13.0
9	54.580	1.6800	12.2
10	58.305	1.5812	7.2

Figure 1: Preparation of Samaguna Rasasindur

Figure 2: XRD Pattern of Samaguna Rasasindur

Physico-chemical Analysis

Detection of Mercury

Sample was carefully dissolved in concentrated nitric acid in ice cold condition for about 24 hours. The solution was diluted to 300 ml with cold distilled water. 10% solution of Stannous chloride was added to precipitate Mercurous chloride. This was allowed to stand overnight. This was filtered through whatman filter paper 42 and washed with cold water. The precipitate was dried at 110°C and Mercurous chloride measured and from this mercury was calculated. The value was also confirmed by XRF technique by pressed powder.

Detection of sulphur

Sample was digested in a mixture of Bromine water, HCL and HNO₃. This was diluted with water and filtered through whatman filter paper 40. Water was added to make the volume to 300 ml. This was heated on burner and (10 ml) 10% solution of Barium chloride was added. This was allowed to stand overnight. The precipitate was filtered through whatman filter paper 42 and washed with cold water. The precipitate was ignited at 800°C. Cooled

and weight was taken to measure BaSO₄. From this sulphur was calculated.

Total Ash Value

The sample was ignited in silica crucible at 950°C. The mass was weighed and the quantity of ash was calculated.

Water Soluble Ash

The crucible was filled with water and heated on burner. This is then filtered through whatman filter paper 40 and washed with water. The filter paper was ignited in same silica crucible and the quantity of water soluble ash was calculated.

Acid insoluble Ash

Ash in crucible was treated with dilute HCL and heated on burner. This it was filtered through whatman filter paper 40 and washed with water. The filter paper was ignited in same silica crucible and the quantity of acid insoluble ash was calculated.

X-Ray Diffraction (XRD) Study

X-Ray diffraction methods are based on the scattering of X-Rays by crystals. This method is used to identify the chemical composition and crystallographic structure of materials. Monochromatic X-Rays were used to

determine the interplanar spacings of the unknown materials. Samples were analyzed as powders with grains in random orientations to insure that all crystallographic directions were sampled by the beam. When the Bragg conditions for constructive interference were obtained, a reflection was produced and the relative peak height was generally proportional to the number of grains in a preferred orientation.

About 2 gm of sample was placed in the sample holder aluminum sheet. After spreading uniformly, it was covered and sealed with a glass plate. It was then exposed to X-Ray beam of intensity 35 kW and 20 mA. The scanning was performed in the range of 10° to 100° . The reflected rays were recorded and the results were interpreted.

RESULT

In Physico-chemical study of Samaguna Rasasindur, Mercury % was 83.68, Sulphur % was 13.88, Total ash % was 0.49, water soluble ash % was 0.24 and Acid insoluble ash % was 0.03 measured.

In XRD of Samaguna Rasasindur sharp crystal were very less in number as the high peaks were infrequent. The relative intensities and their corresponding d -values were tallied with standard values of compound. This comparison was made using the catalogue of d -values (JCPDS-ICDD, 1995). The XRD strong lines of *Cinnebar syn.* (HgS) and *Metacinnebar syn.* (HgS) were found to be

matching with sample under study. This indicates that largest component of Samaguna Rasasindur has got physical and chemical structure almost identical to these compounds. Structural characteristic of the Samaguna Rasasindur was found as Hexagonal. Results are summarized in Figure No. 2 and Table 2

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REFERENCES

1. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 6/183-186, p.138-140
2. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 6/190-234, p.140-148
3. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 5/27-29, p.79
4. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 8/7-10, p.176
5. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 2/27, p.16
6. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 6/162, p.135
7. Kashinath Shastri, Sadanand Sharma, editor. Rasatarangini. New Delhi; Motilal Banarasidas; 2002. Chapter 6/163-167, p.135

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