A CRITICAL REVIEW OF THESIS WORKS DONE ON RASAKARPURA

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ABSTRACT:

Rasakarpura is a mercurial preparation in the field of ayurved. It is a Nirgangha (without using sulphur as an ingredient) type of kapipakva (sublime) metallic preparation. There are different 53 methods for the preparation of Rasakarpura. Different opinions about mercuric chloride, mercurous chloride or mixture of both as chemical composition of final product are available in classical books of ayurved. Various types of research works on Rasakarpura were also carried out in many institutes of ayurved. Therefore here an attempt was made to compile those MD (Ayu) and PhD works so that some conclusions are drawn to identify the Rasakarpura and its chemical composition.

Key Words: Rasakarpura, Mercuric chloride, Mercurous chloride, Rasashastra

INTRODUCTION

To promote the ayurved many institute are working in the India and also in some other countries of world. One of the efforts to promote the ayurved is research of drugs. Previously physicians were made medicines for their own use on the base of the need of patients and availability of the ingredients. So that many drugs are having many methods of preparation and therefore chemical composition of the final product is found different opinions. Now a day due to advance technology it is possible to identify the structure of the some products in certain level. One of such drug is Rasakarpura. Different type of research works regarding preparation method, analytical, toxicological and clinical were carried out in various institute of ayurved. So here an attempt was made to compile those works and due to this effort, may be some conclusion will be drawn on the composition of Rasakarpura, which is the main controversial part.

MATERIAL AND METHOD

Total fifty three (53) methods for the preparation of Rasakarpura are available in classics of ayurved.[1] Various post graduation and doctorate level research works are done to develop Standard Manufacturing Process (SMP) for Rasakarpura. In some of these works it was prepared by different methods and analyses of those samples were carried out by the scholar. Some works were also extended for toxicity study and clinical study. Total twelve (12) M.D. (Ayu) and Ph.D. works are found on Rasakarpura from the various institute of ayurved. Those works are concisely presented as below.

Patel A. S. et al.[2] has worked on the problem of “Rasakarpura Nirmana” in which various classical references were utilized for the preparation of Rasakarpura. But the study indicates the failure of many procedures.

H. Yeri Swami et al.[3] has prepared Rasakarpura for 28 times. In which 21 were performed according to reference of Rasa Tarangini, 2 were prepared by method of commentator Pandit Haridattta Sastry of Rasa Tarangini book (by changing the ratio of Parada and Gandhakamla-sulphuric acid i.e. 1: 0.5) and remaining 5 were performed by following different references. There was no final product by using method of Rasachintamani due to failure of practical. Other samples were analyzed for the chemical structure of final product. They found that Rasakarpura prepared by Rasa Ratnakar method is 96.08% mercurous chloride and 05.02% is mercuric chloride. Sample of Rasakarpura prepared by Ayurved Prakash method is having 83.95% of mercurous chloride and 09.63% of mercuric chloride. Rasakarpura prepared by Rasa Tarangini method is 99.79% w/w mercurous chloride. Sample prepared by using modify method of Rasa Tarangini by Haridatta Sastry (half amount of sulphuric acid than mercury) is mercurous chloride 92.66% w/w.
Rao P. G. et al[10] also worked on Rasakarpura as his post graduation research work. In this work Rasakarpura was prepared by using Rasa Tarangini method. But details of the work can not be found by author of this article.

Rao P. G. et al[8] has prepared Rasakarpura in four sets. In 1st set Parada 1 part, concentrated H₂SO₄ 1.5 part and Saindhava Lavana equal to intermediary product was used. In 2nd set, mercury (1 part), Kasisa (2 part) and Saindhava Lavana (2 part) were used. In 3rd and 4th set, Tuttha and Sphatika were used instead of Kasisa in addition to Parada and Saindhava Lavana. He reported that 300 – 320°C temperature for 6 – 6½ hours are sufficient in EMF to sublime the product. On analysis of samples he found that Rasakarpura Sample I as mercuric chloride, Sample II as mercurous chloride and Sample III and IV as mixture of mercuric chloride and mercurous chloride.

Mehta N. J. et al[8] developed Standard Operating Procedure of Rasakarpura and Rasakarpura Drava as per the reference of Rasa Tarangini 6/65-71 & 6/103-105. In the pharmacological study acute and chronic toxicity of Rasakarpura and Dermal toxicity of Rasakarpura Drava with using standard drug i.e. chemically prepared Mercuric chloride was carried out. Result shows Rasakarpura is less toxic in comparison to chemically prepared mercuric chloride. In analytical study of Rasakarpura, mercuric chloride 97.98% along with Sodium, Magnesium and Calcium as trace element were found. In clinical study patients were cured by 0.1% of Rasakarpura Drava and Gandhaka Malahara.

Suvarna et al[7] also prepared Rasakarpura by using Rasa Tarangini method. An analytical report reveals that it is completely soluble in water and alcohol, and slightly in chloroform. As the particle size of Rasakarpura was found 11.48μm, so it is quickly absorption. The percentage of Parada obtained is 70.08% and chloride is 19.4% in the Rasakarpura. N.P.S. Test indicates it may be mercuric chloride.

Sarode Sandeep et al[8] concluded that Rasakarpura prepared as per Rasa Tarangini method was better than that prepared by using equal quantity of Parada and Romaka Lavana. They used Sharava in Lavana Yantra for Paka (indirect heating pattern).

Shetti Shraddha et al[9] prepared Rasakarpura by using Rasa Tarangini method. An analytical report reveals that Rasakarpura has density of 5.43 g/cm³ and an acidity of 3.2 and crystal structure orthogonal. For elemental analysis SEM and EDTX proved to be useful, which had showed mercury as the main element followed by chlorine. Other trace element like Na, O, C, S etc were also determined. AAS that worked on the principal of cold vapour technique failed to detect mercury in Rasakarpura as the level above the detectable limits. However, Mg was detected by AAS in Rasakarpura. XRD showed mercuric chloride HgCl₂ as the major crystallite phase for Rasakarpura.

Reddy Sekhar et al[10] prepared Rasakarpura by using 5 different methods and after that they were analyzed by using different parameters. Rasakarpura – 1 was prepared by Rasa Tarangini method. Rasakarpura – 2 was prepared by heating Suddha Parada-18 parts, Gandhakamla-10 parts, Saindhava Lavana-10 parts by adopting special Kupi which was made by using waste glass pieces in Bhatti as used in Traditional method. Rasakarpura – 3, 4 and 5 were prepared by using reference of Rasamrita, Paradasamhita and Yoga Tarangini. Total mercury was found to be 67.28%, 45.97%, 69.85%, 69.85% and 72.82% in Rasakarpura – 1, 2, 3, 4 and 5 respectively. Particle size for Rasakarpura – 1, 2, 3, 4 and 5 material which passed through the sieve no 44 (355μ) were 56.45%, 96.37%, 51.54%, 73.94% and 90.50% respectively. By XRD analysis, Rasakarpura - 1 was identified as Mercury chloride, with orthorhombic crystal structure, having Primitive Lattice and Rasakarpura – 2, 3, 4 and 5 were identified as Calomel, with Tetragonal crystal structure, having Body centered lattice respectively.

Mehta N. J. et al[11] developed S.O.P. for the preparation Rasakarpura Drava and Rasakarpura Malahara (gel). Sophisticated analyses were carried out by TG-DTA-DSC method to find out the sublimation point of Rasakarpura (prepared as Rasa Tarangini method). Report suggest that this is started at 282.06°C and completely sublimed at 282.88°C temperature.

Naik M. S. et al[12] compiled various preparation techniques of Rasakarpura. The large scale manufacture of Rasakarpura is seen only in Kondapalli. The process is carried out at a distance place outside the village to avoid toxicity of fumes that arise during the preparation for local public. In the process, a wide porcelain vessel is taken and 17 kg of mercury is placed in it. 10 liters of Sulphuric acid (H₂SO₄) is gently added to mercury with great care. It is kept on hearth to provide heat. Medium type of heat is given, the mercury starts bubbling after 30 minute and white colored fumes start to originate from this mixture, the
mixture is stirred with an iron ladle continuously, the fumes intensify further with a stink of burning corps. After one hour when the mixture becomes like a white paste, the stirring is also intensified. Gradually it becomes powder at the end of one and half hours. The fumes ceases completely when the mixture is converted into white powder. Then the contents are transferred into an iron bowel. No change is found in the weight of mercury. The outcome of this process is made into fine powder and mixed with Saindhava and carefully kept inside the mud smeared thin glass bottles which are readily prepared in the factory itself. Each bottle is filled with the 120 gm of the compound and sealed with black mud paste. After seal is dried, three such sets are kept amidst pebbles 1 cm. size in an earthen plate. This set is arranged on hearth and severe heat is given with firewood for 2 hours, to process the whole quantity of the compound it required 225 glass bottles which are kept on 75 hearths. After intense heating for 2 hours, the sets are left for cooling down. After almost 24 hours when the set is cool down by itself, the bottles are carefully taken out the external mud cover is scraped with great care, the bottle is broken and the Rasakarpura formed as a glittering white layer is collected and preserved. The Rasakarpura appears like camphor flakes.

Vinay T. C et al[13] was prepared Rasakarpura by using Rasa Tarangini reference. In analytical part of this study, XRD reveals presence of HgCl₂ as main constituents along with other trace elements like Ca, Na, Pb, Ar, Zn,Mg, Fe. LD50 value was found to be 55 mg/kg with a confidence limit of 35.02 to 155 mg/kg.

DISCUSSION

Today a problem has arises before the present scholar that what is the scientific identity to be placed before the scientific world for the chemical composition of Rasakarpura, because the physical properties of Rasakarpura are seem to be somewhat identical with mercuric chloride, mercurous chloride or even combination of the both. There is difference opinion in the chemical identity of Rasakarpura as available in Rasashastra book.

Vaidya Vasudeva Mulashankar Dwivedi[14], Pandit Girija Dayalu Sukla[15], Dr Siddhinandana Mishra[16], Pandit Visvanath Dwivedi[17] are the authorities who have quoted Rasakarpura as mercuric chloride.

Vamana Ganesh Desai[18], Nadakarni[19], Dr Prabhakar Chatarji[20] are the name of the authors who opine Rasakarpura as mercurous chloride or calomel.

Dr Himasagar Chandra Murti[21] and Shri Hari Prapannajji[22] opine corrosive sublimate as savvira or dachikana. Swami Hari Sharanananda also claimed Dalchikana as the product of mercury with double part of sulphuric acid.[23]

By the above all references we can say that the authors differ in their opinion regarding Rasakarpura.

Amongst the 53 references so far we have collected, only 3 references have indicated the use of Gandhakamla in the preparation of Rasakarpura. The proportion of Parada and Gandhakamla in references of Rasa Tarangini[24], Rasa Yog Sagar[25] and Siddha Prayog Sangrah[26] is found 1:1.5, 1:1 and 1:0.6 respectively.

As we can see, mercuric chloride is called per chloride of mercury or Hydragirum per chloride or corrosive sublimate and its formula is HgCl₂. Mercurous chloride is called sub chloride of mercury or calomel and its formula is HgCl or Hg₂Cl₂.

Mercuric chloride and mercurous chloride differs their formula, chemical reaction as well as action. Mercuric chloride is completely soluble in water and mercurous chloride is insoluble in water. Mercuric chloride is anti septic and antibacterial whereas mercurous chloride is laxative.

According to modern chemistry mercuric chloride can be prepared by heating mercury with excess of concentrated sulphuric acid and then subliming the product with salt.[27]

The process of chemical reaction can be shown in the following equation.

$$\text{Hg} + 2\text{H}_2\text{SO}_4 \rightarrow \text{HgSO}_4 + 2\text{H}_2\text{O} + \text{SO}_2$$

$$2\text{HgSO}_4 + 2\text{NaCl} \rightarrow \text{HgCl}_2 + 2\text{Na}_2\text{SO}_4$$

Mercuric chloride can be prepared by heating excess quantity of mercury with less volume of concentrated sulphuric acid and then sublimating the product with salt.

Mercurous chloride can also be prepared by grinding mercuric sulphate thoroughly with common salt and metallic mercury and sublimating the whole mass.[28]

$$2\text{HgSO}_4 + 2\text{NaCl} + \text{Hg} \rightarrow 2\text{HgCl}_2 + 2\text{Na}_2\text{SO}_4$$

By the above equations it is evident that the total proportions of mercury and sulphates will determine the product as mercurous and mercuric chloride.
It has been observed in other references of the preparation of Rasakarpura that in its ingredients, sulphate form like Sphatika $[K_2SO_4\cdot Al_2(SO_4)3H_2O]$, Kasisa ($FeSO_4\cdot 7H_2O$), Tuttha ($CuSO_4\cdot 7H_2O$) etc are used. It is known that the compound like ferrous sulphate release sulphuric acid when heated. $2FeSO_4\cdot 7H_2O \rightarrow Fe_2O_3 + H_2SO_4 + SO_2 + 6H_2O$

In almost all references either Sphatika or Kasisa are taken in 1 part or even less than that of mercury. So we can very well grasp the idea behind this proportion that excess of metallic mercury is made to react with less quantity of sulphuric acid leading to mercuric chloride or calomel.

This is supported by experiments, in which Kasisa or Sphatika are used, have led to mercuric chloride. Similarly the practical done according to Rasa Tarangini by using concentrated sulphur acid with the one and half proportion of mercury has given out mercuric chloride.

In Andhra Pradesh it is considered to be a common remedy for Arthritis, Shwasa, Kasa and Sootikopadravas (post-partum complications). In Kondapalli near Vijayawada, Rasakarpura is being prepared in large scales by many families and supplied throughout Andhra Pradesh and exported all over India. They also follow formula and ingredients mentioned in Rasa Tarangini with slight modification in the proportion of the ingredients and techniques. A good quality and high yield is obtained by this technique, so all south Indian ayurvedic pharmacies using this type of manufacturing for Rasakarpura. Even today some families totally thrive on the traditional manufacturing of Rasakarpura. This method was used and analysed by Niak M.S. in his thesis.

Rao P. G. et al, Mehta N. J. et al-MD thesis, Suvarna et al, Shetti Shraddha et al, Reddy Sekhar et al, Mehta N. J. et al-PhD thesis, Vinay T. C. et al analysed that Rasakarpura prepared by Rasa Tarangini method is mercuric chloride. In these works also analysed that Rasakarpura prepared by other method than Rasa Tarangini is mercurous chloride and in some methods it is found mixture of mercuric and mercurous chloride.

Sarode Sandeep et al and Mehta N. J. et al also concluded that Rasakarpura preparation method of Rasa Tarangini is easier and convenient.

Mehta N. J. et al, Shetti Shraddha et al and Vinay T. C. et al conclude that in Rasakarpura there are also some other elements as trace elements.

By the above facts it is clear now that the preparation according to the reference of Rasa Tarangini will lead to mercuric chloride which is in fact Dalchikana or Savvira as claimed by Swami Hari Sananandaji. The preparation done without concentrated by using other sulphate materials lead to mercurous chloride which is the Rasakarpura before the period of Rasa Tarangini.

So it is important to select reference for preparation of Rasakarpura according to the use of Rasakarpura.

CONCLUSION:
Rasakarpura is chloride salts of mercury along with trace elements. If proportion of Gandhaka (direct or indirect) is less than Parada than there may be chance to find mixture of mercuric and mercurous chloride, while the proportion of Gandhaka is more than Parada than there may be found mainly mercuric chloride in final product.

REFERENCE
9. Shetti Shraddha et al, A pharmaceutical chemical study of Bhutaghna chakra and the evaluation of its antimicrobial activity when administrated in the form of Rasakarpura Drava. MD Dissertation, year - 2010, Munjyal institute of Ayurved medical science, RGIHS, Manipal.
18. Vaman Ganesh Desai, Bharatiya Rasashastra, p.222
20. Prabhakar Chatterji, Rasachikitsa, Chaukhamba vidya bhavan, 1956, p.27
22. Hari Prapannaji, Rasa Yoga Sagar, Krishna Das Acadmey, Varanasi, part 2, p.621
23. Swami Hari Sharanananda, Bhasma Vignan, part 2, p.621

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