

REVIEW ARTICLE

Review on Rasasindura - A Mercurial preparation of Indian System of Medicine**Rohit A Gokarn*, Biswajyoti Patgiri, Galib, P K Prajapati***Department of Rasashastra and Bhaishajya Kalpana, IPGT & RA, Gujarat Ayurved University, Jamnagar, Gujarat, India*

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ABSTRACT

Conceptual basis of science enables one to study, analyse and explore the different facets of drug development. *Rasasindura*(RS) is a well known drug for its wide range of utilization in therapeutics with different *anupanas*.

Collected and analysed various references of RS and to analyse phases of drug development.

Twenty two classics starting from *Rasahridayatantra* (10th AD) to *Rasatarangini* (20th AD) were reviewed for relevant references of RS. Various research works conducted in different institutions and published articles were also searched and included to review updated knowledge regarding the drug.

The screening revealed that, scholars of *Rasashastra* belonging to 10th to 12th Century AD were well versed in *Gandhaka jarana* and related procedures. 39 different RS procedure were found in different text with varying proportion of *Parada* and *Gandhaka* (1:1/4 to 1:6), different *Bhavana dravya*, mode of preparation and time duration were observed.

Proportion of *Gandhaka* and duration of preparation of RS varies in different texts. The duration from 12 hours to 7 days is advocated during the process according to the amount of *Gandhaka*. Newer manufacturing techniques and characterization of RS have been explored in recent researches. Toxicity studies proved the drug to be safer in therapeutic dosage form.

Key words: *Ayurveda, Kupipakwa rasayana, Rasasindura, Parada Bhasma.***INTRODUCTION**

Rasashastra an ancient science of pharmaceutics has discovered many formulations with quicker action in smaller doses and longer stability period^[1,2]. *Kupipakwa rasayana* (a kind of metallic preparations) is one among *Parada murchana* (inducing disease curing properties). *Rasasindura* (RS), a kind of *Kupipakwa rasayana*, where *Kajjali* (black lustreless powder) is prepared by levigating Mercury and Sulfur with prescribed herbal juices, and then subjected for processing in furnace for prescribed time duration. According to the proportion of sulfur used in the process RS, there are different references available in classics i.e. *chaturamsha*^[3] (1/4 part) to *Shadguna Bali jarita* (6 parts) RS^[4]. It has been claimed in the text that mercury treated with the process of *Gandhaka Jarana*, becomes highly potentiated i.e. it acquires many pharmaco-therapeutic properties^[5]. Amount of *Gandhaka jarana* and *agni* are also

responsible for enhancing therapeutic properties of Mercurials^[6].

Around 39 references of RS are mentioned in classics of *Rasashastra*. Studying such literary work enables one to acquire detailed knowledge of the formulation and choose the best possible for pharmaceutical processing and standardization. Various researches conducted on RS were reviewed for better understanding and up gradation of concepts regarding the drug.

METHODS

Twenty two classics starting from *Rasahridayatantra* (10th AD) to *Rasatarangini* (20th AD) were reviewed for relevant references of *Rasasindura* (RS), *Rasabhasma* and *Gandhaka Jarana* etc. In addition, few recent researches on RS have also been reviewed to provide updates on the formulation.

10th Century AD

1. A formulation similar to RS prepared in *Loha Samputa* (*Parada Bhasma*) has been mentioned for the first time in *Rasahridayatantra* of 10th AD [7]. *Valuka Yantra* is mentioned for the first time in this text [8].

12th Century AD

1. *Rasarnava*, a text of 12th AD, mentions different types of 'Gandhaka Jarana' [9,10] and processes of *Parada Marana* [11]. *Rakta varna Parada Bhasma* consisting of *Parada*, *Gandhaka* and *Makshika Satva* is mentioned in this later text, but, the term RS or its method of preparation are not found in this text.
2. Another text of the same period, *Rasendra Chudamani* has mentioned about *Kajjali*, [12] *Pisti* of *Gandhaka* and *Parada* [13] and *Valuka Yantra* [14]. But, information on RS is not available.

13th Century AD

1. Thirty one procedures of *Parada marana* methods have been mentioned in *Ananda Kanda* of 13th AD. Out of these, only two procedures involve with *Kachakupi* and *Valuka Yantra* [15,16]. Product with *Sindura* or *Rakta Varna* is mentioned thrice, though they are prepared with the help of *Yantras*, other than *Valuka yantra* [17-19].
2. *Rasa Prakasha Sudhakara*, another text of the same period mentioned three preparations with different names and similar colours and manufacturing procedure of RS viz. *Udayabhaskara Rasa* [20] and *Rasa Bhasma* [21,22].
3. *Rasayana Khanda* of *Rasa Ratnakara* from the same period elaborates eleven methods of *Parada Bhasma*. In this text a type of *Rakta Varna* (red colour) *Parada Bhasma* preparation has also been mentioned [23]. But as it contains *Makshika Satva* it is not considered as RS.
4. *Rasa Ratna Samucchaya* of the same period describes on *Valuka Yantra* and *Kachakupi* [24], but information on RS is missing. Eight *Parada Bhasma* methods of unspecified colour are described. The composition of one formulation is found to be similar to RS, [25] which has been described as RS by the commentators [26].
5. One reference of RS in the context of *Parada murchana* has been mentioned by author [27].

15th Century AD

1. *Rasa Chintamani* explained nineteen methods of *Rasa Bhasma*, out of which three formulations resembling RS [28-30]. One formulation (*Kamadevarasa*) has been mentioned in the context of therapeutics that is similar to RS [31].
2. *Rasa Sanketa Kalika* mentions a few preparations resembling RS with different names like two types of *Haragauri Rasa*, [32,33] and *Kamadevarasa* [34] etc.
3. *Rasendra Chintamani* emphasized on 'Gandhaka Jarana' and its importance. The term *Rasa Sindura* has been mentioned for the first time in this text, there are two reference of *Sindura Pakas* [35,36].

16th Century AD

1. One reference of *Rasa Sinudra* has been described in *Bhava Prakasha* [37].
2. Three preparations of *Rasa sindura* have been mentioned in *Rasendra Sara Sangraha* [38].
3. One preparation of *Rasa sindura* with the name of "Nayanananda Sindura" [39] is available in *Rasa Kaumudi*.
4. One reference is available in *Rasa Kamadhenu* (*Haragauri rasa*), which is the same version as available in *Rasa Sanketa Kalika* of 15th Century AD

17th Century AD

1. Four references of RS are available in *Ayurveda Prakasha* [40-43]. Need of *Tapta shalaka* in clearing the blocked mouth of *Kachakupi* is emphasized in this text [44].

18th Century AD

1. Many preparations of RS [45] have been mentioned in *Yoga Ratnakara*, most of them are the compilations from the earlier classics.

20th Century AD

1. *Rasendra purana* of 1916 mentions three methods of RS with varying proportions of Sulfur (*Samaguna*, *Dviguna* and *Shadguna*) [46-48].
2. *Rasa Yoga Sagara* (1927-1930) a comprehensive compilation of *Rasa yogas* mention ten preparations of RS [49]. Author has not contributed anything special to his credit expect compilation.
3. *Kupipakva Rasa Nirmana Vignana* (1950), another compilatory text, mentions five types of RS [50].
4. *Bhasma Vignana* (1950) mentions 54 preparations under the heading of *Parada Bhasma*, out of these 17 preparations resembles RS.

5. *Rasa Tarangini* refers seven preparations of *Gandhaka Jarita RS* [51-57]. Various proportions of mercury and sulfur (starting from 1:1/2 to 1:6 i.e. from *Ardhaguna* to *Shadguna Gandhaka*) have been prescribed to attain different therapeutic attributes.

All the above references have been reviewed (Table 1) and observed that Sulfur different proportions are the integral part in RS. Based on these varying proportions, the formulations are categorized in (Table 2). The duration of heat to be applied to RS also found to be varying. (Table 3) shows the variations on the same. Properties of RS according the amount of sulfur used also elaborated in classics [58-62] (Table 4). Dose of RS has been mentioned as per age [63,64] (Table 5).

RS is *shadrassa yukta, ushana* in *veerya, madhura* in *vipaka* and has got *guru, snigdha, vajeekara* and *Sarvarogahara* properties [65]. RS is advocated to be administered along with specified *Anupanas* [66]. A brief on the same in (Table 6).

Thesis works & Published articles: In recent past, 24 works have been taken-up by the scholars of *Rasashastra* till 2005. Pharmaceutical

standardization, Analytical profiles, evaluating safety and toxicity data, and clinical efficacies in *Tamaka Shwasa, Vrana, Shwitra, Kshudra Kushta, Hypertension, Male sexual problems* were attempted in these studies [67].

Published research articles on RS:

RS can be prepared in 12 hours by adopting a pattern of three hours each of mild, moderate and six hours of intense temperature in both traditional and conventional methods. Conventional methods have added advantages like better maintenance of temperature, saving of energy, cost effectiveness, less human effort etc [68]. RS has reported to be Mercury sulfide (crystals ranging from 25-50nm) associated with several organic macro molecules and trace elements in different amounts [69]. Toxicity studies with *Samaguna* and *Shadguna* RS prepared with *Astasamsakarita* and *Samanya Shodhita Parada* reported no significant degenerative changes. Samples with *Astasamsakarita Parada* proved to be less toxic than the other samples [70]. RS feeding to *Drosophila melanogaster* did not show any heavy metal toxicity [71].

Table 1: Collected references of RS

S.No	Name	Reference	Composition	Bhavana Dravya	Duration & Type of Paka	Colour	Remarks
1	Parada Bhasma	RHT 14/2-6	P-1, G-1/4	Niyamaka Gana	Tivragni	Raktabha	Putapaka
2	Udaya Bhaskara Rasa	RPS 3/10-11	P-1, G-1	Nimbu Swarasa	Tikshnagni, 3days	Kamala Varna	Kutipaka
3	Rasa Bhasma	RPS 3/15-18	P-1, G-1	-	Tushgni, 12 yama	Rakta varna	Talastha
4	Rasa Manikya	RPS 3/19-22	P-4, G-4, Na-1	Kumari Swarasa	2days	Kamala Varna	Karmavipakaja Roganashaka
5	Rasasindura	RRS / Preparation added by Dr. Kulkarni	P-1, G-1	Nyagrodha ankura Swarasa	Mandagni, 4 yama	Tarunaditya Sannibha	Commentry on Parada Bhasma Prakarana
6	Parada Murchana	RP 43	P- 5, G-1.25, N-1/10, S-1/5	-	4days	Sindura tulya	
7	Parada Murchana	RP 43	P- 5, G-5, N-1/10, S-1/5	-	4days	Sindura tulya	
8	Parada Murchana	RP 43	P- 5, G-2.5, N-1/10, S-1/5	-	4days	Sindura tulya	
9	Rasa Bhasma	Ra.Chi1/5-11	P-1, G-1	-	12hrs	Padmaraga	Repeat process for 7 times
10	Rasa Bhasma	Ra.Chi 1/85-92	P-1, G-1, N-1	Nagarjuni Swarasa, Kakamachi Swarasa	8prahara	Balarka Sannibha	
11	Rasa Parpatika	Ra.Chi 1/93-95	P-1, G-1, N-1	-	8prahara	Raktaparpatika Samam	
12	Kamadeva Rasa	Ra.Chi 7/88-96	P-1, G-2	Bhahupali swarasa	Mandagni, 4prahara	Daradena Samam	Cork with Tankana
13	Haragouri Rasa-1	RSK 4/90-92	P-3, G-1, N-1/10	Unmatta swarasa	Kramagni, 12 yama		
14	Haragouri Rasa-2	RSK 4/93	P-1, G-1	Sarpakshi swarasa	Kramagni, 12 prahara		
15	Madana Kamadeva Rasa	RSK 4/99	P-1, G-1	Karpasa Rasa	Kramgni, 12prahara		
16	Sindura Paka	R.Chi 2/13	P-1, G-1	-	Kramagni	Sindura dyuti	-
17	Rasa Sindura	R.Chi 2/14	H-1, G-1	-	Kramagni	-	-
18	Sindura Rasa	BP 7/191-95	P-1, G-1/2	-	Kramagni, 8prahara	Darada Samam	-
19	Sindura Rasa	BP 7/191-95	P-1, G-1/4	-	Kramagni, 8prahara	Darada Samam	-
20	Rasa Sindura	RSS 1/66-68	P-10, G-30, Na-1	-	Kramagni, 3days	Bandhuka Pushpa Varna	Antardhuma
21	Rasa Sindura	RSS 1/69-71	P-1, G-1	Vatankura swarasa	Mandagni, 4prahara	Tarunaditya Varna	
22	RasaSindura	RSS 1/72-76	P-1, G-1, N-1, GD-1	Nimbu swarasa	Kramagni, 12 prahara	-	-
23	Nayananda Sindura	RK 3/36-37	P-1, G-1	Mulika swarasa, Rakta mandala Dhattura swarasa	Mandagni, 12hrs	-	-
24	Rasa Sindura	AP 1/397	P-20, G-20, N-1/40, S-1/20	-	Kramagni, 3days	Arunabha	

25	Rasaraja Rasa Sindura	AP 1/398	P-1, G-1, N-1/4	-	Kramagni, 12 prahara	Kumkum Pinjaram	
26	Rasa Sindura	AP 1/401-403	P-3tola, G-3tola, N-1masha		Kramagni, 3days	-	
27	Rasa Sindura	AP 1/426-427	P-1, G-1/2		Kramagni, 4prahara	Sindura sadrasa	
28	Rasa Sindura	AP 1/426-427	P-1, G-1/4		Kramagni, 4prahara	Sindura sadrasa	
29	Rasa Sindura	YR 155/1-8	P-2, G-2, N-1/4	Nimbu swarasa	Kramagni, 8prahara	Sindura sadrasa	
30	Rasa Sindura	RaPu 3/157	P-5pala, G-5pala, N-8masha, S-1tola		Kramagni, 3days	Vahnibhi Rudravat Arunam	
31	Haragauri Rasa	RaPu 3/158-162	P-1, G-2	-	Kramagni, 27prahara	Hamsapada	
32	Shadguna Rasa Sindura	RaPu 163-168	H.P-1, G-6	-	Kramagni, 7days	Sindura colour	
33	Rasa Sindura	RT 6/168-176	P-1, G-1	3 Bhavanas each of Vatankura, Musali and Semala swarasa	Kramagni	Rakta Kamala Sadrusha	
34	Talastha Rasa Sindura	RT 6/177-182	P-1, G-1	-	Vanyopala agni	Shona Varna	Putra given in Adhasikata yantra
35	Ardha Gandhaka Jarita Rasa Sindura	RT 6/183-184	P-8, G-4, N-2	Lungamla swarasa	Kramagni	Hingulabha	
36	Samana Gandhaka Jarita Rasa Sindura	RT 6/185	P-1, G-1, N-1/4	Nimbu swarasa	Kramagni	Rakta varna	
37	Dwiguna Gandhaka Jarita Rasa Sindura	RT 6/186	P-1, G-2	Raktakarpara pushpa swarasa	Kramagni, 1day	Rakta Kamalavat	
38	Triguna Gandhaka Jarita Rasa Sindura	RT 6/187-188	P-1, G-3	-	Kramagni, 1day	Rakta Kamalavat	
39	Shadguna Gandhaka Jarita Rasa Sindura	RT 6/189	P-1, G-6	Kumari swarasa	Kramagni, 7days	Sindura varna	

P-Parada, G-Gandhaka, Na-Naga, N- Navasadara, GD- Grahadhuma, RHT-Rasa Hridaya Tantra, RPS-Rasa Prakasha Sudhakara, RRS-Rasa Ratna Samucchaya, RP-Rasa Paddhati, RaChi- Rasa Chintamani, RSK-Rasasanketalika, RChi- Rasendra Chintamani, BP-Bhavaprakasha, RSS-Rasendra Sara Sangraha, RK-Rasa Kamadhenu, AP-Ayurved Prakash, YR- Yoga Ratmakara, RaPu- Resendra Purana, RT- Rasa Tarangini.

Table 2: Variable proportions of Sulfur in RS

Hg:S	1:1/4	1:1/3	1:1/2	1:1	1:2	1:3	1:6	Total
No of references	04	01	04	23	03	02	02	39

RS- Rasasindura

Table 3: Duration of Heat

Duration of heat (hrs)	12	24	36	48	72	81	96	168	Not mentioned
No. of references	7	7	6	1	5	1	3	2	7

Table 4: Properties of RS according to the amount of Gandhaka

Proportion of sulfur	Ra. Chi & AP	YR & AP	RT
Samaguna	Suddhata sata gunorasahah	Rogaghna	Samanya gadanashanah
Dviguna	Sarvakushtahara	Rajayakshmajita	Maharogahara
Triguna	Sarva jadyata vinasanah	Kaminidarpa Nashanah	Pusatva Prakashnah
Chaturguna	Valipalita Nashanah	Tejasvi sarvasatrartha, Vishada	Mahotsaha, Medha-Smriti Vivardhana
Panchaguna	Kshaya nashanah	Sidha Bhavata	Gada Santapa Nashanah
Shadguna	Sarvarogahara	Mrityujit	Adbhuta Kriya krita

Table 5: Dose of RS

Age	Dose
1 year	1/16 Rati
2 years	1/7 Rati
6 years	1/3 Rati
12 years	1/2 Rati
>12 years	1 Rati
	1-3 Rati

Table 6: Therapeutic uses and Anupana (Adjuvants)

S. No	Diseases	Anupana
1	Ajirna	Madhu & Musta Kwatha
2	Amavata	Guduchi, Shatavari, Pippali, Haritaki, Vacha and Shunthi Kwatha
3	Apasmara	Vacha Churna or Brahmi, Vacha, Shankha pushpi, Ela Kwatha
4	Arsha	Haritaki Kwatha
5	Aruchi	Matulunga Swarasa
6	Bhagandara	Triphala & Vidanga Kwatha
7	Dhatukshaya	Abhraka Bhasma or Swarna Bhasma
8	Garbhashaya Roga	Kakoli Churna & Narikela Taila
9	Gulma	Ajmoda Churna & Vida Lavana
10	Jirna Jwara	Guduchi, Parpataka Kwatha & Dhanyaka
11	Jwara	Jiraka, Pippali & Dhanyaka Kwatha
12	Kamla	Dariharidra Kwatha
13	Kaphaja Roga	Chitraka Moola, Sunthi, Maricha & Pippali
14	Kasa	Vasa Swarasa, Pippali & Madhu
15	Madatyaya	Hingu, Ajamoda, Shunthi, Dhanyaka and Souvarchala
16	Murccha	Pippali Churna & Madhu
17	Mutrakriccha	Sitopala, Sukshmeta & Shilajatu equal with Dugdha
18	Nava Jwara	Tulasi, Ardraka Swarasa, Tambula Rasa
19	Pandu	Loha Bhasma
20	Parinama shoola	Yavakshara and Tankana

21	Pradara	Ashoka & Bala Kwatha
22	Prameha	Guduchi & Hridra Swarasa
23	Prameha (Atikalaja)	Vanga bhasma & Madhu
24	Pittaja Roga	Ela, Mishri & Karpur
25	Rajyakshma	Ghrita
26	Raktapitta	Draksha & Sita
27	Sannipatika Jwara	Nirgundi Swarasa
28	Shirashoola	Dashamoola Kwatha
29	Shotha	Punarnava Kwatha
30	Swasa	Vibhitaka & Vasa Swarasa
31	Swapna Meha	Jatiphala, Lavanga, Karpura, Ahiphena churna with Sitodaka
32	Ummada	Kushmanda Swarasa
33	Udara Shoola	Triphala Kwatha
34	Vajikarana	Shalmali moola, Mushli Churna, Vidarigana and Dugdha
35	Vamana	Brihat Ela Kwatha or Madhu
36	Varna	Brahati, Neeru, Guduchi and Sunthi Kwatha
37	Visphota	Chaturjata Churna and Guduchi, Nimba, Khadira, Indrayava Kwatha

DISCUSSION

The screening revealed that, scholars of *Rasashastra* belonging to 10th to 12th Century AD were well versed in *Gandhaka jarana* and related procedures. A preparation resembling RS prepared through *Loha samputa* has been mentioned for the first time in *Rasahriday Tantra* of 10th Century AD. Information on *Valuka yantra* has also been available in this text. The author goes on emphasizing the duration of *agni*, which needs to be given till red hot appearance of *Samputa*. *Kachakupi* has been referred for the first time in *Anandakanda*. Though, the author has the knowledge of *Kachakupi* and *Valuka yantra*, they were not utilized in the preparation of *Parada bhasma*. Appropriate use of these *Yantras* was adapted in *Rasa prakasha shudhakara* of 13th Century AD, who frequently used them in the preparation of *Udaya bhaskara rasa*.

Historically, RS word was first appeared by the same name in *Rasendra Chintamani* (15th Century A.D.) which contained mercury and sulfur prepared through *Kupipakva* method.

The preparations resembling to RS are mentioned in different texts with different names, such as *Udaya Bhaskara Rasa* [20], *Kamdev Rasa* [31], *Haragauri Rasa* [32,33], *Madan Kamdev Rasa* [34], *Sindura Paka* [35,36] and *Nayananda Sindura* [39].

All these formulations contain *Parada* and *Gandhaka* as major components besides the others and prepared in *Kachakupi* by heating through *Valuka Yantra* method.

Thus, the idea of making a deep red coloured preparation with *Parada* and *Gandhaka* has probably been started from 10th century A.D. However, scholars succeeded in preparing RS through *Kupipaka* having vermilion colour only in 13th century A.D. *Rasa kama dhenu* opines *kupi* can be made-up of *Kacha* (glass), *Mrittika* (clay), *Hema* (gold), *Loha* (iron) and *Raupya* (silver). Later texts like *Bhava Prakasha*, *Rasendra Sara Sangraha* emphasises the importance of wrapping mud smeared cloth to *kupi* to increase its stability.

Ayurveda Prakasha emphasized the need of *Tapta shalaka* (Hot iron rod) in clearing the blocked mouth of *Kachakupi*. The concept of *Samaguna* to *Shadguna Balijarita* RS is elaborately mentioned in *Rasatarangini*.

Later, the scholars of *Rasasastra* have studied *Kupipakva* extensively and based on the experiences the *kramagni paka* has been categorized into three stages viz. *Mridu*, *Madhyama* and *Tivra agni*. The temperature ranges are as follows *Mridu Agni* - Temp. 30 to 250°C, *Madhyama Agni* - 250 to 450°C, *Tivra Agni* - 450 to 650°C [72].

CONCLUSION

The critical literary review reveals that primitive forms of *Kupipakva Rasayana* came into light during 10th Century onwards. Differences of opinions exist regarding the proportion of *Gandhaka* and duration of preparation of *Rasasindura*. The duration varies from 12 hours to 7 days. Pharmaceutical and analytical advancements have contributed to the newer manufacturing techniques and characterization of *Rasasindura*. Toxicity studies proved the drug to be safer in therapeutic dosage form.

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