



CRITICAL REVIEW ON *RASAMANIKYA*: AN *AYURVEDIC* MINERAL BASED FORMULATION

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ABSTRACT

Rasamanikya is a mineral formulation mentioned in the chapter on *Shwitraroga* (Vitiligo) in *Rasendrasara Sangraha*, a classical Ayurveda text. Another classical text, *Rasatangini*, has also stressed upon the efficacy of *Rasamanikya* in *Kushtharoga* (skin disorders). However, the fact that *Rasamanikya* is prepared from *Hartala*, ie. Orpiment (an arsenic sulfide mineral), is fear evoking among some medical practitioners and thus a probable cause for its marginal use in therapeutics. The present review explores *Rasamanikya* from all the aspects. To start with, the present review first provides an insight into the pharmaceutical and analytical aspect of *Rasamanikya*. Thereafter, the pre-clinical studies that include the in-vitro antimicrobial activity study and the in-vivo toxicity studies conducted on *Rasamanikya* have been discussed. And lastly, the clinical aspects of *Rasamanikya* have also been enlightened in this review. The classical and authoritative *Ayurvedic Rasashastra* literature, the scientific research papers and the relevant information on the internet have been used in this review. The present review also provides clues for further scientific studies on *Rasamanikya*.

KEYWORDS: *Ayurveda, Rasamanikya, Anti-microbial effect, Toxicity study, Skin disorders*



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INTRODUCTION

Rasashastra is a branch of Ayurveda that deals with the pharmaceutical aspects and the clinical applications of *rasaushadhi* (mineral and herbo-mineral formulations). By and large, the raw constituents used in *rasaushadhi* preparation are toxic in nature. The knowledge and the skill required to transform these toxic substances into potent, efficacious and safe therapeutic drugs has been mentioned in the classical and authoritative *Ayurvedic Rasashastra* literature. The present review focuses on a *rasaushadhi* named *Rasamanikya*. *Rasamanikya* has been first described in the classical text *Rasendra Chintamani* by *Dhundukanatha* in 13th century A.D. as "*Rasam Manikya Prapbham*". The same product had been described in *Siddha Bhaishajya Manimala* (another classical text) as *Kumuda Rasa*.

PHARMACEUTICAL ASPECT

Rasamanikya is prepared from *Hartala* (orpiment). Orpiment is a deep orange-yellow colored arsenic sulfide mineral with formula As_2S_3 . It is found in volcanic fumaroles, low temperature hydrothermal veins, and hot springs.² It is mentioned in *Rasatarangini* that, the *hartala* to be taken for the pharmaceutical preparations should be Yellowish-red in colour with a hue of gold, shiny, heavy and should disintegrate into small and flat chip-like pieces (*tanupatrachitam*) upon pounding.³ For the preparation of *Rasamanikya*, different classical and adopted pharmaceutical procedures have been described in *Rasashastra* literature. As per a study by Sushant Sud et al/ IJRAP 2011, 1651-1654, three pharmaceutical procedures of *Rasamanikya* have been discussed in this review.⁹

HARTALA SHODHANA

In *Rasashastra*, the metallic and mineral crude ingredients of any given formulation are to be processed by the respective method of *shodhana* given for those particular ingredients stated in the classical texts, before using them in the pharmaceutical preparation. The *sanskrita* word '*shodhana*' can be translated as 'purifying, cleansing'.⁴ However, in Ayurveda pharmaceuticals, '*shodhana*' can mean more than mere purification, but discussing the entire concept of *shodhana* is beyond the scope of this review. It can however be summarized that '*shodhana*' is the primary stage in the preparation of *Ayurvedic rasaushadhis*. Thus, before starting the preparation of *Rasamanikya*, *shodhana* of *Hartala* is to be done. One of the methods of the process of *shodhana* of *hartala* is by *swedana* in *kushmanda swarasa* (juice of fresh fruit of *Benincasa hispida*), ie. Enclosing the coarse powder of crude *hartala* in a cotton cloth pouch and suspending that pouch in a vessel containing *kushmanda swarasa* and heating it over flame for 3 hours, ensuring that the pouch stays dipped in the juice at all times and also does not touch the base of the heating vessel during the entire heating procedure. More juice can be added as required during the procedure as and when required. After this, again the same procedure is repeated on the above treated *hartala* except the media to be used during the second time is *choornodaka* (limewater)

instead of *kushmanda swarasa*. Then the treated *hartala* is washed with potable water and dried.⁵ The product obtained at the end of the above procedure is called '*Shuddha Hartala*' and is to be used in the preparation of *Rasamanikya* by different methods of which the commonest three methods have been discussed in the present review

METHOD OF PREPARING RASAMANIKYA BY CLASSICAL ABHRAKA PATRA METHOD (RM I)

This method of preparation is given in the classical text named *Rasatarangini*. For preparing *Rasamanikya* by this method, *shuddha* coarsely powdered *Hartala* weighing 2 *masha* (1440 mg) is taken and is enclosed between two thin *Shweta Abhraka patra* (transparent sheets of mica) and heated by keeping them over direct flame (gas stove/ charcoal fire) till the contents turn *manikyavarni* (ruby-like red in colour). After self-cooling to room temperature, the contents between the *Abhraka patra* (*Rasamanikya*) are collected, powdered and stored.⁶

METHOD OF PREPARING RASAMANIKYA BY CLASSICAL (MODIFIED) SHARAVA SAMPUTA METHOD (RM II)

This method of preparation is given in the classical text named *Rasendra chintamani*. For preparing *Rasamanikya* by this method, *shuddha* powdered *Hartala* is taken in a *sharava* (an earthen saucer). Another *sharava* of same size is taken and a hole of about 1 cm diameter is drilled at its centre and is placed upside down over the previous *sharava* such that the outer edges of the two *sharava* coincide with each other and the two *sharava* are secured together and sealed by multiple layers of mud smeared cloth. This apparatus is then subjected to heat by keeping over direct flame till the surface of the lower *sharava* turns *Arunavarni* (red). At this stage the flame is stopped and the apparatus is kept untouched and allowed to self-cool up to room temperature. The seal is then scraped off and the *Rasamanikya* prepared inside is collected, powdered and stored.⁷

INSTITUTE FOR POSTGRADUATE TEACHING & RESEARCH IN AYURVEDA (I.P.G.T & R.A), JAMNAGAR DEVELOPED METHOD (RM III)

The filament of a fused electric glass bulb is removed by carefully breaking away the narrow part of the bulb such that a round bottom flask-like apparatus is obtained. *Shuddha hartala* is taken in this bulb and is held over flame and heated till the contents inside it turn *manikyavarni* (ruby-like red). At this stage, the flame is removed and the apparatus is allowed to cool down to room temperature. This ruby-like red substance is *Rasamanikya*. It is obtained by carefully breaking the apparatus. It is collected, powdered and stored.⁸

RESULTS AND DISCUSSION OF THE PHARMACEUTICAL STUDY

Maximum yield of *Rasamanikya* was observed in the

Abhraka patra method (Table 1) and the characteristic colour (*manikya varna*) was obtained. However, only a small quantity of *Rasamanikya* can be prepared at a time, with this classical method. Also, the *Abhraka patra* (thin transparent sheets of mica) could not be re-used and they were difficult to obtain in large quantities. Less yield was obtained from *sharava samputa* method as some *Hartala* at the periphery of the lower *sharava* had remained unchanged i.e. not transformed to *Rasamanikya*. Also, the characteristic colour (*manikya*

varna) was not appreciated (Table 2) in the *Rasamanikya* prepared by this method. However, a large quantity of *Rasamanikya* can be prepared using this method. Satisfactory yield of *Rasamanikya* was obtained from the fused electric glass bulb method (Table 1) and also the characteristic *manikya varna* was appreciated but removing the coil of the used electric bulb without destroying the entire bulb was a little tedious and only a small quantity of *Rasamanikya* can be prepared at a time using this method.⁹

Table 1
Output of final product (*Rasamanikya*) obtained from different preparatory methods⁹

Sr. No.	Method	Output %
1	RM I (<i>Abhraka patra</i>)	90%
2	RM II (<i>Sharava samputa</i>)	70%
3	RM III (Fused Electric bulb)	85%

ANALYTICAL ASPEC

For this, a study by Sushant Sud et al/ IJRAP 2011, 1651-1654 was reviewed. In this study, samples of crude *hartala*, *shuddha hartala* and *Rasamanikya* prepared by the above mentioned three methods (RM I, RM II and RM III) were subjected to organoleptic (Table 2) and physicochemical analysis (Table 3). For the detection of elements in the crude *hartala*, *Rasamanikya* and the intermediate products during the pharmaceutical process, ICP-AES analysis of the samples was done. ICP-AES is a type of emission spectroscopy that uses the inductively coupled plasma to produce excited atoms and ions that emit electromagnetic radiation at wavelengths characteristic of a particular element. The intensity of this emission is indicative of the concentration of the element within the sample.¹⁰ the results of the study have been discussed below.

RESULTS OF ANALYTICAL STUDY

In the ICPAES analysis, it was found that the proportion

of the entire elements ratio varied in a minimal state in all the samples. But from the quantitative analysis of all the samples, Arsenic and Sulphur were found to be the main content of the drug (Table 4). In the XRD analysis of crude *hartala*, it was observed that it was highly crystalline (~100%) and Monoclinic system pattern showed that it was purely As_2S_3 (Arsenic trisulphide). XRD analysis of RM I showed that it was relatively amorphous in nature. A few peaks of As_2S_3 and AsS were seen. XRD analysis of RM II also showed that it was relatively amorphous in nature showing 20% crystallinity remained. Few prominent peaks of As_2S_3 were observed along with small peaks containing little quantity of AsS. XRD analysis of RM III showed that all the particles were converted to amorphous form. The graph was simply zig-zag in shape and was not having any long peaks at all. This indicated that RM III had lost the crystallinity and fully attained the amorphous form.⁹

Table 2
Organoleptic characters of *Rasamanikya* prepared by three methods⁹

Sr. No.	Organoleptic characters	RM I	RM II	RM III
1	Colour	Reddish brown	Brick red	Reddish black
2	Odour	Odourless	Faint	Odourless
3	Taste	Tasteless	Tasteless	Tasteless
4	Touch	Soft	Soft	Soft
5	Appearance	Powder form	Powder form	Powder form

Table 3
Physico-chemical parameters of *Rasamanikya*⁹

Sr. No	Organoleptic Characters	RM I	RM II	RM III
1	Total Ash (%)	0.50	1.09	0.28
2	Acid Insoluble Ash (%)	0.34	0.27	0.07
3	Water soluble Ash (%)	0.29	0.19	0.21
4	Moisture Content (%)	0.02	0.01	0.02
5	pH	6.91	6.63	7.32

Table 4
Elemental Analysis of all samples using ICP-AES⁹

Elements	Crude <i>Hartala</i> Sample (ppm)	Shuddha <i>Hartala</i> Sample (ppm)	RM I Sample (ppm)	RM II Sample (ppm)	RM III Sample (ppm)
Fe	363.6187	283.1833	362.4671	351.7045	535.2871
Mg	95.99535	95.36357	108.1555	106.592	114.1348
Si	5964.8	5891.7	6760.1	10787.5	7161.2
As	422665.1	418895.3	421724.2	404026.9	431120.4
S	309613.6	302699.2	312356.5	297732.6	3037554.5

TOXICOLOGICAL ASPECT

A toxicity study on *Rasamanikya* by Sushant Sud et al Ayu. 2013 Jul-Sep; 34(3) 309–315 was reviewed. In that study, *Rasamanikya* samples RM I, RM II and RM III prepared using three different methods (as mentioned above in the pharmaceutical review) were separately subjected to acute as well as sub-acute toxicity studies on Wister strain albino rats as per the standard operating procedures mentioned for toxicity studies.¹¹

ACUTE TOXICITY STUDY

In the above mentioned acute toxicity study, the “up and down method” or popularly known as the staircase method, for the determination of LD₅₀ was carried out with the purpose of finding out the maximum non-lethal and the minimum lethal doses by using about 10 rats. Two healthy male albino rats were taken, weighing about 200 g and kept in separate cages and were fasted overnight. The rats were administered with 1 ml of 2% G.C solution + 200 mg of sample RM 1. Both rats had sedation effect after 10 min of feeding; later on after 24 h of observation no death was recorded. The subsequent doses were increased by factor 1.5 as the dose was tolerated. The doses were given as 300 mg, 450 mg and 675 mg for 6 rats. In all the 6 rats very minimal changes were seen in their physiological activities and no death was recorded. As the given dose was tolerable, a further increase in the dose was done up to 1012.5 mg, 1518.75 mg and 2278.12 mg. In all the 6 rats, no signs of toxicity and mortality were noticed even after 24 h of observation. A highest dose of 3417.18 mg/200 g body weight of the drug was administered and again no sign of toxicity or mortality was observed in rats within 24 h. Rats were kept under observation for 1 week to observe any mortality or abnormality in their activities. Following the same procedure, the experiment was conducted for sample R.M II and sample R.M III and it was observed that till 3417.18 mg/200 g. No sign of toxicity or mortality was seen for RM II and RM III.¹¹

CONCLUSIONS OF ACUTE TOXICITY STUDY

In the acute toxicity study, no immediate and evident signs of toxicity or mortality were observed. The maximum dose administered was 3417.18 mg/200 g body weight of rats, thereafter administration was stopped. It was observed that no signs of toxicity or mortality were there in 24 h of the time period and also when the rats were kept under observation for 1 week. It therefore represented that the prepared *Rasamanikya* samples were practically non-toxic when administered for a short period of time.¹¹

SUB-ACUTE TOXICITY STUDY

In the acute toxicity study reviewed above, the MTD was not traced out. So for the sub-acute study 10 times that of the therapeutic dose was used by the researchers (Sushant Sud et al) in all the three Trial groups (RM I, RM II and RM III was orally administered to Trial group I, Trial group II and Trial group III respectively) and in the fourth group (Control group) equal numbers of rats were fed with normal food and water. The normal human adult dose is 125-250 mg. Hence the suitable dose for rats was fixed as 45 mg/200 g of body weight of rat. The drug was given for 21 days. All other rats showed a considerable increase in their weight including the control group, which might be due to the food intake. Liver function tests (LFT) were conducted on blood samples that were collected prior administration of drug and after 21 days of trial drug administration. After 21 days duration of drug schedule, from each group albino rats were anesthetized and sacrificed to obtain organs such as kidney, liver and brain. The tissues were subjected for histopathological study.¹¹

CONCLUSIONS OF SUB-ACUTE TOXICITY STUDY

Following were the conclusions drawn by the researchers from the above sub-toxicity studies. Comparing all the above three Trial Groups of *Rasamanikya*, Trial Group-I (sample RM I) and Trial Group-II (sample RM II) had a minimal histopathological changes proving its non-toxicity, whereas Trial Group-III (sample R.M-III) prepared out of Electric bulb method showed mild toxicity, but with a chance of healing and repairing. These toxic effects of mild to moderate changes in rat cells with correspondence to human cells may be considered as non-specific and reversible.¹¹

ANTIMICROBIAL ASPECT

An in-vitro antimicrobial study of *Rasamanikya* by Shalini T.V. et al / IJRAP 2011, 2 (5) 1455-1556 was reviewed. In that study, the anti-bacterial activity of *Rasamanikya* was evaluated to prove that it could act equivalent to the antibiotics used in modern medicine. The study was done on two bacteria namely- *Staphylococcus aureus* (Gram positive) and *Pseudomonas aeruginosa* (Gram negative). The activity was determined by Kirby bauer method (method I) and Gradient plate technique (method II). The results of method I showed that the zones of inhibition were observed for both *Staphylococcus aureus* and *Pseudomonas aeruginosa* at the concentration of 100 mg. The diameter was 2.5 cm for *S. aureus* and 1.6 cm for *P. aeruginosa*. In method II, the organisms used in the study, did not show growth in the region which

contained *Rasamanikya*. At the end of this study, *Staphylococcus aureus* and *Pseudomonas aeruginosa* showed positive result. The organisms did not show growth in the region which contained *Rasamanikya*. Thus the study concluded that Anti-bacterial activity of *Rasamanikya* was found on *Staphylococcus aureus* (Gram positive) and *Pseudomonas aeruginosa* (Gram negative) and it could be effectively used as an antibiotic in infections caused by that bacteriae.¹²

CLINICAL ASPECT

In the present review, the clinical aspects of *Rasamanikya* has been discussed under two headings

- According to Classical and authoritative Ayurveda literature.
- As per the Published research articles.

ACCORDING TO CLASSICAL AND AUTHORITY AYURVEDA LITERATURE

According to the classical *Ayurvedic Rasashastra* texts, *Rasatarngini* and *Rasendrasara Sangraha*, the therapeutic dose of *Rasamanikya* is 2 *ratti* (240 mg).^{13,14} Its indications as per the above mentioned text are *Vatarakta* (an inflammatory arthritis that is correlated with gout), *Kushtha* (skin-disorders), *Firanga* (considered analogous with syphilis), *Upadansha* (gonorrhoea), *Nadivrana* (Sinus Tracts), *Bhagandara* (Fistula), *Dushtavrana* (Chronic wounds/ non-healing ulcers).^{13,14} According to Ayurveda concepts, *Rasamanikya* is primarily a *vata-kaphahara* and *rasa-raktadhatugami kalpa*. *Rasamanikya* is mainly useful where *kledajanya* or more particularly *kothajanya samprapti* is present. This formulation is also useful in *vata-shleshmajwara*, *vishamajwara*, *shwasa*, *kasa* (cough) and *pratishyaya* (common cold).¹⁵

AS PER THE PUBLISHED RESEARCH ARTICLES

A trial conducted to evaluate the efficacy of *Rasamanikya* along with *Guduchyadi churna* in the management of Psoriasis by Damle Neena et al IJAAR Jan-Feb 2015, 41-47 was reviewed. Totally 10 patients showing classical symptoms of Psoriasis were enrolled. Both male and female patients between the age group of 18 and 60 years were selected. 50 mg of *Rasamanikya* along with 3g of *Guduchyadi churna* was given twice daily for 2 months before food with warm water. *Guduchyadi Churna* was based on the *Guduchyadi Kwatha* described in *Yogaratanakara Uttaradha Kushtarogadhikara* and it contains fine powders of *Guduchi* (*Tinospora cordifolia*), *Amalaki*

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(*Embelica officinalis*), *Haritaki* (*Terminalia chebula*), *Bibhitaki* (*Terminalia bellerica*), *Daruharidra* (*Berberis aristata*) all taken in equal parts and mixed homogenously. The effect of therapy was assessed based on improvement obtained in signs and symptoms of the patients. In Psoriasis *Rasamanikya* with *Guduchyadi Churna* was found to be significantly effective in reducing discoloration of skin, dryness of skin, in reducing pruritus. The patients showed up to 60 percent improvement gradually after 2 months of treatment.¹⁶

CONCLUSION

Pharmaceutical review highlights that *Rasamanikya* of desired standard can be easily prepared by classical *Abhraka patra* method, but the method is ideal only for small scale production. The other classical *sharava samputa* method with suitable modifications is laborious but appreciable for large scale pharmaceutical preparation. The adopted method of I.P.G.T & R.A., Jamnagar prepared by using fused bulb varies from the basic idea concept of classical preparation as there is a direct air contact in this while heating. Toxicity study revealed that, *Rasamanikya* prepared according to classical methods ie. *Rasatarangini* method (RM I) and *Rasendra Chintamani* method (RM II) was non-toxic, whereas the one prepared by using the adopted method of I.P.G.T & R.A., Jamnagar (sample R.M-III) showed mild toxicity.. In the antimicrobial study, anti-bacterial activity of *Rasamanikya* was found on *Staphylococcus aureus* (Gram positive) and *Pseudomonas aeruginosa* (Gram negative) and that it can be effectively used as an antibiotic in infections caused by those bacteria. *Rasamanikya* is primarily a *vata-kaphahara* and *rasa-raktadhatu gami kalpa*, mainly useful where *kledajanya* or more particularly *kothajanya samprapti* is present. In Psoriasis *Rasamanikya* with *Guduchyadi Churna* was significantly effective in reducing discoloration of skin, dryness of skin, in reducing pruritus.

AUTHOR CONTRIBUTION STATEMENT

Both authors Dr. Pritam C. Vaity and Dr. Vaishali M. Khobragade have equal contribution towards Review of literature as well as writing of the manuscript.

CONFLICT OF INTEREST

Conflict of interest declared none.

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