


**Research Article**
**PHARMACEUTICO- ANALYTICAL STUDY OF RASAMANIKYA PREPARED BY VARIOUS METHODS**
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**ABSTRACT**

*Rasamanikya* prepared from *Shodhita Haritala* is one of the effective and economical medicines used in different skin and respiratory disorders. Different methods are explained in the classics for the preparation of *Rasamanikya* and few adopted methods are also developed from scholars of *Rasashastra* depending upon their experience. Present study is aimed at exploring all these methods in detail and any modifications if needed. The *Patra Haritala* is subjected to different *Shodhana* procedures in different media, the changes observed are discussed in the article. The yield of *Shodhita Haritala* was 92% to 96% in different *Shodhana* methods.

*Rasmanikya* is prepared in six different methods. *Sharava samputa* method (Method III & IV) can be considered as suitable methods for pharmaceutical preparation of *Rasamanikya* in large quantity as there was loss of only 11% to 13% drug was noticed. Chemical analysis and X-Ray diffraction of *Patra Haritala* and *Rasamanikya* prepared from all the methods is carried as a part of standardization. In Analytical study of all the methods, 44% to 47% of Arsenic and 22 to 29% of Sulphur was present in *Rasamanikya*. X-RD study of *Haritala* and *Rasamanikya* samples revealed that crystalline form of *Haritala* was changed to relatively amorphous form in *Rasamanikya* prepared by I, II, III and IV methods, which indicates quick and better absorption of the drug *Rasamanikya* on administration making it one of the economical and potent medicine. Chemically *Rasamanikya* can be considered as a complex compound of  $As_2S_3$  and  $As_2O_5$ .

**KEYWORDS:** *Rasamanikya*, *Sharava samputa*, X-RD study,  $As_2S_3$  and  $As_2O_5$ .

**INTRODUCTION**

*Haritala* is a well-known drug since Vedic period. It has a unique place in *Dehavada* and *Dhatuvada*. *Rasamanikya* is a simple unique medicine as it only contains *Patra Haritala*. It is prepared by heating *Patra Haritala* till it attains *Manikya varna*. In present study *Rasamanikya* is prepared by 6 different methods and subjected to analytical study including X-RD to explore the chemical nature of *Rasamanikya*. The details of the study are as follows:

*Patra Haritala* ( $As_2S_3$ ) was obtained from SDM Pharmacy, Udipi. It is observed for all *Grahya lakshana* mentioned in *Rasashastra* classics.<sup>[1]</sup>

The *Patra Haritala* is subjected to *Shodhana* and *Rasmanikya* (RM) prepared by 6 methods. The details are as follows:

- RM1- Glass bottle method (Adapted method)
- RM2 - *Abhraka Patra* method (R T 11/90- 93)
- RM3- Modified *Sharava Samputa* method (R C 9/128-131)
- RM4-Modified *Sharava Samputa* method (RS S1/182)
- RM5 - *Churnodaka* method (Adapted)
- RM6- *Kushmanda Swarasa Swedana* method

**Table 1: *Rasa Manikya* prepared by 1<sup>st</sup> Method (RM1)**

<b>Hartala Shodhana</b>	<b>Rasa manikya preparation</b>
i) <i>Patra Haritala</i> is (230gm) subjected to <i>Swedana</i> in <i>Churnodaka</i> <sup>[2]</sup> ii) <i>Churnodaka Swedita Patraharitala</i> was kept in <i>Kushmandaswarasa</i> (2 ltrs) and <i>Amladadi</i> (2 ltrs) for 3 days respectively.	i) <i>Shodhita Haritala</i> was grinded in mortar and pestle and taken in small glass bottle filled up to 3/4 <sup>th</sup> ii) Glass bottles were placed over a wire plate which is kept on gas stove and subjected to moderate fire for 10 to 20 minutes. iii) When colour of <i>Haritala</i> completely changes to Ruby red, a stick is introduced into the middle of the bottle to assess <i>Tantupaka</i> . iv) Glass bottle taken out from the gas stove and were rolled in cold

<i>Haritala</i> pieces washed with hot water and weighed after complete drying (195gm). (Photo plate I)	water by which glass bottles were broken. v) <i>Rasa Manikya</i> collected carefully and grinded into fine powder and filtered through the cloth. (Photo plate II)
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**Table 2: *Rasa Manikya* prepared by 2<sup>nd</sup> Method (RM2)**

<i>Hartala Shodhana</i>	<i>Rasa manikya</i> preparation (R T 11/92-93)
i) <i>Patrahartala</i> was grinded in <i>Khalva Yantra</i> and subjected to <i>Bhavana</i> with <i>Kushmanda Swarasa</i> and <i>Amladadhi</i> for 3 times separately and dried well <sup>[3]</sup> (R.T. 11/90) (Photo plate I)	i) <i>Patrahartala</i> (50gm) was spreaded evenly in between two <i>Shweta abhraka patra</i> <sup>[4]</sup> and <i>Abraka patra</i> were sealed with pin. ii) Burning Charcoal was taken in a <i>Sharava</i> and <i>Shweta abhraka patra</i> were placed over it. iii) <i>Haritala</i> colour change was observed. iv) <i>Rasamanikya</i> deposited in between <i>Abrhaka patra</i> was collected, grinded into fine powder and filtered through the cloth. (Photo plate III)

**Table 3: *Rasa Manikya* prepared by 3<sup>rd</sup> Method (RM3)**

<i>Hartala Shodhana</i>	<i>Rasa manikya</i> preparation (R C9 /128-131)
i) <i>Patra Harital</i> was purified by keeping it in <i>Kushmanda swarasa</i> & <i>Amla dadhi</i> for 3days in each separately. (Photo plate I)	i) <i>Shodhita Haritala</i> spread evenly in a <i>Sharava</i> and covered with another <i>Sharava</i> which had hole in the middle. <sup>[5]</sup> ii) <i>Sharava Samputa</i> is done and <i>Sharava</i> is kept on moderate fire. iii) The hole of the upper <i>Sharava</i> was initially closed with plug of <i>Multani Mitti</i> . iv) When fumes observed the plug of <i>Multani Mitti</i> was removed from the upper <i>Sharava</i> . v) A stick was passed through the hole to observe the <i>Tantupak</i> and <i>Sharavsamputa</i> taken out from the fire. vi) After cooling <i>Rasamanikya</i> was collected from lower <i>Sharava</i> then it is grinded into fine power and filtered out through the cloth. (Photo plate III)

**Table 4: *Rasa Manikya* prepared by 4<sup>th</sup> Method (RM4)**

<i>Hartala Shodhana</i>	<i>Rasa Manikya</i> Preparation
i) <i>Patraharitala</i> is purified by <i>Swedana</i> in <i>Dolayantra</i> containing <i>Kushmanda Swarasa</i> for 3 hours and <i>Amladadi</i> for 3 hours one after the other. <sup>[6]</sup> (RSS 1/182) (Photo plate I)	i) <i>Shodhita Haritala</i> was crushed into small size and spread evenly in a <i>Sharava</i> which is covered with another <i>Sharava</i> having hole in the middle. <i>Sharava Samput</i> was done and it is subjected to moderate fire. ii) The hole of the upper <i>Sharava</i> was initially closed with plug of <i>Multani Mitti</i> . iii) When fumes observed the plug of <i>Multani Mitti</i> was removed from the upper <i>Sharava</i> . iv) A stick was passed through the hole to observe the <i>Tantupaka</i> and <i>Sharavsamputa</i> taken out from the fire. v) After cooling <i>Rasamanikya</i> was collected from lower <i>Sharava</i> and filtered out through the cloth.

**Table 5: *Rasa Manikya* prepared by Glass Bottle Method (RM5)**

<i>Hartala Shodhana</i>	<i>Rasa manikya</i> preparation
i) <i>Patraharitala</i> is purified by <i>Swedana</i> in <i>Dolayantra</i> containing <i>Churnodaka</i> for 3 hours. (Photo plate I)	i) <i>Shodhita Patra Haritra</i> was taken in small, clean glass bottles filled up to 3/4 <sup>th</sup> . ii) A wire plate was kept on gas stove; 2-3 bottles were placed on it. iii) It was subjected to moderate fire when the glass bottles turned to red; they were kept transversely on the wire plate. iv) When the colour of <i>Haritala</i> changed into ruby red, a stick was introduced into the middle and observed for <i>Tantupak</i> and taken out from fire. v) The hot glass bottles rolled in cold water, due to sudden cooling glass bottles broken down and <i>Rasamanikya</i> is collected carefully. vi) <i>Rasamanikya</i> is grinded into fine powder and filtered through the cloth.

**Table 6: Rasa Manikya prepared by Glass Bottle Method (RM6)**

<b>Hartala Shodhana</b>	<b>Rasa manikya preparation</b>
i) <i>Patraharitala</i> is purified by <i>Swedana</i> in <i>Dolayantra</i> containing <i>Kushmanda Swarasa</i> for 3 hours. (Photo plate 1)	i) <i>Shodhita Patra Haritra</i> was taken in small, clean glass bottles filled up to 3/4 <sup>th</sup> . ii) A wire plate was kept on gas stove; 2-3 bottles were placed on it. iii) It was subjected to moderate fire when the glass bottles turned into red they were kept transversely on the wire plate. iv) When the colour of <i>Haritala</i> changed into ruby red, a stick was introduced into the middle and observed for <i>Tantupak</i> and taken out from fire. v) The hot glass bottles rolled in cold water, due to sudden cooling glass bottles broken down and RM collected carefully. vi) RM grinded into fine powder and filtered through the cloth.

**Table 7: Observations noted during above six methods. (Photo plate IV)**

S.No.	Sample	Colour	Taste	Touch	Smell	Yield%	Time	Temp °C
1	RM 1	<i>Istika Varna</i>	Tasteless	Fine	Odor less	93.88	12min	180
2	RM 2	Black	Tasteless	Fine	Odor less	93	4min	190
3	RM3	Pale brick	Tasteless	Fine	Odor less	88.88	45min	200
4	RM4	Brownish yellow	Tasteless	Fine	Odor less	88.26	42min	200
5	RM5	Red	Tasteless	Fine	Odor less	93.3	12min	180
6	RM6	Brown	Tasteless	Fine	Odor less	91.11	13min	180

**Analytical study**

The samples of *Rasamanikya* prepared by above six methods collected separately and subjected to analytical study through organoleptic, qualitative and quantitative analysis.

**Organoleptic study****Table 8: Organoleptic study of RM by different methods**

S.No	Sample	Colour	Taste	Touch	Smell
1	RM 1	<i>Istika Varna</i>	Tasteless	Fine	Odor less
2	RM 2	Black	Tasteless	Fine	Odor less
3	RM3	Pale brick	Tasteless	Fine	Odor less
4	RM4	Brownish yellow	Tasteless	Fine	Odor less
5	RM5	Red	Tasteless	Fine	Odor less
6	RM6	Brown	Tasteless	Fine	Odor less

**Qualitative study****Nambudari phase spot test**

0.25gm fine powder of RM was dissolved in 0.5ml of concentrated HNO<sub>3</sub>, 5N HNO<sub>3</sub> and Aquaregia in 3 separate test tubes heated and kept for 24hrs. Next day a drop of solution from each tube was put on chemically reacting 10% KI paper and 5% Potassium Ferrocynide paper and observed for the development of spots in three phases.

In the third phase, a central white coloured spot observed with con HNO<sub>3</sub> on 10% KI paper. Central green coloured spots were observed on 5% potassium ferrocynide paper by all solutions.

**Quantitative study**

*Rasamanikya* samples of each method collected separately and subjected quantitative analysis as follows.

Glass bottle method (I method)

S1= Raw drug *Patra Haritala*

S2= Powder of *Ashuddha Haritala* subjected to *Swedana* in *Churnodaka*

S3= *Haritala* tied in a *Pottali* kept in *Kushmanda Swarasa* for 3 days

S4= *Haritala* tied in a *Pottali* kept in *Amladadhi* for 3 days

S5= *Rasamanikya*

**Table 9: Quantitative Analysis of Rasamanikya by I Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble Ash	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.27	0.43	0.099	0.191	0.88	86.66	0.099	1.69	6.78
S2	46.069	24.90	0.11	0.24	0.43	0.159	-	0.47	83.66	0.15	1.19	7.28
S3	45.84	25.50	0.22	0.02	0.45	0.119	0.009	-	87.18	0.019	0.88	6.63
S4	47.141	27.68	0.11	0.02	0.46	0.159	-	0.5	84.03	0.15	2.30	7.76
S5	47.058	28.58	0.11	0.02	0.54	0.2	0.2	0.54	86.40	0.2	1.7	7.78

**Abhraka Patra method (II method)**S1= Raw drug *Patra Haritala*S2= *Patra Haritala* after giving 3 *Bhavana* of *Kushmanda Swarasa*S3= *Patra Haritala* after giving 3 *Bhavana* of *Amla Dadhi*S4= *Rasamanikya***Table 10: Quantitative Analysis of Rasamanikya by II Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.027	0.43	0.099	0.1912	0.88	86.66	0.099	1.69	6.78
S2	46.179	20.98	0.86	0.63	0.93	0.69	0.0976	-	82.95	0.69	3.25	6.4
S3	46.26	21.99	0.87	0.64	0.78	0.31	0.0097	-	84.27	0.31	1.64	4.83
S4	47.24	22.98	1.04	0.89	0.80	0.65	0.0991	-	98.60	0.65	1.64	6.68

**Modified Sharava method (III method)**S1= Raw drug *Patra Haritala*S2= *Patra Haritala* after keeping 3 days in *Kushmanda Swarasa*S3= *Patra Haritala* after keeping 3 days in *Amla Dadhi*S4= *Rasamanikya***Table 11: Quantitative Analysis of Rasamanikya by III Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.027	0.43	0.099	0.1912	0.88	86.66	0.099	1.69	6.78
S2	44.05	24.17	0.50	0.49	0.78	0.72	0.19	-	79.4	0.72	2.51	6.71
S3	47.22	24.59	0.45	0.11	0.70	0.32	0.25	-	93.05	0.32	2.31	6.29
S4	44.80	23.32	0.43	0.42	0.78	0.38	0.29	-	96.62	0.38	3.38	5.97

**Modified Sharava method (IV method)**S1= Raw drug *Patra Haritala*S2= *Patra Haritala* subjected for *Swedana* in *Kushmanda Swarasa* for 3hrs.S3= *Patra Haritala* subjected for *Swedana* in *Amla Dadhi* for 3hrs.S4= *Rasamanikya***Table 12: Quantitative Analysis of Rasamanikya by IV Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.027	0.43	0.099	0.1912	0.88	86.66	0.099	1.69	6.78
S2	44.35	22.17	0.44	0.10	0.67	0.39	0.99	-	90.64	0.39	0.38	6.18
S3	44.50	23.35	0.44	0.10	0.68	0.31	0.009	-	84.62	0.31	0.37	6.03
S4	44.52	28.87	0.44	0.10	0.67	0.55	0.09	-	85.60	0.55	0.39	6.02

**Churnodaka method (V method)**S1= Raw drug *Patra Haritala*S2= *Patra Haritala* subjected to *Swedana* in *Churnodaka* for 3 hrs.S3= *Rasamanikya***Table 13: Quantitative Analysis of *Rasamanikya* by V Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.027	0.43	0.099	0.1912	0.88	86.66	0.099	1.69	6.78
S2	46.11	24.9	0.11	0.24	0.43	0.15	-	0.47	83.66	0.15	1.19	7.28
S3	46.54	26.18	0.45	0.11	0.81	0.64	0.29	-	94.58	0.56	0.38	6.82

**Kushmanda Swarasa Swedana method (VI method)**S1= Raw drug *Partra Haritala*S2= *Patra Haritala* after *Swedana* in *Kushmanda Swarasa*S3= *Rasamanikya***Table 14: Quantitative Analysis of *Rasamanikya* by VI Method in %**

Sample	As	S	Fe	Mg	Ca	Silica	Moisture	Ash value	Water Insoluble	Acid Insoluble	Water Insoluble Ash	PH
S1	44.031	20.90	0.11	0.027	0.43	0.099	0.1912	0.88	86.66	0.099	1.69	6.78
S2	44.37	22.17	0.44	0.10	0.95	0.39	0.99	-	90.64	0.39	0.38	6.18
S3	47.39	29.73	0.92	0.22	0.90	0.57	0.49	-	94.18	0.57	0.27	6.85

**Particle size determination**

Microscopic examination of samples for particle size determination with filar eye piece revealed size as follows.

**Table 15: Particle size determination**

Particle Size	S	RM1	RM2	RM3	RM4	RM5	RM6
	74.4µm	90 µm	81 µm	90 µm	60 µm	204 µm	60 µm

**Table 16: Surface area determination**

Surface Area (Sq.m/gm)	S	RM1	RM2	RM3	RM4	RM5	RM6
	1.11	0.28	0.42	0.14	0.22	0.28	0.34

**Table 17: Sieve analysis**

S. No	Sieve no	Retained	% Retained	% Passed
1	170BSS	16.960Gms	33.920	66.080
2	200 BSS	5.044Gms	10.088	89.912
3	240BSS	5.237Gms	10.474	89.526
4	300 BSS	12.99Gms	2.598	97.402
5	350BSS	0.202Gms	0.404	99.596
6	Pan	6,110Gms	12.220	

**X- Ray Diffraction study**

Based on the peak developed by each sample during X-RD study following interpretation can be made.

**Haritala sample**

1. The sample is more crystalline in nature
2. It showed prominent peak of  $As_2S_3$ .

**RM 1 sample**

1. It is relatively amorphous
2. There is a prominent peak of  $As_2S_3$  and  $As_2O_5$  and also some peaks of  $AsS$

**RM 2 Sample**

1. It is relatively amorphous in nature.

2. There is a peak mainly contributed by  $As_2O_5$  and  $Cu_5(AsO_4)_2(OH)_2$

**RM 3 Sample**

1. It is relatively amorphous in nature
2. There is a prominent peak contributed by  $As_2S_3$  and  $As_2O_5$
3. Small peaks indicate little quantity of  $AsS$  and very little quantity of  $As_2O_3$

**RM 4 Sample**

1. It is relatively amorphous in nature
2. The prominent peak is contributed by  $As_2S_3$  and



3. It also contains little quantity of  $\text{As}_2\text{O}_3$

#### RM 5 Sample

1. It is relatively crystalline in nature
2. The shift of the higher peak compared to other sample is due to the formation of new compound  $\text{Cu}_5\text{H}_2(\text{AsO}_4)_4\text{H}_2\text{O}$  Along with  $\text{As}_2\text{S}_3$

#### RM 6 Sample

1. It is relatively crystalline in nature
2.  $\text{As}_2\text{S}_3$  and  $\text{As}_2\text{O}_5$  contribute to the prominent peak

### DISCUSSION

#### Haritala shodhana

As *Haritala* is considered as *Dhatu visha*<sup>[7]</sup>, different media were used for *Shodhana*. In the first method of *Rasamanikya* preparation *Haritala* was subjected to *Shodhana* in *Churnodaka*<sup>[2]</sup> which is a basic media hence it neutralizes acidic impurities of *Haritala*. Then *Haritala* was kept in *Kushmanda Rasa*<sup>[3]</sup> and *Amladadhi*<sup>[3]</sup> which are acidic media, neutralizing the basic impurities of *Haritala*. This rationality can be applied for the use of different media in *Haritala Shodhana*.

There was no much difference in the yield of *Haritala* in different *Shodhana* procedures. 92% to 96% yield was observed.

#### Pharmaceutical study

The method of preparation of *Rasamanikya* can be divided in to two types.

- a) **Closed method:**  $\text{As}_2\text{S}_3$  heated in limited supply of oxygen, loss of sulphur as oxides are less e.g., *Sharava Samputa* method, *Abhraka Patra* method.
- b) **Open method:** In this method oxygen supply is more, loss of sulphur as oxides is more. E.g; Glass bottle method.

But by analytical study there was no much difference observed in the quantity of Sulphur, hence there was no much difference in yield of *Rasamanikya* was noted in between these two methods.

**By X-RD study chemically *Rasamanikya* can be considered as a complex compound of  $\text{As}_2\text{S}_3$  and  $\text{As}_2\text{O}_5$ .**



### Analytical study

From the quantitative analysis of all the six methods Arsenic and Sulphur were found to be main contents of the drug. During *Haritala Shodhana* and *Rasa Manikya* preparation in each method it is observed that percentage of sulphur and Arsenic were increased. It can be justified as the substances used in *Shodhana* are enriched with organic compounds containing elements of carbon and hydrogen. During *Shodhana* these elements may make some linkage with the elements present in crude  $\text{As}_2\text{S}_3$  causing an increase in the percentage of Arsenic after *Shodhana*.

During the practicals it was observed that weight of RM reduced as compared to *Haritala* sample. It may be due to evaporation of volatile contents during the procedure. As the weight decreases concentration of arsenic and Sulphur increased in RM.

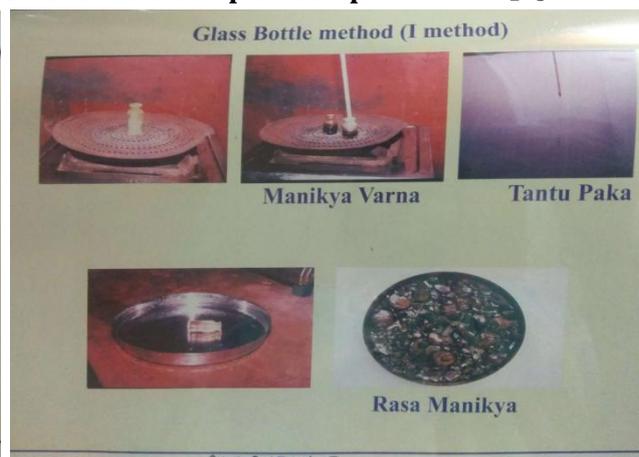
**X-RD study:** In most of the methods sulphide form of *Haritala* was changed to oxide form and a complex compound of  $\text{As}_2\text{S}_3$  and  $\text{As}_2\text{O}_5$  was observed in prominent peaks.

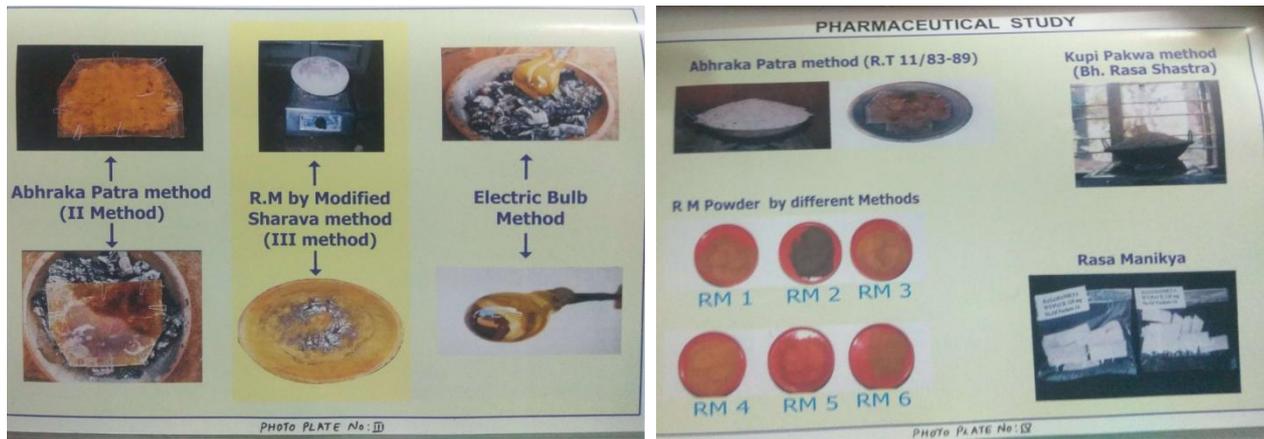
Crystalline form of *Haritala* was changed to amorphous form in RM 1,2,3,4 samples, which indicates better absorption of the drug in the body.

### CONCLUSION

The lustre and smell of *Patra Haritala* were decreased after different methods of *Shodhana*. Along with *Manikya Varna*, the *Tantu Paka* should also be considered as criteria for the completion of *Rasamanikya* preparation. *Rasamanikya* powder by different methods showed different colours, but analytically there is no marked difference between the *Rasamanikya* prepared by different methods.

The *Sharava Samputa* method with suitable modifications is suitable for the large-scale pharmaceutical preparation of *Rasamanikya*.





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