INTERNATIONAL
AYURVEDIC MEDICAL
JOURNAL

IAMJ

International Ayurvedic Medical Journal, (*ISSN: 2320 5091)* Volume 5, Issue 12, December, 2017

COMPARATIVE PHARMACEUTICO-ANALYTICAL STUDY OF HARAGAURI RASA PREPARED BY CONVENTIONAL AND VERTICAL MUFFLE FURNACE METHOD

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ABSTRACT

Background: The present study aimed to prepare *Haragauri Rasa which* is one of the unique herbo-mineral formulations explained in the text *Rasakamadhenu* in *Vatavyadhi Chikitsa* context. **Materials & Methods:** *Kajjali* was prepared by using *Parada* and *Gandhaka* with 3:1 ratio where *Navasadara* was 1/10 part. The *Kupipakwa* preparation was done as per classical reference by adopting standard operative procedures. As the quantity of *Gandhaka* and *Navasadara* were minimum, the *kramagni* was maintained for 48 hrs in this *Kupipakwa Rasayana.* **Instrumental Analysis** Qualitative and quantitative analysis was done to check the quality of the final product. **Discussion:** Comparative pharmaceutical discussion were made and in analytical results 17 peaks were identified in 2 samples of XRD at different angles.Particles of 1-10µm size are found and FTIR analysis shows presence of 7 absorption peaks frequencies. **Conclusion:** Hence the "Comparative Pharmaceutico-Analytical study of *Haragauri Rasa* prepared by conventional and vertical muffle furnace" was evaluated.

Keywords: *Kupipakwa Rasayana,Haragauri Rasa*

INTRODUCTION

Haragauri Rasa[1] *is* prepared with the help of *kramagni*.Methodology and therapeutics were explained in *Rasakamadhenu Vatavyadhi Chikitsa*.SOP for *Kupipakwa rasayana* was incorporated to obtain good product. Analytical assay including instrumental and physio-chemical revealed particle size, absorption peaks, organic chemical bonding, loss on drying and solubility in both samples.

Aim

Comparative pharmaceutico-analytical study of *Haragauri Rasa prepared* by conventional method and by vertical muffle furnace.

Materials and Methods

Materials (As per API Vol 7)

Hingulotha Parada- 440g
ShodhitaamalasaraGandhaka- 146g
ShodhitaNavasadara-44g
Datturapatra swarasa-Q.S

Method

Pre Operative Procedures*:*

440gHingulottha Parada and 146g *Shodhita Amalasara Gandhaka* was taken in a cleaned and dried *khalvayantra*. It was triturated vigorously till it attains proper kajjali form. Then 44g of powdered *Shodhita Navasadara* was added to this *kajjaili* and mixed well. Quantity sufficient *Dhatturapatra swarasa* was added and triturated continuously till it attains *subhavithalakshana*. Obtained powder was then filled into 7 layered *mritpatalepithaKacha Kupi*[2]and place the cork.

Operative Procedure*:*

Kajjali filled *kachakupi* was subjected to *Valukayantra* and remove the cork. Heat was introduced and maintained in *mandagni*. Continued the fire and observed the changes during heating. Precautions were taken often. Heat was maintained for 22hrs till the appearance of dense yellow fumes. When *kajjali* starts melting heat was gradually raised to *Madhyamagni* and maintained for next 20hrs. Appearance of fumes, irritant odour and melting of *kajjali* were observed during this phase. After complete cessation of sulphur fumes appearance of *Sooryodayalakshana* was found at the bottom of the *kupi*. By confirming the copper foil test *kupi* was corked. Later increased the temperature to *teevragni* stage and maintained for 6hrs.Same procedure was repeated in vertical muffle furnace by adopting the heating pattern followed in classical method.

Post Operative Procedure

The *kupi* was taken out from *Valukayantra* after attaining *swangasheeta*. Scrapping was done with sharp knife. After observing the product inside the bottle carefully broke it. The *kantastha* product was carefully collected and stored.

Heating pattern / schedule [3]:

In current study signs and standards of different heating stages of *Kupipakwa Rasayanas* are mentioned by the ancient scholars for deciding proper *pachana* of the ingredients, through *Kramagnipaka* was incorporated.

Kramagni pattern is categorized into three stages [4].

MruduAgni – 125 -250°C (Initial phase)
Madhyamagni - 250 - 450°C (Middle phase)
Teevragni –450 - 650°C (End phase)

Table 1: Observations of HGR (Classical)

TIME	OBSERVATIONS
5.30pm-8.30pm	No changes
8.30pm-11.30pm	Slight white fumes were coming out of *Kupi*.
11.30pm-2.30am	The fumes became slight dense inside of *Kupi*, but *Kajjali* inside*Kupi* can be seen with torch light.
2.30am-5.30am	The fumes became dense, can't see the*Kajjali* inside the*kupi* with torch light. Slight sulfur fumes

	found inside the *kupi* with irritant smell.
5.30am-8.30am	Still dense brownish fumes found inside *Kupi*.& even emission of fumes have seen.Slight yellow particles were start adhering to the neck of Kupi.
8.30am-11.30am	Dense yellow fumes observed with irritant odour.
11.30am-8.30pm	Dense yellow fumes observed with irritant odour. Yellow substance started to collect outside the neck of the *kupi*
8.30pm-11.30pm	Partial Melting of *Kajjali*.
11.30pm-2.30am	Honeycomb appearance.
2.30am-5.30am	Bluish flame appeared while inserting *Taptashalaka*
5.30am-8.30am	Flame disappeared
8.30am-11.30am	Sooryodayalakshana found, Copper foil test positive

Results:

Total weight of *Kajjali* - 260gms
Obtained product - 185 gms
Loss - 75gms
Yield of HGR - 71.15 %
Colour of the product - *Sindhura Varna*

Table 2: Observations during the preparation of HGR (VMF):

TIME	OBSERVATIONS
5.30pm-8.30pm	Kajjali powder seen through the naked eye.
8.30pm-11.30pm	Slight white fumes were coming out of *Kupi*.
11.30pm-2.30am	The fumes became slight dense inside of *Kupi*, but *Kajjali* inside*Kupi* can be seen with torch light.
2.30am-5.30am	The fumes became dense, can't see the*Kajjali* inside the*kupi* with torch light. Slight sulfur fumes found inside the *kupi* with irritant smell .
5.30am-8.30am	Still dense brownish fumes found inside *Kupi*.& even emission of fumes have seen.Slight yellow particles were start adhering to the neck of Kupi.
8.30am-11.30am	Dense yellow fumes observed with irritant odour.
11.30am-8.30pm	Dense yellow fumes observed with irritant odour. Yellow substance started to collect outside the neck of the *kupi*
8.30pm-11.30pm	Partial Melting of *Kajjali*.
11.30pm-2.30am	Honeycomb appearance.
2.30am-5.30am	Bluish flame appeared while inserting *Taptashalaka*
5.30am-8.30am	Flame disappeared
8.30am-11.30am	Sooryodayalakshana found, Copper foil test positive

Result:

Total weight of *Kajjali* - 260gms
Obtained product - *Kantastha* – 120gms.
Loss - 140gms
Yield of HGR - 53.8%
Colour of the product - *Kantastha–Sindhura Varna*
Residue - Dark black.

Table 3: Brief description of HGR (Classical) & HGR (V.M.F.)

Haragauri Rasa	**HGR(Classical)**	**HGR(V.M.F.)**
Ingredients	Haragauri Rasa *Kajjali*-260gms	Haragauri Rasa *Kajjali*-260gms
Apparatus	Valukayantra	Vertical Muffle Furnace
Procedure	As same as Kupipakwa Rasayana.	As same as Kupipakwa Rasayana.
Observations	Total time taken 42hrs and for complete self-cooling 24 hours. The maximum temperature recorded was 850^0C.	Total time taken 42hrs and for complete self-cooling 24 hours. The maximum temperature recorded was 675^0C.
Yield	Kantastha- 180gms, Residue – 3gms,	Kantastha- 120gms, Residue –140 gms,
Precautions	All the precautions were considered.	All the precautions were considered.

Table 4: Result of Organoleptic Characters of HGR (Classical), HGR (VMF)

Physical test	HGR(Classical)	HGR(VMF)
Colour	Brownish Red	Brownish Red
Odour	Characteristic	Characteristic
Touch	Amorphous	Amorphous
Taste	Tasteless	Tasteless

Table 5: Results showing p^H Value of *HGR* (Classical) *HGR* (VMF)

HGR (Classical)	7.3± 0.10
HGR(EMF)	7.2± 0.09

Table 6: Results showing Ash Value of *HGR* (Classical), *HGR* (VMF)

HGR. (Classical)	9.82±0.01
HGR.(EMF)	10.26±0.01

Table 7: Results showing Acid Insoluble Ash of *HGR* (Classical), *HGR* (VMF)

HGR. (Classical)	6.64±0.01
HGR.(EMF)	6.73±0.01

Table 8: Water Soluble Ash of *HGR* (Classical), *HGR*(VMF)

HGR. (Classical)	3.98±0.01
HGR.(EMF)	4.21±0.01

Table 9: Result showing Loss on Drying at 105^0c and *HGR* (Classical), *HGR* (VMF)

HGR. (Classical)	0.067±0.01
HGR.(EMF)	0.085±0.01

SOLUBILITY TEST

Table 10: Result of Solubility test

Solvents	Sample -1	Sample - 11
Distilled wáter	Not soluble	Not soluble
Methanol	Not soluble	Not soluble
Ethanol	Not soluble	Not soluble
Honey	Not soluble	Not soluble
Chloroform	Not soluble	Not soluble
Glycerine	Not soluble	Not soluble

Instrumental Analysis

Table 11: XRD Result of HGR (Classical)

Peak No	Identified			Standard	
	Angle 2 θ	d space	Intensity	d space	Intensity
1	26.6794	3.34138	100	1.7636	116
3	31.3817	2.85060	91.74	1.7636	116
5	43.7636	2.06856	25.92	1.2689	24
Name of standard : Cinnabar (HgS), Crystal structure : Hexagonal Mol. Weight : 232.65 , Volume (CD) :141.29, Dx :8.203, Dm:8.090, a - 4.149					

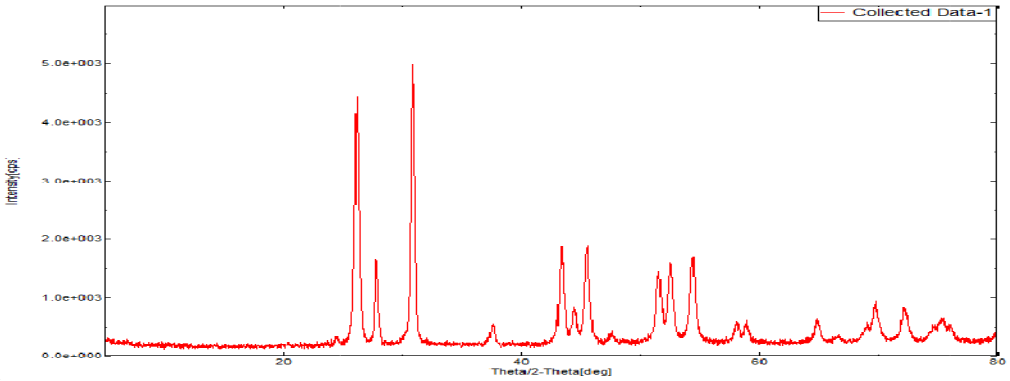


Table 12: XRD of *HGR* (VMF).

Peak No	Identified			Standard	
	Angle 2 θ	d space	Intensity	d space	Intensity
2	26.6503	3.34497	100	1.7636	116
3	28.3125	3.15225	24.56	1.2689	24
4	31.3315	2.85505	87.71	1.7636	116
Name of standard : Cinnabar (HgS), Crystal structure : Hexagonal Mol. Weight : 232.65 , Volume (CD) :141.55, Dx :8.188, Dm:8.090, a - 4.149					

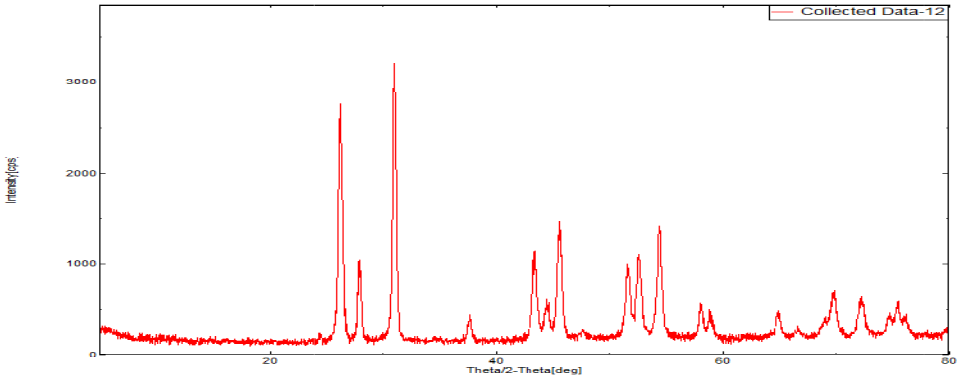


Table 13: Results Showing Particle Size

Name of the Sample	Diameter	Particle size	Mean Particle Size
***HGR.*(Classical)**	10%	0.31µm	**0.64µm**
	50%	0.51 µm	
	90%	1.10 µm	
***HGR.*(VMF)**	10%	0.21µm	**0.51µm**
	50%	0.40µm	
	90%	0.93µm	

Table 14: FT-IR Observations& Results of HGR (Classical)

Absorption Peak Frequency Cm^{-1}	Standard Peaks Frequency Cm^{-1}	Specific Type Of Bond	Bond	Functional Group
3434	3500-3200	Strong	N-H	Primary Amines
2924	2870-2960	Medium or Strong	C-H	Alkanes, Methyl
2854	2850-2925	Medium or Strong	C-H	Alkanes, Methylane
1632	1560-1640	Strong	N-H	Primary Amines, Alkanes
1404	1500-1400	Weak or strong	C=C	Aromatic
1114	1100-1200	Two strong broad bands	C-X	Fluroalkanes
613	540-760	Medium to Strong	-C=C-H or C=H	Bromo-alkanes

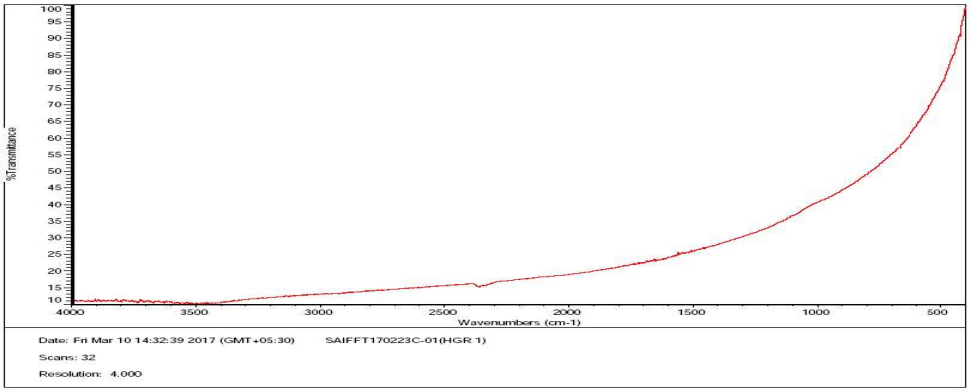
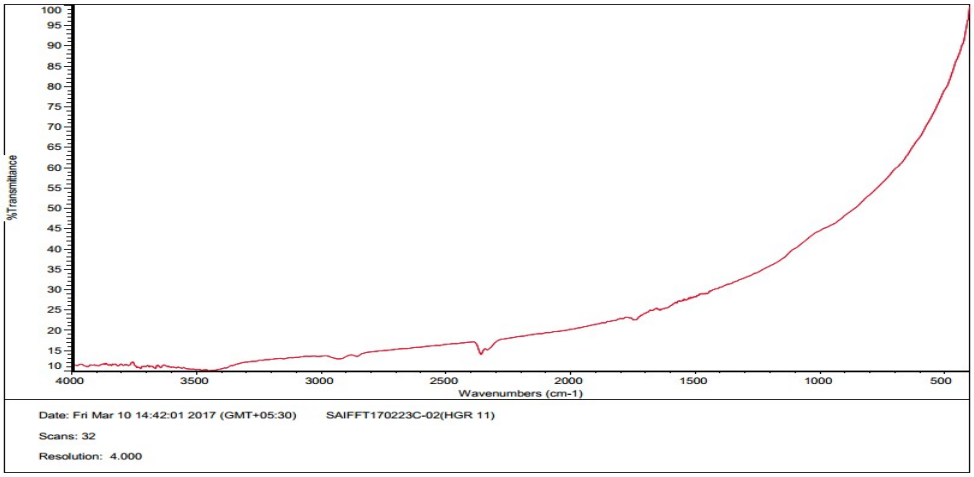


Table 15: FTIR OBSERVATIONS OF HGR (VMF)

Absorption Peak Frequency Cm^{-1}	Standard Peaks Frequency Cm^{-1}	Specific Type Of Bond	Bond	Functional Group
3435	3500-3200	Strong	N-H	Primary Amines
2924	2870-2960	Medium or Strong	C-H	Alkanes, Methylane
2061	2850-2925	Weak	C=C	Alkynes.
1631	1560-1640	Strong	N-H	Primary Amines , Alkanes
1383	1500-1400	Weak or strong	C=C	Aromatic
1052	1100-1200	Ordinary	C-X	Fluroalkanes
669	540-760	Medium to Strong	-C=C-Hor C=H	Chloro-alkanes



DISCUSSION

Rasaushadhis play an important role in *Ayurvedic* therapeutics. Small doses, tastelessness, quick action, effectiveness and *Rasayana* property make them more popular. *Kupipakva Rasayana* is having *Rasayana* effect more as its name itself suggests. *Kupipakwa Rasayana* is a preparation where *Parada* is processed with other *dravyas* in *kupi* with *kramagni*. In this, *Prathvi* and *Jalapradhanadravya* will get *Agnisamskara*for long period of time and it is transformed and attained into *laghu*, *sukshmaguna* along with *Tejopradhanaguna* by which the drug can easily enter into *SukshmaSrotases* and helps in very fast and effective action of the drug in the body. By these qualities, *dravyamatra* is also very minimal in dose to treat the disease.

In classics two references are available in the name of HGR. In most of the *kupipakwa* preparations *Acharyas* explained *samagunakajjali*. The main specialty of this preparation is its proportion itself i.e. 3 part of *parada* and 1 part of *Gandhaka* and also the heating pattern of this preparation is for 48 hrs. Here the *Parada bandha* and *murchana* were carried with *Gandhaka* and *Navasadara.* As per the reference of *Rasakamadhenukupipaka* was done in 48hrs.The system of applying *kramagni* or ladder step heating procedure is recommended to give uniform, slow and steady rise in temperature. By this, the ingredients are given enough time at each range of tempera-

ture allowing them for any kind of reaction to take place.

Totally 17 peaks were identified in XRD at different angles (2 θ) from 26.67 to 43.76.The d values of HGR (Classical) - Sample 3 values (3.34, 2.85, 2.06). Totally 17 peaks were identified in HGR (VMF), at different angels (2 θ) from 26.65 to 31.33.

Particles of 1-10µm size are found in the sample when it is visualised through SEM magnification which ranged from 1500X-10000X. The FT-IR analysis of HGR shows the presence of 7 Absorption Peak frequencies cm^{-1} i.e. 3433, 2922, 2852, 1632, 1458, 1120, 617. HGR (Classical) Shows the presence of 7 Absorption Peak frequencies cm^{-1} – i.e. 3434, 2924, 2854, 1632, 1404, 1114, 613. S.S.R.(VMF) Shows the presence of 7 Absorption Peak frequencies cm^{-1} – i.e.3435, 2924, 2061, 1631, 1383, 1052, 669.This reveals the presence of Organic functional groups like primary amines, alkanes, Methylane, Alkynes in both HGR (Classical) & HGR (VMF).

CONCLUSION

Haragauri Rasa was prepared successfully using *Parada, Gandhaka* and *Navasadara* in the ratio 3:1:1/10. Pharmacuetico-Analytical study was a first attempt towards studying *Haragauri Rasa.*

HGR.71.15% yield obtained in HGR (Classical), 53.8% of yield obtained in HGR (EMF) comparing both the methods Pharmaceutically, Vertical Muffle Furnace is more convenient to prepare HGR, but the yield is more in Classical method. Handling of the procedure, cost, comfort and SOP are good in EMF method.

By comparative analytical study, HGR (Classical) shows Good analytical results compare to HGR (VMF).

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Source of Support: Nil
Conflict Of Interest: None Declared

How to cite this URL: Remya.R.G & B. Vinayachandra Shetty: Comparative Pharmaceutico-Analytical Study Of Haragauri Rasa Prepared By Conventional And Vertical Muffle Furnacemethod. International Ayurvedic Medical Journal {online} 2017 {cited December, 2017} Available from: http://www.iamj.in/posts/images/upload/4305_4312.pdf