ISSN 0976 – 3333

Available Online at www.ijpba.info

International Journal of Pharmaceutical & Biological Archives 2012; 3(6):1462-1466

ORIGINAL RESEARCH ARTICLE

Standard Manufacturing Procedure Of *Hridayarnava Rasa* –A Herbo-Mineral Formulation

Jagtap C Y* and Prajapati PK

Dept. of Rasashastra and Bhaishajya Kalpana including drug research, I.P.G.T. & R.A., G.A.U., Jamnagar, India

Received 08 Sep 2012; Revised 01 Dec 2012; Accepted 12 Dec 2012

ABSTRACT

Purpose: Along with herbal drug industry, popularity and demand of herbo-mineral formulations are increasing day by day. Many Ayurvedic pharmacies are preparing these formulations on large scale. Therefore the need of the hour is to standardize their manufacturing procedure on laboratory scale so that these observations can be reproducible on large scale production also. With this aim, this study was carried out to set the standard manufacturing procedure (SMP) for the famous herbo-mineral compound formulation, *Hridayarnava Rasa* (HR), which is widely used in the treatment of cardiac disorders.

Methods: It was prepared by the reference of AFI-I 20:55. *Samaguna Kajjali* was prepared from *Shuddha Parada* and *Gandhaka*. *Tamra Bhasma* [TB] (calcined ash of copper) was prepared by the reference of Rasaratnasamuuchaya 5/53. Five batches of HR were prepared for the standardization purpose. 100g *Kajjali* and 100g TB were taken and triturated. One *Bhavana* (wet trituration) of *Triphala Kwatha* [TK] (decoction of three myrobalans) was given followed by one *Bhavana* of *Kakamachi Swarasa* [KS] (expressed juice of *Solanum nigrum* Linn. Physicochemical parameters like loss on drying (LOD), ash value, acid insoluble ash etc were carried for three batches as per pharmacopoeial standards.

Results: Average 18g (9%) and 27.6 g (13.8%) increase in weight was observed after one *Bhavana* of TK and KS respectively. On an average, weight of HR obtained was 227.6 g. Average values of LOD, ash value, acid insoluble ash, water soluble extractive, alcohol soluble extractive and pH were 0.93%, 39.53%, 2.93%, 9.24%, 4.56%, and 6 respectively.

Conclusion: Data obtained from the present study is reproducible. Thus SMP of HR has been developed. To avoid the batch to batch variation, this SMP may be applied to large scale production of HR. The values of physicochemical parameters can be taken for quality assurance.

Key words: *Tamra Bhasma*, standard manufacturing procedure, quality assurance, quality control.

INTRODUCTION

Increased popularity of Ayurvedic medicines has also brought concerns and fears regarding the quality, efficacy and safety of the raw materials and final products. In spite of the existence and use of traditional medicines over many centuries, the safety, efficacy and batch to batch consistency of Ayurvedic formulations are not up to the mark, to meet the criteria needed to support their use worldwide.[1] Nowadays metal content of Ayurvedic preparations is currently a hot topic of discussion especially regarding its safety and efficacy. Therefore Ayurvedic preparations need stringent quality control of the finished products, as many of them contain inorganic elements such as arsenic, mercury and lead, which are known to be highly toxic.[2, 3] Moreover to meet the increased demand, many Ayurvedic pharmacies are preparing these formulations on large scale. Therefore the need of the hour is to standardize their manufacturing procedure on laboratory scale so that these observations can also be reproducible on large scale production. The present study was carried out to set the standard manufacturing procedure (SMP) for the famous herbo-mineral compound formulation, *Hridayarnava Rasa* (HR), which is widely used in the treatment of cardiac disorders.

MATERIALS AND METHODS

Procurement of raw materials:

Shuddha Parada (mercury), *Shuddha Gandhaka* (sulphur), and *Triphala Yavakuta* (coarse powder of three myrobalans) were procured from

***Corresponding Author:** Jagtap C Y, **Email:** drshikhar84@gmail.com

Pharmacy, Gujarat Ayurved University, Jamnagar. *Kakamachi* (*Solanum nigrum* Linn.) was collected from the campus of IPGT & RA, Jamnagar.

Preparation of *Kajjali* and *Tamra Bhasma* (TB):

Samaguna Kajjali (SK) was prepared by triturating equal amount of *Shuddha Parada* and *Shuddha Gandhaka* in end runner. *Tamra Bhasma* (calcined ash of copper) was prepared by the reference of Rasaratnasamuucchaya 5/53. *Samanya* (general) *Shodhana* (Ayurvedic purification and/or detoxification) [4] and *Vishesha* (specific) *Shodhana* of *Tamra* (copper) [5] was done as per classical references. For the preparation of *Bhasma*, first three *Putas* were given by adding equal amount of SK and triturating with sufficient quantity of *Nimbu Swarasa* (Juice of *Citrus medica* Watt.). Following temperature pattern was followed in Electric muffle furnace (EMF): 1st *Puta* – 700 °C for 20 minutes, 2nd *Puta* – 600 °C for 25 minutes, 3rd *Puta* – 500 °C for 30 minutes. Procedure of *Amrutikarana*[6] of TB was done as per the reference of Rasa Tarangini.[7] TB was subjected to various classical parameters of *Bhasma*, including *Dadhi Pariksha* (curd test), specific for TB.

Preparation of *Hridayarnava Rasa*:

It was prepared by the reference of AFI-I 20:55.[8] Five batches of HR were prepared for the standardization purpose. SK and TB were taken in porcelain mortar and triturated well. One *Bhavana* (wet trituration) of *Triphala Kwatha* [TK] (decoction of three myrobalans) was given followed by one *Bhavana* of *Kakamachi Swarasa* [KS] (expressed juice of *Solanum nigrum* Linn.). The final product was kept in airtight glass bottle. A detailed pharmaceutical proforma was prepared. The observations and results were noted down systematically.

Analysis of the final product:

Physicochemical parameters like loss on drying, ash value, acid insoluble ash etc were carried for all the batches as per pharmacopoeial standards.[9]

RESULTS AND DISCUSSION

HR is *Sagandha Niragni Murchhana* of *Parada* with *Tamra*. It is a *Khalviya Rasayana* prepared by processing in *Triphala Kwatha* and *Kakamachi Swarasa*.[10] Although there are many preparations in Ayurveda like *Brihat Vatachintamani, Prabhakar Vati, Arjunarishta* etc which are commonly used in the treatment of different cardiac disorders, little attention has been paid to famous herbo-mineral formulation called *Hridayarnava Rasa* in the area of pharmaceutical as well as clinical research in *Ayurveda*. So as to explore this formulation, pharmaceutically and analytically, this study was carried out.

Two different methods of *Hridayarnava Rasa* preparation are found varying in proportions of *Tamra Bhasma*. (**Table 1**) Method of Rasendrasarasamgraha is quiet famous among them and the same was used in this study. For the preparation of *Kajjali*, trituration in end runner was continued till the powder became black in color and very fine like *Kajala* (collyrium) and it fulfilled all the criteria of *Kajjali*. *Varitaratva* (floating on stagnant water), *Rekhapurnatva* (filling the furrows when rubbed between two fingers) and *Nischandratva* (lustreless) were found after average 26.33 hours of *Mardana* (trituration). *Kajjali* (Black sulphide of mercury - HgS)[11] is a *Sagandha Niragni Murchchana* of *Parada*. Acidic and alkaline substances used during the *Tamra Shodhana* procedures [*Nirvapa* (heating and quenching) and *Pachana* (boiling)] produce the corrosive chemical environment which favors for the stress corrosion cracking of copper.[12] Thus, *Shodhana* procedures of *Tamra* not only remove the impurities but also make it brittle which eases the further process of *Marana*. The Bhasmas prepared with *Parada* or *Parada Bhasma* as media are considered superior to others.[13] Hence, in this study, TB was prepared by using the *Kajjali* as media of *Marana*. After three Putas, TB complied with all the classical parameters of *Bhasma*. In curd test, no discoloration was observed when TB was sprinkled on curd (pH = 3.5) and observed for next 48 hours. This indicates that the TB is devoid of free copper and/or copper sulphate. The process of *Amrutikarana* removes any unstable compound and makes the product more stable. The color of TB obtained was black. Color indicates the formation of specific compound. In this case black color indicates the formation of either cupric oxide or cupric sulphide of copper or both.[14,15] In some previous studies, XRD pattern of TB showed the presence of CuS whereas some showed the presence of Cu_2S and Cu_7S_4.[16, 17,18]

For all the five batches of HR preparation equal amount of SK and TB were taken. (**Table 2**) Proper trituration of SK and TB was done to make their uniform mixture. 70 ml of TK was sufficient for the proper trituration of mixture which was done continuously. After complete drying, Bhavana of KS was given. Total three days were required to complete the practical. (**Table 3**) After

Bhavana of TK, average 17.9g (8.9%) increase in weight was observed which 28.2g (14.1%) was after the *Bhavana* of SK (**Table 4**). Increase in weight of final product is attributed to the solid contents from both the *Bhavana* dravyas. Organoleptically, final product was black in color, smooth in touch with specific odor and astringent-bitter taste (**Table 5**).

Standardization with classical tests and modern analytical tests plays an important role in the production of quality drugs. So it is of prime importance that single method standardization must be done with specific aim. Average values of physico-chemical parameters of three HR samples were found identical with some of the previous studies.[19,20] (**Table 6**) Very less value of loss on drying is indicative of almost absence of moisture. High ash value in TB shows the presence of very high inorganic content. Lower value of the acid insoluble ash suggests the greater physiological availability of the drug.

Table 1: Two methods of *Hridayarnava Rasa* preparation

S. No	*Tamra Bhasma*	*Parada*	*Gandhaka*	*Bhavana*	Reference
1	2 parts	1 part	1 part	TK, KS	RSS 2, RT 17
2	1 part	1 part	1 part	TK, KS	R.Chi 9

RSS: Rasendrasarasangraha; RT: Rasatarangini; R. Chi.: Rasendra Chintamani

Table 2: Quantity of ingredients taken in all five batches

Ingredients	Batches	Quantity (g)
Samaguna Kajjali (SK)	Batch 1.1 to 1.5	100
Tamra Bhasma (TB)	Batch 1.1 to 1.5	100

Table 3: Observations regarding the *Bhavana*

Bhavana drug	Batches	Quantity (ml)	Duration of Trituration (h:min)	Time required for completion of *Bhavana* (h:min)
Triphala Kwatha (TK)	Batch 1.1	70	4:45	26:40
	Batch 1.2	70	4:30	28:20
	Batch 1.3	70	4:38	27:30
	Batch 1.4	70	5:10	24:50
	Batch 1.5	70	4:50	26:30
	Average	**70**	**4:55**	**26:54**
Kakmachi Swarasa (KS)	Batch 1.1	70	4:30	28:10
	Batch 1.2	70	4:55	26:30
	Batch 1.3	70	5:20	27:40
	Batch 1.4	70	4:45	26:50
	Batch 1.5	70	5:10	27:20
	Average	70	5:12	27:10

Table 4: Description of weight before and after *Bhavana*

Description	Batches	Weight (g)	Increase in weight (g)	% increase
Ingredients	All	200	--	--
After *Bhavana* of *Triphala Kwatha*	Batch 1.1	215.6	15.6	7.8
	Batch 1.2	220.4	20.4	10.2
	Batch 1.3	218.9	18.9	9.5
	Batch 1.4	216.4	16.4	8.2
	Batch 1.5	218.6	18.6	9.3
	Average	**217.9**	**17.9**	**8.9**
After Bhavana of *Kakamachi Swarasa*	Batch 1.1	226.8	26.8	13.4
	Batch 1.2	228.3	28.3	14.2
	Batch 1.3	228.8	28.8	14.4
	Batch 1.4	229.1	29.1	14.6
	Batch 1.5	227.9	27.9	13.6
	Average	**228.2**	**28.2**	**14.1**

Table 5: Organoleptic characteristics of all the ingredients, in process material and final product

Material	Color	Touch	Odor	Taste	Sound
SK	Black	Smooth	Nil	Not specific	Nil
TB	Black	Smooth	Not specific	Nil	Nil
Before Bhavana of TK	Black	Smooth	Not specific	Not specific	Nil
After Bhavana of TK	Light black	Smooth	Specific	Astringent	Nil
After Bhavana of KS	Black	Smooth	Specific	Astringent, Bitter	Nil
Final product (HR)	Black	Smooth	Specific	Astringent, Bitter	Nil

Table 6: Physico chemical analysis of *Samaguna Kajjali, Tamra Bhasma* and *Hridayarnava Rasa*

Parameter	SK	TB	HR
Loss on drying at 105 ^{o}C (% w/w)	0.68	0.35	0.93
Ash value (% w/w)	78.98	98.79	39.53
Acid insoluble ash (%w/w)	0.97	1.89	2.93
Water soluble extractive value (%w/w)	0.09	0.58	9.24
Alcohol soluble extractive value (%w/w)	0.06	0.09	4.56
pH	8	8	6

Figure: Ingredients and final product of *Hridayarnava Rasa*

Samaguna Kajjali

Tamra Bhasma

Triphala Kwatha

Kakmachi Swarasa

Bhavana

Hridayarnava Rasa

CONCLUSION

The adopted method for preparation of *Hridayarnava Rasa* can be considered as easy, convenient and standard manufacturing procedure. Data obtained from the present study is reproducible. To avoid the batch to batch variation, this SMP may be applied to large scale production of HR. The values of physicochemical parameters can be taken for quality assurance.

REFERENCES

1. Liang Y Z and Xie CK, Quality control of herbal medicine. J. Chromatogr., 2004, 812, 53–70.
2. Hamilton E. M. N., Whitney EN and Size FS, Nutrition: Concepts and Controversies, West, MN, USA, 1998, 4th edn, p. 232.
3. Marian E., Metals and their Compounds in the Environment: Occurrence, Analysis and Biological Relevance, VCH, Weinheim, 1991.
4. Vagbhattacharya, Rasaratna Samuchchaya, 5/13, Kulkarni D.A., Hindi commentary, Meharchand Laxmandas publication, New Delhi, 1998; 93.
5. Vagbhattacharya, Rasaratna Samuchchaya, 5/52, Kulkarni D.A., Hindi commentary, Meharchand Laxmandas publication, New Delhi, 1998; 101.
6. Sharma S. N., Rasa Tarangini, 2/5827-30, Shastri K. N., Hindi commentary, Motilal Banarasi Das, Delhi, 2004;24.
7. Sharma S. N., Rasa Tarangini, 17/40-42, Shastri K. N., Hindi commentary, Motilal Banarasi Das, Delhi, 2004;418.
8. Anonymous (2003), The Ayurvedic Formulary of India, 2nd ed, Govt. Of India. Ministry of Health and Family Welfare, Dept. Of I.S.M. and H., New Delhi, part 1; 20:55; 279.
9. Anonymous (1999), The Ayurvedic Pharmacopoeia of India, 1st ed, Govt. Of India. Ministry of Health and Family Welfare, Dept. Of I.S.M. and H., New Delhi, Vol I, Appendix 2.
10. Gopala Krishna, Rasendrasarasamgraha, Hridroga Chikitsa, ‘Rasavidyotini’ hindi commentary by Indradeo Tripathi,

Chaukhamba Orientalia, Varanasi, 2nd edition, 1998; 380.
11. Ray PC, History of chemistry in ancient and medieval India, edited by Ray P, Chaukhamba Krishnadas Academy, Varanasi, 2004;110.
12. http:///H:/Stress_corrosion_cracking.htm
13. Vagbhattacharya, Rasaratna Samuchchaya, 5/14, Kulkarni D.A., Hindi commentary, Meharchand Laxmandas publication, New Delhi, 1998; 94.
14. Nayak S. Pharmaceutical standardization of Tamra Bhasma and to evaluate its antihyperlipidemic and cardio protective activity in experimental models. Ph.D thesis. (Gujarat Ayurved University, Jamnagar, Gujarat); 2009.
15. Bijjal AG. Preparation and analysis of Tamra Bhasma by various procedures as per Rasa Tarangini. M.D. dissertation. (Rajiv Gandhi University of Health Sciences, Bangalore, Karnataka); 2008.
16. Chitnis KS, Stanley A. Chemical evaluation of Tamra Bhasma. Int J Pharma Bio Sci 2011; 2:160-168.
17. Wadekar MP, Rode CV, Bendale YN, Patil KR, Gaikwad AB, Prabhune AA. Preparation and characterization of a copper based Indian traditional drug: Tamra Bhasma. J Pharm Biomed Anal 2005; 39: 951–955.
18. Rai R. A comparative study of Tuttha and Tamra Bhasma with special reference to its toxicity study. M.D. dissertation. (Benaras Hindu University, Varanasi, U.P.); 1999.
19. Mathur (Smt) L *et. al*., Hridaya Roga mein Paravata Shakrita evam Hridayarnava Rasa ka chikitsatmaka vivechana, PG dissertation, NIA, Jaipur; 1992.
20. Singh Sandeep Pal *et. al*., Clinical evaluation of the role of Hridayarnava Rasa and Haritakyadi Churna in the management of ischemic heart disease (Hridroga), PG dissertation, NIA, Jaipur; 2003.