Research Article

www.ijrap.net

PHARMACEUTICO ANALYTICAL STUDY OF MANDOORA LAVANA: AN ORGANO-METALLIC PREPARATION

B. Vinayachandra Shetty^{1*}, Rohit A Gokarn², Dhanya K.U³

¹Principal and HOD, Department of P G Studies In Rasa Shastra, A.A.M.C, Moodbidri, Karnataka, India

²Associate Professor, Division of Ayurveda, Centre for Integrative Medicine and Research, Manipal University, Manipal, Karnataka, India

³P.G. Scholar, Department of P G Studies In Rasa Shastra, A.A.M.C, Moodbidri, Karnataka, India

Received on: 20/08/16 Revised on: 02/09/16 Accepted on: 06/10/16

*Corresponding author

E-mail: ravisorake@gmail.com

DOI: 10.7897/2277-4343.075221

ABSTRACT

Mandoora Lavana is one of the *Rasoushadhi* (herbo-mineral compound formulations) explained under *Lavana Kalpana* (Preparations containing salt as major ingredients) It contains the ingredients like *Mandoora* (iron rust), *Saindhava Lavana* (rock salt) and *Gomutra* (Cows Urine). Traditionally, it is used for the effective management of *Pandu* (Anemia). Objectives were set to carryout Pharmaceutical standardization of *Mandoora Lavana* and were analyzed with standard physico chemical parameters. *Mandoora Lavana* was prepared as per classical guidelines in three different batches to ascertain standard manufacturing process. *Mandoora Lavana* is also analyzed by XRD, SEM, EDAX, which revealed the presence of ferrous oxide, and the presence of elements such as Iron, Sodium, Chlorine etc in the percentage of 50.91%, 27.84%, 11.14% respectively. The temperature pattern (highest required temperature: 800°C) adopted in electric muffle furnace to prepare *Mandoora Lavana* is considered as standard heating pattern. Average 182.6g of *Mandoora Lavana* can be obtained by adopting present standard manufacturing procedure.

Key words: *Mandoora Lavana*, Standardization, XRD, SEM-EDAX

INTRODUCTION

Rasashastra, the pharmaceutical science, deals mainly with the processing and therapeutic utilization of metals, and minerals. It aims at designing novel drugs with better curative attributes at minimum doses.¹ *Lavan Kalpana* constitutes of formulation in which *Saindhav Lavan* (Rock salt) is one of chief ingredients.² *Lavana Kalpana* is the ash obtained by igniting the drugs (herbs or minerals) with rock salt in a closed *Samputa*. *Mandoora Lavana* is one such preparation containing the ingredients like *Mandoora*, *Saindhava Lavana* and *Gomutra* and is used as a traditional medicine for *Pandu* (Anemia).³ *Lavana* is said to be *Sukhma Srotogami* (enters minute pores of tissues and enhancing absorption), hence *Kalpana* prepared by using *Lavana* also possess such properties. Although the formulation is often being used by many practitioners, but the standardization and qualitative analysis of *Mandoora Lavana* has not been studied till date. Standardization is most essential part and a major challenge in Ayurvedic pharmaceuticals. The present work was taken up to develop standards for *Mandoora Lavana* prepared with the help of muffle furnace and to evaluate its detailed physical, chemical and instrumental analysis.

MATERIALS AND METHODS

Materials: Raw *Mandoora*, *Saindhava Lavana*, *Gomutra* were procured from authentic sources and verified for their authenticity.

Mandoora Shodhana was carried out as per classical guidelines^{4,5} and observations were noted. (Table 1) *Shodhita Mandoora* was taken in a mortar and finely powdered. Then this powder was heated till red hot and dipped in *Gomutra* for ten times. Thus formed *Mandoora* was added with *Saindhava*

Lavana and mixed properly. Earthen vessel was taken and filled with the above mixture and *Sandhibandhana* (sealing the vessel) was carried out by using *Multani mitti*. Then the *Sharava* was kept in the muffle furnace and heat was given for three hours.⁶ Initial temperature was set for 100°C and in every 15 min. temp was raised by 100°C till it reached upto 800°C. For rest of the time it was maintained on 800°C. Then the furnace was turned off and left for self cooling. Next day the *Sharava* was taken out and the *Sandhibandhana* was opened. Prepared product was taken out and powdered. *Mandoora Lavana* was thus prepared in three batches for standardization.

Analytical tools: Organoleptic characters, pH, Loss on drying, Total Ash, Acid insoluble Ash were analyzed based on standard Ayurvedic Pharmacopoeia of India procedures.⁷ Crystallinity of the sample was studied using X-ray diffractometer (XRD, machine JEOL make, JPX 8). $\text{Cu-K}\alpha$, $\lambda = 1.5418$ from Physics department, M.I.T Manipal. The morphology of the samples was characterised using scanning electron microscope (SEM, JEOL make, model 6380LA). Elemental compositions at various regions in the coating were estimated using energy dispersive spectroscopy (EDS) attached to SEM from Dept of Metallurgy and Material Sciences Engineering, NITK, Surathkal.

RESULTS

Average weight of the final product obtained was 182.6g (Table 2) and the temperature pattern adapted is shown in Graph 1. Final product obtained was more appreciated for its color, reduction in particle size and while grinding, the product seemed to be very easily powdered. (Table 3) *Mandoora Lavana* was acidic in nature with pH 5.55 with minimal loss on drying. Total ash was 98.36% whereas 61.04% was insoluble in

acid. (Table 4) Elements like iron 50.91%, Na 27.84%, Cl 11.4%, O 9.69%, K 14% were found by EDAX analysis. (Table 5) (Graph 2) On analysis of the spectrum the compounds present in the sample were mainly Fe_2O_3 and NaCl. (Table 6) (Graph 3)

DISCUSSION

Various trials were carried out to fix the temperature for the preparation of *Mandoora Lavana*. At 400°C and 600°C the final product did not show any remarkable changes and the color was blackish and there was no much reduction in particle size. Second trial was carried out by fixing the temperature at 800°C . In previous research work by Sarkar Prashanta *et al.* for the preparation of *Mandoora Bhasma* the temperature fixed was 783°C in muffle furnace.⁸ On this basis the three batches of *Mandoora Lavana* were prepared and the final product obtained had fulfilled chief desired characteristics.

Color exhibited by *Mandoora Lavana* was reddish brown in colour which corresponds to red ferric oxide.⁹ pH of the sample *Mandoora Lavana* possess the pH 5.55, ie slight acidic

in nature, may be due to the long exposure to the heat. Lower value of loss on drying indicates the absence of moisture in the drug. Acid-insoluble ash is an indicator of quantity of acid non-digestible mass in the sample and lower acid-insoluble ash indicates higher bioavailability of the drug.¹⁰ *Mandoora Lavana* shows the presence of particle size ranging from $1.56\mu\text{m}$ to $3.13\mu\text{m}$. Considerable reduction in particle size by *Puti* is evident in *Mandoora Lavana*, which would result in greater absorption of the drug. The atomic percentage of iron in the *Mandoora Lavana* sample was 50.91%, whereas rest of elements like Na 27.84%, Cl 11.4%, O 9.69%, K 14% were also noticed by EDAX analysis. The given XRD data of the sample was identified the presence of Fe_2O_3 and NaCl. Concept of calcination in Ayurveda is conversion of metals and minerals into assimilable compound form. As reported in previous studies with iron complexes it has been reported to be Fe_2O_3 ^{10,11} which was similar in present context. NaCl found in both analysis reveals the presence of rock salt used during preparation. However specific study on *Mandoora Lavana* has not been reported.

Table 1: Observations of *Mandoora Shodhana*

Particulars	<i>Mandoor before Shodhana</i>	<i>Mandoor after Samanya Shodhana</i>	<i>Mandoor after Vishesha Shodhana</i>
Weight	750g	735g	730g
Physical changes	Intact Iron rust	Became Brittle	Turned to powder form
Colour	Brownish red	Brown	Brown

Table 2: Ingredients and Final product of *Mandoora Lavana*

	Batch 1	Batch 2	Batch 3
<i>Mandoor</i>	100g	100g	100g
<i>Saindhav Lavan</i>	100g	100g	100g
<i>Gomutra</i>	100ml	100ml	100ml
Wt. of Product	182.5g	180.5g	185.0g

Table 3: Organoleptic characters of *Mandoora Lavana*

Colour	Taste	Odour	Texture
Reddish Brown	Salty	No specific smell	Smooth

Table 4: Result of chemical analysis

Test	Results
pH	5.55
Loss on drying	0.38% w/w
Total Ash	98.36%w/w
Acid insoluble Ash	61.04% w/w

Table 5: Results of elemental analysis of *Mandoora Lavana*

Elements	Mass%	Atomic %
O	3.83	9.69
Na	15.80	2
Cl	9.75	11.14
K	0.13	0.14
Ca	0.28	0.29
Fe	70.20	50.91
Total	100.00	100.00

Table 6: XRD peak values of *Mandoora Lavana*

2 theta (deg)	Height(cps)	d spacing	FWHM(deg)	Peak Int. (cps deg)
22.833	155.52	3.891	4.616	829.75
27.194	893.56	3.276	0.240	235.63
31.360	13790.18	2.850	0.178	3161.64
32.796	499.6	2.728	0.231	167.87
35.302	544.73	2.540	0.331	348.36
45.111	3491.37	2.008	0.222	904.37
56.147	797.6	1.636	0.206	271.67
62.400	58.85	1.486	2.389	161.53
65.940	622.22	1.415	0.293	218.26

Graph 1: Temperature pattern during the process

Graph 2: Results of EDAX of Mandoora Lavana

Graph 3: XRD pattern of Mandoora Lavana

Figure 1: Raw Mandoora

Figure 2: Saindhava Lavana

Figure 3: Gomutra

Figure 4: Raw materials in Sharava

Figure 5: Sharava samputa

Figure 6: Sharava In Muffle Furnace

Figure 7: Final product Opening

Figure 8: Final product on trituration

Figure 9: The average particle size of given sample was 2.39µm

CONCLUSION

The adopted method for preparation of *Mandoora Lavana* is considered as easy, convenient and standard method. The temperature pattern (highest required temperature: 800°C) adopted in electric muffle furnace to prepare *Mandoora Lavana* can be considered as standard heating pattern. *Mandoora Lavana* analyzed by XRD, SEM-EDAX, which revealed the presence of ferrous oxide, and the presence of elements such as Iron, Sodium, Chlorine etc in the percentage of 50.91%, 27.84%, 11.14% respectively. This observation can be considered as standard for further studies on *Mandoora Lavana*.

REFERENCES

- Gokarn RA, Rajput DS, Patgiri B. Pharmaceutical standardization of *Samaguna Bali Jarita Rasasindura* prepared by conventional and modified method. *Ancient Science of Life*. 2012;31(3):123-128.
- Kothari Vasavdutta, Jain Snehal, Kotecha Kalpu. Activated Charcoal- in Narikela Lavan. *Pharm. Sci. Monitor* 2015;6(1): 217-219.
- Anonymous: Yoga Ratnakara, Vidyotini Hindi commentary by Shastri Lakshmiapati, 6th edition, Chaukhamba Sanskrit Sansthan (Varanasi); (verses 1-2) 1997. p 342.
- Acharya Vagbhata: Rasaratna Samucchaya, Rasaprabha Hindi vyakhya by Tripati Indradev, Chaukhamba Sanskrit Sansthan Varanasi; (Verses 29) 2009. p. 55
- Acharya Vagbhata: Rasaratna Samucchaya, Rasaprabha Hindi vyakhya by Tripati Indradev, Chaukhamba Sanskrit Sansthan Varanasi; (Verses 151) 2009. p. 68.
- Anonymous: Yoga Ratnakara, Vidyotini Hindi commentary by Shastri Lakshmiapati, 6th edition, Chaukhamba Sanskrit Sansthan (Varanasi); (verses 1-2) 1997. p. 342.
- Anonymous: *The Ayurvedic Pharmacopoeia of India*, New Delhi: Govt. of India: Ministry of Health and Family Welfare, 1st edition, part 2, vol. 2, Appendix 5 (5.2.11), 2006; p.151-270.
- Sarkar Prashanta et al. A Comparative Pharmaceutico-Pharmaco-Clinical Study Of Lauha Bhasma And Mandura Bhasma W.S.R. To Its Pandu-Hara Effect, Dept. of RSBK, IPGT&RA (Jamnagar); 2005.

9. Chemistry of Iron, Chemistry, UWI-Mona, [cited 2015 May 15]. Available from: <http://www.chem.uwimona.edu.jm/courses/iron.html>.
10. Balaji Krishnamachary, Brindha Pemiah, Sridharan Krishnaswamy, Uma Maheswari Krishnan, Swaminathan Sethuraman, Rajan K Sekar. Elucidation of A Core-Shell Model for *Lauha Bhasma* through Physicochemical characterization. *Int J Pharm Pharm Sci* 2012; 4(2), 644-649.
11. Ramanathan R, Ramasamy R and Jamespandi Annaraj. Comparison of physical and morphological properties of mandura bhasma and iron oxide nanoparticles. *Int. J. Res. Ayurveda Pharm.* 2015;6(6):788-792 <http://dx.doi.org/10.7897/2277-4343.066147>

Cite this article as:

B. Vinayachandra Shetty, Rohit A Gokarn, Dhanya K.U. Pharmaceutico analytical study of Mandoora lavana: An organo-metallic preparation. *Int. J. Res. Ayurveda Pharm.* Sep - Oct 2016;7(Suppl 4):62-66 <http://dx.doi.org/10.7897/2277-4343.075221>

Source of support: Nil, Conflict of interest: None Declared

Disclaimer: IJRAP is solely owned by Moksha Publishing House - A non-profit publishing house, dedicated to publish quality research, while every effort has been taken to verify the accuracy of the content published in our Journal. IJRAP cannot accept any responsibility or liability for the site content and articles published. The views expressed in articles by our contributing authors are not necessarily those of IJRAP editor or editorial board members.