Pharmaceutical Standardisation

Characterization of Tarakeshwara Rasa: An Ayurvedic herbomineral formulation

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Abstract

Tarakeshwara Rasa (TR) is an Ayurvedic herbomineral compound formulation used in the intervention of Prameha vis-à-vis diabetes mellitus. The present study was executed to establish a fingerprint for this unique formulation, which can be adopted by the Ayurvedic pharmacies for drug standardization. TR is a formulation prepared by the trituration of four ingredients Abhraka Bhasma (AB), Loha Bhasma (LB), Vanga Bhasma (VB) and Rasa Sindhura (RS) in equal quantities with honey for one day. Each of the ingredients were prepared according to the norms of Ayurvedic classical texts and by employing Electric Muffle Furnace as heating device for incineration. To ensure the proper preparation of Bhasmas, standard tests (Bhasma Pariksha) were employed. After Bhasma complies these tests, TR was prepared and subjected for qualitative analysis, X-Ray Diffraction (XRD) and Scanning Electron Microscopy (SEM) studies. LB, AB, VB, RS and TR were also studied for free metal presence by employing phosphomolybdic acid. Chemical analysis of TR reveals that it contains Fe, Sn, Hg, Al, Mn, Ca and Mg. XRD study indicates that TR contains Fe₂O₃ (maghamite) in major phase and SnO₂ (cassiterite), HgS, SiO₂, HgO in minor phases. SEM study revealed that the compound is an agglomeration of particles. The particle size was in between 0.5 and 2 µ. Free metal detection by phosphomolybdic acid revealed the absence of free metals in the final Bhasmas. This is the first study establishing the characterization of Tarakeshwara Rasa.

Key words: Bhasma, characterization, rasashadhi, scanning electron microscopy, X-ray diffraction

Introduction

Ayurveda employs the usage of Rasoushadhis (herbomineral preparations) since centuries for a wide range of maladies. Modern medicine has very less documentation regarding the therapeutic utility of metals and minerals. They are apprehensive about the safety of these compounds. The role of metals in curing ailments was first realized in Ayurveda. Ancient Acharyas were conscious about the ill effects of the metals and they were well-versed in transforming them into safe effective medicines. In earlier days, the quality of a medicine was not subjected for critique, but it was based on the sacred trust which existed between the physician and the patient. The technological development and apprehensions of modern science obligated the patients and physicians to be watchful about the quality assurance, safety and efficacy of the medicine. Ayurvedic medicines have no exception in this regard. Hence it is the need of the hour to produce fingerprints for quality medicines. Many researchers have analyzed the metal and mineral-based individual Bhasmas. But the independent Bhasmas are used occasionally. Hence it is required to develop fingerprints not only for Bhasmas but also for the compound formulations. Tarakeshwara Rasa (TR) is the first line compound Rasa formulation used in the treatment of Prameha and is well known as “Poor man’s Vasanathakusumakara Rasa.” Literary search of classics reveals that, TR has been mentioned in various classics with different ingredients and different indications i.e., Prameha, Mutra Ghata and Mutra Krichhra. TR mentioned in Bhaishajya Ratnavali is widely used for Prameha and is available in the market. Hence this formulation was selected for the study. Earlier few researchers have established the effect of TR in diabetes mellitus clinically. But till date no scientific work has been carried out on this formulation with respect to physicochemical characterization, which is essential for drug standardization.
Materials and Methods

Preparation of research formulation
Vanga Bhasma, Rasa Sindhura, Abhraka Bhasma and Loha Bhasma were taken in equal quantities. These were triturated with honey for 1 day then they were made into tablets. For preparing individual Bhasmas, the guidelines were adopted from various classical texts of Rasa Shastras and expert opinions[10] [Table 1].

For the preparation of Rasa Sindhura, Kumari Bhavita Kajjali (black sulfide of mercury, wet-triturated with fresh juice of aloe) was taken in a beer bottle wrapped by seven layers of clay and cloth. It was subjected to mild (250°C) moderate (250–450°C) and severe (650°C) heat through vertical electric muffle furnace. Total duration of heating was nine hours. Rasa Sindhura thus obtained was collected in the form of sublimate at the neck of the bottle.

Characterization of Tarakeshwara Rasa
Characterization with Ayurvedic parameters
The final Bhasmas were analyzed for quality control as per the Ayurvedic texts and then subjected for the preparation of TR.

a. Physical characterization

i. Varna (Color): Well-prepared Bhasmas possess a specific color as per the classics. In the present study the following were the colors of the Bhasmas, Abhraka Bhasma- brick red,[11] Vanga Bhasma- white (conch shell),[12] Loha Bhasma- ripened Jamoon fruit (purple),[13] Rasa Sindhura -Sindhura Varna (orange red) TR - light brick red.

ii. Nischandratvam (lusterless): Metal loses its metallic luster after proper incineration. This was examined under sunlight.[14] No luster was found in any of the Bhasmas.

iii. Rek hapur nat a (finger lines test): The particles were so fine that when a pinch of Bhasma was taken between index finger and thumb, all the particles entered the furrows of the fingers.[14]

iv. Varitara (floating on water): Small quantity of each Bhasma was sprinkled on still water and it floated for some time on water.[14]

v. Unama: On each Varitara Bhasma rice grain was kept, it floated on the water.[14]

Thus three Bhasmas passed all the five tests for physical characterization.

b. Chemical characterization

vi. Apunarbhava: It is the inability of Bhasmas to revert to its original form. Bhasmas were mixed with Mitra panchaka, triturated, and subjected for Puta. After cooling no metallic particles were detected.[14]

vii. Ninuttha: It is the inability to regain its alloy forming metallic property. If the Bhasma is subjected to Puta and kept along with silver foil, the weight of silver foil did not increase. All three Bhasmas passed these two tests.

Characterization of TR by using modern parameters

i. Qualitative analysis: Qualitative analysis[15] was carried out in the Department of Medicinal Chemistry, Faculty of Ayurveda, Institute of Medical sciences, Banaras Hindu University, Varanasi.

For digestion of sample, one gram of sample was added with 20 ml of HCl+20 ml of HNO₃+4 ml of H₂O₂ in a closed vessel device using temperature control microwave heating at 200°C for 45 minutes then after cooling vessel device, solution is filtered and washed by ionized water. The insoluble portion was discarded and the solution was taken for the analysis.

The sample of TR was grinded well in agate mortar and desiccated well prior to the experiment, as any sort of moisture will give improper results.

The samples of the study were mounted on the sample holder of a commercial high resolution X-ray power Diffractometer fitted with a curved crystal monochromator. This diffractometer operates on “Bragg- Brentano geometry”. An 18 Kw rotating anode generator was used as a source of X-ray. The XRD data was collected[16] [Figure 1, Table 2].

Table 1: Pharmaceutical preparation of Tarakeshwara Rasa

| Ingredient       | Shodhana                           | Pre incineration processes          | Bhavana Dravya                  | Putapaka (EMF method) | Number of incineration cycles |
|------------------|------------------------------------|-------------------------------------|---------------------------------|-----------------------|------------------------------|
| Vanga (Tin metal)| Dhalana in Churnodaka and Nirgundi Swarasa mixed with Haridra Chuma both 7 times | Jarana with Apamarga Panchanga Chuma | Kumari Swarasa (aloe juice)     | Peak temperature (°C) 500 | Duration of peak temperature 1 hr | 5 |
| Krishna Vaja Abhraka (Biotite) | Nirvapa in Triphala decoction 7 times | Dhanyabhrapeekaranam (special method of milling) | Kasamarda Swarasa (Cassia oxidentalis fresh leaf juice) | Peak temperature (°C) 800 | Duration of peak temperature 1 hr | 40 |
| Tikshna Loha (iron) | Nirvapa each 7 times in sesame oil, butter milk, cows urine, sour gruel and decoction of horse gram | 1. Bhanu Paka (sun drying) with Triphala Kwatha 2. Sthali Paka (boiling) with Triphala Kwatha | Triphala Kwatha | Peak temperature (°C) 650 | Duration of peak temperature 1 hr | 20 |
iii. Detection of free metal: Phosphomolybdic acid was used as a reagent for the detection of free metal.\[17\]

Preparation of reagent: Two grams of phosphomolybdic acid was accurately weighed and transferred to a clean volumetric flask (100 ml). Fifty milliliters of distilled water was poured into the flask and the acid was dissolved by warming on the water bath. The volume of the solution was made up to 100 ml by addition of acetone. The color of the solution should be bright yellow. In case the solution shows a dull green color, addition of a drop or two of nitric acid is necessary.

Procedure: Four clean sample tubes were taken for tin and iron and the prepared Bhasmas were labeled. Fifty milligrams of each sample was weighed and transferred into appropriate sample tubes and 1 ml of phosphomolybdic acid reagent was added in each of the sample tubes. All the sample tubes were shaken well for 1 minute and then allowed to stand for 5 minutes. The color change if any was noted.

iv. Scanning electron microscope: SEM was performed in the Department of Physics, Faculty of Science, BHU, Varanasi.

One of the basic features of SEM is their excellent depth of focus due to which it provides a three dimensional view of the surface. Hence, the specimen surface does not require any elaborate surface preparation and even a fractured surface can also be studied at sufficiently high magnification i.e., up to 5000 magnification. For the present study SEM 840 A (JEOL - Japan electronics optical limited) was used for taking the micrographs. It is a state of the art high resolution SEM. Its maximum limit of magnification is 3 lakh.\[18\]

**Method**

In this study a small pellet of sample of TR was kept in desiccator for drying. After complete desiccation the sample was subjected for carbon coating and then was placed over the specimen holder and observed under the microscope at 500, 1000, 1500×. Micrographs were taken with the inbuilt camera.

**Observations and Results**

In qualitative analysis TR showed the presence of Sn, Hg, Fe, Ca, Al, Mn and Mg. Detection of free metal by using phosphomolybdic acid reagent shown that there is no color change observed with final Bhasmas of Lauha, Vanga and Abhraka but tin and iron showed immediate color change from yellow to blue. There were no free metals present in the Bhasmas selected. In SEM pictures [Figures 2 and 3] of TR, individual particles were visualized clearly. The horizontal line in the right corner of the micrograph corresponds to 10 and 5-µ length. A comparison could be made between the length of the particles visible in the micrograph with this line and the length of the Bhasma particle was calculated. The SEM study pictures show that the particles were homogeneously mixed. The particle size ranges from <1 to 40 µ and the bigger particles were agglomeration of smaller particles itself. The smaller particles had a size less than 0.5 µ which shows high dispersion.

**Discussion**

Lack of standardization is considered as the biggest pitfall in the growth and or differentially as per the individual requirement dissemination of Ayurveda.\[19\] Previously, the Bhasmas were being prepared on small scale by the Ayurvedic physicians themselves, but now they are manufactured on large scale in pharmaceutical houses. This new approach has created several troubles, as the uses of new appliances have not
been standardized with respect to the quality of these Bhasma preparations. For standardized Bhasma preparations, there is a need for scientific approach, which may be defined as 1. Physical standardization and elemental analysis of raw materials and final products. 2. Determination of oxidation state of metals and association of these metals with acidic radicals in the final product.[20] Along with these parameters for quality assurance of Bhasmas, process standardization is also essential. Preparation of Bhasma is very elaborate, time, and labor consuming. After the purification methods (Shodhana), pre-inclusion methods, converting metal and minerals into suitable form for incineration i.e., powder form (Dhanyabhakeekarana and Jarana), the individual drugs were triturated with herbal juices and inverted. The impregnated herbal coat on the surface of the metal or mineral and trituration helps in particle size reduction. Method of preparation of Bhasma is similar to the modern day surfactant-mediated nanomaterial production. [21] Classical texts of Rasa Shashtra have explained tests (Bhasma Parikshas) to identify the accuracy of Bhasma preparation. Bhasma Parikshas are nothing but characterization of Bhasmas with minimal tools. They may be classified into nondestructive (Nischandratvam, Rekhapurnita, Vartiara, and Unama) and destructive (Aparnabharva and Niruttha).

Qualitative analysis of TR reveals the presence of Sn, Fe, Al, Mn, Ca and Mg. The other metal presence in the final Bhasma may be due to adulteration or usage of earthen caseroles during preparation or the herbs and methods used throughout the pharmaceutical study. The role of these elements in the characterization is uncertain.

In XRD pilot study, it was found that if honey is used for trituration, it showed amorphous nature of TR. Hence, the fine powder of TR without addition of honey was subjected to XRD studies. This study confirms the presence of ingredients of TR. Ten Fe₂O₃ (maghamite) peaks, four SnO₂ peaks, four SiO₂ peaks, four HgS peaks and one HgO peak were observed in the study. These peaks indicate the presence of respective Bhasmas and Rasa Sindhura. The XRD pattern of TR shows the presence of Fe₂O₃ (maghamite) as the major phase, which is marked to the corresponding peak of each phase and remaining peaks of SnO₂, SiO₂, HgS and HgO were minor phases. The presence of Fe₂O₃ (maghamite) in Loha Bhasma,[22] SiO₂ peaks along with Fe₂O₃ peaks in Abhraka Bhasma,[23] the traces of HgO along with major phase of HgS in Rasa Sindhura[24] were reported by the earlier scholars. The present study also supports these findings.

The scanning micrographs obtained from the various surface regions of the sample clearly depicts the particle size which ranges from <5 to ~ 40 µ. Bigger particles mimic the agglomeration of the smaller particles, which are of the size <5 µ. More interestingly various crystallites in different shapes namely rod (5-10 µ length, ~2-4 µ diameter), elliptical (~4 µ length), Cubical (~1 µ) and rectangular (length ~ 10 µ, width 1-4 µ) were embedded in the lumps and hence bigger particles (~40 µ) were obtained. Unlike the bigger particles, these shaped particles had smooth surface features. It is evident from the well-defined XRD peaks, that these particles were crystalline. Distribution of smaller particles (<1 µ) shows high dispersion throughout the surfaces and their typified surface features are favorable to consider that they are crystalline. Some bigger crystalline particles may be of Rasa Sindhura. It shows that even after triturating for one day, the particles of Rasa Sindhura were still bigger. Remaining all particles are of 0.5-2 µ size. Hence a conclusion can be drawn that all the Bhasmas were of the size less than 2 µ in TR. The earlier SEM studies on Swarna Makshika Bhasma - particle size 1-2 µm,[25] Swarna Bhasma -particle size 56-57 nm,[26] 669-717 nm,[27] Naga Bhasma - particle size 60 nm[28] and Yashada Bhasma has identifiable fraction of particles in nano size.[29] Particle size distribution of LB - the particle size range of 2.55-40.9 µm was found in Sahastraputi Lauha Bhasma and 5.1-51.6 µm in Satputi Lauha Bhasma.[30] Hence a logical conclusion can be drawn, that the Bhasmas possess significant percentage of particles in nanosize, but microsized particles are also present. So Bhasmas have nano to micro particles. Particle size depends on the nature of drug and number of calcination cycles.

The interaction of biological systems with particles depends on various factors such as nature of particles (size, shape, composition, etc), cell type and environment. Other factors governing the interaction are yet to be completely understood.[29] Thus it can be concluded that Bhasmas possess a micro to nano-sized particles.

Free metals exert their toxic effects by combining with one or more reactive groups (ligands) essential for normal physiological functions. Hence, free metal presence is not desirable in final Bhasma. The phosphomolybdic acid test is useful for primitive screening of Bhasma.

**Conclusion**

TR is a red-colored compound formulation used in the
intervention of Prameha. Chemical analysis of TR reveals the presence of iron, tin, mercury, manganese, magnesium and calcium. The XRD studies indicate Fe$_2$O$_3$ in major phase and SnO$_2$, HgS, SiO$_2$, HgO as minor phases. SEM studies reveals that majority of particles were found to be in between 0.5 and 2 µ. Analysis with phosphomolybdic acid confirmed the absence of free metal in the prepared Bhasmas. Free metal absence is essential in the safety of Bhasma, as elemental form of metal can produce oxidative stress. This study can serve the need for the characterization of TR. This study can be a step forward for the direction of establishing the fingerprint of, Tarakeshwara Rasa a herbomineral compound formulation.

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**References**

1. Choudhary E, Qibal Z, Khan T, Ashraf M. Trace metals analysis in selected pharmaceutical multimineral formulations. Pak J Pharm Sci 2005;18:40-3.
2. Shah Nageendas Chhagandas, Bharata Bhaishajya Ratnakara, Part 2. 2nd ed. New Delhi: B Jain Publishers Pvt. Ltd; 1999. p. 434-5.
3. Sen Govinda Das Bhaishajya Ratnakali, Hindi Commentary of Sastry Venimadhav, Chaukamba Krishnadas Academy, Varanasi. 1st ed; 2008; 540 p. 540.
4. Nityanathaa Siddha, Rasa Ratnakara, Rasendra Khandha 18/48-50, Telugu commentary Edited and Published by by Krishnamacharya S, Tirupathi, 1936; p. 374.
5. Mishra Chudamani, Rasa Kamadhuenu Ucataradha commented by Sharma Santosh kumar 2/73-75 Chaukamba Orientalia, Varanasi, 2nd Edition. 2003; p. 14.
6. Bhatt Sri Gopala Krishna, Resendra Sara Samgraha, English commentary by Satpute Ashok D, sloka 2/1-2 1st Edition, Chaukamba Krishnadas Academy,Varanasi, 2003. p. 535-6.
7. Anonymous, Classical medical index, Mutra Vaha Srotas, Ayurvedline Ayurvedic drug index, published by Sesharam Prasad, Bangkok 2001; p. 378.
8. Joshi RK, Sharma AK, A scientific study of Tarakeshwara Rasa and Trikatu Gutiya with Vasti Karma in the management of Madhumeha Roga (Diabetes Mellitus). Journal of research in Ayurveda and Siddha 2003;24:71-87.
9. Murthy Sri Rama Chandra, “Clinical trial of Herbo-mineral compound Nishamalaki and Tarakeshwara Rasa in Madhumeha,” Souvenir of Ayurvedic Seminar on Diabetes, New Delhi: Rashtra Ayurveda Vidyapeeth, Publication 2005; p. 198-203.
10. Gupta KL Virupaksha, Neeraj Kumar, Acharya SB, Study on Tarakeshwara Rasa (Pharmaceutical Standardization and experimental study), MD thesis- Department of Rasa Shastra, Faculty of Ayurveda, IMS, BHU, Varanasi, 2006; p. 74-95.
11. Rasa Vagbhatla, Rasa Ratna Samuccayah, Satpute Ashok, 3rd edition, 5/136, Chaukhamba Sanskrit Pratishthan, New Delhi, 2003; p. 137-8.
12. Sharma Sadananda, Rasa Tarangini, 18/24, Delhi: Motilal Banaras Das, 2004; p. 440.
13. Upadhyaya Madhava, Ayurveda Prakasha, Mishra G.S Reprint, New Delhi: Choukhamba Bharathi Academy; 1999, p. 289.
14. Rasa Vagbhatla, Rasa Ratna Samuchayah, Kulkarni DA. 3rd edition-reprint, Mehrarchand Laxmandas Publications, NewDelhi.1998; p 200 and 109.
15. Goswami B. Elements of Inorganic Chemistry, 1962. 1st ed. Calcutta: T. Moulik Library.
16. Cullity BD. Elements of X-Ray diffraction. 2nd ed. London:Addison Wesley Publishing Company, Palo Alto; 1978.
17. Paul AK, Detection of free metal in Bhasmas employing Spot Test, M.D thesis, Department of Rasa Shastra, BHU Varanasi, 1989.
18. Goldstein J, Newbury DE, Joy DC. SEM and X-Ray Microanalysis. 3rd ed. New York: Springer Science; 2003.
19. Quazi GN, Standardization, quality control and safety of traditional medicine, Proc Int Conclave Traditional medicine, 16-17 Nov 2006 (NISCAIR New Delhi).
20. Tripathi Yamini Bhusan. A Multidisciplinary Approach to Standardize Bhasmas (Ayurvedic Metallic Preparations). Current Science, 2006;90: p. 897-98.
21. Yu-de Wang, Chun-lai Ma, Xiao-dan Sun, Heng-de Li, Preparation of nano crystalline metal oxide powders with the surfactant-mediated method, inorganic chemistry communications. 2002;15: p. 751-55.
22. Singh Neetu, Reddy KRC, Prasad NK, Manjeet Singh,’Chemical Characterization of Lauha Bhasma by X-Ray Diffraction and Vibrating Sample Magnemtometry. Int J of Ayurveda Med 2010:143-49.
23. Kadam A, Jha CB. A Comparative study of Abhraka Bhasma Satva Bhasma and Loha Bhasma), MD thesis Department of Rasa Shastra, Faculty of Ayurveda, IMS, BHU Varanasi, Varanasi; 2003.
24. Singh SK, Choudhary A, Rai DK, Rai SB. Preparation and characterization of a mercury based traditional drug Rasa Sindhoor. Ind J Traditional Knowledge 2009;8:346-51.
25. Mohapatra S, Jha CB, Physicochemical characterization of Ayurvedic Bhasma (Swarna Makshika Bhasma): An approach to standardization. Int J Ayurveda Res 2010;1:82-6.
26. Brown CL, Bushell G, Whitehouse MW, Agrawal DS, Tupe SG, Paknikar KM, et al. Nanogold Pharmaceuticals, Gold Bulletin, 2007; 40:9:245-250.
27. Paul W, Sharma CP, Blood compatibility studies of Swarna Bhasma (gold Bhasma), an Ayurvedic drug. Int J Ayurveda Res 2011;2:14-22.
28. Singh SK, Gautam D, Kumar M, Rai SB, Synthesis, characterization and histopathological study of a lead-based Indian traditional drug: Naga bhasma. Indian J Pharm Sci 2010:72:24-30.
29. Bhowmick TK, Suresh AK, Kane SG, Joshi AC, Bellare J R. Physicochemical characterization of an Indian traditional medicine, Jasada Bhasma: Detection of nanoparticles containing non-stoichiometric zinc oxide. Journal of Nanoparticle Research 2008;11:655-664.
30. Verma PR, Prasad P. Standardization and Bio-availability Of Ayurvedic Drug Lauha Bhasma, Physical And Chemical Evaluation (Part-1), Ancient Science of Life,1995;15:2, p. 129-36.
हिन्दी सारांश

आयुर्वैदिक वानस्पतिक-खनिज योग तारकेश्वर रस का मानकीकरण

रत्नस्वरूप गुप्ता के. एल., नीरज कुमार

तारकेश्वर रस (त.र.) एक विशेष वानस्पतिक-खनिज योग है जो प्रमेह (डाइबिटिज मेलाइटस) के लिए प्रयोग किया जाता है। वर्तमान अध्ययन इस योग के फिंगर प्रिंट स्थापित करने के लिए निष्पादित किया गया है, जिससे आयुर्वैदिक फार्मेसियों द्वारा औषधि मानकीकरण के लिए अपनाया जा सकता है। त.र. योग के निर्माण के लिए अन्धक भलस (अ.भ.), लौह भलस (लौ.भ.), वंग भलस (वं.भ.) और रससिंदूर (र.सि.) इन चारों घटक का सम प्रभाव में मधु के साथ 9 दिन दर्ज करते हैं। प्रत्येक घटक का आयुर्वैदिक ग्रन्थ के मापदंड के अनुसार निर्माण किया गया है तथा भक्षीकरण के लिए इलेक्ट्रॉन माइक्रोस्कॉप का प्रयोग किया गया है। भ्रमण का उचित निर्माण सुनिश्चित करने के लिए मानक परीक्षा (भलस परीक्षा) का उपयोग किया है। भ्रमण की परीक्षा के बाद, त.र. का निर्माण किया गया एवं उसे गुणात्मक विश्लेषण, एक्स-रे डिफ्रेक्शन (XRD) और Scanning Electron Microscopy (SEM) के लिए भेजा गया। Phosphomolybdic acid के उपयोग द्वारा लौ.भ., अ.भ., र.सि. और त.र. में क्रम के अनुसार की उपस्थिति का भी अध्ययन किया गया। त.र. के साप्ताहिक विश्लेषण में Fe, Sn, Hg, Al, Mn, Ca एवं Mg पाए गए। XRD परीक्षण से पता चला कि त.र. में मुख्यतः Fe2O3 (मेथामाइट) होता है एवं SnO2 (कैस्टेट्रोट), HgS, SiO2, HgO कम मात्रा में होते हैं। SEM के द्वारा पता चला कि यह योग कणों का समिक्षण है। Phosphomolybdic Acid द्वारा परीक्षण करने पर सभी भ्रमण में Free metal अनुपस्थित पाया गया। वानस्पतिक खनिज योग तारकेश्वर रस के लक्षणों को स्थापित करने वाला यह पहला अध्ययन है।