

SUBSTITUTION OF AYURVEDIC DRUGS OF METAL, MINERAL, ORE ORIGIN WITH SYNTHETIC AND HIGHLY REFINED DRUGS - A BRIEF REVIEW

Prashant B. Bedarkar*

Assistant Prof., Dept. of Rasashastra and Bhaishajya Kalpana, IPGT and RA, Gujarat Ayurved University, Jamnagar, Gujarat, India.

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*Corresponding Author

Prashant B. Bedarkar

Assistant Prof., Dept. of
Rasashastra and Bhaishajya
Kalpana, IPGT and RA,
Gujarat Ayurved
University, Jamnagar,
Gujarat, India.

ABSTRACT

Introduction-Inclusion of newer drugs in pharmaceutico-therapeutics of *Rasashastra* in different era has been evident. Many synthetic drugs are included in contemporary pharmaceutico-therapeutics of *Rasashastra*. **Aim of the study-** To correlate classical *Rasavarga Dravya* with their representative synthetic compounds assumed to be by maximum scholars or being used today. **Material and Methods-** Classical *Rasadavya* were compared for source, acceptable varieties, possible chemical nature or composition and similarity, with their representative synthetic compound assumed to be by maximum scholars or being used in Pharmaceutico-therapeutics of *Rasashastra* in present era, from classical, contemporary Ayurvedic texts, modern texts and researches. Different varieties of same *Rasadavya* are

correlated with other possible minerals, ores, alloys, principle compounds or chemical composition apart from assumption in present era. **Results and Discussion-** Maximum number of *Rasavarga Dravya* shows similarity with their representative synthetic compound of *Rasashastra* in present era. **Conclusion-** Adoption of synthetic drugs in Ayurvedic pharmaceutico-therapeutics is beneficial in view of standardization, however for research purpose, possibility of different compounds or chemical composition apart from assumption in present era, should not be denied.

KEYWORDS: Rasadravya, Rasachikitsa, Metals, Minerology, Traditional, Ayurveda, Bhasma.

INTRODUCTION

Owing to differences in morphology and other attributes, natural adulterations due to habitat and scarcity, unavailability of certain substances, efforts have been taken by ancient seers, to adopt more and more precise pharmaceutical processing or techniques to achieve desirable substance with more precision and adoption of technology for artificial synthesis of substances and mentioned their substitutes in view of standardization. Many synthetic drugs are included in contemporary *Rasashastra*.

MATERIAL AND METHODS

Classical *Rasadravya* were compared for source, acceptable varieties, possible chemical nature or composition and dissimilarity with their representative synthetic compound commonly accepted by maximum contemporary Ayurvedic scholars or peers, stakeholders or being used in present era, from classical, contemporary Ayurvedic texts, modern texts and researches. Different varieties of same *Rasadravya* are correlated with other possible minerals, ores, alloys, principle compounds or chemical composition apart from their commonly accepted form in present era. Only those *Rasadravya* are included for review and mentioned in present article which are commonly used today and which found to possess significant dissimilarity among its classical description and commonly accepted or used substitute in pharmaco-therapeutics in present era.

Table No: 1 Dissimilarity of classical *Rasadravya* among API¹ standards, usage in contemporary *Rasashastra* or common assumptions.

Classical <i>Rasa dravya</i>	Classical Description (Varieties)	Description as per API ¹	Current Assumptions and usage	Dissimilarity (among Classical description, API, AFI standards, assumptions and use in present era)	Probable Minerals, ores compounds (used in ancient era)
Sandrita Swarna makshika	Not mentioned, New entity	Product of beneficiation of Chalcopyrite ore min. 12 % Cu.	Product of beneficiation as per API	Not applicable	Not applicable
Tankana	<i>Neelakantha</i> (acceptable), <i>Gudabha</i> , <i>Sphatikabha</i> , <i>Pandura</i> ,	Borax mineral ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$), Tincal	Synthetic Borax is used. Available in Natural as well as processed form. ^[2]	Colour or consistency of <i>Gudabha</i> variety suggest composition along with other salts, Refined from lake water, ores, in ancient times, less likely only Sod Borate ^[3]	Along with other salts in lake like NaCl, KCl, Na_2SO_4 etc
Kanta lauha	Magnetic Mineral/stone, <i>Dravaka</i> (superior) Rusted mineral unacceptable. <i>Chumbaka</i> [types- <i>Pita</i> , <i>Krushna</i> (for <i>Rasayana</i>), <i>Rakta</i>].	Iron Ore, iron ore containing Magnetite, a Ferric oxide (Fe_3O_4) mineral.	Magnetic iron ore, Wrought iron having metallic resemblance- commonly used	Wrought iron used now a days do not possess magnetic property. Magnetic iron ore, usually rusted and rarely used,	May also contain Titaniferous iron ores) Iron Chromate and Ferromanganese ores
Mandura	<i>Kanta mandura</i> with magnetic property	Metallic oxide-cum-silicate of iron, generally having composition Fe_2SiO_4 commonly called slag.	Rusted wrought iron, Ferric oxide or slag, old rusted slag	Samples used in practice often do not possess significant magnetic property denying magnetite as principal composition.	Slag containing above constituents
Kasisa	Different varieties in <i>Dhatukasisa</i> , <i>Panshukasisa</i> , <i>Pushpakasisa</i> ,	Ferrous Sulphate, ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$), green vitriol, melanterite mineral, Copperas	Synthetic Ferrous Sulphate, In recent past, refined from clays/ minerals.	Yellow, black, Colours, <i>Pushpakasisa</i> poor water solubility, <i>Swedana</i> for <i>Shodhana</i> reduces possibility	Cu, Mg as impurities ³ and different Hydrated states ⁴ , Adulterated with minerals. ^[3]

	<i>Hirakasisa</i> , As per colour- <i>Shweta</i> , <i>Peeta</i> , <i>Krushna</i> . Type of clay with <i>Amla rasa</i> , ^[4]			of complete water solubility. ^[4]	
Tuttha/ Sasyaka	Colours like neck of Peacock, mainly greenish blue often with tinch of many violet, brownish, reddish shades.	Copper sulphate (Cu SO ₄ .5H ₂ O), blue vitriol, copper vitriol, blue stone or chalcantite mineral	Synthetic Copper sulphate pentahydrate (blue vitriol) is commonly used.	<i>Swedana</i> for <i>Shodhana</i> denies chances of complete water solubility. ^[5] Considered as Bonite. Colour of synthetic CuSO ₄ .5H ₂ O is different from Chalcantite (Greenish blue) which contains additional SO ₃ , CuO ^[3]	Adulteration of Fe, Mg, Zn ores in sulphated form. Poorly water soluble ores like Azurite.
Samudra lavana		Sea Salt, halite mineral, described as sea salt (NaCl)	Refined sea salt (NaCl) with traces of other alkaline earth metal salts	Turbidity, colour of sample or declared composition of samples of <i>Samudra lavana</i> being used mismatches with non refined sea salt	Contain significant proportion of Salts, sulfate, Mg,Ca, K, remnants of dead or attenuated flora and fauna
Khatika	<i>Khati</i> (Dull white colour), <i>Gaura Khati</i>	Kaolinite, Al ₂ (Si ₂ O ₅) (OH) ₄ , an aggregate of minerals and colloidal substances known as Clays	CaCO ₃ , Chalk, Clay principally containing CaCO ₃	Significantly different chemical composition which is in use or assumed as that of description of API	More % of Aggregate of many Minerals ^[3] in <i>Khati</i> variety.*

*Aggregate of many minerals like Calcite, Dolomite, Babingtonite, Pectolite, Oldhamite, Zamboninite, Hydrophylite, Anorthite, Oligoclase, Andesine, labradorite, Wollastonite, Custerite, Grossularite, Andradite, Montisellite, Gehlenite, Zoisite, Radiophyllite, Okenite, Gyrolite, Flokite, Hillebrandite etc.

Table No-2: Dissimilarity of classical *Rasadravya* (Monographs yet not included in API¹) as that of usage in contemporary *Rasashastra* or their common assumptions.

Classical <i>Rasadravya</i>	Classical (Varieties, variety)	Description acceptable	Common assumptions and use in present era	Dissimilarity (among Classical description, common assumptions and use in present era)	Probable Minerals, ores compounds used in ancient era
Kankshi	A type of clay/ Mineral from <i>Saurashtra</i> region, types- <i>Phataki</i> (<i>Peetika</i>), <i>Phullika</i> (<i>Shubhra</i>), <i>Saurashtri</i> , <i>Tuvari</i> , <i>Adhaki</i>		synthetic Potash Alum or processed and purified from clays (mineral aggregates e.g. Alunite, Alum Schist, Bauxite and Cryolite etc).	Yellow colour mismatches with Potash Alum	May contain Iron Alums(<i>Hallotrichite</i> , <i>Billinite</i>) in yellowish variety.
Rasaka (Kharpara)	<i>Karavellaka</i> (without layers, acceptable for medicinal use), <i>Dardura</i> , <i>Mruttikabha</i> (Acceptable), <i>Gudabha</i> , <i>Pashanabha</i>		Now a days often Processed <i>Yashada</i> is used in place of processed <i>Rasaka</i> which is recommended by AFI ^[6] too, difference of opinion regarding mineral varieties.	varieties of <i>Rasaka</i> or their substitutes commonly assumed or used in present days are dissimilar as compared with <i>Yashada</i> .	Calamine, adulteration of Pb, Sulphides (<i>Gudabha</i>), Carbonates or Oxide (<i>Mruttikabha</i> / <i>Dardura</i>), silicates of Zn (<i>Pashanabha</i>) ^[4]
Gauripashana / Somala	Varieties- <i>Sphatikabha</i> (acceptable), <i>Shankhabha</i> , <i>Haridrabha</i> , <i>Shweta</i> (artificial, acceptable), <i>Pita</i> (<i>Dadimabha</i>) ^[4] A type of stone		Synthetic white Arsenic (Arsenic trioxide)	Although artificially prepared variety is mentioned in ancient classics, its operative details are not explored, may be different from methods adopted in present era.	<i>Haridrabha</i> and <i>Pita</i> variety along with compounds of Fe, may contain compounds of S,Cu ⁴ , Co, Ni, As, As sulphides in traces.
Hingula	<i>Hamsapada</i> (<i>Rakta varna</i> , acceptable), <i>Shukatunda</i> , <i>Charmara</i> , <i>Krutrima</i> (since recent past)		Synthetic red mercury sulphide (Cinnabar)	Different method of preparation of <i>Krutrima Hingula</i> ^[4] in classics, chemical composition of mineral cinnabar would be different	Ores of red mercury sulphide, May contain Metacinnabar along with trace minerals
Mukta	Animal product		Cultured pearls	Method of artificial preparation in classics and present age different.	Mainly CaCO ₃ , conchioline Glycine along with trace elements
Bida lavana,	Ashes of plants, animal excreta		Synthetic Ammonium chloride	Description, method of preparation	Mixture of many salts principally

Chullika lavana, Navasagara	etc., <i>Vida</i> along with <i>kshara</i> artificially may also be prepared with different methods		doesn't support formation of NH_4Cl as major constituent, <i>Chullika lavana</i> is considered as <i>Navasara</i> ^[7]	containing NA, Cl, Ca, K etc traces of Ph, Fe and Alkaline earth metals.
Suryakshara, Soraka	<i>Mrutkshara</i> , <i>Vahnikshara</i> , <i>Soraka</i> , <i>kshara</i> derived from certain clays ^[7]	<i>Kalamisora</i> , Synthetic KNO_3	Different method of preparation ^[8]	Mix.of salts (as that of <i>Bida</i>) apart from principal component KNO_3
Swarjika khara	<i>Bhumikshara</i> , <i>Kshara</i> (derived from clays or total solid of lake water at certain places), used for washing cloths apart from medicine ^[2]	Synthetic Sodium Bicarbonate	Different method of preparation	Mix.of salts (as that of <i>Bida</i>) apart from major constituent Na_2CO_3 .
Rasanjana	Artificial- <i>Ghana</i> , of <i>Darvi Kwatha</i> prepared with Goat milk, Natural- Type of mineral, Types- [<i>Strotonjana</i> and black stone with metallic properties ^[9] (<i>Sauviranjana</i>).	<i>Ghana</i> , of <i>Darvi Kwatha</i> prepared with Goat milk is exclusively used.	2 Assumptions are different from each other. Few scholars consider it as Yellow oxide of Mercury (HgO) ^[4] or Mercurial compound	Yellow oxide of Mercury (HgO), Mercury ores.

RESULTS AND DISCUSSION

Maximum *Rasavarga Dravya*, being from natural habitat or procured to process from natural sources, unavoidably may contain different adulterations in traces and in some cases inclusions^[1] or may get affected with environment^[1] or with associated mineral, ore etc, which may alter morphology and might be one among basis of their classification.^[4,10] Considering scarcity, unavailability or unaffordability, substitutes of certain *Rasadravya* as well as methods of artificial preparation has been described by ancient seers^[11,12] some of those (e.g. *Muktakarana*, artificial preparation of (*Hingula*^[7], *Chumbaka Kanta Lauha*^[13]), *Dhatu*, *Ratna*, *Uparatna*, *Lavana*^[4]), *kshara*^[4], etc)^[14] are different from their methods of preparation adopted in contemporary *Rasashastra* (e.g. cultured pearls, Induction of magnetic property).^[4] Substitutions of *Rasadravya* in classics not only mimic similarity with chemical constituents in terms of modern science but they are more focused to therapeutic effect too, however substitutions by present day Pharmacopoea^[6] seems to be more precise in terms of probable chemical constitution of *Rasadravya* with its substitute. It is observed that, Advancements in knowledge of science especially chemistry, adoption of newer technologies of separation like beneficiation, extraction, refining and purification has helped a lot in standardization of *Rasadravya* e.g.-Artificial synthesis of Orpiment, FeSO_4 , CuSO_4 , desired Alum and Borax, easy differentiation between *Swarnamakshika* and *Vimala*¹, increasing its purity, elemental concentration especially Copper and sulphides by froth flotation^[1] and removal of traces of adulteration of Arsenic, Copper and Iron compounds (sulphides) from *Gandhaka* process by desulfuration and sublimation^[5] like processes respectively. It is advisable that, therapeutic use of processed substitutes of classical *Rasadravya* should be justified by comparative studies with respective processed classical *Rasadravya* or comparative studies carried among different substitutes in view of safety and efficacy, which requires number of studies in view of number of varieties of *Rasadravya* and multiple processings as well as formulations, hence data maintenance of their therapeutic usage, in view of Pharmacovigilance is one among affordable, needed and reliable practical solutions. Few comparative Pharmaceutico-analytical^[15,16,17] toxicological.^[16] pharmacological.^[16,17,18,19] and clinical researches has been carried out.^[20]

CONCLUSION

Adoption of synthetic drugs, newer more specific refining, synthesis technology in Ayurvedic pharmaceutico-therapeutics and preparation of monographs of *Rasavarga Dravya* by API is beneficial in view of standardization, resolution of ambiguity among varieties or nature of

certain *Rasadravya*. However for research purpose, possibility of different compounds or chemical composition apart from assumption in present era, should not be denied.

REFERENCES

1. Anonymous, Ayurvedic Pharmacopoea of India. Ministry of Health and Family Welfare Government of India, Department of AYUSH, New Delhi. Part, *Swarnamakshika*, I(VII): 56.
2. Vishvanatha Dwivedi. Bharatiya Rasashstra. Sharma Ayurveda Mandira, Datiya, India, 2nd edition, 1987; 387.
3. William E ford. Dana's Textbook of Mineralogy. CBS publications, Delhi, Indian reprint, Sulphates, Chromates, 2006; 761-763.
4. DA Kulkarni, Rasaratna samucchaya. Meharchanda lacchamandas Publications Delhi, Reprint, 2010; 44: 73,74,191-195.
5. PV Dhankar. Ayurvediya Aushdhi Dravya Shodhana vidhi. Dhootapapeshwara limited, Khetavadi, Mumbai, 115-116.
6. Anonymous, Ayurvedic formulary of India. Ministry of Health and Family Welfare Government of India, Department of AYUSH, New Delhi. Part I, *Rasayoga*, 20/36; 708-709.
7. Gularaja Sharma Mishra, Ayurveda Prakasha. Chaukhambha Bharati Academy, Varanasi, reprint, 2014; 258.
8. Kashinath Shastri, Rasatarangini. Motilal Banarasidasa publication, Delhi, 11th edition, reprint, 2000; 24/27-35: 331-332.
9. Narayana ram. Sushrutsamhita. Chaukhambha Surabharati prakashana, Varanasi, edition 2014, Sutrasthana 38/41-42, Dalhana commentary, 167.
10. Anonymous, Melanterite mineral, Net download, Available at <http://www.mindat.org/min.>, cited on 30.06.2017 at 9pm.
11. Ambika Datta Shastri, Bhaishajya Ratnavali, Chaukhambha Samskrut sansthana, Varanasi, Vidyotini commentary, 13th Ed., 1997; 4/62, 63, 66, 82: 39, 40.
12. Vishwanatha Dwivedi, "Bhavaprakasha Nighantu" Motilal Banarasidasa Publications, Varanasi, 9th edition, Dravya pariksha, pratinidhi Dravya, 2007; 27, 35,49,50-52. 462,463.
13. Siddhinanada Mishra, Anandakanda. Chaukhambha orientaliya, Varanasi, 1st edition, 2008; 5/9-14: 714.
14. Swaminatha Mishra, Rasaratnakara Ruddhi khanda, Chaukhambha orientaliya, Varanasi, 1st edition, 1991; 19/1-74: 265-305.

15. Shubha H. S., R. S. Hiremath, Preparation and physicochemical analysis of *Rasaka Bhasma*. AYU, Oct-Dec, 2010; 31(4).
16. Hitesh Ghetiya *et al.* "Pharmaceutical standardization of two types of *Makshika Bhasma* and evaluation of their anti-hyperglycemic activity". Unpublished thesis submitted to Gujarat Ayurved University for Degree of Ayurved vachaspati, in, 2014; 57-110.
17. Manisha B. Standard manufacturing procedure for *Laghu Malini Vasanta Rasa* in context of *Bhavana* (levigation). AYU, Apr-Jun 2015; 36(2).
18. Manisha Walunje. Role of media in preparation of *laghu malini Vasanta rasa*. Unpublished thesis submitted to Gujarat Ayurved University for Degree of Ayurved vachaspati, in. Pharmaceutico-analytical study, 2013; 1-25.
19. Shubha H. S., R. S. Hiremath, Evaluation of antimicrobial activity of *Rasaka Bhasma*. AYU, Apr-Jun, 2010; 31(2).
20. Manisha B Walunj *et al.* Critical review of *Vasanta Malati Rasa* – A Herbomineral Product. International Journal of Ayurvedic Medicine, 2014; 5(3): 244-253.