Journal of Ayurveda Medical Sciences

Refereed, Indexed, Peer reviewed, Open access, Quarterly Journal for Rapid Publication of Ayurveda and Other Traditional Medicine Research

ISSN: 2456-4990
www.jayumedsci.com

HRGS' Ayurveda Journal
Journal of Ayurveda Medical Sciences
Peer Reviewed Journal of Ayurveda and other Traditional Medicines
ISSN: 2456-4990 | www.jayumedsci.com | jayumedsci@gmail.com

Review Article

Svarṇa Mākṣika Śodhana - A review through Rasa classics

Krushnkumar Taviad[1*], Shweta Vekariya[2], Prashant Bedarkar[3], Galib Ruknuddin[4], Biswajyoti Patgiri[5]

[1,3,5]Department of Rasa Shastra and Bhaishajya Kalpana [2]Department of Dravyaguna, Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar 361008, Gujarat. [4]Department of Rasa Shastra and Bhaishajya Kalpana, All India Institute of Ayurveda, New Delhi 110076, India.

Correspondence: Email: drkrishnat@gmail.com, Mobile: +91-9427222898

ABSTRACT

Introduction: *Rasa Śāstra* is a branch of science exclusively dealing with different aspects of metals and minerals including their origin, varieties, characteristics, processing techniques, properties, therapeutic applications etc. in a comprehensive way. These metals and minerals are to be processed before their internal administration. The processes include *Śodhana*, *Māraṇa* etc. that are essential in making the raw material suitable for therapeutics. *Svarṇa Mākṣika* is one such mineral that after proper processing become highly potent and useful in *Prameha* (Diabetes), *Pāṇḍu* (Anemia), *Kuṣṭha* (Skin diseases), *Jwara* (Fever), *Anidrā* (Insomnia) etc. Classics mention different treatment procedures for *Svarṇa Mākṣika* that are scattered throughout the texts of *Rasa Śāstra*. Here an attempt has been made to compile all such references pertaining to *Śodhana*. ***Methods:*** *Śodhana* processes of *Svarṇa Mākṣika* were compiled from classical texts and analysed by segregating type of basic procedure, media and principle used in the procedure etc. ***Results:*** At least 34 (Plant origin-24, Animal origin- 05, Mineral origin-05) varieties of liquids are used as *Śodhana dravya* in classics. Twenty six methods of *Śodhana* were described in various texts that can be categorized into five basic methods like *Swedana*, *Bharjana*, *Nirvāpa*, *Mardana* and *Puṭapāka*. ***Conclusion:*** This work may prove a torch bearer for future research works on *Svarṇa Mākṣika.*

KEYWORDS

Ayurveda, Chalcopyrite, *Rasa Śāstra, Śodhana, Svarṇa Mākṣika*

Received: 04.04.2017 **Accepted:** 22.06.2017 **DOI:** 10.5530/jams.2017.2.11

Rasa Śāstra is a well-established branch of Ayurveda serving humanity with its unique heritage of drugs derived from mineral, metal and animal origin combined with certain herbs. Metals and minerals are extracted from the earth crust, so the drugs come in contact with impurities, heterogeneous materials, toxic substance and unwanted qualities. To remove all such unwanted material and to increase the potency; an exclusive procedure - *Śodhana* is indicated in classics. Wide range of *Śodhana* methods are prescribed for metals, minerals and other substances in different classics of *Rasa Śāstra*. These methods not only eliminate unwanted principles from the raw material, make the material feasible for further processing but also help in enhancing their therapeutic potentials. [1] These processes are individualized in term of material media, method etc.[2]

Svarṇa Mākṣika (SM) is an important mineral used for medicinal purposes since *saṁhitā* period in many diseases in the form of *Bhasma*. It is one of the major ingredients in popular formulations like *Candraprabhā vaṭi*,[3] *Vātagajānkuśa rasa*,[4] *Śvāsakāsa cintāmani rasa*,[5] *prabhākara vaṭi* [6] etc. Ancient Rasa Scholars have developed number of processing methods for a single substance by which crude form of drug can convert into highly potent therapeutic agent. Till date no published review work is found on the different *Śodhana* procedures of *Svarṇa Mākṣika*. This work may prove a torch bearer for future research work on *Svarṇa Mākṣika.*

In this review, information from various texts belonging from 7th AD to 20th AD has been compiled. The books referred in this attempt are Rasendramangala,[7] Rasahridayatantra,[8] Rasarṇāva,[9] Rasendra cuḍāmani,[10] Ayurveda prakāśa,[11] Śārangadhara *saṁhitā*,[12] Rasa ratnākara,[13] Rasaprakāśa sudhākara,[14] Rasa ratna sammuchaya,[15] Rasapaddhati,[16] Ānanda kanda,[17] Rasa cintāmani,[18] Rasamanjari,[19] Rasa sanketa kalikā,[20] Rasendra cintāmaṇi,[21] Rasendra sāra saṁgraha,[22] Rasa kaumudi,[23] Rasa kāmadhenu,[24] Yoga taraṅgiṇi,[25] Yogaratnākara,[26] Arka prakāśa,[27] Brihat rasa rāja suaṁdara,[28] Rasarāja mahodadhi,[29] Rasāyanasāra,[30] Rasa jalanidhi,[31] Siddha bheṣaja maṇimālā,[32] Raṣopaniśata,[33] Rasāmitram[34] Sahasrayogam,[35] Rasataraṅgiṇi,[36] Rasendra saṁbhava,[37] Anupāna maṁjari,[38] Abhinava navajeevaniyama,[39] Rasa dipikā,[40] Rasa tantrasāra and siddha yoga saṁgraha,[41] Rasāyana sāra.[42] *Svarṇa Mākṣika Śodhana* in the above mentioned texts of *Rasa Śāstra* are analyzed with respect to liquid media and involved principles etc.

Śodhana is a procedure to be adopted to remove possible impurities from *Rasa Dravya* and other material of such manner. Besides this, the procedure is aimed to change the nature of the substance (Physical as well as pharmacological aspects). It is a pre-requisite procedure for all substances (*Rasa* and *Viṣa Dravya* etc.) that may have a bad effect in their raw form over body. As per Ayurvedic texts; all metals, minerals, poisonous herbs are to be processed through this specific procedure.[49] General procedures, drugs used for *Śodhana* process and their probable impacts are well explored in Ayurvedic classics. Selection of particular method and media for *Śodhana* has been left on physician with application of *Yukti* (Rationale – logical reasoning).[50] The changes made by *Śodhana* in nature of drug can be preliminarily and easily perceived at pharmacognostic as well as chemical levels, however its utility will be majorly dependent on therapeutic actions. Different methods of *Śodhana* also play an

important role in altering pharmaceutical[51,52] analytical[53,54] toxicological[55] pharmacological[56,57] and therapeutic aspects of a metal/mineral or its formulations. There is a separate book named "*Āyurvediya auṣadhi dravya Śodhana Vidhi*" exploring logical selection of various methods of *Dravya Śodhana*, with details of changes after *Śodhana*.[58]

Need of *Svarṇa Mākṣika Śodhana*

A drug can be panacea or poison. A drug fulfilling the criterion of a standard drug will always become panacea provided, if it is used properly. On the other hand, a poorly prepared or manufactured drug however used skillfully, will always prove to be a poison.[59] *Svarṇa Mākṣika* (SM) is the most abundant copper containing mineral with nearly equal part of copper (34.5%), Iron (30%), Sulphur (35%)[60] along with trace elements like Ag, Au, As, Se, Sn, Zn etc. As per API, SM in ore form should contain not less than 5 % Copper, 20 % Iron and 12% Sulphur[61] which matches with several analytical reports.[47,62] If raw SM is used without *Śodhana*, it will cause untoward effects like *Agnimāndya* (dyspepsia), *Vāaṁti* (vomiting), *Viṣṭhaṁbha* (failure to pass flatus), *Vibaṁdha* (constipation), *Vātaprakopa in koṣṭha*, *Krimi* (worm infestation), *Halimaka* (fulminant hepatic failure), *Gaṁḍamālā* (hypo or hyperthyroidism), *Vraṇa* (ulcers), *Kuṣṭha* (skin disorders), *Netraroga* (eye diseases), *Daurbalya* (generalized weakness), *Kṣaya* (emaciation), *Balanāśa* (loss of strength) and even *Maraṇa* (death).[11,36] Most of the symptoms mentioned in classics resembles with acute or chronic copper toxicity.[63] To avoid these manifestations, one need to process it before its application in therapeutics.

The media used in the process of *Śodhana* has very important role in either breaking down or destroying the chemical constituents that are not required. The heat treatment through constant boiling of the drug in a particular media for a particular duration has a role in modification of the chemical constituents etc. Studies have shown that the toxic constituents are transferred into media rendering the drug non-toxic. Media has definitely an important role in making a drug to act without causing any side effects.[64]

Careful review of available classical texts to compile *Śodhana* procedures of SM revealed multiple methods that were categorized according to the involved individual and multiple media used. Twenty six methods of SM *Śodhana* are described in classics on Rasashastra that can be categorized into five basic methods like *Swedana, Bharjana, Nirvāpa, Mardana and Puṭapāka* among which *Swedana* method is found most frequently mentioned (Table 1).

Table 1. Frequency of procedures indicated for *Svarṇa Mākṣika Śodhana*

Sr. No.	Procedure	Frequency
1	*Swedana* (boiling)	11
2	*Bharjana* (frying in pan)	5
3	*Nirvapa* (quenching)	4
4	*Puta* (incineration)	4
5	*Bhavana* / *Mardana* (grinding)	2

More than 19 classics of *Rasa Śāstra* have described details about SM *Śodhana*. Seven individual liquids are found utilized for *Śodhana*. Among them the frequency of use of *Kadali kanda Svarasa* in *Rasa* classics is found highest (5 times) followed by *Triphalā Kvātha* (4 times). Compiled data also revealed that, total 19 multiple liquid media are used for SM *Śodhana* (Table 2).

Daḍima (*Punica granatum* Linn) *tvak* or *Kulatha* (*Dolichos biflorus* Linn.) *Kvātha* are mentioned as an antidote of *Svarṇa Mākṣika* toxicity due to over-dosage or usage without purification procedure.[38] Among them *Kulatha Kvātha* frequently used by many seers in *Śodhana* procedure of SM. *Nimbu Svarasa* as liquid media by *Bharjana* method advised in Rasatarangiṇi is recommended by Ayurvedic Formulary of India (AFI),[65] which is followed by most of the research scholars.[66-68] Majority of the texts prefers using *Lohapātra* (Iron vessel) in the *Śodhana* procedure that was emphasized in AFI too. SM *Śodhana* by *Nirvāpa* procedure is advised to be repeated for 21 times, while in *Puṭapāka* method 1 to 6 repeated *Puta* are given. One hour to three days *Swedana* procedure whereas one to three days *Bharjana* procedure are also advised for SM *Śodhana* (Table 2). Media advocate for SM *Śodhana* by *Nirvāpa* method is nothing but the *Samanya Śodhana* procedure of metals and minerals.[12] *Puṭapāka* method is used by various Acharya for SM *Śodhana* but text Ānandakanda admits this as *Māraṇa* of SM.[17] Ānandakanda also mentioned use of metal i.e. *Nāga* (lead) as a *Śodhana* media for *Śodhana* of another mineral i.e. SM. Three parts of SM and one part of each *Nāga* and *Ṭankaṇa* are taken in an iron vessel and roasted in *Mātulunga* or *Jambiri svarasa* till SM achieves *Tāmra varṇa* (reddish brown). SM *Bhasma* preceded with this method of *Śodhana* will contain whole of the added *Nāga* and roasted *Ṭankaṇa* too. Although not mentioned but it is advisable to use *Śodhita or Jārita Nāga* in this process. *Aśuddha* SM and *Saindhava lavaṇa* are taken in powdered form and subjected to *tīkṣṇāgni* (intense heat) in an iron pan with *Nimbu Svarasa* for *Śodhana*. This method is mentioned by majority of *Rasācārya* that is commonly used.[69] In classics, it is clearly mentioned that after completion of *Śodhana* the colour of SM will be changed to *Tāmra varṇa* [17] or *Śodhana* procedure should be carried till SM turns to *Lohita varṇa* (red colour).[11] Multiple physicochemical, structural changes in different common categories of *Śodhana* processes of *Svarṇa Mākṣika* (Chalcopyrite) may take place which are summarized in Table 3.

Table 2. Media used for *Svarṇa Mākṣika Śodhana*

	Media	List of Media		Principle	Duration	Reference
1	Individual	1	*Triphalā Kvātha*	*Nirvāpa*	-	RJN, RRS, RCh, BRRS
		2	*Nimbu svarasa*		21 times	RT
		3	*Kadali kanda svarasa*	*Swedana*	1 Day or 2 *Ghaṭikā* (1 hour)	RJN, RRS, RCh, RT, BRRS
		4	*Kalamārśa* (*Ṭanduliyaka*)		1 Day	RT
		5	*Nimbu Svarasa*	*Bharjana*	2-3 Days	RT
		6	*Saindhava lavaṇa*		-	RMan
		7	*Eranḍa taila*	*Puta*	1 *Yāma* (3 hours)	RJN, BRRS
2	Multiple	1	*Saindhava, Mātulunga* or *Jambiri Svarasa*	*Bharjana*	1 Day	RJN, ShS, AP, RSS, RChi, AK, RMri, R Rat, RTS & SPS, BRRS
		2	*Saindhava, Eranḍa taila, Triphalā Kvātha, Nimbu Svarasa, Kadali kanda Svarasa*		-	RS
		3	*Nāga, Ṭankaṇa, Mātulunga Svarasa* or *Jambiri Svarasa*		-	AK
		4	*Agasti Puṣpa Niryāsa, Śigru Mūla, Pāṣāṇabheda*	*Puta*	6 *Puta*	RJN, BRRS, RRat
		5	*Agastipatra Niryāsa, Śigru, Nimbu Svarasa*		1 *Puta*	RJN, RChi
		6	*Kṣāra, Amla, Lavaṇa, Eranḍa Taila, Goghrita*		3 *Puta*	RN
		7	*Meghanāda, Pāṣāṇabheda, Kulatha Kvātha, Jala*	*Swedana*	1 Day	RJN, RRat
		8	*Tanḍuliya, Śāli Kvātha*		-	RJN, RSS
		9	*Kānji, Nimbu Svarasa, Gomutra, Jayanti Svarasa*		3 Days	RJN, BRRS
		10	*Eranḍa, Mātulunga Svarasa*		-	RJN, RP, RRS, RCh, BRRS
		11	*Suraṇa kanda, Gomutra, Kānji, Tilataila, Godugdha, Kadali Svarasa, Kulatha, Kodrava Kvātha*		-	RJN, RN
		12	*Kadali kanda Svarasa, Kakoṭi kanda Svarasa*		2 *Ghatika* (1 hour)	RP
		13	*Jālini, Tanḍuliya, Kulatha*		3 hours	AK
		14	*Punarvanā, Kulatha*		-	AK
		15	*Nara mutra, Kulatha Kvātha, Amlavetasa Kvātha, Ṭankaṇa, Trikatu*		1 Day	RJN, AK, RRat
		16	*Tila taila, Takra, Gomutra, Kulatha Kvātha, Triphalā Kvātha*	*Nirvāpa*	-	RJN
		17	*Tila taila, Takra, Gomutra, Kulatha, Kānji*		-	AK
		18	*Meṣaśrungi, Karkaṭaśrungi Svarasa*	*Mardana*		YT
		19	*Mutra, Takra, Kulatha Kvātha*		-	RPS

AK - Ānanda kanda, AP - Ayurveda prakāśa, BRRS - Brihat rasa rāja suaṁdara, RCh - Rasendra cuḍāmani, RChi - Rasendra cintāmani, RJN - Rasa jalanidhi, RMan - Rasamanjari, RMri - Rasāmitram, RN - Rasarṇāva, RP - Rasa Paddhati, RPS - Rasa prakāśa sudhākara, RRat- Rasa ratnākara, RRS- Rasa ratnasamuchaya, RS - Rasāyana sāra, RSS - Rasendra sāra saṁgraha, RT - Rasatarangiṇi, RTS & SPS - Rasa tantrasāra and siddha yoga saṁgraha, ShS - Śārangadhara *saṁhitā*, YT - Yoga tarangiṇi.

Table 3. Evidence based and probable physicochemical changes in different common categories of *Śodhana* processes of *Swarnamakshika (Chalcopyrite)*

Procedure	General Method	Probable physicochemical changes[43-48]
Swedana (boiling)	In this process, SM is boiled in prescribed liquid media through *Dola Yantra* method for at least three hours. The impurities which are soluble only in boiling hot acidic or alkaline liquids could be removed through this process.	Formation of organo-inorganic compounds. Leaching of metal contents in liquid media.
Bharjana (frying in pan)	Here the SM is place into the iron pan and subjected to heating with or without adding any material/ liquid while heating. In this process constant stirring of the material is done till the	Sulphation. Sulphatizing (formation of metallic sulphates).

	added liquid is evaporated and the material is converted into red.	Cloridizing (Formation of flux with salts). Desulphuration (reduction in sulphur content and resulting in increase of copper, iron and other trace elemental content). Sulphation followed by desulphuration, formation of $CuSO_4$. Formation of ferrites. Oxidation of metals (increase in oxygen content). Removal of undesirable elements like Arsenic, Antimony.
Nirvapa (quenching)	In this process, small crystals of *Svarṇa Mākṣika* are heated up to red hot and dipped into the various types of cold liquids (oily, acidic or alkaline types). This heating and dipping is repeated till complete cessation of sulphur fumes.	Desulphuration, Annealing of Iron, copper (Isothermal decomposition and Phase interchange) Removal of undesirable elements like Arsenic, Antimony. Formation of little quantity of oxides, sulphides, sulphates of metals.
Puta (incineration)	*Svarṇa Mākṣika* is ground with prescribed liquid media till it attains semisolid paste like consistency. Then *chakrikas* (small round pellets) are made and dried. After drying these *chakrikas* are kept in *sharava samputa* (earthen plate) and sealed with the help of cloth smeared with *multani matti*. This is subjected to *putapaka*.	Desulphuration, Oxidation of metals (Copper oxide, Fe_2O_3, SiO_2), Formation of new polysulfides in lesser amount (CuS, FeS). Formation of sulphates. Reduction of particle size. Physical/structural changes (Regularization of loss of crystallinity). Uniform arrangement of particles). Removal of undesirable elements like Arsenic, Antimony, Carburising.
Bhavana / *Mardana* (grinding)	In this process SM is triturated with the paste of certain herbs and other drugs such as salts, alkalies, carths and some vegetable extractives having acidic/ alkaline reactions or with acidic juices and/or fluids for a specified period.	Reduction of particle size Formation of organo-inorganic compounds.

Maximum *Śodhana* methods i.e. 13 were described by Ācharya Bhudeva Mukharji in *Rasajalanidhi*. Compiled data revealed that, at least 34 (Plant origin - 24, Animal origin - 5, Mineral origin - 5) varieties of liquid media as *Śodhana dravya* are mentioned in classics (Table 4).

Table 4. Types of various liquids used in *Svarṇa Mākṣika Śodhana*

Category of Liquid	Varieties of Media		Number
Plant Origin	*Svarasa* (fresh juice)	*Nimbu* (*Citrus limon* Linn.), *Kadali Kanda* (*Musa paradisiaca* Linn.), *Matulunga* (*Citrus medica* Linn.), *Jambira* (*Citrus aurantifolia* (Christm.) Swingle), *Agasti pushpa* (*Sesbania grandiflora* Linn.), *Jayanti* (*Sesbania sesban* Linn.), *Karkoti* (*Momordica dioica* Roxb.).	7
	Kvātha (decoction)	*Triphala* (Fruits of *Terminalia chebula* Retz., *Terminalia bellirica* Roxb., and *Phyllanthus emblica* Linn.,) *Kulatha* (*Dolichos biflorus* Linn.), *Amlavetasa* (*Garcinia pedunculata* Roxb.), *Trikatu* (Fruits of *Zingiber officinale* Roscoe, *Piper longum*, Linn. and *Piper nigrum* Linn.), *Shigrumula* (Root of *Moringa oleifera* Lam.), *Pashnabheda* (*Bergenia lingulata* Wall.), *Shali* (*Oryza sativa* Linn.), *Tanduliya*, (*Amaranthus virdis* Linn.), *Surana Kanda* (Rhizome of *Amorphophallus campanulatus* Roxb.), *Kodrava* (*Paspalum scrobiculatum* Linn.), *Devadali* (*Luffa echinata* Roxb.), *Meshashringi* (*Gymnema sylvestre* R.Br.), *Karkata Shringi* (*Pistacia integerrima* J.L.Stewart).	13
	Kalka (paste)	*Punarnava* (*Boerhavia diffusa* Linn.)	1
	Taila (oil)	*Eranda* (*Ricinus communis* Linn.), *Tila* (*Sesamum indicum* Linn.)	2

	Kanji (fermented sour gruel)	1
Total liquids from herbal origin		24
Animal Origin	*Godugdha* (cow's milk), *Goghrita* (cow's ghee), *Gomutra* (cow's urine), *Takra* (Butter milk), *Naramutra* (Human urine)	5
Mineral Origin	*Jala* (water), *Kshara* (Alkali), *Naga* (Lead), *Saindhava lavana* (Rock salt), *Ṭankaṇa Kshara* (Borax).	5

CONCLUSION

Śodhana is unique and distinct pharmaceutical procedure in Ayurvedic Pharmaceutics, with potential to influence physicochemical, toxicological, pharmacological and therapeutic profile of *Svarṇa Mākṣika* and thereby useful in increasing safety and optimizing desirable efficacy of *Svarṇa Mākṣika*. Physicochemical changes may occur depending upon the selection of the *Śodhana* media such as particle size reduction, variation in elemental composition and addition as well as deletion of minor elements from the raw material.

REFERENCES

1. Jagtap CY, Prajapati PK. Validation of Samanya and Vishesha Shodhana procedures of Tamra to develop their Standard Manufacturing Procedure. Rasamruta 2013;5(9):1-12.
2. Chaudhary A, Prakash B. Scientific validation approach for application of Mandura Bhasma: A Review. Electronic Journal of Pharmacology and Therapy 2010;3:35-40.
3. The Ayurvedic Formulary of India. Part I-A, Formulations 12:10. New Delhi: Dept of AYUSH, Ministry of Health and Family Welfare, Government of India; 2008; p.512-5.
4. The Ayurvedic Formulary of India. Part II-A, Formulations 16:57. New Delhi: Dept of AYUSH, Ministry of Health and Family Welfare, Government of India; 2008.
5. The Ayurvedic Formulary of India. Part II-A, Formulations 16:58. New Delhi: Dept of AYUSH, Ministry of Health and Family Welfare, Government of India; 2008.
6. The Ayurvedic Formulary of India. Part I-A, Formulations 12:15. New Delhi: Dept of AYUSH, Ministry of Health and Family Welfare, Government of India; 2008.
7. Nagarjuna. Rasendramangal, 1st Ed. H S Sharma Editor. Varanasi: Chaukhamba Orientlia; 2003.
8. Shrimad Govinda Bhagvatpad. Rasahridayatantra. Vaidhyaraj Pavani Prasad Sharma Editor. Varanasi: Chowkhambha Krishnadas Academy; 2004.
9. Tripathi Indradeor. Rasachandrika Hindi commentary of Rasarnaav. 4th Ed. Varanasi: Chaukhambha Sanskrit series: 2001; p.87.
10. Somdeva. Rasendrachudamani. Rameshwar Dayal Bajpai Editor. Varanasi: Chowkhamba Krishnadas Academy; 2004; p.165.
11. Acharya Madhava. Ayurvedaprakasha 4/1-15, Arthavidyotini & Arthaprakasini Sanskrit & Hindi commentaries by Gulraj Mishra, Vatranasi: Chaukhamba bharati Academy; 2007; p.410.
12. Acharya Sharangadhara. Sharangadhara Samhita Madhyam Khanda 11/54-7, Dipika commentary by Adhamalla and Gudarthadipika commentary by Kashiram, 6th Ed. Vidyasagar PS Editor. Varanasi: Choukhambha Orientalia; 2005; p.249.
13. Siddha Nityanatha. RasaRatnakar. Lala Shastragramji Editor. Mumbai: Khemraj Shrikrushnadas Prakashan; 2001; p.45-6.
14. Acharya Yashoddhara. Rasaprakashasudhakara 5/121-24. 2nd Ed. Siddhinandana Mishra Editor. Varanasi: Chaukhamba Orientalia; 1998; p.111.
15. Vagbhatacharya. Rasaratnasamucchaya 2/77-83. 9th Ed. Shastri Ambikadutta Editor. Varanasi: Chaukhambha Amarabharati Prakashan; 2010; p.49.
16. Acharya Bindu. Rasapaddhati Maharasa Prakaran 78-79. Siddhinandana Mishra Editor. Varanasi: Chaukhamba orientaliya; 1987; p.100.
17. Bhairav. Anandakanda 1/90-101. 2nd Ed. Mishra Siddhinandan Editor. Varanasi: Chaukhambha Orientalia prakashan; 2008; p.653-4.
18. Anantdev suri. Rasachintamani. 1st Ed. Mishra Siddhinandan Editor. Varanasi: Chaukhambha Orientalia prakashan; 1990.
19. Acharya Shalinath. Rasamanjari 3/80-81. 2nd Ed. Siddhinandan Mishra Editor. Varanasi: Chaukhamba Orientalia; 2003; p.40-1.
20. Kayasthachamunda. Rasa Sanketa Kalika. 1st Ed. Prammi Satyagraha Sastry Editor. Varanasi: Chaukhambha Krishnadas Academy; 2005.
21. Dhundhukanath. Rasendrachitamani 7/103-05. 1st Ed. Siddhinandan Mishra Editor. Varanasi: Chaukhambha Orientalia Prakashan; 2000; p.104-5.
22. Bhatt Gopalkrishna. Rasendrasarasamgraha1/208-12. 1st Ed. Pandeya Ramteja Editor. New Delhi: Chaukhambha Sanskrit Pratishthana; 2010; p.55-6.
23. Jananachandra Sharma. Rasakaumudi. Pavani Prasad Sharma & Bhahmasankar Mishra Editors. Varanasi: Chaukhamba Bharati Academy; 2003.
24. Mishra Chudamani. Rasakamadhenu. 2nd Ed. Mishra Gulrajsharma Editor. Varanasi: Chaukhambha Orientalia; 1999.
25. Trimallabhat. Yogatarangini. 1st Ed. Charantirtha Maharaja Editor. Gondal: Rasashala Aushadhashrama; 1956; p.142.
26. Shastrilakshmipati. Yogaratnakara. 1st Ed. Varanasi: Chaukhambha Prakashana; 2010.
27. Lankapatiravan. Arkaprakasha. 1st Edi. Tripathi Indradev Editor. Varanasi: Krishnadas Academy; 1995.
28. Chaubhe Dattaram. Brihat rasa raja sunadara. 3rd Ed. Varanasi: Chaukhambha orientalia Prakashan; 2000; p.101-3.
29. Chaubhe Dattaram. Brihat Rasarajasunadara. 3rd Ed. Varanasi: Chaukhambha Orientalia Prakashan; 2000; p.101-3.
30. Bhagat Bhagwandas. Rasaraja mahodadhi. 1st Ed. Mumbai: Khemraj Shrikrishnadas Prakashan; 2010.
31. Mukherjee Bhoodeb. Rasa Jala Nidhi. Vol II. 4th Ed. New Delhi: Chaukhambha Orientalia Prakashan; 2004; p.67-70.
32. Bhatt Krishnaram. Siddha Bheshaja Manimala. 3rd Ed. Varanasi: Chaukhambha Krishnadas Academy; 2003.
33. Sharma Badrinath. Rasopanishat. 1st Ed. Kaleda: Krishna Gopal Mudranalaya. 1959.
34. Yadavji Trikamji Acharya. Rasmritam, Lohavigyaniyam 57-69 1st Ed. Damodar Joshi & G Prabhakar Rao Editors. Chaukamba Samskrit Bhavana; 1998; p.55.
35. Panditrao DD. Sahasrayogam. 1st Ed. CCRAS, New Delhi: Yugantarprakashan; 1990.
36. Mishra Sadanand. Rasatarangini 21/1-18. 11th Ed. Shastri Kashinath Editor. Delhi: Motilala Banarasidas; 2000; p.521-3.

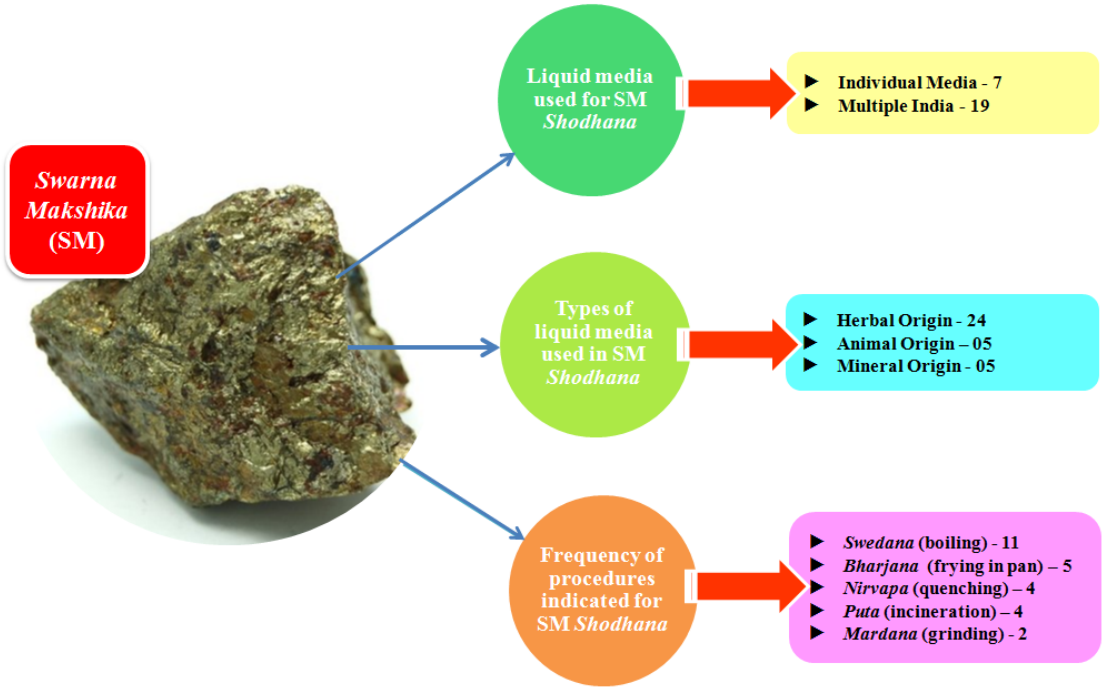
37. Dwivedi Vishwanath. Rasendra sambhav. 1st Ed. Krishnadas academy, Varanasi; 1997.
38. Acharya Vishram. Anupana manjiri. 2nd Ed. Gujarat Ayurved University, Jamnagar. Sahitya Sanshodhan Vibhagiya Prakashan; 1972.
39. Mishra Siddhinandana. Abhinava navajeevanniyam. 1st Ed. Varanasi: Chaukhambha Orientalia; 2000.
40. Bajpai Rameshwar Dayal. Rasa dipika. 1st Ed. Varanasi; Chaukhmbha Krishnadas academy; 2003.
41. Krushnanand. Rasatantrasaar and Siddhaprayog Sangraha. 21st Ed. Kaleda: Krushna Gopal Ayurved Bhavan; 2012; p.28.
42. Shyamsundaracharya Vaishya. Rasayana sara Vol. II. Varanasi: Krushnada Acadamy, 2002; p.285-86.
43. Mustafa Gulfen, Ali Osman Aydin. Dissolution of Copper from a primary chalcopyrite ore calcined with and without Fe_2O_3 in sulphuric acid solution. Indian Journal of chemical technology. 2010;17:145-9.
44. Swarup and Saxena. Elements of Metallurgy.13th Edi. In: Priciples and processes of extractive metallurgy. Merrut: Rastogi publications; p.283.
45. Pemsler J Paul. Recovery of copper from chalcopyrite. US Patent number US 3880650 A, by Kennecott Copper Corp. Available from: https://www.google.ch/patents/US3880650, lat accessed on 02/04/2017.
46. Michael Mourad Hanna et al. Treatment of roasted metal sulphide ores and ferrites by leaching with peroxysulphuric acid. European patent, applicant- Protium Metals Inc, PCT/CA1999/000536.2001. Available from: http://www.google.com/patents/EP1086256A1?cl=en, last accessed on 02/04/2017.
47. Sudhaldev Mohapatra, CB Jha. Analytical study of raw Swarna Makshika (Chalcopyrite) and its Bhasma through TEM and EDAX. AYU, 2013;34(2):204–8.
48. Sudhaldev Mohapatra, CB Jha. Physicochemical characterization of Ayurvedic bhasma (Swarna makshika bhasma): An approach to standardization. International Journal of Ayurveda Research, 2010;1(2):82–6.
49. Shivanand T Biradar, Galib, Prajapati PK. Haratala Shodhana- a review through rasa classics. Global Journal of Ressearch of Medicinal Plants & Indigenous Medicine 2016;5(3):107–13.
50. Agnivesh. Charakachandrika hindi commentaty of Charaka Samhita. Sutra 1/124-7 Bramhanand Tripathi Editor. Varanasi: Chaukhambha Surbharati Prakashan; 2009; p.46-7.
51. Chaudhari SY, Jagtap CY, Galib R, Bedarkar PB, Patgiri B, Prajapati PK. Review of research works done on *Tamra Bhasma* (Incinerated Copper) at Institute for Post-Graduate Teaching and Research in Ayurveda, Jamnagar. AYU 2013;34(1):21-5.
52. Amol H. Waghmare, Nilima S. Dharkar, Yadunath C. Waykole, Mangesh M. Udmale and Deepak S. Thorat. Pharmaceutical and physico-chemical study of Tamra bhasma (incinerated copper). World Journal of Pharmacy and Pharmaceutical Sciences 2016;5(8):1432-41.
53. Pattnaik N, Acharya RK, Das AK. Role of Shodhana (purification) in the pharmaceutical processing of Tamra Bhasma and its physico-chemical characterization. International Journal of Current Research in Chemistry and Pharmaceutical Sciences 2016;3(11):33-8.
54. Sudheendra Honwad, Reena Mahagonkar. Concept of Shodhana and its effect with special reference to Tamra (Copper). International Journal of Research in Ayurveda and Pharmacy 2012;3(1):51-4.
55. Jagtap CY, Ashok BK, Patgiri BJ, Prajapati PK, Ravishankar B. Acute and subchronic Toxicity Study of Tamra Bhasma (Incinerated Copper) prepared from Ashodhita (Unpurified) and Shodhita (Purified) Tamra in Rats. Indian Journal of Pharmaceutical Sciences 2013;75(3):346–52.
56. Jagtap CY, Ashok BK, Patgiri BJ, Prajapati PK, Ravishankar B. Comparative anti-hyperlipidemic activity of Tamra Bhasma (incinerated copper) prepared from (purified) and Ashodhita Tamra (raw copper). Indian Journal of Natural Products and Resources 2013;4(2):205-11.
57. Acharya RN. Conservation, cultivation and exploration of therapeutic potential of Medicinal plants, Edition: 1, Chapter: Exploration of Therapeutic potential, Publisher: Central Council for Research in Ayurvedic Sciences, New Delhi, Editors: Abhimanyu Kumar, M M Padhi, N Srikanth, BP Dhar, A K Mangal; p.427-50.
58. Dhamankar PV. Ayurvediya Aushadhi dravya Shodhana Vidhi. Mumbai. Dhootpapeshwar Limited; 1888.
59. Agnivesha. Charakachandrika hindi commentaty of Charaka Samhita. Sutra 11/17 Bramhanand Tripathi Editor. Varanasi: Chaukhambha Surbharati Prakashan, 2009; p.230.
60. Devanathan R. A Review on Swarna Makshika. International Research Journal of Pharmacy 2011;2(9):1-5.
61. The Ayurvedic Pharmacopeia of India. Part I, Vol. VII. New Delhi: Dept of AYUSH, Ministry of Health and Family welfare, Government of India,; 2008; p.36-7.
62. Deepali Prakash Patil, Mangala Jadhav. Comparative study of physico-chemical Characteristics of swarnamakshik by different Shodhan methods w.s.r. to Rasaratna samuchchya. World Journal of Pharmaceutical Research 2017;6(2):1340-52.
63. Copper Toxicity. Available from: https://en.m.wikipedia.org/wiki/Copper_toxicity (Last Accessed on 11/03/2017)
64. Ilanchezhian R, Roshy JC, Acharya R. Importance of media in Shodhana (purification/Processing) of poisonous herbal drugs; Ancient science of life 2010;30(2):54-7.
65. The Ayurvedic Formulary of India. Part I-B, Appendices Shodhana-53. New Delhi: Dept of AYUSH, Ministry of Health and Family welfare , Government of India; 2008.
66. Ramesh Kumar Gupta, Jha CB. Standard manufacturing procedure of Makshika Bhasma. International Journal of Ayurvedic Medicine 2013;4(4):361-6.
67. Neetu Singh, Anand Chaudhary. Pharmaceutical Standardization of Swarna Makshika Bhasma. International Journal of Pharmaceutical & Biological Archives 2013;4(2):361-5.
68. Sumer singh, Laxmikant Dwivedi, Ramesh Kuamr Gupta, Seema Rana. Standard Manufacturing Procedure of Makshika Satva Bhasma. International Journal of Research in Ayurveda & Pharmacy 2015;6(1):43-6.
69. Devanathan R. Pharmaceutical and Anlytical studies on Swarna Makshika Bhasma - An Ayurvedic formulation. Asian Journal of Pharmaceutical and Clinical Research 2013;6(1):27-9.

ABOUT AUTHOR/S

Dr. Krushnkumar Taviad obtained his MD Degree from Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, Jamnagar in 2016. He is now pursuing PhD in Dept. of Rasashastra & Bhaishajya Kalpana, Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, Jamnagar, India. KT made substantial contributions to conception and design of the work, literature search, acquisition of data, analysis and interpretation of data; and manuscript preparation. **Dr. Shweta Vekariya** obtained her MD Degree from Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, Jamnagar in 2015. She is now pursuing PhD in Dept. of Dravyaguna, Institute for Post Graduate Teaching & Research in Ayurveda, Gujarat Ayurved University, Jamnagar, India. She has contributed in literature search, acquisition of data and manuscript preparation. **Dr. Prashant Bedarkar, MD (Ayu)** is currently serving as Assistant Professor in Department of Rasashastra and Bhaishajya Kalpana at Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar, India. He has more than 10 Years PG Teaching in concerned subject. Guided 07 theses, authored around

20 research articles and investigated 1 projects as PI. PB participated in drafting the article and revising it critically for important intellectual content. **Dr. Galib Ruknuddin, MD (Ayu) PhD** is currently serving as Associate Professor in Department of Rasashastra and Bhaishajya Kalpana at All India Institute of Ayurveda, New Delhi. Previously, he served at IPGT & RA, Gujarat Ayurved University, Jamnagar till October 2016. He has more than 10 Years PG Teaching in concerned subject. Guided more than 20 theses, contributed around 10 chapters and investigated 3 projects as PI / Co-PI. GR participated in drafting the article and revising it critically for important intellectual content. **Prof. BJ Patgiri, MD (Ayu) PhD** is currently serving as Professor and Head in Department of Rasashastra and Bhaishajya Kalpana at Institute for Post Graduate Teaching and Research in Ayurveda, Gujarat Ayurved University, Jamnagar-361008, Gujarat, India. He has more than 16 Years PG Teaching in concerned subject. Guided more than 40 theses, authored around 170 research article, 3 monographs and investigated 4 projects as PI / Co-PI. BJP gave final approval of the version to be submitted and revised version.

GRAPHICAL ABSTRACT



Cite this article as: Krushnkumar T, Shweta V, Prashant B, Galib R, Biswajyoti P. *Svarṇa Mākṣika Śodhana* - A Review through Rasa classics. J Ayu Med Sci 2017;158-64. DOI: 10.5530/jams.2017.2.11